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A Philosophical Approach to CETI:
Developing a Conceptual Framework Based on Umwelt Theory

Master's Thesis in Philosophy

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Introduction

What if scientific research that has captured our imagination for decades and became the subject of science fiction books and movies has relied on fundamentally flawed assumptions? Communication with extraterrestrial intelligence (CETI) research might be one of our most ambitious and interesting scientific pursuits, yet its philosophical foundations have remained largely unexamined.

The argument of the CETI research can be outlined as follows: (1) If extraterrestrial intelligence (ETI) exists, it would possess features and technology similar to those of human beings; (2) If communication with ETI is possible, it would be via the transmission of information by radio telescopes (or similar signaling technologies); (∴) Researchers should send and expect to receive radio signals for CETI.

In this thesis, I aim to develop a conceptual framework to address the problematic assumptions underlying the premises of the CETI argument. I claim that based on this framework, CETI should be divided into two distinct research areas: the search for extraterrestrial organisms (SEO) and the discovery of terrestrial types of intelligence (DTI).

In the first section, I argue that the CETI argument is unsound. First, I demonstrate that the assumption of anthropocentric intelligence underlying the first premise is problematic because it solely relies on the generalization based on a single case, which is human intelligence. Second, the information transmission model of communication underlying the second premise is problematic because the definition of "information" includes the existence of "meaning," which is only relevant in the human context and is not universal across all species. Thus, I conclude that the conclusion of the CETI argument is unsupported, and it has misguided this research. I claim that a conceptual framework is needed for CETI and any kind of research concerned with the communication of non-human species. Thus, I propose three principles this framework must meet to move away from the above-mentioned anthropocentric assumptions and provide a foundation for understanding non-human communication more broadly.

In the second section, I develop a conceptual framework based on Umwelt theory, which explains the subjective worlds of organisms. By doing this, I address the problematic innate anthropocentrism within CETI. After, I introduce the term "commonage," which explains the shared aspects of the Umwelten among organisms, to address the necessary common grounds for "communication." Once the diversity of the worlds of organisms and the necessary common grounds were addressed, I propose a new definition for

“communication” as the exchange of signs among organisms based on their commonage. In the end, I propose a new definition of “intelligence” as a relational feature emerging from the relationships of organisms.

The third section focuses on this framework's implications within CETI and other disciplines. Based on the proposed definitions of “intelligence” and “communication,” I argue that CETI should be divided into two different research areas: the search for extraterrestrial organisms (SEO) and the discovery of terrestrial types of intelligence (DTI). I also briefly discuss the implications of this framework within philosophy and semiotics as well, mainly regarding the novel approaches and definitions that I introduced for “commonage,” “communication,” and “intelligence.”

In the last section, two objections are raised against the proposals of this work. First is Susan Schneider's argument for possible non-biological ETI (NBE). According to this, if NBE is accepted, then ~ CFU (my proposed conceptual framework based on Umwelt) follows, as NBE provides a simpler explanation. As a response, I propose two *reductio ad absurdum* arguments following the same reasoning as NBE. Accepting these would be a contradiction for the supporters of NBE, and the rejection would imply the rejection of NBE as well. The second objection is the possibility of mathematics-based cosmological language (LINCOS). According to this, if LINCOS, then ~ CFU, again, because LINCOS is a simpler explanation. In response, I introduce philosopher Andre Kukla’s criticism of similar proposals. I also point out the overreliance of LINCOS on the generalization from a single case. This overreliance is problematic as long as there is no strong argument for the proponents of LINCOS.

1. Critique of the CETI Argument and A Need for Conceptual Framework

In this section, I focus on the CETI argument, which claims that we should send and expect to receive radio signals for this research, relying on the premise that ETI would have technology similar to ours and that communication with them would be based on the transmission of information. This argument is unsound, as it relies on problematic assumptions that ETI possesses human-like intelligence, and that communication is universally based on the information-transmission model (encoding and decoding of messages).

Afterward, I conclude that this unsound argument has misguided the CETI research. I claim that a conceptual framework is necessary for addressing the philosophical gaps in

our understanding of “communication” and “intelligence,” which, in turn, can be used not only by CETI but also by other interdisciplinary fields such as animal research, zoosemiotics, comparative psychology and more.

1.1 CETI within Philosophy

Philosophers have paid little attention to CETI over the past decades (Beck, 1971, 5; Ruse, 1985, 44; Antonites, 2013, 72; Eklund, 2024, vii). For this reason, it is unsurprising that there have been even fewer philosophical works questioning the assumptions underlying the CETI argument. Here, I briefly analyze these.

The philosophical works that attempted to challenge the assumption of ETI possessing human-like intelligence failed to address the deeper problem within philosophy: the vagueness of our understanding of intelligence. For example, philosophers like Mayr (1985), Kukla (2010), and Ćirković (2014) focus on the debates about whether evolutionary convergence - different species evolving similar functions or physiologies based on different evolutionary processes (Bakker, 2017, 3) - of human “intelligence” is probable or not. However, these above-mentioned philosophical works mostly overlook an in-depth conceptual analysis of intelligence itself.

Other philosophical contributions to CETI focus more on the history of ETI within philosophy (Kukla, 2010; Crowe, 2008). Some others further speculate on ETI. For example, according to Susan Schneider, ETI would likely be superintelligent AI rather than a biological organism (Schneider, 2019). Similarly, Bakker (2017) argues that based on the possibility of evolutionary convergence, we would come across what he calls “humanoid convergian” ETI (human-like ETI). More comprehensive analyses of the CETI have also been conducted, often concluding that it is not worth spending millions on this research, for example, Kukla (2010) and Mayr (1985). Works such as Narveson (1985) also focused on CETI's political and ethical implications. Scenarios like humans being enslaved or occupied by ETI have attracted some interest.

A proper philosophical critique of CETI should involve a detailed analysis of the CETI argument and examine its underlying assumptions. It should either provide clarity to the core concepts of the research or acknowledge the vagueness of them. The persistent lack of engagement by philosophers in this area would be acceptable only if there were a consensus regarding the definitions of “intelligence” and “communication” within philosophy, independently from CETI. However, as we will see in this work, this has not been the case.

1.2 CETI Argument, Underlying Assumptions, and Their Refutation

In this section, I introduce the CETI argument, its premises, and its underlying assumptions. After introducing each assumption, I also provide the refutation of it.

The CETI argument outlined here is not explicitly stated in the works of scientists or philosophers but is constructed based on key patterns in the two comprehensive collections focused on CETI, *Interstellar Communication* (1974) and *Xenolinguistics* (2024). There are two main reasons behind choosing these two collections. First, these works compile papers from the experts of the disciplines involved in CETI, such as astronomy, astrophysics, computer sciences, animal cognition and communication, primatology, neuroscience, linguistics, cognitive science, and so on. Second, the five-decade gap between these two works allows for a comparative analysis of changes and persistent patterns within CETI across the disciplines.

The argument of the CETI research can be outlined as follows:

Premise 1: If ETI exists, it would possess features and technologies similar to those of humans.

Premise 2: If communication with ETI is possible, it would be via the transmission of information by radio telescopes (or similar signaling technologies).

Therefore, researchers should send and expect to receive information via radio signals for CETI.

In the following subsections, I analyze both premises, explain their underlying assumptions, and refute them. At the end of this section, I discuss how these flawed assumptions have misguided the research over the past decades.

1.3 Assumption Underlying Premise 1: Anthropocentric Intelligence

Here, I demonstrate that in both works, it is assumed that ETI would possess human-like features and technologies.

In *Interstellar Communication* (1974), we see features taken from human experience, history, and culture being ascribed to ETI by most scientists. For example, most scientists included in this collection assume that ETI would develop technologies similar to those of ours, such as radio telescopes (Cameron, 1974, 44; Ponnamperuma, 1974, 46; Bracewell, 1974, 102; Drake, 1974, 118; Oliver, 1974, 143; Morrison, 1974, 177). Others even further argue that ETI should be a technological civilization with similar interests to ours (Sagan, 1974, 20; Cameron, 1974, 27; Bracewell, 1974, 102; Drake, 1974, 118; Morrison, 1974,

175). When it comes to finding the planets that ETI might be inhabiting, Sagan argues that there are specific artifacts of "intelligence" detectable via space observations, such as roads, cities, changes in rivers, etc. He concludes that intelligence has "a tendency to control and acquire information from its environment" (Sagan, 1974, 17). More anthropocentric patterns can be found in this collection. However, what we need to focus on is the fact that the above-mentioned works ascribe human-like features to "intelligence" rather than first analyzing and proposing a clearer definition of what "intelligence" is and then speculating about the extraterrestrial versions of it. The implicit assumption of anthropocentric intelligence is underlying the first premise of the CETI argument.

Now, let us travel in time for five decades and analyze the second comprehensive work, *Xenolinguistics* (2024), edited by Douglas Vakoch, president of the Messaging Extraterrestrial Intelligence (METI) organization. The attribution of human-like features to ETI also remains persistent in this work. Again, nearly all the papers in this collection expect ETI to possess highly advanced human-like technologies (Pepperberg, 2024, 54; Berea, 2024, 63; Granger et al., 2024, 75). We also see that there is an expectation of human-like language possession among ETI (Hobaiter et al., 2024, 23; Ortner, 2024, 39; Berea, 2024, 63; Bowern, 2024, 97; McKenzie, 2024, 110). It is visible that after five decades, the assumptions of the scientists involved in CETI have not changed in its essence.

Based on the examples from both collections, we can conclude that an anthropocentric approach to intelligence has been widespread within CETI. This assumption is the underlying basis of the argument's first premise: if there is ETI, then it would have features and technologies similar to those of humans. In the following subsection, we see that there has been no strong argument, evidence, or justification for this assumption.

1.3.1 Refutation of Premise 1: Lack of Justification for Anthropocentric Intelligence

First, I present criticisms of this approach from the previously discussed works. We see the arguments that the above-mentioned anthropocentric approach to "intelligence" is not justified, and there is no strong evidence for it. Second, I analyze the concept of "intelligence" within philosophy and show that there is no consensus or a clear definition for it, even independently of CETI. Therefore, the first premise is refuted altogether without maintaining the anthropocentric intelligence assumption. Lastly, I introduce a recent definition of "intelligence" proposed by philosopher Dimitri Coelho Mollo. I argue that even this recent definition of "intelligence" cannot avoid anthropocentrism.

Already in *Interstellar Communication* (1974), physicist Philip Morrison explained what we mean by "intelligence." According to him, the anthropocentric assumption is problematic, and we have no strong justification for it. He explains that the anthropocentric approach is based on the assumption of evolutionary convergence of human "intelligence." However, using a single example of the evolution of intelligence among humans to generalize the nature of intelligence requires strong evidence. Regarding whether this generalization is valid or not, he acknowledges that we simply do not have a "...sufficiently strong theory to answer that" (Morrison, 1974, 183). Even though he provides examples of evolutionary convergence among different species regarding certain biological features, he admits that this does not provide a good reason for expecting human-like species via different evolutionary paths (Morrison, 1974, 184). Some philosophers also raise this "N=1 argument" that we simply cannot make an inductive inference based on a single example (Raup, 1985, 35; Kukla, 2010, 7, 58; Mariscal, 2015, 120). Throughout *Interstellar Communication* (1974), as Morrison also indicated, we do not see a strong argumentation or reasoning for the assumption and expectation of human features, which we acquired through biological and cultural evolution, among ETI.

Similarly, in *Xenolinguistics* (2024), the zoologist Arik Kershenbaum explains how language is on top of a long biological, social, and cultural evolution. The assumption of the existence of human-like language among ETI implicitly includes the similar, if not the same, preceding biological, social, and cultural evolution (Kershenbaum, 2024, 12). As we have seen previously, we have no grounds for such assumptions. As Kershenbaum also points out, the assumption of the existence of something like language among ETI requires the assumption of the conditions that led our ancestors to develop language. Thus, we cannot assume the existence of language among ETI or other non-human species in isolation. We also need to expect a very similar evolution to ours, which led to the evolution of language. This assumption is clearly much stronger or heavier and, therefore, more challenging to maintain or have a strong argument for compared to the assumption of the existence of language "in isolation" among other non-human species. Again, we have not seen any convincing argument proposed for this assumption from its supporters.

After seeing the criticisms, let us return to the concept of "intelligence" within philosophy. Here, I demonstrate that even independently from the CETI research, this concept has been vague and lacks a clear definition. I claim that there is insufficient work within philosophy regarding the concept of "intelligence," which is one of the main reasons this term has been used vaguely and anthropocentrically. I also focus on one recently

proposed definition of “intelligence” by Coelho Mollo. After analyzing his approach, I show that even his definition does not escape anthropocentrism and cannot be suitable for CETI research.

Even the most recent papers on "intelligence" indicate that the philosophical work on this concept has been minimal, and there is no consensus over its definition (Coelho Mollo, 2024, 705; Curry, 2021, 162; Glock, 2019, 652; Dumouchel, 2019, 241; Kukla, 2010, 60). Neither within philosophy nor within the works that were introduced previously on CETI do we see a proposed specific definition. Thus, the concept stayed vague, with anthropocentric features inscribed without justification. Unless there is a clear definition and an agreement on a specific usage of this term, these problems will stay persistent.

However, recently, Coelho Mollo took up the challenge of defining “intelligence.” He provided an in-depth analysis of the concept to propose a definition with a distinctive theoretical and explanatory power (Coelho Mollo, 2024, 707). To achieve this, he introduces five *desiderata* based on the characterizations of “intelligence” within the dominant disciplines. These *desiderata* are species-neutrality (no privilege to one species over others), origin-neutrality (no privilege to one type of origin - biological - over others), multiple realizability (diversity of different underlying mechanisms - that may give rise to “intelligence”), epistemic distinctness (a distinctive theoretical and explanatory role - not a different version of similar concepts like cognition and rationality), and responsiveness to scientific practice (respond to and refine the use already made of the notion in the relevant sciences) (Coelho Mollo, 2024, 708). In this work, I do not further question the *desiderata* proposed by Coelho Mollo and adopt it as it is. However, I analyze the definition he introduced, which, according to him, fulfills four out of five of these *desiderata*. Here is Coelho Mollo’s definition of "intelligence":

> An intelligent system S is a system that manifests behaviours that are often enough: **general**, i.e. that are appropriate in a variety of different circumstances; **flexible**, i.e. that change appropriately in light of changed, novel, or uncertain circumstances; **goal-directed**, i.e. that are appropriate in light of goals S plausibly possesses; **adaptive**, i.e. that change appropriately in light of previous interactions with the world. (Coelho Mollo, 2024, 710)

Prima facie, this definition seems to fulfill the proposed *desiderata*. He claims that it only leaves epistemic distinctness out. It may even be implemented within CETI since he expects this definition to be used in other disciplines as well. However, I do not agree that

his definition actually fulfills the four *desiderata* that Coelho Mollo claims it does. Here, I write down why.

Firstly, Coelho Mollo's definition of intelligence (hereafter, CMI) does not meet the species-neutrality *desideratum*. He criticizes the ascription of certain human behaviors, such as "language use" or "doing predicate logic," as being anthropocentric. However, he does not explain how the **general**, **flexible**, **goal-directed**, and **adaptive** behaviors escape anthropocentrism. In fact, there are two anthropocentric problems with his definition.

First, he claims that we can easily observe and test the behaviors of organisms and systems to determine their intelligence (Coelho Mollo, 2024, 710). However, we humans, due to our biological, social, and cultural evolution, have a specific environment/world that we live in. The world that surrounds us, in which we observe the behaviors of other human and non-human species, is exclusive to humans. He does not explain how observation, testing, and comparison can address the problem of being bound to the human world. It is true that we can observe non-human species in their natural habitats (forests, water bodies, etc.) and assess whether the observed behaviors of these organisms within their environmental conditions fit CMI. However, the observable behaviors of these organisms are still limited by our human condition (biological organs and technological tools). For example, imagine that non-human species (A) actually demonstrate behaviors that meet CMI but on a wavelength, speed, or style that we are not able to detect. Thus, we focus and assess only the behaviors that we are able to detect. We are still doing these observations within the world that we live in, not within the worlds that these organisms actually belong to. Assessing the behaviors of non-human systems under human conditions means that anthropocentrism is still present, and this way of understanding "intelligence" is not species-neutral.

The second problem related to the fulfillment of the species-neutrality *desideratum* is closely connected to the first one. It is the proposed manifestation of intelligent behaviors. According to Coelho Mollo, these manifestations do not give any species a privilege over another. However, we cannot see why **general**, **flexible**, **goal-directed**, and **adaptive** behaviors are chosen as manifestations of intelligence. We can see that human behaviors meet these requirements. In fact, it may seem like many other non-human species might meet these requirements, too. However, when analyzed further, each of these factors has innate anthropocentric features. For example, all four above-mentioned factors include displaying appropriate behavior, yet it is vague what does "appropriate" means in this context. Coelho Mollo does not explain this. Or, according to him, **flexibility** is changing in the light of

change. However, this is very general, and it is not clear how we would be able to assess it. For example, is the lamp flexible when it brightens the room when the conditions are changed - the light switch is turned on? In addition, **goal-directedness** and **adaptivity** require familiarity with the worlds of these non-human species. Yet, as I demonstrated in the previous paragraph, our observations of these organisms are bound to our human condition. The four behavioral factors of CMI are rooted in human experience and the human world. Although it applies to some non-human species, too, it heavily relies on certain conditions that have clarity within the human context, such as "appropriateness." Thus, it seems like we are still not escaping anthropocentrism. What we are doing is simply changing the very obvious anthropocentric features, such as "doing predicate logic," with more implicit ones, such as demonstrating "goal-directed" behaviors.

The other problem with CMI is the fulfillment of the multiple realizability *desideratum*. As explained earlier, CMI does not meet the species-neutrality *desideratum*. The function(s) of "intelligence" that can be understood from his definition is based on human features and experiences. The multiple realizations that we expect "intelligence" to have are actually certain human-specific functions, which is problematic and lacks proper reasoning. It is necessary to meet the species-neutrality *desideratum* in order to meet the multiple realizability *desideratum* as well. Otherwise, philosophers end up with confusion. For example, philosopher Alex Antonites, writing on CETI research, without questioning or explaining what "intelligence" is, argues that the minds of extraterrestrial intelligence should be similar to our minds and "aliens can't be too alien" (Antonites, 2013, 71, 83) It is clear that these kinds of conclusions are problematic, rushed, and not giving addressing the existing problems with the understanding of "intelligence".

Based on my concerns regarding the species-neutrality and multiple-realizability *desiderata*, we can conclude that CMI does not fulfill four out of five proposed *desiderata*. This definition cannot be suitable for CETI research either, mainly because it does not escape anthropocentrism.

Conclusion:

In this subsection, we have seen criticisms against the anthropocentric approach to "intelligence" within the scientists involved in the CETI research. These criticisms were mainly focused on the problematic generalization of "intelligence" based on a single example of human evolution. According to these scientists and some philosophers, we have

no good reasoning or justification for maintaining the anthropocentric intelligence assumption.

Later, we explored the state of "intelligence" within philosophy independently from the CETI research. We addressed the vagueness of the concept of "intelligence" within philosophy. For this reason, we focused on one of the recently proposed *desiderata* for the defining "intelligence" by Coelho Mollo. I argued that CMI does not fulfill the species-neutrality and multiple-realizability *desiderata.* Therefore, this definition also fails to escape anthropocentrism and is unsuitable for CETI research.

Considering that the scientists involved in CETI also acknowledge the problems of the anthropocentric intelligence assumption, the vagueness of "intelligence" outside the CETI research, and the failure of even the most recent definitions to escape anthropocentrism, I conclude that there is simply no good reason to maintain the assumption underlying the first premise, namely, anthropocentric intelligence assumption. Without this assumption, the first premise is refuted. Even if there is ETI, we have no reason to expect it to have features and technology similar to that of human beings.

1.4 Assumption Behind Premise 2: Information-Transmission Model

Neither *Interstellar Communication* (1974) nor *Xenolinguistics* (2024) provides a clear definition of "communication." However, in both collections, we see that the communication with ETI is assumed to be based on the information-transmission model of communication. For example, in the former work, we repeatedly see that communication is understood as sending and receiving information through various channels of transmission (Arbib, 1974, 73; McCarthy, 1974, 84; Drake, 1974, 127; Oliver, 1974, 166). Similarly, in *Xenolinguistics* (2024), we see that the information is understood as something to be encoded and decoded (Kershenbaum, 2024, 10; Hobaiter et al., 2024, 18; Herzing, 2024, 36), which would be conveyed, shared or transmitted (Kershenbaum, 2024, 6; Hobaiter et al., 2024, 21; Herzing, 2024, 33; Pepperberg, 2024, 52; McKenzie, 2024, 110). Once again, the information-transmission model is assumed in CETI research without explicit justification.

1.4.1 Refutation of Premise 2: Unsuitability of the Information-Transmission Model

Here, I analyze "communication" within philosophy and raise criticisms against the information transmission model from both philosophy and semiotics. Later, I will introduce my criticisms against using this model and explain why it is not suitable for research like CETI.

Giacomo Turbanti, philosopher of communication, summarizes the state of "communication" within philosophy as being mostly understood as the information transmission model of communication (Turbanti, 2022, vi). Philosophical works written on CETI also use the concept of "communication" in this way, such as Gaston Asla (2016), Schneider (2019), and Bakker (2017).

According to the code model, encoded information is sent and/or transmitted through a channel and decoded by the receiver (Turbanti, 2022, 12). Turbanti claims that the information model falls short when it comes to providing explanations regarding the crucial aspects of communication, such as interpretation and understanding. His main argument against the model is the lack of contextual information in the processes of communication. According to him, neither decoding the encoded information nor the "code" that is used gives the contextual information (Turbanti, 2022, 48). Thus, he concludes that the code model is not sufficient even for explaining human communication

On the other hand, semioticians Donald Favareau and Kalevi Kull explain that the "information" understood in the information transmission model of communication is highly technical, mechanistic, and not appropriate for the investigation of living beings. According to them, this model does not address the meaning and understanding of the sender and receiver of the information (Favareau, Kull, 2024, 35). Thus, it is clear that the information transmission model of communication is not suitable for understanding "communication" and addressing the crucial elements of it.

While agreeing with the above-mentioned concerns, I have two different criticisms regarding the usage of the information transmission model of communication for our inquiry. My first criticism is against the assumption of "objectively existing information in the world," which can be encoded and decoded. To understand this, we must ask ourselves what "information" means. According to the theoretical physicist Benjamin Schumacher, information has two components: the physical medium (sound, radio wave, electrical signals, etc.) and the message that is being carried via these physical mediums (Schumacher, 2015, 4). When we approach the mathematician C.E. Shannon's definition of information, "Information is the ability to distinguish reliably among possible alternatives" (Schumacher, 2015, 6). Based on these definitions, information is not just physical (sound, light, radio waves, etc.) but also the message it carries. As per Shannon's definition, it is the ability to distinguish reliably. This ability should belong to an organism/system, and the part about reliability is about getting the message out of physical mediums of information. Then, for the information model to be suitable for CETI research or the communication of any non-

human species, the message that the physical medium would carry must be shared among the organisms participating in this interaction. Whether the receiver could decode what the sender encoded is a different problem. Information theory and the information transmission model of communication fail to address the above-mentioned requirement because the physical mediums that are considered as information are the ones that carry a message that is only relevant to us humans. The "information in the world" is, actually, "the information in the human world," not independently of it according to the definition of "information." That is to say, once there is no human (or human technology) to distinguish the message from its physical medium reliably, there will be no information. Thus, this model of communication is not suitable for CETI as it fails to address how the human-relevant messages would be familiar to ETI as well.

My second criticism is that even if my first criticism is refuted, that information as we know it indeed objectively exists in the world, it does not entail that other non-human species/systems experience and understand it in the same way that we do or in the same way that the information objectively exists. By using the information transmission model of communication for research like CETI, or any research concerning the communication of organisms belonging to different species (interspecific communication), we are either projecting the human world/environment to non-human species/systems or we are assuming that these species/systems experience the objective world directly. We have no good reason or justification for either of these assumptions. There is no reason to expect that other non-human species/systems would experience the world as it is or the way we humans experience it. We are undermining the possible diversity of worlds of non-human species. Therefore, this is not a suitable model of communication to start with for research like CETI or for any interspecific communication.

Conclusion:

In this subsection, we have seen three criticisms against the information transmission model of communication. First, Turbanti's criticism that this model leaves the context outside the process of "communication." Second, Favareau and Kull argue that this model leaves out meaning and understanding of the senders and receivers participating in "communication." Third, my two criticisms: (1) "information" by definition exists in the human world, and we have no evidence or argument to assume the existence of the messages outside the human context, thus making this model of communication unsuitable for CETI; (2) even if information (as we know it) exists in the world independently of us, we have no reason to assume that other non-human species/systems experience that objective world.

Based on these, we concluded that the information transmission communication model is unsuitable for CETI or any other interspecific communication. Therefore, even if communication with ETI is possible, it would not be via the transmission of information.

1.5 Conclusion of the First Section: The Unsoundness of the CETI Argument

In this section, I demonstrated that the CETI argument is unsound by refuting its flawed anthropocentric assumptions about intelligence and communication.

We saw that the anthropocentric approach to intelligence, which was based on the possible evolutionary convergence of human intelligence, fails due to relying on the problematic generalization from a single example. In addition, we analyzed the concept of intelligence within philosophy independently of CETI. I focused on Coelho Mollo's recently proposed definition. I argued that his definition does not fulfill two crucial desiderata out of the five he proposed: species neutrality and multiple-realizability. Thus, his definition, too, fails to escape anthropocentrism.

Afterward, I focused on the information transmission model of communication. I presented criticisms from philosophy and semiotics against this model due to its failure to address context, meaning, and understanding of "communication." Later, I pointed out that, per Schumacher and Shannon's definitions, "information" exists within the human world, not independently of it. However, I also argued that even if "information" existed independently of human beings, we would still have no good reason to expect other non-human species to experience it in that objective way.

The assumptions behind the premises of the CETI argument are flawed, and they should not be maintained. Without these assumptions, both premises of the CETI argument are refuted, and its conclusion is unsupported. The CETI argument is unsound.

1.5.1 Unsupported CETI Argument: Misguidance of the Research

If the argument does not provide enough reason for its conclusion, what are the implications of this unsupported conclusion within CETI research? Here, I briefly demonstrate that this unsupported conclusion of the CETI argument has misguided the research over the past several decades. I aim to analyze whether any scientific findings or historical events might have directed the research toward this conclusion, independently of the CETI argument, which would compete with or bypass my criticisms in this section.

Nathalie Cabrol, an astrobiologist and director of the Carl Sagan Center for the Study of Life in the Universe, wrote a short but influential philosophical reflection on this research. She analyzed the historical events within science, which have directed this research to where it is now. To summarize her reflections, (1) scientists had no supporting data and justifications for the anthropocentric understanding and usage of the notions within the research, especially for "life," "intelligence," and "communication" (Cabrol, 2016, 3) and (2) the research need an "umbrella" vision or framework which would move away from the anthropocentrism and can be used and contributed by the disciplines involved in the research (Cabrol, 2016, 9) We can see that there is a precise alignment between the conclusion of this paper and the reflections of Cabrol, who has been involved in the research for many years. It is clear from both threads that the unsupported conclusion of the CETI argument has misguided the research.

1.5.2 A Need for Conceptual Framework

I agree with Cabrol's conclusion that there is a need for an "umbrella" framework. I claim that a framework like this should be developed based on the following three principles. First, the diversity of worlds of different species must be the basis of this framework. Second, a new communication theory should be developed based on the diversity of the worlds of organisms and the necessity of having common grounds among organisms. Third, a new definition of "intelligence" should be proposed to meet Coelho Mollo's desiderata. Such a framework developed based on these three principles can be used within CETI and across disciplines such as zoosemiotics, comparative psychology, animal research, philosophy of mind, science, and many more.

2. The Conceptual Framework

As concluded in the previous section, an "umbrella" framework providing clear definitions for "communication" and "intelligence" while addressing the diversity of the worlds of organisms is needed, not only for CETI but also for many other disciplines that are involved with the "communication" of non-human species. In this section, I develop a conceptual framework to meet these requirements.

This framework is developed based on the biologist Jakob von Uexküll's Umwelt theory. As we will see in the following paragraphs, Umwelt is the subjective surrounding world of each organism. The starting point of the Umwelt theory is the diversity of worlds

of organisms, which is the way to decentralize the human world, the anthropocentrism that has been so innate, as we have seen in the previous section. As the philosopher Brett Buchanan writes regarding Uexküll's *A Stroll Through the Worlds of Animals and Men* (1934), Uexküll guides the reader to move away from the anthropocentric view of the world and understand how and why this world of ours is not necessarily shared by other organisms (Buchanan, 2008, 187). Uexküll articulates and clearly explains the difference between the subjective worlds/environments of organisms. As the theoretical philosopher and biologist Kristian Köchy writes, Uexküll's approach gave us the grounds for discussing the subjective worlds of the organisms (Köchy, 2020, 57). According to Uexküll, when investigating an animal, it is necessary for observers to differentiate the "signs" and "indicators" of their own world from those of the animals (Uexküll, 1926, 78). Due to the clarity and success of Umwelt theory in bypassing the problem of anthropocentrism, I developed my conceptual framework based on Umwelt theory.

After establishing the diversity of the worlds of organisms, it is crucial to explain the necessary sharedness or common grounds that are required for any kind of "communication" to take place. Such a requirement has been indicated by philosophers, semioticians, and also scientists involved in CETI (Turbanti, 2022; Kershenbaum, 2024, 10; Hobaiter et al., 18). Even in the information transmission model of communication, there is a "code" that needs to be shared between the sender and receiver, based on which information is encoded and decoded. Otherwise, "communication" cannot take place. To address this requirement, based on Umwelt theory, I introduce the notion of "commonage" as being the shared aspects of the worlds of organisms. These shared aspects of worlds are dependent on the shared biological features and experiences of organisms. Once the necessary common grounds are addressed by the introduction of "commonage," I will propose a new general definition of "communication," which is the exchange of signs among organisms based on their commonage.

At the end of this section, I will propose a new definition for "intelligence" based on this framework and Coelho Mollo's *desiderata*. According to this definition, intelligence is a relational feature of a shared Umwelt, emerging as a result of communication (RDI). I will explain how RDI fulfills four out of five desiderata that Coelho Mollo proposed, only leaving the origin-neutrality out.

2.1 Umwelt

According to Uexküll, Umwelt is the subjective surrounding world (or the self-world) of an organism (Favareau, Kull, 2024, 40; Kull, Favareau, 2022, 492; Köchy, 2020, 62; Maran et al., 2016, 14; Ferreira, Caldas, 2013, 498; Uexküll, 1926, 127). This world is all that an organism can perceive (perceptual world) and have an effect on (action/operational world) (Favareau, Kull, 2024, 39; Maran et al., 2016, 14; Köchy, 2020, 62). The perceptual and operational worlds, or the aspects of Umwelt, are exclusively constituted by sign relations. These sign-relations are produced and transformed (semiosis) through the organism's perceptions and the actions within its Umwelt (Favareau, Kull, 2024, 40; Maran et al., 2016, 14). The signs that can be perceived and affected by an organism are determined by the biological features of that organism (Favareau, Kull, 2024, 39; Ferreira, Caldas, 2013, 498) and the experience (actions) of that organism based on the already existing signs (Favareau, Kull, 2024, 40). Considering the above-mentioned features and descriptions of the concept of Umwelt, I will use the following definition for the rest of this work: the subjective world (all that is and can be there) - Umwelt - of an organism, is the unity of the signs and the potential of that organism for signs.

Here, I explain each part of this definition in more detail.

Signs:

The way I understand signs are the most basic components of the Umwelt of an organism. Signs are relevant and "meaningful" (Ferreira, Caldas, 2013, 499) for that organism through its perceptions and interactions. Signs are inseparable components of a given Umwelt. As Kull explains, "signs are not independently existing relationships or entities in the world, but that the patterned regularities and entities of the world can be, and often are, used to function as signs by some living agent" (Favareau, Kull, 2024, 38). This means that particular signs (or sign systems) exist in specific Umwelt and not independently of them. For example, the signs acquired through echolocation among bats exist in that particular Umwelt, not independently of it, or not in the Umwelten of those organisms that lack the necessary potential (biological features) for those signs. This could be a different explanation to the philosopher Thomas Nagel's problem of why we cannot know "what it is like to be a bat."

There can be various signs depending on the potential for signs of the given organism. Within the field of Semiotics, there have been several categorizations and typologies of different signs and signs systems (Maran et al., 2016, 16). However, in this work, I will approach this topic in a more straightforward way, as going into more detail would go beyond both my knowledge of semiotics and the scope of this work.

Potential for signs:

I understand the potential for signs through two main aspects of it, biological features (sensory organs, genetic background, etc.) and experiences (perception, interaction, non-biological evolution, etc.). For example, an organism that lacks necessary biological features (visual sensory organs) has no potential for acquiring visual signs; therefore, the Umwelt of this organism will not include visual signs. From the human experience, we can roughly mention the visual, auditory, tactile, and olfactory signs.

The other aspect of the potential for signs for an organism is its experiences: perception, interaction, and non-biological evolution. For example, a dog might have a physical sign (perception of the physical aspects of the surrounding world) of a rock until a particular time when a human being decides to attack the dog by using a rock. After this experience, a rock might have an additional sign for the dog, based on this experience. Regarding humans, social and cultural evolution can also be categorized under experience. Different societies and cultures have signs closely relevant to their own experiences. For example, to understand the signs related to midsummer celebrations in Estonia, it is necessary to understand its context and history. Without this, a member of a different culture has no potential to understand specific signs related to these celebrations.

Umwelt and CETI:

Based on the assumption that an extraterrestrial organism will also be biological, the Umwelt theory will necessarily be relevant to CETI. Depending on the potential for signs of a given extraterrestrial organism, it will have its own distinct Umwelt. This means that the nature of the CETI research would move away from the usage of anthropocentric assumptions and become more similar to interspecific communication research. In the following sections, we will dive into the details of interspecific communication more. However, at this point, we can conclude that unless we have substantial evidence to assume that an extraterrestrial organism will be the exact copy of humans, we cannot project or ascribe the signs and the means of interacting with these signs, which are exclusive to human Umwelt, to the Umwelten of possible extraterrestrial organisms.

2.2 Commonage

As indicated earlier, a common ground is necessary to explain any kind of "communication." However, from the description of Umwelt, it seems like each organism has its subjective world, its "bubble." Then, the establishment of a common ground appears to be problematic, if not impossible.

To address this, I introduce the term "commonage." Charles Morris was the one who used commonage in relation to communication in 1946. According to him, making things common and establishing commonage was the example and goal of communication. (Morris, 1946, 118; Nöth, 2014, 101) Similar to commonage, Peirce also had a similar notion, "cominterpretant," which was described as "consists of all that is, and must be, well understood between utterer and interpreter at the outset, in order that the sign in question should fulfill its function" (Nöth, 2014, 102). It is clear that a sharedness/commonness is necessary for any communication to take place. As the linguist and semiotician Winfried Nöth describes, commonage is the "presupposed common world horizon" that the communicators must share (Nöth, 2014, 102). To address this commonness, we need to ask, what do organisms have for sharing? Each organism has its own Umwelt. Thus, their common ground can only be based on shared signs and the potential for signs. Therefore, within this work, I use commonage as the commonly shared Umwelt (signs and potential for signs) among organisms.

Commonage addresses the necessity of sharedness without imposing or projecting the signs of the Umwelt of one species over another. Instead brings the focus to the shared aspects of two different Umwelten, which will become the grounds for communication.

Commonly shared potential for signs:

While introducing the concept of Umwelt, we focused on the potential for signs. Biological features and experiences determined these potentials. Now, by commonly shared potential for signs, I mean the biological features and experiences shared by different organisms. For example, the organisms that belong to the same species have very similar, if not exact, biological features. Thus, we can say that these organisms commonly share their biological features. For example, humans have the same sensory organs, excluding edge cases (disabilities, etc.). However, it is also possible for organisms belonging to different species to share similar biological features. For example, cats, dogs, humans, and snakes have visual sensory organs - thus a shared potential for visual signs. We must be careful while discussing these kinds of shared biological features because sharing a visual sensory organ among different species does not mean the potential for the same or similar visual

signs. It is only a shared potential for visual signs in general. We cannot claim more without in-depth research and understanding.

The second aspect of the commonly shared potential for signs is experiencing. Organisms belonging to the same or different species can have the potential for the same or similar signs based on their shared experiences. We can see examples of this in nature and animal research. For example, organisms belonging to different species but living in the same geographical location tend to share some signs. These may primarily concern food sources, prey-predator relationships, and so on.

Commonly shared signs:

When it comes to the commonly shared signs, we understand the signs with a similar, if not the same, function and relevance among different organisms. As can be expected, organisms that belong to the same species have the highest potential for commonly shared signs since their potential for signs - their biological features and experiences - are mostly similar. However, as we saw before, even organisms that belong to different species can share some signs based on their shared biological features and experiences.

2.2.1 Individual Umwelt, Commonage, and Species-Specific Umwelt

Here, I will briefly discuss the general acceptance of the species-specific Umwelt, possible concerns regarding this arising from problems with species categorization, and the possibility of classifying organism groups based on their commonage levels.

As the semiotician Timo Maran writes, Umwelt was described by Uexküll himself as belonging to the whole species, even though it is still the individual animal that perceives and affects the signs (Maran, 2016, 14). This way of understanding the species-specific Umwelt seems to work, especially after we discussed commonage among organisms and how this sharedness can be significant among organisms belonging to the same species due to their biological features and experiences.

However, the categorization of species within biology is not free of problems. For example, as the philosopher Edit Talpsepp explains, defining species based on specific shared properties among all members of a given group of organisms conflicts with the gradualness of evolutionary theory (Talpsepp, 2015, 369). Another way of categorization would be based on sexual interbreeding relations. However, this also becomes problematic when we start thinking about ring species or asexually reproducing organisms (Talpsepp, 2015, 372). If the categorization of the groups of organisms as species is not as

straightforward as it seems and has serious problems, then talking about species-specific Umwelten needs to be further explained. Which organisms share the same Umwelt and why?

As Talpsepp points out, there is no magical best way of categorizing the groups of organisms that would work for all theoretical purposes. Instead, she argues that as long as the classifications serve different theoretical purposes, we can tolerate different conflicting categorizations (Talpsepp, 2015, 375). For our distinct theoretical purpose here, explaining "communication" based on Umwelt theory, I claim that the categorization of organisms based on their commonage levels would be the best approach. This would help us avoid the problematic aspects of the biological classification of species and develop a categorization based on the Umwelt theory itself.

In this work, I will not propose a classification of organisms based on their commonage levels. However, I must acknowledge that agreeing on species-specific (biological classification) Umwelt is not the best approach for the purposes of this inquiry. I believe that implementing this framework, especially within animal research, in the future can make it possible to develop a classification of groups of organisms based on their commonage levels. This would help us have a clearer understanding of both intraspecific and interspecific communication.

2.2.2. Umwelt Overlap vs Commonage

Before we move on to "communication," it is crucial to indicate the similarities and differences between "commonage" and a concept with a similar function, "Umwelt overlap," proposed by Ferreira and Caldas. They propose a mathematical model for explaining cognitive processing and predicting future actions in multi-agent systems. According to "Umwelt overlap," the organisms/agents belonging to the same species, systems, or teams have a similar architecture which makes the semiosis (sign-producing, meaning-making) among them very similar. These organisms/agents also share a species-specific environment where their individual experiences overlap (Ferreira, Caldas, 2013, 505). This is very similar to what we mentioned above regarding the species-specific Umwelt. According to Ferreira and Caldas, when the similarities among these organisms are very high, there is a strong Umwelt overlap which makes it possible for Umwelt shifting - putting oneself in another's shoes (Ferreira, Caldas, 2013, 511) Thus, the goal of this model is to predict the future actions of the agents belonging to multi-agent systems.

There are some similarities and differences when it comes to the concepts of "commonage" and "Umwelt overlap." The main similarity is regarding the organisms

belonging to the same species. Both “commonage” and “Umwelt overlap” point to very similar things when it comes to the organisms belonging to the same species. For example, according to “commonage,” it is the high levels of sharedness of the signs and the potential for signs (biological features and experiences) among organisms of the same species that make them share the most aspects of their Umwelten, if not sharing the exact same Umwelt (see Figure 1). Similarly, according to “Umwelt overlap,” these organisms already share the same environment but have individual experiences that also overlap with each other (see Figure 2). Thus, organisms have very similar experiences and are able to put themselves in each others’ shoes.

Figure 1
Representation of the Umwelt Overlap. Adapted from The Concept of Umwelt Overlap and its Application to Cooperative Action in Multi-Agent Systems, by Ferreira, M. I. A. and Caldas, M. G., 2013, 509.

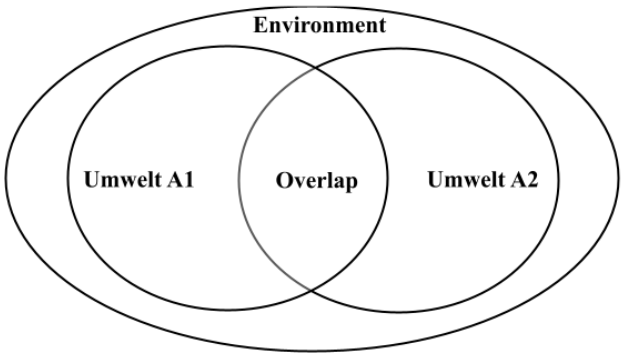
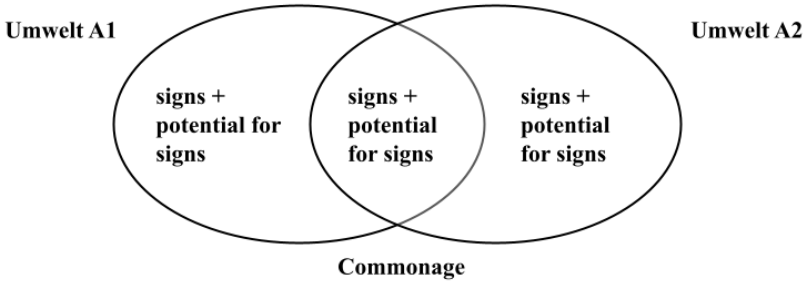


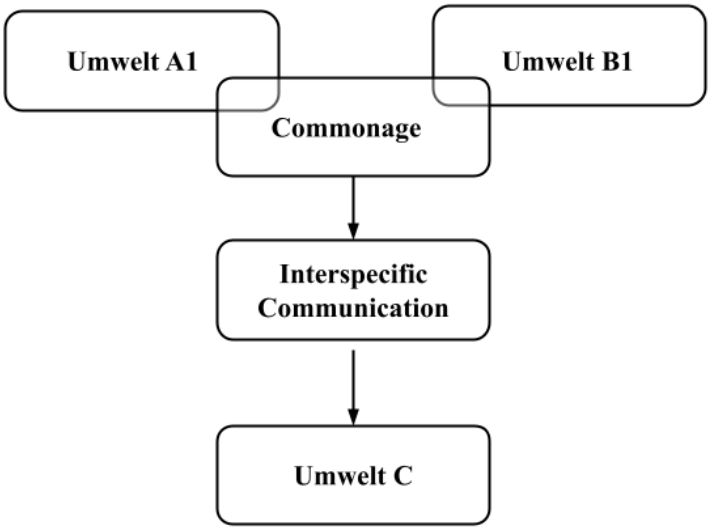
Figure 2
Commonage between the organisms belonging to the same species



However, there is a significant difference between “commonage” and “Umwelt overlap” when it comes to interspecific communication. As mentioned above, Ferreira and Caldas have a narrower focus and scope in mind for the concept that they introduced, which is a mathematical model for predicting the actions of the agents in multi-agent systems. On the other hand, commonage aims to address the necessary sharedness for communication, both intraspecific and interspecific. “Umwelt overlap” does not address interspecific communication or the possible sharedness that might exist among the organisms/agents of different species/systems. However, as we will see in section 2.3.1, interspecific communication is possible due to the commonage among the organisms of different species, which gives rise to a new environment (see Figure 3). Thus, we are not talking about any

kind of Umwelt overlap, but instead a new Umwelt different from the organisms' initial Umwelten.

Figure 3
Commonage between the organisms belonging to different species: A New Umwelt



2.3 Communication

In the first section, we established that the information transmission model of communication has been widely used across disciplines. However, it is unsuitable for explaining communication because it overlooks the diversity of the worlds of non-human species. With this framework, the concept of Umwelt addressed this diversity of worlds of organisms. Afterward, the necessary common ground was addressed with the introduction of commonage. Therefore, we can now talk about "communication" and propose a definition that avoids the criticisms raised against the information transmission model of communication.

I propose the following definition for "communication" and use it in this specific way throughout the rest of this work. Communication is the exchange of signs among organisms based on the commonage of these organisms.

This definition of communication is general, meaning that based on it, species-specific sub-definitions of communication can be developed.

Communication as the exchange of signs:

By exchange of signs, I mean the interaction among organisms based on the signs that are shared and have a similar function and relevance in their Umwelten. What these interactions are or might look like is diverse, and it is impossible to list a finite example of these. However, I will still list some examples of these exchanges of signs within the same species: a human giving a gift to another human; a human telling or writing something to another human; dogs smelling and licking each other; birds singing together; monkeys making alarm calls regarding predators; etc. In all these examples, the organisms belonging to the same species have very similar biological features and shared experiences. It is due to this high level of commonage that makes it possible for them to exchange signs with each other.

We can also list some examples of the exchange of signs among the organisms of different species: man using a rock to scare a dog; deers and birds moving away from the sound of a human hunter; a pet cat asking for food from its owner human by tapping on its food bowl; etc. The crucial part when it comes to the exchange of signs is that the organisms have commonage regarding the signs used in these interactions. The examples and cases where there is no commonage regarding the signs, we cannot talk about communication. What is happening in the cases of interaction without commonage is simply two different organisms interacting and experiencing specific signs within their own Umwelten without "touching" each other. In Uexküll's terms, these organisms would interact within their exclusive bubbles.

Communication as being based on the commonage between the organisms:

Commonage explains the shared aspects of the Umwelten of organisms. It addresses the necessary sharedness for any communication to take place. For this reason, it has a crucial role in the definition of communication. There can simply be no communication among the organisms that have no commonage at all. While talking about the levels of commonage—whether partial, high, or low—are beyond the scope of this work, they determine the potential for communication and explain its limitations. It is also possible that two organisms have high commonage over many things but not over some other things. For example, on their first date, Anna tells Peter that she really likes "Gorillaz", which makes Peter think that talking about great apes is quite weird. However, he smiles, and starts giving a long speech on famous primatologist Jane Goodall. Anna and Peter never meet again. This example demonstrates a failure of communication due to the absence of commonage

regarding the auditory sign 'Gorillaz.' It points out how even shared language can fall short without the commonage of specific signs.

2.3.1 Interspecific Communication: A New Umwelt

If (a) Umwelt is the unity of signs and potential for signs; (b) commonage is the shared signs and potential for signs; (c) Communication is the exchange of signs based on commonage, then we can conclude that communication between the organisms belonging to different species gives rise to a new Umwelt.

In a new Umwelt among the organisms of different species, neither side's Umwelt becomes dominant. Instead, they interact within a new Umwelt with the signs exclusive to it. The signs in the new Umwelt do not exist in either of the “initial” Umwelten of participating organisms.

For example, a human and a pet cat might share specific signs based on their shared experiences. From the perspective of a human, certain physical signs that exist in his own human Umwelt (sofa, small soft ball, door, etc.) become different signs when sharing experiences with the cat. Namely, the sofa is the sleeping and game space of the cat, the soft ball is the sign of the game time, the door is the sign of sadness for the cat, etc. These are my speculations. It is not essential whether these new signs are precisely like this. What is important is the fact these are new and different signs. These new signs are not shared between this human and other humans. If I visit the home of this human, as a person who is not a cat owner and does not share this commonage, I will be outside of the signs shared between that human and his cat. I will be excluded from their bubble. They have created a new Umwelt together, and other humans are not a part of this Umwelt. One may argue that most pet owners might understand these signs. Maybe most cats and their human owners have a tendency to create similar or the same signs. This is something to be investigated further. Yet, even the possibility of this would not undermine the current argument and example.

Now, from the perspective of that cat, similarly, specific physical signs that exist in its own Umwelt (unknown to us) become different signs when sharing experiences with this human. If we replace that cat with a totally random cat, the new cat will not share these signs with this human. The new cat will stay in its own Umwelt. The signs shared between the human and the old cat will not be relevant in the Umwelt of this new cat.

Based on this reasoning, we can conclude that interspecific communication, the exchange of signs among the organisms of different species, is actually the formation of a new Umwelt, a new world shared among these organisms.

2.3.2 Interspecific Communication and CETI

In the third section of this work, I focus on this framework's implications for CETI research. However, I will briefly examine interspecific communication and CETI here.

In the first section, we explained why we have no good reason to expect ETI to be similar to humans. In the best-case scenario, they would be of biological origin (life as we know it). Since we have not discussed "intelligence" yet, let us focus only on communication with extraterrestrial organisms.

It is clear that among the vast diversity of species, the commonage of the organisms belonging to certain species is higher than with other species. For example, think about the commonage between humans and chimpanzees versus the commonage between humans and bats. While some species are closer to each other, some are very far away from each other, primarily due to the differences in their biological features. Thus, when it comes to communication with extraterrestrial organisms, since (a) these organisms do not belong to the same species as us, (b) do not interact with us, and (c) we do not know their biological features, we have no reason to assume a commonage between us and them.

The problem with CETI is that researchers often assume the presence of the signs from the human Umwelt in the unknown Umwelt of an unidentified organism belonging to an unknown species. The assumption that the signs unique to human Umwelt exist in completely unknown Umwelten simply because it might make communication easier is deeply problematic. It is as flawed as the story of the man who, having lost his keys inside his house, chooses to search for them outside under a streetlight because it is brighter there. Such an approach ignores the reality that unknown organisms will have fundamentally different Umwelten.

For now, let's return to the last part of the conceptual framework and discuss its implications for CETI research in the third section.

2.4 Intelligence: A Relational Definition (RDI)

At the end of the first section, I proposed three principles that must be met by any proposed conceptual framework for CETI. By introducing the concept of Umwelt, we

fulfilled the first principle of addressing the diversity of the worlds of organisms. Later, by introducing commonage and defining the communication based on it, we met the second principle, which was to develop a theory of communication based on the first principle. The one left unfulfilled is proposing a definition that would meet Coelho Mollo's *desiderata* for "intelligence." Thus, here, I introduce my definition of "intelligence" and explain it in detail. Afterward, I analyze it against Coelho Mollo's *desiderata*.

My definition is as follows: Intelligence is a relational feature of a shared Umwelt emerging due to communication. This definition explains the interactional nature of intelligence, emerging from the relationships organisms create through the exchange of signs. Let us call this the Relational Definition of Intelligence (RDI) for its emphasis on relationality.

Relational Feature of a Shared Umwelt:

To ground this definition, let us recall the concepts of Umwelt and commonage. Umwelt refers to the unity of signs and potential for signs for an organism, while commonage describes the shared signs and potential for signs among organisms. Communication is the exchange of these shared signs, and within these communicative exchanges, intelligence emerges as a relational feature.

Intelligence, therefore, is not an inherent property of an individual organism but an emergent phenomenon that arises within shared Umwelten. Through communication, organisms build relationships that develop their commonage and, in turn, enrich their communication. In this framework, organisms demonstrate intelligence in relation to one another through these dynamic interactions. This definition of intelligence also ties it back to its etymological origin, the Latin word *intelligere*, which means "to understand".

Let us take a look at some examples where intelligence emerges. Since I argued in this work that the organisms of the same species share an Umwelt, and organisms of different species form a new Umwelt based on their commonage and communication, I will provide examples from both cases.

First, imagine the human Umwelt, in which humans have high commonage and exchange signs based on it. This relationship of communications with the shared human Umwelt is human intelligence, in which individual humans demonstrate intelligence in relation to one another. For example, humans A and B look outside the window and see that it is snowing. Human A gets worried as the roads will be dangerous to drive a car on, whereas human B gets excited since it will be easier to slide the car on the streets now. When A and

B communicate about what they perceive, “it’s snowing outside,” they fail to understand each other's emotions, one getting worried and the other excited. Thus, they do not demonstrate intelligence in relation to one another.

We have also seen that organisms from different species can have specific commonage based on their biological features and shared experiences. Again, intelligence is the relationship among these organisms which is based on the communication among them. For example, a dog owned by a human is living in the garden, and there is also a crow living by. Every time the owner gives food to the dog, the crow starts waiting near the dog to be done with the food. Once the dog is done, the crow can come close and eat the leftovers. If the crow rushes and tries to come closer before the dog is done with its food, the dog will snarl, and the crow will move away. Based on the exchange of signs between the dog and the crow, they demonstrate intelligence in relation to one another in this specific example. This example shows that intelligence is not limited to human-like cognitive skills but emerges wherever organisms develop shared signs and communicative relationships, even across species.

Solitary intelligence:

As indicated above, according to RDI, intelligence is not an inherent feature of organisms. Due to the relational nature of this definition, one might ask: how about the solitary organisms - are they never intelligent? The answer is yes, solitary organisms, or organisms that are simply isolated, are not intelligent. This might sound counterintuitive, especially due to the everyday usage of “intelligence” that we are accustomed to. However, it must be noted that RDI says nothing about the cognitive skills of organisms. That is to say, an organism, let us say a crow, that has specific cognitive abilities such as solving puzzles, and remembering, does not necessarily make it an intelligent organism. Another example could be a philosopher, Peter, who is left alone on an isolated island. He is not intelligent even though he has vast knowledge and cognitive skills. This aspect of RDI also gives it the distinctive theoretical and explanatory role that we will talk about further while analyzing it based on Coelho Mollo’s *desiderata*.

2.4.1 Analysis Based on *Desiderata*

I argue that RDI fulfills four of five of Coelho Mollo's *desiderata*. Although RDI does not meet origin-neutrality desideratum, I explain that this is not detrimental to its applicability.

Species-neutrality: (no privilege to one species over others)

RDI does not privilege any species over another. The definition is based on the Umwelt theory, which describes the subjective worlds of organisms as the unity of signs and the potential for signs of organisms. According to RDI, neither signs nor the potential for signs (biological features and experiences) of any specific organism are central.

CMI, on the other hand, failed to meet this *desideratum* due to overlooking the subjective worlds of non-human species and giving a privilege to the experiences taken from the human context, such as general, flexible, goal-directed, and adaptive behaviors.

The main difference between RDI and my framework, as opposed to CMI, is very similar to Uexküll's explanation of the difference between a physiologist's and a biologist's approach to a living being. According to him, for a physiologist, every living being exists in his human Umwelt as an object to be observed and investigated, like a machine. Whereas, for a biologist, every living being exists in its own Umwelt as the subject of that world; thus, it cannot be investigated as a machine (Uexküll, 1957, 7, 8). My criticism of CMI in the first section was along the same lines.

Multiple realisability: (diversity of different underlying mechanisms)

According to RDI, since the potential for signs and the exchange of signs can be vastly diverse among the organisms, intelligence can also have vastly diverse underlying mechanisms depending on the Umwelt.

On the other hand, due to CMI's failure to meet the species-neutrality *desideratum*, it also fails the multiple-realisability. The functions ascribed to intelligence are taken from the human context, and how there can be different underlying mechanisms is not explained.

Epistemic distinctness: (a distinctive theoretical and explanatory role)

The phenomenon of communication-based relationships among organisms within a shared Umwelt that RDI explains is not tied to specific biological features such as cognitive skills. Therefore, RDI avoids the weaknesses of the widespread anthropocentric approach to "intelligence," which has heavily relied on specific cognitive skills and abilities. As Coelho Mollo also indicated, the traditional anthropocentric approach to intelligence had the

challenge of being unable to explain a particular phenomenon (Coelho Mollo, 2024, 712). Intelligence has mostly been understood as something reducible to cognitive abilities, leaving intelligence as some kind of a collection of cognitive skills (Coelho Mollo, 2024, 712; Dumouchel, 2019, 242). For this reason, intelligence did not have a distinct theoretical role. However, RDI avoids these problematic aspects by focusing on and explaining a totally different phenomenon. RDI can also advance the philosophical discussions regarding having clearer "borders" between intelligence, cognition, and rationality.

Responsiveness to scientific practice: (respond to and refine the use already made of the notion in the relevant sciences)

RDI is a general definition for intelligence based on which species-specific sub-definitions can be developed. For example, human-type intelligence would be based on human-type communication. Most, if not all, of our knowledge regarding biological, social, and cultural evolution can be used for mapping out the human commonage. For human-type communication and intelligence, most of our knowledge across the disciplines involved can be explained through CFU and RDI.

The possibility of the species-specific sub-definitions of RDI also makes it applicable within CETI, animal research (especially animal communication), comparative psychology, zoosemiotics, and many other disciplines and research areas. As we will see in the next paragraph, even though this definition does not fulfill the origin-neutrality *desideratum*, I claim that it can also be adjusted for use in relation to AI.

Origin-neutrality: (no privilege to one type of origin - biological - over others)

It is clear that RDI and the whole CFU I proposed are developed based on the Umwelt theory, which makes it closely tied to biological organisms. For this reason, RDI does not fulfill the origin-neutrality *desideratum*. There is a privilege given to biological types of origin.

However, I argue that not meeting the origin-neutrality *desideratum* is not detrimental to RDI. As mentioned earlier, previous definitions of intelligence were primarily based on specific human features. Therefore, it is questionable whether those definitions, including CMI, actually meet the origin-neutrality *desideratum*. We can agree on one thing: the most well-known example of "other type or origin" is artificial intelligence (AI). However, as philosophers like Paul Dumouchel wrote, AI is more of a computer-based imitation of human intelligence (Dumouchel, 2019, 243). rather than a different type of

intelligence. Thus we can even call it artificial human-type intelligence (AHI) rather than intelligence of a different origin.

We see that without a clear definition of intelligence, it is even problematic to talk about the artificial versions of it. Yet, RDI is flexible enough to go through certain adjustments to explain artificial human-type communication (AHC) and artificial human-type intelligence (AHI). However, this is beyond the goal and scope of this work.

2.5 Conclusion of the Second Section

In this section, I proposed a conceptual framework consisting of four key concepts: Umwelt, commonage, communication, and intelligence. My goal was to provide an "umbrella" framework that can be implemented across the disciplines and avoid the problematic assumptions regarding "communication" and intelligence."

Firstly, I introduced the Umwelt theory to address the diversity of the subjective world of different organisms. I explained how the Umwelt is the unity of signs and potential for signs. Using the Umwelt theory helps us avoid ascribing or projecting signs of human Umwelt to the Umwelten of other non-human organisms. In this way, the anthropocentrism is avoided.

Later, I introduced the concept of commonage, which is the shared Umwelt among organisms. Since the Umwelt was the unity of signs and potential for signs, commonage is the shared signs and potential for signs. I clarified how the organisms of the same species share the same Umwelt. The necessary sharedness or common grounds for any communication to occur was addressed by introducing the concept of commonage. Afterward, I proposed a new general definition of communication, which is exchanging signs among organisms based on their commonage.

Lastly, I proposed a new definition for "intelligence" based on this framework. According to this definition, intelligence is a relational feature of a shared Umwelt, emerging as a result of communication (RDI). I explained how RDI fulfills four out of five desiderata that Coelho Mollo proposed, only leaving the origin-neutrality out.

In the following section, I will focus on the implications of CFU for CETI and other disciplines.

3. Implications of the Conceptual Framework

When concluding the first section, it was indicated that an “umbrella” framework is needed to address the CETI argument's problematic assumptions and provide a clearer vision and direction for the CETI research. I have also proposed three principles that a framework like this should meet. The aim of the framework that I developed in this work was to meet these principles.

In this section, I claim that the CFU does not only impact CETI but also other disciplines and interdisciplinary research areas. I start with CFU’s impact on CETI, then continue with its broader implications.

3.1 Implications within CETI:

In the first section, the premises of the CETI argument were refuted due to the problematic assumptions underlying “intelligence” and “communication.” It was concluded that an “umbrella” framework in which these concepts are clearly defined and their problematic assumptions addressed is necessary so that the disciplines involved in this research can implement, test, and contribute with a clear direction.

According to CFU, communication precedes intelligence. Thus, we cannot presume that there are intelligent organisms before we can communicate with them. The concept of “intelligence” should not have the centrality it had previously within CETI research. Until we actually communicate with extraterrestrial organisms, there is simply no grounds for talking about “intelligence.” Therefore, communication with extraterrestrial intelligence cannot be the topic of this research.

On the other hand, we saw that communication can occur based on commonage, and we have no good reason or knowledge about what our commonage would be with an unknown extraterrestrial organism. Therefore, communication with extraterrestrial organisms cannot be the topic of this research either.

Based on these, the extraterrestrial part of the CETI equation should be limited to the search for extraterrestrial organisms (SEO). The other half of this equation, concerning communication and intelligence, can be considered a separate research area about discovering the terrestrial types of intelligence (DTI). CETI can be relevant only if we encounter an extraterrestrial organism, understand the commonage between us and those organisms, and start communicating with them.

Search for extraterrestrial organisms (SEO)

This research would not require any significant changes to already existing research areas. Naturally, the search for extraterrestrial organisms (life as we know it) has been a part of SETI (Search for Extraterrestrial Intelligence) and CETI for decades. The implications of CFU only propose further clarity regarding the scope and direction of such inquiries. It suggests that there should be a clear focus on the definition and artifacts of life and the development of further technologies and methodologies for detecting extraterrestrial organisms.

Discovering the terrestrial types of intelligence (DTI)

Different from SEO, DTI would bring a novel approach to existing research. DTI would be interdisciplinary research that includes philosophy, bio and zoosemiotics, animal research, comparative psychology, and many other disciplines. The initial task for DTI would be to create the commonage maps, which can be done based on vast knowledge that already exists within the involved disciplines. The second task would be to develop a classification of groups of organisms based on the commonage maps that have been drawn. The third would be to continue implementing the CFU and have distinct sub-definitions of communication and intelligence based on the Umwelten of the terrestrial organisms. This would give us clear explanations for explaining human-type, artificial human-type, particular interspecific-type communication, and intelligence. Through this, we can analyze further and see whether there are any universal patterns.

3.2 Broader Implications of CFU

It is beyond the scope of this work to exhaustively explore all possible implications of the CFU across disciplines. However, it introduces novel concepts and definitions for communication and intelligence, which may influence various fields, including philosophy, semiotics, animal research, and comparative psychology. Due to the limitations of this thesis, I will focus on its potential implications within philosophy and semiotics.

Implications within Philosophy

CFU challenges widespread anthropocentric philosophical assumptions by proposing novel definitions for “communication” and “intelligence.” These definitions are not strictly limited to CETI-related topics. Instead, they can be used to answer various philosophical questions, such as: What is intelligence in a non-human or extraterrestrial

setting? What are the similarities and differences of different types of intelligence? How can communication transcend anthropocentric assumptions? CFU might also challenge certain theories in the philosophy of mind. For example, there might be tension between the radical enactivists who argue that it is possible for there to be basic minds without representational content (Hutto, Myin, 2013, 12) and the fact that CFU is based on Umwelt theory which is based on the assumption of the existence of subjective phenomenal worlds and experiences of each organism. Or another example, as indicated in the previous section, an adjusted version of RDI can also become a novel philosophical approach to AI debate. Especially considering the increasing popularity of language models such as (GPT), a relational definition of intelligence based on communication can be interesting.

Implications Within Semiotics

The Umwelt theory has been one of the central and impactful theories in semiotics, especially within bio and zoosemiotics. Within CFU, I provide a somewhat different definition of Umwelt. One of the important contributions of CFU to Semiotics would be the introduction, modification, and usage of the concept of "commonage."

My conclusion regarding the interspecific communication and the creation of a new Umwelten might seem problematic to some semioticians. The existing theories, such as biotranslation (translation of signs from one Umwelt to another), can oppose what I have proposed in this framework. For example, Kalevi Kull and Peeter Torop argue that it is possible to put particular signs in an Umwelt A into correspondence with signs in an Umwelt B, thus having a translation (Kull, Torop, 2011, 414). According to this approach, there is no need for a new Umwelt, and the biotranslation can make interspecific communication possible. This raises the tension between CFU and such theories.

4. Objections and Replies

Considering the critique of the CETI argument, the proposal of the CFU, and the possible implications of this framework, a variety of objections can be raised against the work done in this thesis. Due to the limitations of this work, I will focus on two highly relevant objections. The first objection is that if we encounter any ETI, it will likely be a non-biological one, thus bypassing CFU. The Second objection is the claim that a universal cosmological language for communication, such as LINCOS, could bypass CFU and offer a

more straightforward approach to CETI. After introducing each objection, I will also give my response to it.

4.1 Objection 1: Non-Biological Intelligence vs CFU

According to philosopher Susan Schneider, if we ever encounter any ETI, it will be a superintelligent AI. ETI would be non-biological, synthetic, and more "intelligent" than humans. Let us call this approach the non-biological ETI argument (NBE). If NBE holds, CFU might be considered unnecessary since NBE offers a more straightforward explanation. This would mean: if NBE, then ~ CFU. NBE can be outlined as follows:

Premise 1: If non-biological intelligence can be developed somewhere in the universe in a very short time, similar non-biological intelligence may have developed elsewhere in the universe as well (Schneider, 2019, 98, 100).

Premise 2: If any sufficiently advanced civilization transitions from biological to non-biological life somewhere in the universe, considering the vast age of the universe, most already existing civilizations elsewhere in the universe have transitioned to a non-biological life (Schneider, 2019, 98, 103).

Premise 3: If non-biological materials are superior when it comes to endurance (more resilient to extreme conditions) and efficiency (medium for faster information pro-cessing), then non-biological intelligence has a higher chance to be abundant in the universe (Schneider, 2019, 103).

Conclusion: If we encounter any ETI, it will likely be non-biological (Schneider, 2019, 100).

4.1.1 Reply to the First Objection

First, Schneider repeats the error I pointed out in the first section. She does not provide any clear definition of intelligence and communication. Second, Schneider's premises are either (a) based on a single case - human experience, or (b) have the potential to happen within this case. Although Schneider acknowledges the obvious counterarguments against making generalizations from a single case, she does not provide any strong reply to it. She only mentions that it would be unwise not to account for human learning as it is the

only one we know. However, (b) relying on human technological trajectories assumes universality without evidence. For example, biological evolution may not universally lead to synthetic intelligence or similar transitions elsewhere.

I haven't seen any strong response from the supporters of the NBE and similar versions of it to the objections criticizing the generalizations based on a single case. Yet, I will not focus on this problematic aspect of its premises and question whether they are true or feasible. Instead, following Schneider's logic, I propose two arguments that similarly rely on the generalization from a single case reasoning (N=1), pointing out the speculative nature of NBE.

Nuclear War Argument:

Premise 1: If nuclear weapons have been developed somewhere in the universe, similar detrimental warfare weapons elsewhere in the universe may have developed as well. (already happened on Earth)

Premise 2: If a catastrophic nuclear war can happen somewhere in the universe, similar catastrophic nuclear wars may happen elsewhere in the universe as well. (already happened on Earth)

Premise 3: If biological microorganisms like Tardigrades can survive extreme levels of radiation (Traspas, Burchell, 2021, 845), which may be caused by catastrophic nuclear war where all the infrastructure needed for non-biological systems is destroyed, then the biological microorganisms have a higher chance to be abundant in the universe.

Conclusion: If we encounter any extraterrestrial organism/system, it will likely be biological.

Restricted Non-Biological Intelligence Argument:

Premise 1: If the usage of non-biological intelligent technologies is strictly restricted somewhere in the universe for the safety of biological life, similar restrictions against non-biological intelligent technologies elsewhere in the universe may have developed as well.

Premise 2: If there has never been any example of a non-biological intelligent technology going against its core algorithm anywhere in the universe, similar situations may have never happened elsewhere in the universe, either.

Premise 3: If biological intelligence stayed dominant and kept control over the technologies it developed somewhere in the universe, similar dominance and control of biological intelligence may have evolved elsewhere in the universe as well.

Conclusion: If we encounter any ETI, it will likely be biological.

If one accepts NBE, then one should accept the arguments mentioned above as well, which would make them contradict themselves. If one rejects these arguments, then one must reject NBE as well. Thus, the ball is in their court.

4.2 Language for Cosmic Intercourse vs CFU

According to some scientists and philosophers, it is possible to develop a language for cosmic intercourse or *lingua cosmica* (LINCOS). This view is based on the existence of certain universal constants that any "human-like intelligence" would be able to understand. First, Hans Freudenthal proposed a LINCOS based on mathematics. Freundenthal's starting point is similar to what I explain with commonage. He tries to find common ground to develop shared understandings with any given "intelligent civilization." Later, different variations of such languages were proposed based on logic, etc.

If the LINCOS argument holds, it would bypass CFU since LINCOS would provide a simpler, more straightforward, and practical solution for CETI. In comparison, CFU would be more complex because it uses concepts like Umwelt and commonage. Thus, if LINCOS, then ~ CFU.

The LINCOS argument can be outlined as follows:

Premise 1: Communication is decoding encoded information transmitted through physical mediums (Freudenthal, 1985, 220; Harbour, 2024, 218).

Premise 2: If mathematics is a universal constant describing the fundamental properties of the universe by numbers, then all human-like intelligence should understand it (Harbour, 2024, 220; Arbib, 1974, 77; Drake, 1974, 135).

Premise 3: Mathematical formulas can be the means of communication (Freudenthal, 1985, 222).

Conclusion: A mathematics-based cosmological language like LINCOS can be used for communication with extraterrestrial intelligence (Freudenthal, 1985, 223).

4.2.1 Reply to the second objection

My reply to this objection will be similar to the criticism I brought against using information theory for the transmission model of communication. There, I argued that (a)

information is not objective; thus, we cannot expect it to be relevant to ETI; (b) even if the information is objective, we have no reason to expect ETI to experience it in its objective form. The philosopher Andre Kukla also argued against proposals like LINCOS based on his OWOS (one world, one science) argument. Accordingly, OW explains the objective working mechanisms of the universe, and OS means the scientific content that describes the parts of OW. According to the proponents of LINCOS, if the laws of the universe are the same anywhere, the science explaining these laws should also be the same (Kukla, 2010, 49). My criticism (a) aligns with arguing against OW, meaning the "universal laws and constants" that we discovered are not actually objective and valid for the whole universe (Kukla, 2010, 49). My criticism (b) aligns with arguing against OS, meaning even if the laws of the universe are the same anywhere in the world, we have no reason to expect ETI to have access or discover these laws in the same way as we did (Kukla, 2010, 50). Kukla proposes several other interesting counterarguments against OWOS in his work. However, Kukla's arguments are mainly against the second premise of the LINCOS argument, namely that if mathematics is a universal constant, describing the fundamental properties of the universe by numbers, then all human-like intelligence should understand it.

However, my reply is not against the premises but the conclusion of the LINCOS argument. Even if all the premises of the argument are true, they are still only relevant for human-like "intelligence" and not for any possible "intelligence," including ETI. In the first section of this thesis, and my response to the NBE argument, I gave the responses to the generalization from a single case. Thus, I will not be repeating it here again. For the LINCOS argument to be valid, it must address the N=1 objections.

Conclusion

I started the first section of this thesis by introducing the CETI argument. I argued that this argument is unsound and refuted its flawed assumptions of anthropocentric intelligence underlying its first premise and the unsuitability of the information transmission model of communication underlying its second premise. I demonstrated that the unsupported conclusion of the CETI argument that researchers should send and expect to receive radio signals for CETI has misguided this research. I concluded by proposing three principles for an "umbrella" framework needed for addressing the problems of the CETI or any kind of research concerned about the communication of non-human species.

In the second section, I developed a conceptual framework based on Umwelt theory. Umwelt is the subjective world of any given organism, which is the unity of signs and the potential for signs for an organism. Later, by introducing the term "commonage," I addressed the necessary common grounds for "communication." The notion of "commonage" refers to the shared aspects of the Umwelten of different organisms. Once the diversity of the worlds of organisms and the necessary common grounds were addressed, I proposed a new definition for "communication" as the exchange of signs among organisms based on their commonage. In the end, I proposed a new definition for "intelligence" as a relational feature emerging from the relationships of organisms. This definition fulfilled the four out of five *desiderata* proposed by Coelho Mollo.

In the third section, I focused on CFU's implications for CETI and other disciplines. Based on the proposed definitions of "intelligence" and "communication," I argued that CETI should be divided into two different research areas: the search for extraterrestrial organisms (SEO) and the discovery of terrestrial types of intelligence (DTI). I also briefly discussed its implications for philosophy and semiotics, mainly based on the novel approaches and definitions CFU introduced for "commonage," "communication," and "intelligence."

In the last section, two objections against the CFU were raised. First was Schneider's argument for possible non-biological ETI (NBE). According to which, if NBE, then ~ CFU. As a response, I proposed two *reductio ad absurdum* arguments following the same reasoning as NBE. Accepting these would be a contradiction for the supporters of NBE, and the rejection would imply the rejection of NBE as well. The second objection was the possibility of mathematics-based cosmological language (LINCOS). According to which, if LINCOS, then ~ CFU. While introducing Kukla's criticism against similar proposals based on his OWOS argument, I also pointed out the overreliance of LINCOS on the generalization from a single case. This overreliance is problematic as long as there is no strong argument for the proponents of LINCOS.

While writing this thesis, I considered CETI enthusiasts, philosophers, and semioticians to be the audience. My main aim was to examine the underlying philosophical assumptions of this research and propose an alternative approach, one that is anti-anthropocentric at its core. Further research, within philosophy and semiotics, on the framework that was presented in this thesis will ignite interesting discussions.

Abstract (word count: 174/200)

This thesis critiques the assumptions underlying the argument of Communication with Extraterrestrial Intelligence (CETI) research, which presumes that extraterrestrial intelligence (ETI) would possess human-like features and technologies, and that communication with ETI would rely on the information-transmission model. These premises are refuted by exposing their reliance on anthropocentric and vague definitions of "intelligence" and "communication." Afterward, a conceptual framework based on Umwelt theory is proposed to address these issues, emphasizing the diversity of subjective worlds (Umwelten) of organisms, the concept of "commonage" as shared aspects of these subjective worlds, and communication as the exchange of signs based on the commonage among organisms. Lastly, intelligence is redefined as a relational feature of shared Umwelten emerging from communication. The thesis argues for dividing CETI into two distinct research areas with a more explicit scope for each: the search for extraterrestrial organisms (SEO) and the discovery of terrestrial types of intelligence (DTI). Broader implications within philosophy, semiotics, and interdisciplinary research are also explored, emphasizing the necessity of avoiding the widespread anthropocentric approach in studying intelligence and communication.

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