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POSTHUMAN PERFORMATIVE SPACE AS A NEW MATERIALISTIC AGENT: THE EVALUATION OF AIR BUBBLE INSTALLATION WORK BY ECOLOGICSTUDIO

YENİ MATERYALİST BİR FAİL OLARAK İNSAN SONRASI PERFORMATİF MEKÂN: ECOLOGICSTUDIO'NUN AIR BUBBLE ENSTALASYON İŞİNİN DEĞERLENDİRİLMESİ

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ABSTRACT

Space is a phenomenon related not only to humans and vitals, but also to non-humans and non-vitals. This study started with a research question "What and how can be a posthuman performative space in between art and design?" and investigates the possibility of posthuman space performing as a self-organising and collaborative agent. Beyond anthropocentric dualisms, this space emerges through intra-actions of agents where it is an agent itself too, as one of the components of this posthuman environment. In this new materialistic scope, the study evolved as a qualitative research based on relevant texts of Braidotti and Barad. The study employed grounded theory methodology to analyze these texts by coding and generating diagrammatic sets of concepts. As a result of analyses, the findings reached were *Distributed Embodied Agencies*, *Temporal Becoming as Relational Entanglements,* and *Emergent Reconfigurations of Posthuman Spatiality.* By these findings, Air Bubble work by ecoLogicStudio was selected as an art and design project realized in two different contexts, enabling a comparative case study. Both implementations were described in detail and compared by their similarities and differences in relation to prior findings. In conclusion, this research asserts that Air Bubble exemplifies the characteristics of a new materialistic agent, functioning as a manifestation of posthuman performative space situated in-between art and design. Within this framework, the study seeks to offer an interdisciplinary perspective on the phenomenon of space and to contribute novel arguments to the scholarly discourse in critical posthuman theory in relation to art and design, for future investigations.

Keywords: *EcoLogicStudio, New materialism, Performativity, Posthuman, Space.*

ÖZ

Mekân, yalnızca insanlara ve yaşamsal varlıklara değil, aynı zamanda insan olmayanlara ve yaşamsal olmayan varlıklara da ilişkin bir olgudur. Bu çalışma, mekân olgusunun bu özelliğini Eleştirel İnsan Sonrası Kuramı'nın Kartezyen düşünce eleştirisi ile ilişkilendirerek "Sanat ve tasarım arakesitinde yer alan bir insan sonrası mekân ne ve nasıl olabilir?" araştırma sorusuyla başlar ve insan/insan olmayan gibi ikilikler olmaksızın, kendi kendini

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örgütleyen ve işbirlikçi bir fail olarak performansta bulunan bir insan sonrası mekân olasılığını araştırmayı amaçlar. Böyle bir performatif mekân insan sonrası faillerin iç-eylemleri yoluyla açığa çıkar ve edilgen bir boşluk olmanın aksine kendisi de etken bir faildir. Bu yeni materyalist kapsamda, çalışma Braidotti ve Barad'ın konuyla ilişkili metinlerindeki kavramlara dayanan kuram odaklı, nitel bir araştırmadır. İki kuramcının literatürdeki önemli metinleri incelenmiş, ancak iki kuramcının da öne çıkan ikişer metni performativite ve yeni materyalizm bağlamında insan sonrası tartışmaları en yoğun olarak içerdikleri için seçilmişlerdir. Öncelikle Braidotti ve Barad'ın metinleri üzerinden araştırma sorunsalı ile ilgili fikir taslakları üretmek üzere sorular çıkarılmıştır. Bu sorularda performativite Austin'in terimi literatüre kazandırdığı halindeki dilsel ifade içeriğinden ziyade; eylemde bulunma potansiyeliyle, dilsel değil operasyonel bir kavram olarak değerlendirilerek, kökündeki performans olgusunun beden, zaman ve mekân bileşenlerinden oluşan ilişkisel bir kapsama yerleştirilmiştir. Bu kapsamda metinler Gömülü Teori yöntemiyle kodlanarak ve diyagramatik kavram setleri analiz edilmiştir. Analizlerin sonucunda ulaşılan *Dağıtık Bedenlenmiş Faillikler,* İlişkisel *Dolaşıklıklar olarak Zamansal Oluş,* ve İnsan *Sonrası Mekânsallığın Açığa* Çıkan *Yeniden Yapılandırmaları* bulgularıyla araştırmanın örneklem seçimine geçilmiş ve performans sanatında teknoloji, hayvanlar gibi insan-olmayan unsurlarla çalışan insan sonrası sanat ve tasarım örnekleri incelenmiştir. Bu aşamada, insan sonrası performatif çalışmalarıyla Stelarc, Eduardo Kac, Pierre Huyghe, Patricia Piccinini, Oron Catts & Ionat Zurr ve ecoLogicStudio ön plana çıkmıştır. Ancak bu çalışmalarda mekânın çoğunlukla sadece bir deneyim alanı ya da gösterim yüzeyi işlevi görmesi etkin failliği sınırladığı için, insan sonrası mekânın operasyonelliği ecoLogicStudio'nun işlerinde sergilenen beden-mekân-zaman bütünlüğüyle en doğrudan karşılığını bulmuştur. Diğer yandan, ecoLogicStudio'nun çoğu işinde de insan-olmayan mekânsal unsurlar ikincil bileşenler konumundayken; Air Bubble projesi mekânı edilgenliğinden çıkararak biyolojik ve teknolojik faillerle birlikte dönüştüren failliğiyle, diğer işlerden farklılaşıp insan sonrası performatif mekânı en açık biçimde örneklenmesi nedeniyle seçilmiştir. Bu seçim, ecoLogicStudio'nun yeni materyalist çerçevedeki bir projeyi iki farklı bağlamda uyguladığı nadir örneklerden biri olduğu ve ulaşılan bulgularla bağlamların nasıl farklılaştığını analiz etme olanağını sunduğu için yapılmıştır. İki uygulama ayrıntılı olarak betimlendikten sonra benzerlikleri ve farklılıklarına göre karşılaştırılmış ve bulgularla ilişkileri kurularak tartışılmıştır. Sonuç olarak, bu araştırma Air Bubble projesinin sanat-tasarım kesişimindeki insan sonrası performatif mekânın bir tezahürü olarak işlev gören yeni bir materyalist faili örneklediğini ileri sürmektedir. İnsan sonrası mekânın kendisinin de bir fail olarak dolaşık olduğu tüm faillerin iç-eylemleri aracılığıyla açığa çıkan bedensellik, zamansallık ve mekânsallık olasılıkları olduğu tespit edilmiştir. Çalışma, bu olasılıkları tartışmaya açan, ilişkisel, dağıtık ve dönüştürülebilir bir çokluk (multiplicity) önererek; sanat, tasarım ve eleştirel insan sonrası kuramıyla ilişkilenen bir mekân olgusu üzerine geliştirilebilecek araştırmalar için akademik bir katkı sunmayı amaçlamıştır. Bu çerçevede, çalışma gelecekteki insan sonrası mekânsal araştırmalar için yeni, işbirlikçi ilişkilerin tohumlarını ekmeyi ve halihazırdakileri beslemeyi; kendisinin de eklemlenme ve çatallanmalara açık bir eşik-sonuç olarak değerlendirilmesini önermektedir.

Anahtar Kelimeler: *EcoLogicStudio, Yeni materyalizm, Performativite, İnsan sonrası, Mekân.*

1. INTRODUCTION

Critical posthuman thought criticizes anthropocentric[1] approaches rooted in Humanism and proposes postdualistic multiple perspectives instead of sharp distinctions built by dualisms such as mind/body, nature/culture, human/animal, self/other. This proposal aims to blur boundaries between organic and inorganic or natural and artificial for a more heterogeneous unity of intersections. Depending on the rejection of the acceptance of the (hu)man as the measure of everything, posthuman thought emphasizes inclusive practices of an ecosystem of living and non-living entities. This rejection also differentiates critical posthuman thought from other posthumanist discourses such as Transhumanism which sees the current human as a primitive ancestor of hi-tech 'transhuman' of the future. So, critical posthumanism is neither an updated version of Humanist thought, nor a continuation of Anti-Humanism.

Critical posthumanist thinker Rosi Braidotti[2] argues posthuman subject at "the primacy of intelligent and self-organizing matter" in relation to new materialism[3]. In this

1 Anthropocentrism is a thought perspective that places the human being at the center of the universe, positioning all other beings as subordinate or instrumental to human needs. In art theory, this perspective became particularly prominent in Western thought from the Renaissance onwards, where the human was framed both as the central representational figure and as the perceptual and meaning-making subject. Alberti's theory of linear perspective or Kant's notion of aesthetic judgment are foundational to this anthropocentric epistemology. Danto (1981: 9) critiques this human-centered worldview, arguing that modern art often reflects the assumption that human perception and intention are the defining factors in the creation and reception of art. Danto's reflections on how art represents the human condition also intersect with the critiques offered by theorists like Haraway, Latour, and Braidotti, whose theories challenge anthropocentric paradigm by rethinking agency and subjectivity beyond the human. While Haraway (2003: 6) critiques anthropocentric thinking by stating: "We are not uniquely defined by our human boundaries or capacities. We are always already in relationality with other-than-human actors"; Latour exposes how modernity privileges the human through the separation of nature and culture, in his critique of the modern constitution (1993: 13). Posthumanist theorist Braidotti defines posthuman thought as "a departure from the dominant vision of the human as the measure of all things" (2013: 26). The critique of anthropocentrism in art theory has gained momentum particularly through the representation of nature, animals, and technology, influenced by these thinkers, have begun to reshape discourses on aesthetics and artistic subjectivity. The artists such as Eduardo Kac, Patricia Piccinini, and Pierre Huyghe challenge the anthropocentric paradigm, opening up new avenues for posthuman and materialist approaches in art.

2 Braidotti, 2018, 1.

3 New materialism refers to a contemporary philosophical movement that rethinks matter not as passive substance but as active, dynamic, and generative. It challenges representationalist and anthropocentric paradigms by emphasizing the agency of matter and the entanglement of the material with the discursive. In art theory, new materialism has influenced a shift toward considering artistic media, environments, and nonhuman elements as co-constitutive in the production of meaning and experience. This framework is central to posthumanist aesthetics, where bodies, technologies, and environments are viewed as intra-active assemblages. As Rosi Braidotti (2013: 66) writes, "matter is an affective field of forces that functions as a relay system of complex interactions".

context, new materialism suggests a new understanding of matter as live, dynamic, relational, operational, performative and productive. This new understanding of matter rejects to define human as *a priori* otherness and to break off the human from other entities. In addition, it doesn't confirm the instrumentalization of matter by humans. This kind of primacy is crucial in Karen Barad's theoretical works too, because it associates posthuman subjects and new matters to performance and performativity. Barad discusses posthuman performativity of matter by building her own terminology through concepts like 'entanglement'[4] and 'intra-action'[5]. Both concepts open up new perspectives in relation to three main components of performance which are *body, time* and *space.* These components are examined by rejecting and reinterpreting established notions like linearity and distance in Barad's theory because they exist and behave as intra-acting agents like other agents in this performative network.

In this context, a new materialistic understanding of posthuman performativity emerges as an exploration of postdualistic practices that may give the space possibility of being (or becoming) an autonomous entity, as a new matter. Thus, such a space can be unveiled through mutual experiences and intra-actions of posthuman agents which or whose are active components of this posthuman performativity. Air Bubble, an installation by ecoLogicStudio, emerges as a possibility for posthuman spatiality aligned with performative ontologies, in this context. Its two distinct implementations in Warsaw and Glasgow open a fertile field of inquiry, engaging with themes of biotechnology, collective participation, and the active agency of materiality as new matter.

2. METHODOLOGY

This study employed ground theory as a methodology to investigate the possibility of a posthuman performative space as a new matter. In this new materialistic context, a theoretical literature review was realized and relevant texts of Rosi Braidotti and Karen Barad were examined. Amongst their multiple works on posthuman theory including articles, books, presentations and lectures, two prominent texts from both theorists were selected as these texts are the most intensely included posthuman discussions in

4 Entanglement is a concept rooted in quantum physics, which Karen Barad extends to the philosophy of science and feminist theory. In quantum mechanics, entanglement refers to a phenomenon where particles become intertwined in such a way that the state of one particle can instantly influence the state of another, regardless of the distance between them. Barad uses this concept to challenge traditional notions of separation and individuality, applying it to the material-discursive practices that shape the world. In her view, entanglement offers a model for understanding how matter and meaning are co-constituted through interdependent relations, where boundaries between entities are not fixed but fluid.

5 Intra-action is a term introduced by Karen Barad to describe a relational ontology where entities do not precede their interactions. This concept diverges from classical notions of interaction, which presuppose independent subjects and objects. Intra-action emphasizes the constitutive role of relationality in the becoming of all matter and meaning. In artistic contexts, it underscores the co-constitutive processes between materials, bodies, and environments.

the context of performativity and new materialism. The first two texts are *Posthuman, All Too Human: The Memoirs and Aspirations of a Posthumanist* which is a lecture given by Braidotti in 2017, and an article by Braidotti titled *A Theoretical Framework for the Critical Posthumanities*[6]. The other texts are Barad's article titled *Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter*[7], and her book *Meeting The Universe Halfway* which was published in 2007. First of all, questions were drawn to produce sketching ideas related to the research problem through these texts. In these questions, performativity was considered as an operational concept rather than a linguistic concept, as the ability, capacity and potential to act and move, rather than the content of linguistic "utterance" that J. L. Austin first introduced to the literature[8]. In this context, performativity was placed in a relational scope consisting of the body, time and space which are the components of the performance phenomenon and performance art. As in Figure 1 and Figure 2, these questions were formed like thought clouds that have an ability to reform by interactions with other thoughts. Not only are they very close to each other, but they also contain common ideas that flow between them. These flowing ideas are three components of performance.

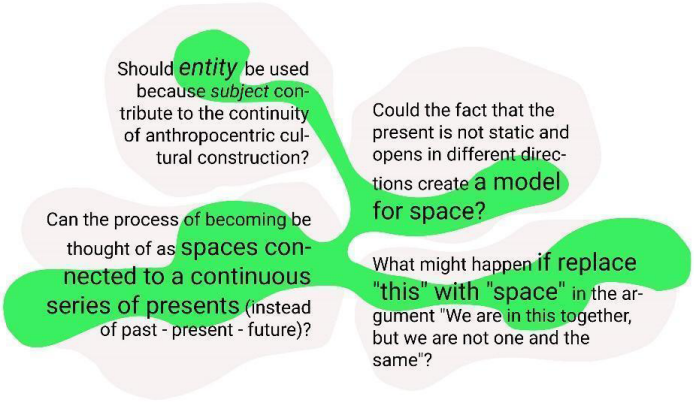

Figure 1. Diagram for sketching ideas by asking questions on Braidotti texts (Produced by the author, 2024)

For instance, the body is related to posthuman subject in Braidotti's sentence "The posthuman subject is a materially embedded, multilayered, nomadic entity"[9] and "This understanding of matter animates the composition of posthuman subjects of knowledge – embedded, embodied and yet flowing in a web of relations with human

6 Braidotti, 2018.

7 Barad, 2003.

8 Austin, 1962, 6.

9 Braidotti, 2017, 6.

and non-human others"[10]. These and other sentences in relation to the body generated the question "Should entity be used because the subject contributes to the continuity of the anthropocentric cultural construction?". This question evaluates the usage of the word *entity* for a non-anthropocentric and posthuman approach that is a criticism of established subject / object distinction. Another example is the time and space components examined in the same question. The sentences "To understand the complexity and multilayeredness of the present,... the present is not a static bloc, but a flow pointing in different directions at once"[11]; and "Cartographies, as a conceptual off-shoot of new materialism… compose a relational community, defined as a nomadic, transversal assemblage that involves non-human actors and technological media" caused the question "Could the fact that present is not static and open in different directions create a model for space?"[12].

In this question, the non-linearity and openness of posthuman time as the present time is associated with the possibility of space as a new matter that can act as a nomadic assemblage[13] including non-human[14] agents as well. These questions revealed that space

10 Braidotti, 2018, 4.

11 Braidotti, 2017, 8.

12 Braidotti, 2018, 2.

13 The term assemblage originates from the work of Gilles Deleuze and Félix Guattari (1987), where it denotes a heterogeneous composition of interacting elements—bodies, objects, technologies, affects, and discourses—that temporarily come together without forming a unified whole. Rather than focusing on essential identities or fixed structures, assemblages emphasize process, transformation, and emergent properties. As they write, "an assemblage has neither subject nor object, only determinations, magnitudes, thresholds, and gradients". This concept has become central to posthuman and new materialist aesthetics, particularly through Jane Bennett's (2010) interpretation of assemblages as "ad hoc groupings of diverse elements, of vibrant materials of all sorts," which possess their own tendencies and capacities In contemporary art, assemblage helps articulate relational artworks that foreground entangled agencies and ontologies. Artists such as Mark Dion, Anicka Yi, and Hito Steyerl create immersive, open-ended systems as posthuman assemblages co-constitute dynamic environments, often blurring the line between living and non-living, organic and technological.

14 Bruno Latour (1993) critically challenged the foundational dualisms of modernity—such as subject/object, nature/culture, and human/non-human—by arguing that these distinctions are artificial and unproductive. He critiques modern epistemology's reliance on such binaries and instead proposes hybrid collectives where humans and nonhumans act as equal agents or actants. Latour (2005) elaborated this critique by outlining Actor-Network Theory (ANT), a framework that reconceives the social as an entangled network of interactions among both human and nonhuman entities—including machines, objects, animals, software, and viruses. Through this lens, Latour becomes one of the key figures shaping the posthuman understanding of agency. In art theory, Latour's thinking has resonated strongly, particularly within the contexts of posthuman aesthetics, new materialist practices, and speculative design. His idea of nonhuman agency finds conceptual affinities with Donna Haraway's (2003) companion species, Karen Barad's (2007) intra-action, and Rosi Braidotti's (2013) zoe-centered subjectivity. These frameworks shift the focus of art from a purely anthropocentric production to an entangled process shaped by ecological, technological, and biological factors. Artworks are increasingly

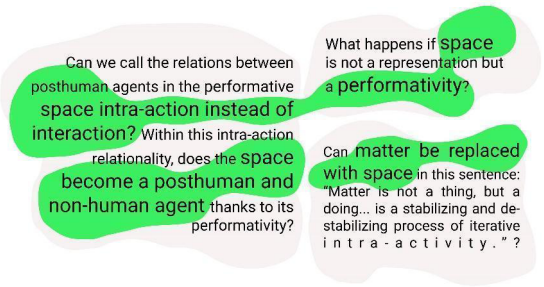

Figure 2. Diagram for sketching ideas by asking questions on Barad texts (Produced by the author, 2024)

is strongly connected to and also defined by time and body components in Braidotti's sentences.

As seen in Figure 2, the sentences from Barad's texts were examined by questions in relation to three components of the performance. By the help of questions on Braidotti, these questions on Barad were further associated with the relationship between new matter and space. For instance, "The move toward performative alternatives to representationalism shifts the focus from questions of correspondence between descriptions and reality… to matters of practices/doings/actions" sentence is related to the body as it defines matter not as a static entity, but with actions and practices[15]. Similarly, "Matter does not refer to a fixed substance; rather, matter is substance in its intra-active becoming—not a thing, but a doing… Matter is a stabilizing and destabilizing process of iterative intra-activity" sentence is connected both to the time and space components[16]. Because it emphasizes the intra-active character of new matter which can be a model for space too, and also the process of becoming as its temporal property. Thus, these sentences generated this question: "Can matter be replaced with space in this sentence: Matter is not a thing, but a doing… is a stabilizing and destabilizing process of iterative intra-activity?". During this sketching ideas phase, seven sentences on the body, six sentences on the time and five sentences on the space from Braidotti's texts came to the fore in generating relational questions. On the other hand, six sentences on the body, three sentences on time and six sentences on the space from Barad's texts were selected for asking questions. The sentences were selected in parallel to the actions of taking notes and writing comments on the texts themselves, as the ideas emerged simultaneously through these actions with the key concepts about three components listed in Figure 3.

interpreted as co-productions of multiple ontological actors. Artists such as Oron Catts & Ionat Zurr, Tomás Saraceno, and Agnes Meyer-Brandis exemplify this expanded ontology by staging complex assemblages where human, animal, microbial, and machinic subjectivities coalesce—reflecting Latour's actor-network logic and non-anthropocentric turn in contemporary art.

15 Barad, 2003, 802.

16 Barad, 2003, 822.

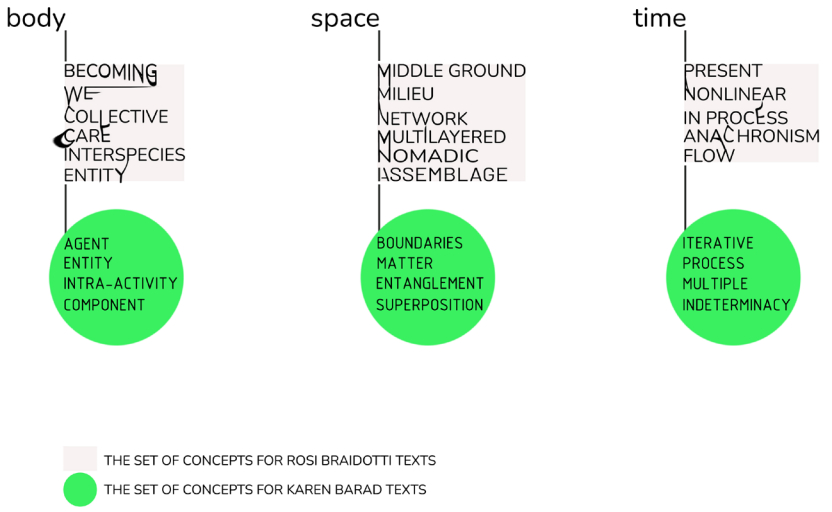

Figure 3. *Diagram for generating set of concepts on body, space and time from Barad and Braidotti texts* (Produced by the author, 2024)

At the end of this sketching ideas phase, the first impressions on the possibility of posthuman performative space began to form by the help of these sets of concepts. It is found that not all of these concepts will constitute the contextual environment of the research problem, but some will come to the fore by the course of the research process. For this, the sentences were analysed by the help of a triple coding system of grounded theory. In the beginning of coding, the sentences with repeating keywords were eliminated and the number of sentences remained as twelve in total. Each theorist's sentences were analysed separately under the headings of body, time and space. Similar to the question phase, Braidotti's sentences were coded at first. As the first step of coding, open codes were derived from each sentence as simple and meaningful pieces of the sentence. Secondly, relational open codes were grouped into axial codes to create new connections. Then, the axial codes were combined to create the selective code that constitutes the main theme of the sentence. This coding process was applied to both sentences on the body. At last, each selective code derived from each sentence was unified to constitute a category on the concept of theorist.

Table 1. *Triple coding table for generating categories on body, time and space from Braidotti's sentences* (Produced by the author, 2025)

	THEORIST-TEXT	SENTENCE	OPEN CODES	AXIAL CODES	SELECTIVE CODE	CATEGORY
BODY	Braidotti, 2017: 47	"A "we-are-in-this-together-but-we-are-not-one-and-the-same" sort of subject. They are the collective multiplicity, materially embedded but differential"	Differential nature of bodies	Embodied Differences within Collective Unity	Posthuman Collective Subjectivity	Distributed Biotechnological Subjectivities
			Our not being one and the same			
			Our multiple collectivity	Material Collective Existence		
			Materially embeddedness of the subjects			
	Braidotti, 2018: 21	"This transversal alliance today involves non-human agents, technologically-mediated elements, earth-others (land, waters, plants, animals) and non-human inorganic agents (plastic, wires, information highways, algorithms, etc.)"	Non-human agency of inorganic things	Inorganic agency of technology	Transversal Biotechnological Agency	
			Otherness of organic entities on earth			
			Inclusive transversal alliance	Transversal alliance of organisms		
			Mediated agency of technology			
TIME	Braidotti, 2017: 8	"To understand the complexity and multilayeredness of the present,... the present is not a static bloc, but a flow pointing in different directions at once"	The complexity of present	Multilayered complexity of present	Dynamic and complex multilayers of present	Fluid Multitemporalities of Becoming-New Matter
			Multilayeredness of the present			
			The non-static nature of time	Dynamic directions of time		
			Free flowing directionality of time			
	Braidotti, 2018: 26	"This time continuum as a process ontology of becoming... supports the vital new materialism... In attempting to describe the predicament we are in, therefore, the best we can do is to speak in the future past"	Time as a process	Process in future past	Temporal fluidity of becoming-new matter	
			Choice of speech in future past			
			Ontological and new materialistic becoming	Temporal ontology of becoming-new matter		
			Our temporal predicament			
SPACE	Braidotti, 2017: 15	"The new space of the non-coincidence between the given and the critique of the given... which points to the future, that is to say to what we are capable of becoming in and out of what we are ceasing to be, on the basis of vital new materialism."	A different and a new space	Material Disjunction	Posthuman Threshold Spaces	Distributed Thresholds of Posthuman Spatiality in New Materialist Ecologies
			The critical space of non-coincidence			
			Becoming space in between past and future	Emergent Spatialities of Temporal		
			New materialistic emerging space			
	Braidotti, 2018: 2	"Cartographies, as a conceptual off-shoot of new materialism... compose a relational community, defined as a nomadic, transversal 'assemblage' that involves non-human actors and technological media."	New materialistic off-shoot space	Emergent Spaces of Non-Human and Technology	Distributed Spatial Agencies in Posthuman Ecologies	
			The space of non-human and technology			
			Relational nomadic space	Nomadic Relationality of Assemblage-Based Spatialities		
			Transversal spatiality of assemblage			

For instance, as seen in Table 1, the sentence on the fourth line of the time column was divided into four open codes which are 'Time as a process - Ontological and new materialistic becoming - Our temporal predicament - Choice of speech in future past'.

Table 2. *Triple coding table for generating categories on body, time and space from Barad's sentences* (Produced by the author, 2025)

	THEORIST-TEXT	SENTENCE	OPEN CODES	AXIAL CODES	SELECTIVE CODE	CATEGORY
BODY	Barad, 2003: 802	"The move toward performative alternatives to representationalism shifts the focus from questions of correspondence between descriptions and reality... to matters of practices/doings/actions"	Performative alternatives to representationalism	Materialization of Action through Performativity	Embodied Performativity in Material Practices	Embodied Performativity and Relational Bodies in Agential Intra-action
			Shift from correspondence to practices/doings/actions			
			Body as a site of action	Embodied Practices in Posthuman Action		
			Action as a form of material practice			
	Barad, 2003: 815	"Agential phenomena don't merely mark the epistemological inseparability of "observer" and "observed"; rather, phenomena are the ontological inseparability of agentially intra-acting "components." That is, phenomena are ontologically primitive relations without preexisting."	Phenomena as ontological inseparability	Ontological Inseparability through Agential Intra-actions	Relational Bodies in Agential Intra-action	
			Agential intra-actions of components			
			Phenomena as non-preexisting relationality	Phenomenal Relations as Material Practices		
			Body as a site of agential intra-action			
TIME	Barad, 2007: 72	"Intra-actions are causally constraining nondeterministic enactments through which matter-in-the-process-of-becoming is sedimented out and enfolded in further materializations."	Intra-actions as causally constraining enactments	Causal Dynamics of Intra-actions in Becoming Matter	Time as a Process of Becoming-New Matter	Time as Agential Reconfiguration of Becoming-New Matter
			Matter-in-the-process-of-becoming			
			Sedimentation of becoming matter	Temporal Materialization of Becoming		
			Enfolding materializations			
	Barad, 2007: 141	"The primary ontological units are not "things" but phenomena-dynamic topological reconfigurings/ entanglements/ relationalities/ (re)articulations of the world... This dynamism is agency. The universe is agential intra-activity in its becoming"	Phenomena as primary ontological units	Relational Phenomena and Agency of Becoming	Time as Agential Reconfiguration in Becoming	
			Agency as ongoing reconfigurings of the world			
			Dynamic topological reconfigurings and entanglements	Dynamic Reconfigurations and Agential Intra-activity		
			Universe as agential intra-activity in becoming			
SPACE	Barad, 2003: 816	"This indeterminacy of the "outside" boundary represents the impossibility of closure—the ongoing intra-activity in the iterative reconfiguring of the apparatus of bodily production. Apparatuses are open-ended practices"	Indeterminacy of the "outside" boundary	Indeterminate and Open-Ended Boundaries of Apparatuses	Space as Open-Ended and Iteratively Reconfigured through Intra-activity	Space as Dynamic and Relationally Reconfigured Intra-activite Apparatuses
			Apparatuses as open-ended practices			
			Impossibility of closure	Intra-activities in the Iterative Reconfiguration of Space		
			Ongoing intra-activity in reconfiguring bodily production			
	Barad, 2007: 451	"The assemblages are generally assumed to be collections of individual determinate objects. Importantly, apparatuses are not assemblages of preexisting, separately determinate individuals of one kind or another. It is crucial to remember that these "gears" are intra-acting "component," not preexisting ones"	Assemblages as collections of determinate objects	Relational Nature of Assemblages and Apparatuses	Apparatuses as Dynamic Intra-acting Assemblages in Relation	
			Apparatuses not as preexisting individual objects			
			Intra-acting components	Assemblages and Apparatuses as Intra-acting Components		
			Relationality of assemblages and apparatuses			

These codes were combined to create an axis titled 'Process in future past' explaining the present as a becoming process both situated in past and future; and another axis titled 'Temporal ontology of becoming-new matter' that emphasizes the time's ontologically new materialist nature. Then, a selective code titled 'Temporal Fluidity of Becoming-New matter' was created from these axial codes that examines how new matter evolves in the fluid and unstable nature of time, where the future and the past are intertwined, as a temporary and continuous becoming process. Following the same steps, the second selective code on time titled 'Dynamic and complex multilayers of present' was generated. At the end, two selective codes were unified into a category on Braidotti's concept of time titled 'Fluid Multitemporalities of Becoming-new Matter' which examines becoming-new matter is an ongoing, relational process that transcends fixed temporal boundaries, continuously evolving through the interconnectedness of multiple time layers. The same triple coding system was applied to Barad's sentences too, which was illustrated in detail as seen in Table 2. At the end of coding analyses, six categories were reached in total for each component of performance in relation to posthuman performative space. Following the body, time and space formulation; each couple of categories were combined to obtain a single category that intersects the arguments of two theorists and described under the headings of findings including each category.

Building on the findings outlined above, the study proceeded to sample selection by focusing on artistic and design-based performance practices that bring together human and non-human agents, such as technologies or animals through a posthuman lens. At this stage, internationally recognized artists and designers whose works establish biological, technological, or synthetic relations with non-human agencies were identified, including Stelarc, Eduardo Kac, Pierre Huyghe, Patricia Piccinini, Oron Catts & Ionat Zurr, and ecoLogicStudio.[17] Stelarc's work exemplifies a posthuman line of thought that transcends the biological limits of the human body through cybernetic and robotic installations that transform the body into a kind of technological platform; similarly, Eduardo Kac employs genetic engineering and biotechnological systems to question both the physical and ethical boundaries in his bio-art pieces, using living organisms as artistic media. In a comparable vein, Pierre Huyghe's works generate temporal and ontological ambiguities by circulating human, animal, and machine subjectivities within multilayered spatial configurations. Patricia Piccinini, on the other hand, presents a posthuman performativity through her hyperrealistic sculptures that resemble genetic mutations, interrogating the human's relationship with biological others. Oron Catts and Ionat Zurr make the materiality of life visible by cultivating semi-living tissues in laboratory conditions and exhibiting them in artistic contexts. While these artists significantly contribute to

17 Due to the spatial limitations of the article format and in order to maintain the focus of the conceptual framework, the examined artworks of these artists were not included in the article as individual case analyses accompanied by commentary. Such a section, under the given constraints, would allow only a superficial assessment of each artwork. Therefore, the study focuses on a single exemplary project of ecoLogicStudio, and this decision is framed as a deliberate limitation intended to preserve the academic coherence of the work.

posthuman discourse through their engagements with non-human agencies, the spatial dimension in their work often remains as a surface of display or a field of human experience. Space is rarely conceived as an active, self-organizing agent participating in the performative process. In contrast, ecoLogicStudio's practice directly engages with the notion of posthuman space as a plane of collaborative subjectivation emerging through the intra-action of human and non-human agents. Since 2006, ecoLogicStudio has presented its projects in leading international art and design venues, including the Centre Pompidou (Paris), the Design Museum (London), and the Venice Architecture Biennale. Their work integrates biotechnological materials, parametric design methods, and AI-assisted systems to construct ecotechnological environments. MetaFOLLY, for instance, employed a parametric structure to support biological growth in a public setting, aiming to foster environmental awareness. H.O.R.T.U.S. featured modular structures powered by microalgae that linked human respiration with the building's metabolic cycles. Photo. Synth.Etica proposed a biologically active façade system capable of filtering urban air pollution through embedded algae panels. Although these projects feature non-human subjects such as algae colonies, bacteria, and artificial intelligence, these elements often function as auxiliary components that visualize environmental data or raise awareness. By contrast, this study is grounded in the idea that posthuman performative space can operate as a self-organizing, collaborative agent. Accordingly, space is not approached as a static context or backdrop, but as a co-constitutive site of material, biological, and technological subjectivities acting in concert. In this context, Air Bubble offers a particularly compelling case of posthuman performative space. Designed as an interactive environment sustained by an algal colony responsive to environmental conditions (e.g., light, temperature, CO_2 levels), the installation enables these biological processes to shape the spatial atmosphere via sensor systems activated through visitors' movements. The feedback loop between the algae's metabolic activities and visitors' bodily movement transforms the space into a dynamic nexus of distributed agency across human and non-human actors. While other ecoLogicStudio projects bring together ecological and technological systems, none of them exemplify the self-organization of space through posthuman agency as clearly as Air Bubble.[18] What distinguishes this work is its reconfiguration of space as an active, co-performing entity rather than a passive container. Its selection as the focal case study in this research is therefore directly aligned with the theoretical framework and central questions of this study. Moreover, the fact that Air Bubble is one of the rare projects implemented by the studio in two distinct contexts offers a unique opportunity to analyze how these applications diverge in relation to the theoretical findings of this study, not through their ecological content but by exemplifying how they function as active agents within a posthuman new materialist framework. Then, two different applications of Air Bubble were described in detail, and they were compared according to their similarities

18 In parallel to the constraints mentioned in the previous footnote, the other projects of ecoLogicStudio were not included in the article as individual case analyses accompanied by commentary. The study focuses on a single exemplary project of ecoLogicStudio, and this decision is framed as a deliberate limitation intended to preserve the academic coherence of the work.

and differences for a discussion in relation to the findings obtained from Barad and Braidotti's texts. As a result of the research process, it was claimed that the Air Bubble installation work could be an example of a posthuman performative space between art and design that suits the characteristics of a new materialist agent.

3. FINDINGS AND RESULTS

3.1. Posthuman Performativity In Relation to Embodiment, Temporality and Spatiality

In critical posthumanism, new materialistic matter differentiates from 'old' materialisms by its performative characteristics. The performativity gives the new matter potential and motion to 'interact' with its surroundings. This environmental interactivity between new matters, subjects and living or non-living entities emerges as mutual multiple connections at the same time, which makes it postdualistic and not a matter of subject / object, observer / observed relations. Although J. L. Austin's first coined the term as an utterance[19], the context of performativity[20] has expanded and now relates to performance and performance art through a spatiality including temporality and embodiment. Moreover, performativity has become a concept most frequently mentioned in Butler's gender studies. Butler discussed the concept of performativity via matter too: "Does the notion of gender performativity relate to this conception of materialization?"[21]. Butler highlights the temporality of materialistic performativity as it is a reiterative practice of repeating norms and not a singular act in the present time. Other feminist theorists, such as Braidotti and Barad, have argued performativity from a new materialist perspective in relation to critical posthumanism.

3.1.1. Body - Embodiment: Distributed Agencies in Posthuman Material Practices

In Braidotti's posthumanist new materialism, the body is a collective subjectivity including both human and non-human embodiments as a transversal biotechnological agency at the same time. This perspective reveals that the body is not a static object but a continuously materializing and relationally constituted process. In this context, the body emerges as a relational form that proliferates through biotechnological assemblages and

19 Austin, 1962, 8.

20 Although performativity is commonly recalling Judith Butler's queer theory, it is rooted in the lectures of the linguistic theorist J. L. Austin at Harvard University. Austin coined the term 'performative' for expressions that were also actions: "In these cases… to say something is to do something... Promises, bets, curses, contracts, and judgments do not describe or represent actions: they are actions." (Austin, 1962, as cited in Schechner, 2002, p.123). Another philosopher Jacques Derrida also related 'performative' to language and writing as "it displays language's independence from the referent outside of itself" in a postdualistic sense and also with its multiple temporality as it "enacts the now of writing in the present time." (Derrida, 1988, as cited in Phelan, 1996, p.149).

21 Butler, 1993, 2.

non-human interactions, manifesting as transient nodes of existence; including "earth-others (land, waters, plants, animals) and non-human inorganic agents (plastic, wires, information highways, algorithms, etc.)" too[22]. Ontologically permeable and distributed, the posthuman body is constantly reconfigured across material and temporal dimensions through transversal movements, thus operating as a dynamic material multiplicity beyond fixed models of subjectivity that "transcend the very variables - class, sex, race, gender, age, disability- that structure us" [23].

For Barad, embodiment is configured by relational bodies in agential intra-actions. The body is continuously part of the processes of performative embodiment and relational interaction within material practices. Embodied performativity situates the body as a dynamic entity shaped by agential intra-action and relational bodies, highlighting processes which are more than interactions; because interactions assume that bodies as "separate individual agencies", on the contrary "the notion of intra-action recognizes that distinct agencies do not precede" (Barad, 2007: 33). While "intra-acting is within and as part of", the interaction positions the bodies in a distance (Barad, 2017: 89). Thus, the body is in constant intra-action with other non-human and inorganic entities, revealing its performative nature in a deeper sense. These bodies are not merely material objects as they become relational with their environment and other entities. This process demonstrates that the body is more than a static object like the body in Braidotti's new materialism; it is open-ended, dynamic, and relational.

Therefore, this performative body is distributed and embodied agency through such posthuman material practices. Braidotti's embodiment concept mentions distributed biotechnological subjectivities and emphasizes the redefinition of the body within a network of technological and biological systems, while Barad's approach highlights the embodied performativity and relational intra-actions in a continuous process of becoming. Together, these perspectives reveal that, in the posthumanist framework, the body is no longer a singular subject but a distributed, relational, and agentive network of material practices. The body is continuously reconfigured through biotechnological systems and agential intra-activities.

3.1.2. Time - Temporality: Becoming as Relational New Materialistic Entanglements

Braidotti discusses posthuman temporality through the notion of the "present" because of its multilayered and complex character which is "not a static block, but a flow pointing in different directions at once"[24]. The posthuman present time differentiates from 'now' by not overlapping it with a full synchronicity. She emphasizes that the present is not a singular, fixed moment, but a dynamic and multilayered process in constant flux. Time, from a new materialist perspective, is not a linear, progressive entity but a

22 Braidotti, 2018, 21.

23 Braidotti, 1994, 25.

24 Braidotti, 2017, 37.

fluid process through which matter continuously reconfigures itself. It is a convergence of multiple, overlapping temporalities, where past, present, and future are intertwined and reformed in ongoing material transformations: "a record of what we are ceasing to be (the actual) and the seed of what we are in the process of becoming (the virtual)"[25]. This view challenges traditional notions of time and matter as separate, stable entities, proposing instead that they are inseparable, mutually constituting forces that undergo constant becoming. In this context, becoming-new matter is also an ongoing, relational process that transcends fixed temporal boundaries, continuously evolving through the interconnectedness of multiple time layers.

Becoming-new matter is associated with time in Barad's arguments too, as an agential reconfiguration. This type of time can be understood as the transformation of time that takes shape through the becoming of matter and the ongoing agential reconfigurations letting the emergence of new matter. Agential reconfiguration shows that time is a dynamic and intra-active structure too, that is in constant change, with new matter constantly emerging through this process. This perspective allows us to view time not just as a transient flow, but as an evolving, transformative, and continuously reshaping process including **"**reconfigurings/entanglements/relationalities/ (re)articulations of the world in agency"[26]. This flowing process highlights the new materialistic entanglements which are "not interweaving, or enmeshment in a complicated situation…but refigurings of causality, materiality, agency, dynamics, and topological reconfigurings"[27].

In this context, Braidotti's concept of temporality emphasizes the ongoing becoming of multilayered and simultaneous processes. Similarly, Barad suggests that time is continuously reconstituted through relational entanglements. These posthuman temporalities conceptualize temporality not as a linear or chronological flow, but as a process of relational new materialistic entanglements that constantly reshapes itself. Time emerges as a dynamic ontology unfolding within the entangled relations of non-human entities, technological agencies, and material formations.

3.1.3. Space - Spatiality: Emergent Reconfigurations of Posthuman Ecologies

As a new matter, space is always in process and in continuous motion too. Braidotti interprets this spatiality as "a creative space of becoming that would fall not between the mobile / immobile, the resident / the foreigner distinction, but within all these categories"[28]. Likewise this posthuman space is normatively neutral too, as "embedded, embodied and yet flowing in a web of relations with human and non-human others" [29]. It is a distributed, transitional, and multilayered structure shaped by non-human

25 Braidotti, 2017, 8.

26 Barad, 2007, 141.

27 Barad, 2007, 160.

28 Braidotti, 1994, 7.

29 Braidotti, 2018, 4.

entities, technology, and ecological factors. In new materialist ecologies, posthuman space transcends being a mere physical area, functioning as "a nomadic, transversal assemblage" process, constantly reshaped by intra-acting multiple actors, as part of a complex ecological system that includes biotic and abiotic natures[30].

On the other hand, Barad follows the new materialistic idea that space is not merely a static entity, rather a structure that is relationally shaped and constantly reconfigured through intra-action. But she needs to dissociate this type of spatiality of being an assemblage. Barad finds use of the notion of assemblage risky, "since assemblages are generally assumed to be collections of individual determinate objects"[31]. She proposes the notion of apparatus because "they are open-ended practices involving specific intra-actions of humans and nonhumans, where the differential constitutions of human and nonhuman designate particular phenomena that are themselves implicated in the dynamics of intra-activity"[32]. Hence, a spatiality among these intra-active components demonstrates that space is not a temporary structure, but rather an emergent and relational entity.

So, in the sense of a new materialistic spatiality for posthuman performativity, Braidotti conceptualizes space through threshold-oriented emergent formations within posthuman ecologies. Barad, on the other hand, approaches space as a dynamically reconfigured relational field through intra-activity. These perspectives depict space not as a fixed or closed entity, but as an emergent, threshold-based, and relational process of becoming new-matter.

3.2. Posthuman Performative Spaces as a New Materialistic Agent: Air Bubble Project

Air Bubble, developed by ecoLogicStudio[33], exemplifies the studio's ecologically performative approach, embodying the synthesis of environmental innovation, material experimentation, and posthumanist spatial practices. Specializing in the intersection of architecture, biology, and computational design, ecoLogicStudio explores the potential of living systems, such as algae, to reconfigure urban environments. ecoLogicStudio's practice is grounded in the development of bio-digital architectures that merge

30 Braidotti, 2018, 2.

31 Barad, 2007, 451.

32 Barad, 2007, 171.

33 ecoLogicStudio is an international design and innovation studio operating at the intersection of art, architecture, design, and biotechnology. Founded in London in 2005 by Claudia Pasquero and Marco Poletto, both architects with expertise in computational design and environmental technologies, the studio has pioneered the integration of living systems into urban environments. Pasquero and Poletto's interdisciplinary approach draws from architecture, environmental engineering, and synthetic biology, allowing their projects to act as experimental prototypes for future ecological urbanisms. ecoLogicStudio's work has been exhibited in major venues worldwide, including the Centre Pompidou in Paris, Venice Architecture Biennale, World Expo in Dubai, and Design Museum in London.

computational design with living organisms. Their work seeks to dismantle the rigid boundaries between the natural and the artificial by promoting symbiotic relationships between human and non-human agents. Rather than treating biological entities as passive materials, ecoLogicStudio frames them as active co-designers, capable of shaping spatial, atmospheric, and ecological conditions. This approach results in environments that are not merely constructed but are constantly evolving, responsive, and performative.

Air Bubble constitutes a paradigmatic case within the emergent field of biodigital spatiality, where living systems, computational design, and material innovation are entangled to reimagine urban environments. Air Bubble is one of the manifestations of such an interdisciplinary approach that articulates studio's consistent interrogations of the posthuman condition of cities, envisioning built environments as evolving, performative ecologies. The conceptual and technological foundations of Air Bubble are rooted in ecoLogicStudio's prior explorations, particularly in projects such as Photo.Synthetica, which utilized "photosynthetic membranes integrated into building façades to filter urban air", and Otrivin Air Lab, which investigated "air pollution's material transformations into biodegradable architectural components"[34]. These precedents inform Air Bubble's new materialist orientation, wherein matter is not a passive substrate but an active participant in ecological becoming. In Air Bubble, microalgae are employed as active agents that purify the air and co-create a new breathable environment. The design is inherently performative; "user interactions—such as physical movements and mechanical manipulations—stimulate the metabolic activity of the algae", thereby entangling human, non-human, and technological agencies into a single material-ecological apparatus[35]. Additionally, the integration of real-time environmental sensors foregrounds Air Bubble as an epistemic device, enabling the public to witness and participate in the continuous intra-action between biological and technological processes. In this sense, Air Bubble transcends conventional spatial paradigms, proposing a model for urban futures wherein spaces are conceived as dynamic, relational, and life-sustaining ecosystems.

Figure 4. ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, bioreactors, timber, ETFE membrane, Copernicus Science Center, Warsaw (Archdaily).

34 ecoLogicStudio, 2021a.

35 Designboom, 2021b.

3.2.1. Air Bubble Warsaw: Urban Biotechnological Playground

The first realization of Air Bubble was installed in Warsaw, Poland, in 2021, as part of an urban regeneration initiative to promote sustainable futures for public spaces. Designed specifically for the city's heavily trafficked and polluted environment, this Warsaw pavilion "integrated living micro-algae photobioreactors into a semi-inflatable ETFE membrane structure, creating a playable, breathable microclimate"[36]. The structure housed 52 glass algae reactors, with each reactor actively absorbing air pollutants such as nitrogen dioxide and fine particulate matter, while simultaneously producing oxygen.

Figure 5. ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, bioreactors, timber, ETFE membrane, Copernicus Science Center, Warsaw (Iconeye).

Children and visitors could engage directly with the environment through climbing and playing activities, physically stimulating the photosynthetic processes of the microalgae. Every physical action had a tangible ecological consequence, making visitors direct participants in the process. This participatory and playful dimension framed Air Bubble not merely as a passive installation, but as a living apparatus responding to and intra-acting with human and non-human agencies. Moreover, integrated environmental sensors provided "real-time data visualization, allowing users to witness air quality improvements, thereby reinforcing an experiential awareness of urban ecologies"[37]. In this Warsaw deployment, Air Bubble operated as a prototype for new materialistic agency in public urban contexts, enacting performative entanglements where human bodies, non-human organisms, and architectural materials co-constituted a dynamic urban ecology through continuous intra-activity.

36 Designboom, 2021a.

37 ecoLogicStudio, 2021a.

Figure 6.
ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, bioreactors, timber, ETFE membrane, Copernicus Science Center, Warsaw (Archdaily).

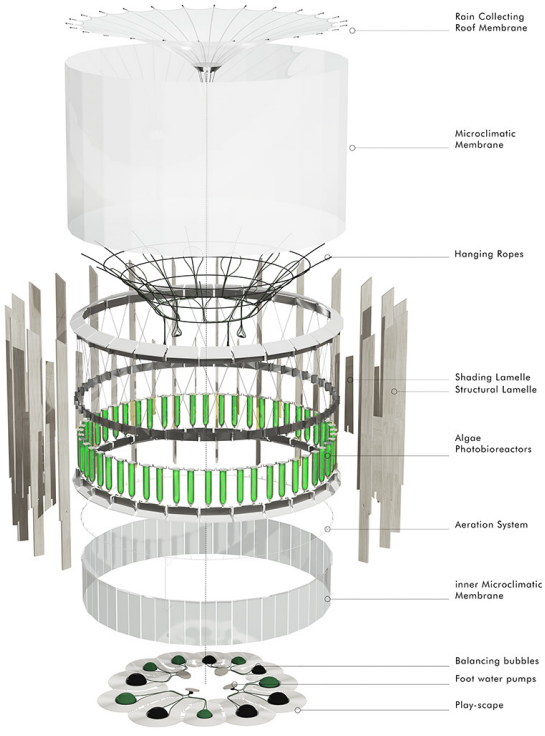

Figure 7.
ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, bioreactors, timber, ETFE membrane, Copernicus Science Center, Warsaw (Archdaily).

3.2.2. Air Bubble Glasgow: Ecological Performances in a Global Context

The second iteration of Air Bubble was showcased at Glasgow during the COP26 climate summit in 2021, emphasizing the project's "global relevance and political urgency"[38]. Unlike the Warsaw installation, which focused on urban play and community interaction, the Glasgow Air Bubble was conceptualized as a performative ecological pavilion, staging live demonstrations of biotechnological air purification in the context of international climate discourse. The pavilion sought to embody 'soft activism', using architectural performance rather than verbal protest to advocate for systemic ecological change.

Figure 8. ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, Bioreactors, Pneumatic shell, COP26 Conference, Scottish Exhibition and Confererence Center, Glasgow (Divisare).

Installed in the Green Zone of COP26, structural elements included a more formalized ETFE membrane envelope, supported by a semi-rigid aluminum and carbon fiber skeleton, enabling greater durability for Glasgow's colder and wetter climate. The structure again featured Chlorella microalgae cultures housed in a network of photobioreactors, yet this version placed greater emphasis on real-time environmental monitoring and data-driven storytelling. Visitors were immersed within a semi-transparent, breathable bubble where visible air quality data interfaces and didactic panels communicated the environmental functions of the living system. Additionally, a centralized bio-digital interface allowed visitors to observe photosynthetic rates,

38 Designboom, 2021b.

Figure 9. ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, Bioreactors, Pneumatic shell, COP26 Conference, Scottish Exhibition and Confererence Center, Glasgow (Divisare).

pollutant absorption levels, and microalgae health, merging scientific monitoring with sensorial experience[39]. This semi-scientific staging highlighted the agency of material entanglements, positioning the installation itself as both an affective and epistemic actor in climate communication efforts. So, unlike the Warsaw version's playful interactions, the Glasgow Air Bubble facilitated contemplative and observational participation. Visitors were encouraged to move slowly through the space, observing environmental data interfaces, feeling the subtle shifts in air quality, and reflecting on the symbiotic relationships enacted by the structure. Public seminars and guided tours supplemented this experience, positioning the installation as a performative epistemological space - a site where visitors could learn, feel, and think with the living materialities.

In Glasgow context, Air Bubble expanded the notion of new materialistic performativity, operating not only as an experimental playground but as a biotechnological envoy of posthuman ecological agency. This transversal agency of living organisms, human participants, and digital-technological interfaces exemplified intra-activity, generating an immersive environment where boundaries between nature, technology, and culture became materially reconfigured. Through an innovative blend of activism, design, and technology, Air Bubble Glasgow unfolded as an exemplar of new materialistic entanglements, where human, nonhuman, and technological actors were intra-actively woven into climate action performances.

39 ecoLogicStudio, 2021b.

Figure 10. ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, Bioreactors, Pneumatic shell, COP26 Conference, Scottish Exhibition and Confererence Center, Glasgow (Divisare).

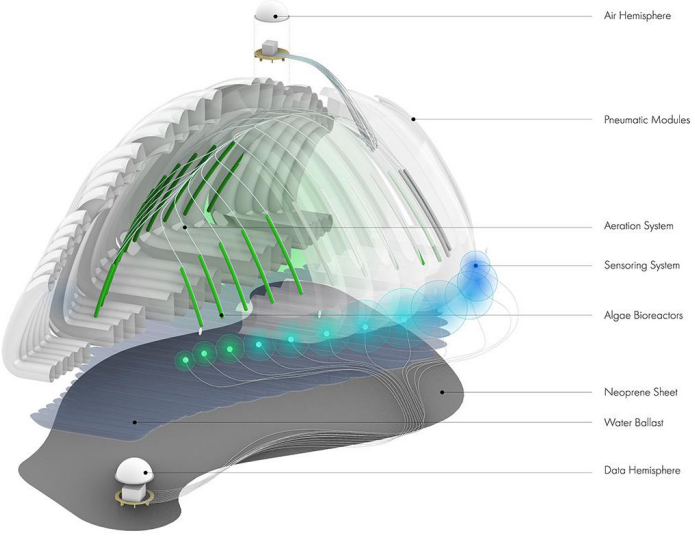

Figure 11. ecoLogicStudio, *AirBubble*, 2021, Bio-digital installation, Automated sensorial system, Bioreactors, Pneumatic shell, COP26 Conference, Scottish Exhibition and Confererence Center, Glasgow (Divisare).

3.3. A Comparative Case Study of Air Bubble Project

Despite their contextual and operational differences, both Air Bubble Warsaw and Air Bubble Glasgow instantiate the principles of new materialistic entanglement and performative ecological agency. Each site becomes a living interface—an evolving threshold where bodies, environments, and technological apparatuses intra-act to reconfigure both ecological materialities and public subjectivities. In this section, both installations are analysed in comparison in parallel to the prior findings on posthuman performative space, which are body - embodiment, time - temporality, and space - spatiality as displayed in Table 3.

Table 3. *Comparative case study table for generating categories on body, time and space for Air Bubble Project (Produced by the author, 2025)*

PROJECT	BODY	TIME	SPACE
Air Bubble Warsaw	Playful Bodily Interaction	Posthuman Present as a Multilayered Flux	Embedded and Relational Ecological Milieu
	Relational Agency Destabilizing Subject / Environment Distinction	Fluid, Affective and Situated in Becoming	Nomadic Transversal Assemblage
	Immediate Sensory Intra-actions with Biotechnological Entities	Materialization as a Living Entanglement	Emergent Field of Intra-activity
Air Bubble Glasgow	Representational Engagement	Becoming on a Political Scale	Planetary Networks of Action and Consciousness
	Collective Posthuman Subjectivities	From Microtemporal to Planetary Time	Distributed and Stratified Spatial Apparatus
	Politically Charged Material Participation	Extended Posthuman Present	Transversal Ecology In Action

3.3.1. Comparative Analysis: Body - Embodiment

In the Warsaw installation of Air Bubble, the body's role is immediately foregrounded through a direct, tactile, and sensory interaction with the biotechnological environment. Children, as primary users, are invited into a playground space where breathing microalgae visibly respond to their presence, creating a performative atmosphere of co-becoming. The architectural skin, composed of ETFE membranes hosting living Chlorella cultures, blurs the boundary between human embodiment and non-human living material. Here, the posthuman body materializes as a transversal biotechnological agent, enacting a continuous co-production of air, experience, and space[40]. The children's bodies are intra-actively entangled with the photosynthetic life forms and the atmosphere itself, performing relational agency that destabilizes clear distinctions between subject and environment. The bodily experience is thus constructed through a distributed agency

40 Braidotti, 2018.

in which multiple organic and inorganic elements collaborate to shape perception and movement. This dispersal of agency across bodies, membranes, and air currents reconfigures embodiment as a posthuman condition—transient, and co-constituted.

By contrast, the Glasgow iteration, located within the broader COP26 conference context, amplifies the political and ecological agency of embodiment. While it maintains the same microalgal architectural system, the Glasgow installation shifts the performative focus from playful bodily interaction toward a more representational engagement. The installation acts as a living demonstrator, encouraging visitors to contemplate the impact of collective bodies (human and non-human) on planetary health. Although physical immersion is still present, the intra-action here is more conceptualized, addressing the distributed nature of embodiment in relation to broader socio-political ecologies. The bodies of visitors become nodes in a planetary network of action and responsibility, embodying posthuman subjectivities both materially and symbolically. This multilayered bodily negotiation within an ecologically attuned interface exemplifies how posthuman embodiment transcends fixed corporeal boundaries.

In both cases, the installations transcend the traditional notion of a bounded human subject. They realize a distributed, relational, and performative embodiment: Warsaw focuses more on immediate sensory intra-actions with biotechnological entities, while Glasgow frames embodiment as a politically charged material participation in global ecological systems. Both reflect Barad's agential intra-action[41] and Braidotti's distributed biotechnological agencies[42], albeit with differing emphases on affective experience versus ecological consciousness. These comparative analysis reveal that embodiment in posthuman agencies are distributed across surfaces, substances, and temporal flows, forming an assemblage that continuously reconfigures how space is inhabited and felt. Thus, this reframing of embodiment as a dispersed and intra-active process not only challenges human-centered art and design paradigms but also proposes a new aesthetics of shared spatial agency.

3.3.2. Comparative Analysis: Time - Temporality

In the Warsaw installation of Air Bubble, temporality is experienced as an immediate and dynamic process of relational transformation. As children move, play, and breathe within the membrane structure, the microalgae respond in real-time by purifying the air and modifying the local atmosphere. This performative responsiveness embodies Braidotti's notion of the posthuman present as a multilayered flux — not a static "now," but a living, shifting convergence of material processes[43]. The children's bodies and the microalgae co-constitute a temporality that is fluid, affective, and situated in becoming, where past emissions, present bodily actions, and future ecological states entangle through intra-active materialities. This alignment generates a durational atmosphere, in

41 Barad, 2007, 33.

42 Braidotti, 2018, 21.

43 Braidotti, 2017, 8.

which time is encountered as material becoming rather than linear progression. Because the visitors are invited into a durational ecology, where experience unfolds in tandem with environmental processes, not against them. Time materializes here as a living entanglement, reshaping space and atmosphere continuously, in line with Barad's concept of agential reconfigurations[44].

In contrast, the Glasgow version, while utilizing the same living system of microalgae, expands the temporality of becoming to a planetary and political scale. Installed during COP26, a conference intensely focused on long-term environmental futures, the Glasgow Air Bubble integrates its microtemporal metabolic cycles into a broader narrative of planetary time. Here, the air-purification performance of the microalgae is not only immediate but symbolically projects into imagined future worlds — sustainable urban environments, climate futures, and alternative ecological timelines. In this context, this installation's more reactive interface generates a different temporal experience: one shaped by immediate feedback and technological anticipation. The structure responds to visitor behavior in near-real time, with light and airflow patterns adjusting in accordance with detected presence and motion. This creates an intensified sense of temporal immediacy—a condensed time of responsiveness that contrasts with the slower, organismic temporality in Warsaw. Time thus operates as an extended posthuman present, weaving the installation's immediate material processes into the larger, more abstract rhythms of environmental politics and global climatic change.

In both cases, Air Bubble actualizes time as non-linear, relational, and intra-active. Warsaw foregrounds a sensory, immediate entanglement with living processes, while Glasgow emphasizes extended, speculative entanglements across environmental and political timescales. Both demonstrate Braidotti's[45] and Barad's[46] visions of time as a dynamic ontology, where becoming-new matter unfolds within material and ecological relations, continuously reconfiguring itself beyond fixed, linear temporalities. Therefore, temporality in both cases are not a metaphorical experience but an ontological, deeply grounded in the physical processes that condition perception, behavior, and spatial meaning. As such, they exemplify how posthuman spatial practices can activate new materialistic temporalities that resist anthropocentric frames of becoming.

3.3.3. Comparative Analysis: Space - Spatiality

The Warsaw Air Bubble manifests spatiality as an embedded and relational ecological milieu, where the space is co-constituted by the presence of microalgae, architectural membranes, environmental factors, and human participants. Rather than functioning as a fixed container, the installation operates as a nomadic, transversal assemblage[47], with space dynamically emerging through intra-actions between human

44 Barad, 2007, 141.

45 Braidotti, 2017, 37.

46 Barad, 2007, 160.

47 Braidotti, 2018, 2.

users, non-human biological systems, air, and light conditions. The boundaries of the space are porous and fluid, allowing environmental factors such as humidity, carbon dioxide, and human bodily movement to co-define its spatial character. In this sense, the Warsaw installation exemplifies Braidotti's view of space as a creative threshold[48] and also resonates with Barad's[49] conceptualization of space as not a static assemblage, but an emergent field of intra-activity constantly reconstituted by ecological and material forces. In this sense, spatiality becomes a co-constructive process shaped through multisensory intra-actions and continuous negotiation between environmental components, human or non-human. This implementation thus exemplifies how space in posthuman ecologies is no longer an inert backdrop, but an emergent experiential terrain shaped through distributed agencies and ecological flux.

Meanwhile, the Glasgow Air Bubble installation deepens and politicizes this emergent spatiality by embedding it into a global ecological discourse. Located within the urban and political setting of COP26, the installation's spatiality extends beyond its immediate material site into planetary networks of climate action and ecological consciousness. Here, space is not only the site of biological interaction but also a performative apparatus[50] that brings together political agencies, activist bodies, technological systems, and living matter into a dynamic, relational field. The Glasgow Air Bubble thus generates a more distributed and stratified spatial apparatus, linking local biotechnological performance with global environmental concerns, enacting a transversal ecology in action. On the other hand, this implementation of Air Bubble reveals a spatiality which is not predefined but performed through adaptive scripts of sensing and acting, as an example of programmable ecology, in which space is produced through the relational computation of human and nonhuman agents. The installation demonstrates how posthuman spatiality can be engineered to facilitate real-time participation in evolving ecological systems, where human experience and perception is only one node in a larger sensorium of spatial awareness.

Both instances demonstrate that Air Bubble transcends conventional spatial categories, producing emergent spaces where biotic and abiotic forces intra-act. Warsaw emphasizes a localized, bodily-scaled emergent ecology, while Glasgow expands into a global, politicized network of spatial intra-activity. Each enactment illustrates that posthuman space, following Braidotti[51] and Barad[52], is not a static backdrop but a dynamic, relational, and threshold-oriented material formation an ever-transforming field of becoming-new matter. In this sense, they challenge the anthropocentric dominance of Cartesian spatial logic, replacing it with an ontology of emergent co-habitation, as

48 Braidotti, 1994, 7.

49 Barad, 2007, 451.

50 Barad, 2007, 171.

51 Braidotti, 1994, 7.

52 Barad, 2007, 171.

these spaces are not objective geometries but affective, metabolic, and affectively charged environments. This also resonates strongly with the idea of space as an agentive assemblag as a field of becoming shaped by the interdependencies of organic, inorganic, and technological entities. Air Bubble thus functions as a testbed for reimagining spatial agency beyond human intentionality, highlighting the transformative potential of ecological design in the posthuman turn.

DISCUSSION AND CONCLUSION

This comparative case study of ecoLogicStudio's Air Bubble installations in Warsaw and Glasgow reveals profound insights into the concept of posthuman performative space, especially when analyzed through the lenses of body-embodiment, time-temporality, and space-spatiality.

First, regarding Body and Embodiment, both installations demonstrate a distributed agency that moves beyond anthropocentric subjectivity. In Warsaw, embodiment is configured through immediate bodily interactions between humans, microalgae, and atmospheric conditions, creating a localized posthuman body composed of biological and technological entanglements. In contrast, Glasgow extends this embodiment into political assemblages, where activist bodies, media networks, and biotechnological agents co-constitute a broader performative corporeality. These findings confirm Braidotti's and Barad's perspectives that the posthuman body is a dynamic material multiplicity rather than a fixed, individualized entity. This ontological fluidity becomes especially salient in performative ecologies of AirBubble, where embodiment is not merely situated but enacted through shared vitality and mutual responsiveness. Embodiment becomes a situated event of co-constitution, where corporeality is constantly redefined through environmental feedback loops, respiratory exchanges, and affective attunements. Thus, these installations not only visualize but materially enact posthuman embodiment as an open-ended, relational field of becoming where agency, perception, and materiality are in continuous, responsive negotiation with each other through the framework of new materialism.

Secondly, in terms of Time and Temporality, both Air Bubble installations materialize temporality as relational and multilayered processes. Warsaw's Air Bubble showcases microtemporalities — the immediate photosynthetic cycles and human bodily engagements — as intra-active flows. Meanwhile, Glasgow's Air Bubble integrates these local temporalities with macrotemporal narratives of planetary ecological crises, embedding the installation within a temporal continuum that simultaneously addresses present urgencies and future environmental transformations. Both cases embody Braidotti's vision of the posthuman present as multilayered and flowing, and Barad's notion of agential reconfigurations that continuously reshape material-temporal realities. These temporalities are not merely represented in the AirBubble projects but are materially instantiated through the embodied and environmental interactions that unfold within each installation. Entangled time cycles operate simultaneously, weaving together biological,

technological, and atmospheric processes. In this way, temporality in posthuman performative spaces becomes an experience where past residues, present actions, and future potentials are continuously folded into one another. Rather than unfolding in a predictable or segmented sequence, time manifests as a dense field of interactions, continuously shaped by the interdependencies of living and non-living elements, as their time scales intersect in this multiple temporality.

Thirdly, concerning Space and Spatiality, the installations enact spatiality as an emergent, threshold-oriented relational process. Warsaw presents a spatial ecology that emphasizes localized, bodily-scaled relationality, while Glasgow rearticulates space as a distributed political ecology, extending the installation's reach into global networks. In both cases, space is neither a container nor a background, but a living, performative material field, constantly reshaped through human, non-human, and technological intra-actions. This resonates with Braidotti's conceptualization of nomadic transversal assemblages and Barad's emphasis on intra-active apparatuses that dynamically configure spatial realities. This redefinition of spatiality foregrounds its role as an active agent within the assemblage. Spatial reconfigurations emerge through constantly shifting thresholds between inside and outside, natural and artificial, individual and collective. The installations thus offer spatial experiences that are immersive yet unstable, inviting participants into a co-constituted sense of place that is provisional, responsive, and open-ended. Spatiality here becomes a dynamic terrain of negotiation, underscoring that space in posthuman ecologies, is always in the making.

In conclusion, the Air Bubble installations in Warsaw and Glasgow collectively illuminate how posthuman performative spaces emerge through distributed embodiments, relational temporalities, and entangled spatialities. By creating environments where human, non-human, technological, and ecological agents intra-act in real-time, they invite a rethinking of spatial practice as ethical and affective world-making in response to ecological urgencies where the space is no longer a passive backdrop but an active, intra-active agent of such posthuman ecological becoming. These findings contribute significantly to new materialistic and posthumanist theories of space, offering experimental models of living architectures that both perform and materialize alternative futures. Processing and inspiring as living laboratories, Air Bubble installations not only visualize but also prototype sustainable futures grounded in interrelational responsibility and material creativity.

Air Bubble project suggests fertile ground for further exploration of posthuman performative space as a new materialistic agent within ecological, technological, and social assemblages and apparatuses. Future research could expand these findings by investigating how such installations operate over extended durations, particularly examining the long-term evolution of relational bodies, temporalities, and spatial configurations. Moreover, comparative analyses with other biotechnological or living systems in art and design could provide deeper insights into how posthuman ecologies are enacted across diverse cultural and environmental contexts. This line of inquiry invites

new interdisciplinary dialogues across art, architecture, environmental humanities, and posthumanist theory, contributing to the ongoing project of reimagining material practices beyond anthropocentric frameworks. In particular, the study contributes to the growing body of literature on posthuman performativity by demonstrating how performative space can itself act as a dynamic mediator of ecological agency. It offers theoretical openings not only through the concepts of intra-action and assemblage, but also by foregrounding spatial performativity, distributed embodiment, and temporal entanglement as methodological lenses for understanding new materialist art and design practices. These insights challenge traditional notions of authorship, agency, art and design, calling for a shift toward ethical material engagements and situated worldings. Future studies may further deepen these perspectives by integrating participatory methods, long-term observational data, or speculative design approaches that track how such ecosystems adapt and transform across time and geographies. Ultimately, this research not only frames posthuman performative space as a conceptual category but also affirms its potential as an active methodology for engaging with complex entanglements of matter, meaning, and planetary ethics.

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