

NEW MATERIALITY AS CORRESPONDENCE Emerging Technological Examples in Public Spaces

SELEN SUPHIYE KANDEMİR (KANDEMIRS@ITU.EDU.TR)¹

MELTEM AKSOY (AKSOYMELT@ITU.EDU.TR)¹

¹Istanbul Technical University, Turkey.

KEYWORDS	ABSTRACT
Materiality New Materialism Public Space Digital Technologies Correspondence	<i>Today, the conception of materiality has evolved to encompass both the material and the immaterial, as well as the human and the non-human. Drawing upon the philosophical foundations of new materialism, this study interprets materiality as a form of correspondence. This interpretation is grounded in a non-dualist and non-hierarchical perspective, conceptualizing correspondence as a dialogue that opens onto a more-than-subject world, a mode of communication taking place among "things." Within this framework, the projects D-Tower, Amphibious Architecture, I'm Lost in Paris, and Air Bubble, all realized in urban public spaces, are examined through the lens of new materiality as correspondence. In these public works, materiality is defined as the reciprocal field of interaction in which correspondence takes place—a space where things write to and respond to one another.</i>

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1. Introduction

Today, materiality occupies a central position not only within architecture but also across a wide range of disciplines, giving rise to diverse theoretical frameworks and scholarly debates on the subject (Löschke, 2016; Nilsson, 2013). The growing prominence of materiality within architecture and design can be associated with three major transformations that became particularly influential during the late twentieth and early twenty-first centuries.

One of these transformations is the emergence of new materialist perspectives in response to the “linguistic turn”. New materialist approaches have expanded conventional understandings of materiality. Within this perspective, matter is no longer viewed solely as a physical substance but also as a relational and interactive domain through which various forms of agency and interaction become possible.

A second transformation is linked to the increasing integration of digital and information technologies into design and production processes. These developments have blurred the distinctions between the material and the immaterial, while also challenging conventional boundaries separating human and non-human actors. Such shifts have significantly contributed to the reconfiguration of contemporary understandings of materiality.

The third transformation stems from the challenges associated with the Anthropocene. Issues such as climate change, environmental pollution, and the depletion of natural resources have highlighted the need to reconsider materials beyond purely aesthetic and functional concerns. As the ontological basis of architectural materiality, materials are now increasingly evaluated within frameworks that emphasize ecological awareness and environmental responsibility. At the same time, developments in advanced manufacturing technologies, together with ongoing research into and production of new materials, have enabled the emergence of alternative forms of material expression.

Building on the intellectual foundations provided by new materialism, this study examines emerging forms of materiality that have developed through the influence of evolving technologies and techniques within urban public spaces. Adopting a relational perspective, it interprets new materiality as a mode of correspondence situated at the intersection of the material and the immaterial, as well as the human and the non-human. The concept of correspondence derives from the Latin terms *com* (“together”) and *respondere* (“to respond”). In contemporary usage, it refers not only to communication conducted through letters or emails among individuals but also to forms of mutual responsiveness, compatibility, and alignment that emerge between different entities (Harper, n.d.).

This study interprets the concept of correspondence, within the framework of new materiality, as a form of conversation/dialogue that opens onto a more-than-subject world and as a mode of dialogical communication occurring among things. The concept is framed beyond anthropocentric verbal communication to encompass heterogeneous entities through a non-dualist and non-hierarchical approach. By reading materiality as a form of correspondence, the study seeks to move public subjectivities beyond a conception of the human subject alone and to reconceptualize the communicative action, experience, and sensory perception that unfold within public spaces as processes taking place across different species, systems, and scales.

The principal contribution of this study lies in expanding the scope of debates on new materiality within the discipline of architecture, one of the principal actors in the production of public structures and installations, and in developing a new perspective for interpreting the forms of materiality emerging in public spaces through the technological developments of the twenty-first century.

The study first examines the concept of materiality from an etymological perspective and explains how matter and materiality are conceptualized within the philosophy of new materialism. In line with the scope of the study, discussions of matter and materiality draw primarily upon the ideas of new materialist thinkers who adopt a relational ontological

framework. Subsequently, the study seeks to provide an overview of how the issue of new materiality has been addressed within the discipline of architecture. Finally, selected examples from public spaces, situated at the intersection of architecture and art, are analyzed and interpreted in relation to the relevant literature. These examples are then subjected to a comprehensive evaluation within the framework of materiality as correspondence.

1.1. An Etymological Trajectory of the Concept of Materiality

The term *materiality* is etymologically derived from *matter* and *material*, both of which originate from the Latin term *materia*, meaning “the substance from which something is made” or “stuff.” *Materia* itself is rooted in mother, meaning “origin,” “source,” or “mother,” and in *hyle*, a term employed by Aristotle to denote the “hard inner wood of a tree” from which beings are made (Gentile, 2014). In Aristotelian thought, *matter* is identified with *potentiality* (*dynamis*), referring to the capacity to become something. *Hyle*, by contrast, denotes wood that has been cut from a tree and is “on its way” toward being used for a particular purpose. Judith Butler argues that in its early usages, *materia* implicitly contained notions of purposiveness, transformation, and temporality (Hafermalz & Riemer, 2015). Furthermore, the connection between *matter* and mother suggests an understanding of matter as possessing an agentive, productive, and generative quality.

By the mid-fourteenth century, the term *matter* had acquired the meaning of the “substance of which physical objects are made,” signifying that which is real and derived from the material world, in contrast to the spiritual and the mental. It also came to denote the “state of being material” or “material quality.” By the fifteenth century, the verbal form *to matter* had emerged, a usage that continues today in the sense of “being important” or “having consequences” (Gentile, 2014).

It is possible to argue that the meanings derived from these etymological roots encompass two distinct ontological positions: a substantialist and a relational one. The substantialist perspective conceives matter as a fixed, passive, immutable, or inert entity. Correspondingly, materiality is understood as the property that grants the objects encountered in the material world their mass, weight, and spatial presence; it is equated with the corporeal existence or physicality of beings (Gygi, 2018). This perspective became firmly established through the rational and positivist worldview that permeated modern Western thought, grounded in Cartesian subject/object and mind/matter dualisms (Hafermalz & Riemer, 2015; Picon, 2010).

The relational perspective, by contrast, returns to the early meanings of *materia* and argues that entities (objects, things, and humans alike) are constituted through interactions (Latour, 2005). From this standpoint, matter is not regarded as a fixed or passive entity but as something that must always be understood relationally, through its connections with other entities (Önder, 2025). Materiality, conceived beyond the dualisms of subject/object and mind/matter, is understood as a capacity to generate effects, produce resonance, and become operative through relations and interactions (Derin & Baytaş, 2025). This perspective gained increasing prominence through the scientific development in the field of quantum physics and the rise of new materialism.

1.2. New Materialism: Matter/Materiality

The philosophy of new materialism adopts a relational ontological framework by emphasizing the interconnectedness of material and discursive elements. Rather than the hierarchical ontology of the chain of being—structured around divisions such as God–human–nature and human–animal–plant–mineral—it proposes an ontology in which all material and immaterial/abstract entities exist in relation to one another (Coole & Frost, 2010). This ontological framework is founded not upon dualistic oppositions such as mind/body, subject/object, living/non-living, and organic/inorganic, which are characteristic of modernist thought, but upon the relationships that emerge among

multiplicities. Philosophically, new materialist perspectives reject transcendental and humanist universalism and take as their point of departure the existence of a material world independent of the mind (DeLanda, 2015). By approaching objects as subjects and inviting reflection on the relationships between human and non-human entities, as well as between the material and the immaterial, they seek answers to the question: "What is it like to be this thing?" (Hood & Kraehe, 2017, p. 35).

Drawing upon the virtual philosophy of Baruch Spinoza and Gilles Deleuze, Manuel DeLanda (2015) proposes a "new" understanding of materiality/materialism that extends beyond universal Newtonian laws and linear causality. Within this framework, matter is conceptualized, in contrast to the Aristotelian hylomorphic model, as an "active" entity endowed with its own virtual tendencies and capacities, animated from within by immanent patterns of existence and becoming. From the smallest material formations to large-scale structures, all material assemblages are understood to possess their own morphogenetic capacities and therefore do not require an external force in order to acquire form.

This understanding of nonlinear causality and self-organizing matter/materiality provides the basis for posthuman conceptions of subjectivity and agency grounded in the continuity of nature and culture. Rosi Braidotti (2019) proposes posthuman subjectivity and an alternative model of life within a neo-materialist vital system. Following a Neo-Spinozist monistic worldview, she envisions a plane of existence in which matter/substance is singular and immanent, while both human and non-human organisms are vital, intelligent, and self-organizing entities. By extending the concept of life from *bios* (life attributed to humans) to *zoe* (life attributed to non-human beings), Braidotti conceptualizes the subject as a "transversal" formation entangled within networks that include animals, plants, viruses, bacteria, and technological devices. Within this framework, posthuman subjects are understood as relational figures situated within a collective assemblage composed of ecological and technological formations. Materiality thus functions as both a shared ontological and methodological category for this plane of existence.

Hayles (1999) argues that within posthuman theory, which advances a new understanding of subjectivity, agency is not grounded in a distinction between a conscious self and an external other. This conception of agency shares important principles with Actor-Network Theory (ANT), which emerged through studies of science, technology, and society. In ANT, Bruno Latour (2005) problematizes the distinction between subject and object and proposes a symmetrical approach that accounts equally for humans (actors) and non-humans (actants), while understanding agency as distributed across networks and relations. Actors and actants, where an actant may be any "thing" capable of generating an action, are not pre-given entities already assembled within the social realm. Rather, they form networks through their relations with other actors and actants. Agency, understood as the capacity to act, is therefore distributed throughout these networks.

Similarly, Jane Bennett (2010) argues that all entities are interconnected as components of relational networks within the material world. Borrowing a term from Latour, she suggests that beings and things may be understood as actants, that is, as entities possessing efficacy, capable of producing effects and altering the course of events. Without distinguishing between human and non-human entities, organic and inorganic matter, or living and non-living forms, Bennett characterizes matter as "vibrant" and "active" (p. 135). She employs the concept of materiality in close association with vitality, incorporating what she terms "thing-power." Vitality refers to the capacity of objects to move and act (p. viii). This capacity encompasses the active power of all human and non-human "things" both to affect and to be affected.

Drawing upon Niels Bohr's quantum perspective, Karen Barad develops a theory of "agential realism," in which matter, meaning, and discourse are understood together. Within this framework, matter is not conceived as a blank surface awaiting interpretation by a subject. Rather than being a substance, matter possesses a performative capacity as an agentive force immanent to relational processes. Materiality is understood as an ongoing process of materialization, "a congealing of agency" through its own "intra-active"

becoming, in which action and agency emerge together (Barad, 2003, pp. 821–822). Agency is therefore not an exclusively human attribute; instead, it is conceived as the capacity of all matter (human and non-human) to generate transformation at multiple levels, beginning with subatomic relations. Furthermore, Barad argues that sensing, desiring, and experiencing are not uniquely human capacities. According to her, “matter feels, converses, suffers, desires, yearns, and remembers.” Materiality itself is “always already a desiring dynamism, a reiterative reconfiguring, an energetic process of receiving and giving, enlivened and life-giving” (Tuin & Dolphijn, 2012, pp. 48, 59). Materiality, by its very nature, exists as a condition of “entanglement”.

Although the conceptions of matter and materiality outlined above differ in significant respects, materiality—one of the key concepts of new materialism—points to far more than matter in its conventional sense (Colebrook, 2017; Coole & Frost, 2010). In a concise formulation, Coole and Frost (2010, p. 9) characterize materiality as “active,” “self-creative,” “forceful,” “vital,” and “relational.” The theoretical significance of these approaches for architecture and design culture lies in their capacity to challenge the conventional assumption that matter/material is passive, inert, and silent, serving merely as a raw resource for human action. At the same time, as we move toward an era in which the boundaries between human and non-human entities are increasingly blurred, these perspectives reject anthropocentrism, acknowledge the role of “things,” and place at their center the development and articulation of design perspectives based on the collaboration of heterogeneous entities.

The conception of materiality adopted in this study is grounded in a relational perspective and is framed through an anti-dualist and anti-hierarchical approach encompassing the systems of interaction among heterogeneous entities (the material and the immaterial, the human and the non-human). Within this perspective, all “things”—humans, objects, nature, technology, living and non-living beings, as well as organic and inorganic entities—are understood as relational entities.

1.3. New Materiality in Architecture

Architectural dictionaries present various definitions of the concept of materiality. Among these are:

- “the touchy nature of material” and “what a building is made of and what it feels like” (Porter, 2011, p. 90);
- the expression of a material’s inherent qualities through its external appearance (Janson & Tigges, 2014, p. 189);
- and “the experienced reality of materials” (Smith, 2012, p. 108).

Beyond these dictionary definitions, the literature contains numerous descriptions that associate materiality with the physical qualities and tangible nature of a building, space, or architectural surface. It can be argued that such definitions are grounded in the positivist paradigm, which adopts the Cartesian subject-object distinction. Within this perspective, the material is equated with physicality or tangibility, whereas the immaterial is associated with intangible and invisible “things.” Conceptual, mental, sensory, psychological, political, economic, and social factors; digital technological infrastructures; atmospheric phenomena that constitute space (such as sound, smell, wind, water, light, and shadow); and materials capable of changing their fluidity, form, and properties (e.g., density, color, and transparency) have generally been classified under the category of the immaterial (Aynali, 2023; Karandinou, 2019). Material properties have been regarded as objective and measurable, while material qualities and spatial experience have been interpreted through a human-centered framework of subjective experience.

In contrast to such dualistic approaches, which separate object from subject and ideas from matter, the literature has increasingly developed expanded definitions of a relational vision of new materiality in order to move architecture beyond substantialist perspectives. The incorporation of digital technologies into architectural design and production, together

with the use and recognition of binary code (0s and 1s) as a form of “raw material,” has opened new theoretical avenues for conceptualizing materiality in architecture.

Marcos (2011) defines new materiality conceptually as a constructive logic specific to materials and emerging design and fabrication methods within the field of digital architecture. Philosophically, new materiality has been discussed as an alternative model to the theory of hylomorphism, which is rooted in an anthropocentric understanding of matter (Thomas, 2022). Architectural theorists have increasingly shared ideas that resonate with the core intuitions of new materialism, motivated by a desire to move beyond conventional assumptions that regard matter and materials as inherently dead, static, and passive (Picon, 2024). Within this framework, the properties and qualities of materials are not understood as fixed givens but rather in terms of behavioral capacities that emerge through specific interactions over time. Materials are thus considered active agents independent of the designer. Design approaches such as material driven design and material computation can be seen as products of this tendency. For example, Neri Oxman (2010) define “new materiality” not as a passive component of form but as an active generator of design and as an integral component of structural, environmental, and architectural performance.

The notion of new materiality has also been explored through the use of technologically advanced materials. Today, materials can be precisely measured, visualized, and manipulated through technological tools and digital software before being integrated with physical materials (Moussavi, 2009). Inspired by the technological potential of such innovative material practices, architectural culture is witnessing what Oxman (2012, p. 20) describes as “a new materiality.” This development has been supported by novel classes of materials designed through collaborations among diverse disciplines, including digital computation, artificial intelligence, nanotechnology, biotechnology, materials science, and synthetic biology (Bianco & Scarpitti, 2024; Kretzer, 2017).

A wide range of materials have consequently entered the world of design as new forms of materiality, including “smart” materials that respond to environmental stimuli and actively alter their properties over time (Bengisu & Ferrara, 2018; Parlac, 2021); software-based programmable materials designed to perform specific functions (Kretzer, 2017); self-healing materials; and biomaterials synthesized at the intersection of the organic and the inorganic. Such materials are thought to exhibit life-like characteristics, thereby blurring the boundaries between animate and inanimate, natural and artificial. Architectural structures/works—and the materials that constitute their conditions of existence—can thus be understood not merely in terms of their physical or current states, but also through their “augmented” materialities, as empathetic actors capable of receiving, processing, and disseminating information and of interacting with their surrounding environments. As Bianco and Scarpitti (2024, p. 360) observe, contemporary materiality possesses a “synaesthetic, vibrant, multidimensional, and pluriversal” character.

Another important arena in which new materiality has been discussed concerns the use of digital environments and tools within design processes. The widespread adoption of computers and the development of virtual worlds have generated competing perspectives on material and immaterial phenomena in architecture. Theorists who approach materiality from a substantialist perspective have generally categorized digital and media technologies, code, abstract data, software, and algorithms as immaterial entities.

In contrast, the relational perspective treats digital technologies as real and material “artificial life environments,” thereby dissolving the distinction between the actual and the virtual. Picon (2004), in alignment with science and technology studies, refers to the physicality of code (0s and 1s) and argues that contemporary materiality should be understood at the intersection of the actual and the virtual—two categories that appear to be opposed yet continuously interact. Drawing upon Latour, he considers computers to be non-human actors. Mahesh Senagala (2010, p. 374) introduces the concept of *softerials*—materials composed of bits rather than atoms—and defines them as a new type of architectural material generated by a world in which “things” originate differently.

Referring to Louis Kahn's famous question about what a brick wants to be, Senagala asks: "What does a softerial want to be?"

Farshid Moussavi (2009), in her expanded definition of new materiality, broadens the notion of architectural material to include not only physical substances but also binary code, climate, sound, economic conditions, socio-cultural contexts, politics, and sensory desires. Within this framework, matter and material can be understood not merely as physical structures but as entities that can be transformed into data, encoded, and reproduced. The relationship between the material and the immaterial –traditionally regarded as a binary opposition– emerges in the contemporary world as a form of conceptual symbiosis. Consistent with the assumptions of new materialist thought, digital objects and technologies are positioned not as instrumental phenomena but as sensitive actors capable of producing material effects within the relational networks in which they participate (Önder, 2025). As in posthuman approaches, a new plane of subjectivity is established beyond human-centered cognitive systems. Luciana Parisi (2013) proposes that algorithms are entities that construct digital spatio-temporal structures. For her, cognition is not exclusive to the human mind. Through an algorithmic ontology, she theorizes algorithms not merely as tools written and controlled by humans but as cognitive entities capable of generating their own modes of thought. This perspective expands into a networked and relational dialogue of existence in which binaries such as nature/culture and human/technology are dissolved. In his ontology that unites matter and life, Lars Spuybroek (2011, p. 38) argues that codes are not immaterial but rather speak the very language of matter itself. He conceptualizes this dialogue as a talk between things and things, a "sympathetic" interaction that opens onto a world of experience beyond the human subject.

As the foregoing discussion suggests, debates surrounding the vision of new materiality in architecture have largely concentrated around several interconnected axes: alternative models that resist hylomorphism within the form-matter/material relationship; the use of technologically advanced materials; and the incorporation of computers and "digital entities" into design and production processes.

1.4. Public Space and New Materiality

Throughout history, human beings have been subject to diverse forms of settlement and habitation. This practical relationship has unfolded not only within individual spaces and senses of belonging but also within shared environments. In this sense, public space may be understood as a phenomenon emerging from the coexistence of beings (Ardatürk, 2022). This condition of togetherness creates a form of commonality that belongs to no one in particular and, at the same time, to everyone. At its most fundamental level, this shared realm is referred to as *public space*.

The two most fundamental characteristics of public space are publicness and spatiality (Liu et al., 2025). According to Tekeli (2023, p. 20), publicness is constituted through various forms of "communicative action." The first prerequisite of public space is "conversation"; the second is "the encounter between individuals and the mutual process of influencing and being influenced by one another"; and the third is the act of "being together." These communicative actions always occur within a spatial setting. Publicness is significant as a social ground that enables the coexistence of differences. Public space, as the embodiment of this ground, serves as the stage upon which interaction and shared experiences unfold. Beyond facilitating interpersonal interaction, space, as Martin Heidegger also suggests, is more than mere physical existence; it is a phenomenon through which experience itself is constituted. Such experience emerges fundamentally through the senses and sensory perception (Ardatürk, 2022). It is through this experiential dimension that space contributes to the organization of humanity's social and collective life.

Conventionally, public spaces have been understood as material and physical domains, while the experience of public space has been interpreted within a human-centered framework. However, in the twenty-first century, under the influence of digital

technologies, public space has been redefined as a relational and multi-scalar phenomenon negotiated between material and digital realms. Contemporary discussions in the literature reconceptualize public space as a multidimensional whole emerging through processes of physical-virtual interaction (Jordan & Rizzioli, 2024; Liu et al., 2025). This hybridization, enabled through technological interfaces, has opened public space and publicness to interpretations that emphasize layered and interconnected structures. Liu et al. (2025) describe public spaces as undergoing a transition from predefined physical containers toward ongoing spatial formations and processual configurations. Jordan and Rizzioli (2024), advocating a shift from the “subject” to the “object,” propose a posthuman reading of publicness. Within this framework, non-human objects are imagined as active participants in public space, understood as an open assemblage system.

The expansion of perspectives on the materiality of public space has been facilitated by experimental projects designed through emerging techniques and technologies. “Performative public spaces” created through the interaction of technology, architecture, public environments, and ecological systems (Cantrell & Holzman, 2015); virtual layers integrated into public spaces through digital technologies; and adaptive, interactive installations that establish dialogue and generate responses with users have transformed the content, operation, experience, and, in other words, the materiality of public spaces and the works that emerge within them. This transformation has been made possible through sensors, data-driven systems, technologies utilizing Internet of Things (IoT) networks capable of enabling public works to respond to environmental changes (Gruosso et al., 2025), as well as actuators and a variety of material experiments.

The new forms of materiality emerging within public spaces function as bridges between material (physical) and immaterial (digital-virtual) worlds, enabling relational interactions not only among humans but also between non-human entities and their environments. Such interactions among heterogeneous entities offer the potential to transform the “communicative action,” experience, and sensory perception that occur within public spaces as shared environments into a mode of interpretation operating across multiple scales and systems. It is this mode of interpretation that is conceptualized in the following section through the framework of *materiality as correspondence*.

2. Research: Forms of Materiality as Correspondence in Public Spaces

2.1. Methodology

This section presents the selected case studies examined in the article through a comprehensive technical, technological, and interpretive framework under the theme of *new materiality in public space*. Adopting a relational perspective, the study approaches new materiality through an anti-dualist and non-hierarchical framework, interpreting it as a form of correspondence emerging at the intersection of the material and the immaterial, the human and the non-human. Semantically, correspondence encompasses connection, communication, and a process through which things respond to one another. Within this system of correspondence, all entities/actors capable of establishing a common ground among heterogeneous forms of existence are referred to as “things.”

Reading materiality as correspondence foregrounds the reciprocal communication of heterogeneous entities within architectural production. It adopts an approach in which the subject-object dualism is suspended and agency is understood as distributed across networks. From this perspective, materiality as correspondence is performed through interactions among various things, including humans, technological devices, digital systems, environmental conditions, living organisms, matter, and materials. It is interpreted as a process of reciprocity in which one thing responds to another within an ongoing dialogue. The dialogue among things and the emergence of their capacities to affect and be affected by one another give rise to a communicative and interactive form of materiality. Within this framework, “things” are not silent or passive entities; rather, they are responsive and influential participants.

The examples examined in this study were selected in order to reveal, from different perspectives, the architectural manifestations of interactions among material and immaterial, human and non-human things. They were also chosen to enable the observation of varying degrees of reciprocal communication and interaction established through digital and technological interfaces.

The criteria for selecting the case studies are as follows:

- Their realization within public space;
- Their incorporation of digital, biological, and material layers;
- Their inclusion of actors that can be conceptualized as “things”;
- Their existence within a relational milieu composed of multiple actors.

For each case study, the operational logic of the work, its technological and material components, and the relational assemblages formed among human and non-human as well as material (physical) and immaterial (digital) entities were analyzed. Furthermore, the ways in which these relationships generate materiality were examined and explained. The findings derived from the analysis, particularly the dialogues established among things within each work, are descriptively summarized in Table 5. Table 5, which may also be interpreted as a translation of correspondence among heterogeneous entities, was structured to address the following questions:

- Mode of Correspondence: How is dialogue/communication established between human and non-human entities?
- Mediator of Correspondence: Is the medium that enables dialogue/communication material (physical) or immaterial (digital)?
- Producer of the Final Outcome: How is the resulting work produced through this dialogue?
- Temporal Characteristic: Does the dialogue/communication occur in real time?

2.2. D-Tower

Designed by Nox Architecture, the D-Tower was conceived as part of an interactive system in which architecture converges with media and digital technologies. It constitutes a hybrid structure emerging from the integration of material, digital, and sensory dimensions.

Figure 1. D-Tower (2001-2003)



Source: V2_ (n.d).

Designed for the city of Doetinchem in the Netherlands, the D-Tower consists of three principal components:

1. The physical structure (the tower)
2. An emotion-measurement system
3. A software-supported website that processes the system's data

These three components are relationally interconnected. The emotion-measurement system is based on a survey developed by Q. S. Serafijn to assess the emotional states of the city's residents. The software-supported website processes the data generated through this survey. Participants complete the questionnaire digitally, and emotions such as love, happiness, fear, and hatred are measured. The survey system is refined and revised on a monthly basis to improve its accuracy and responsiveness.

The collected data are processed through software applications and categorized according to postal codes within the city. Through the identification of peaks and troughs in emotional intensity, the data are transformed into what the project refers to as "emotional landscapes." Within these landscapes, emotions are represented through a system of color coding. The relationship established between emotions and colors determines the illumination of the tower on a given night. In this way, city residents are able to observe the emotion that predominates within the urban environment through the changing appearance of the tower (V2_, n.d.). Variations in color (red, blue, yellow, and green) directly signify shifts in collective affect. Consequently, emotions acquire a material manifestation that is publicly displayed and perceptible within urban space.

Residents may also contribute emotional content to the system in the form of messages, photographs, and letters, which are subsequently associated with specific locations through virtual mapping technologies. The tower was conceived as a structure that spatially and digitally archives the emotions of residents living in different streets and neighborhoods throughout the city (V2_, n.d.).

In this context, the D-Tower can be understood not merely as a public artwork but as a material milieu in which emotional, digital, and social interactions converge. Within this project, human and non-human elements are positioned as actors within a network, mutually influencing one another while collectively generating an emotional topography.

From this perspective, the materiality of the D-Tower establishes a form of correspondence among psychological states, digital systems, and architectural surfaces. By translating the city's invisible, collective, and abstract emotional flows into an architectural expression, it renders them publicly visible. The tower thus functions as a communicative and interactive emotional interface within urban public space.

2.3. Amphibious Architecture

Amphibious Architecture was designed through a collaboration between Chris Woebken Studio, xClinic, and The Living (GSAPP), and was realized along the Brooklyn and East Rivers in New York. The project is an urban public work that presents a hybrid entity formed through the convergence of the digital and the material within an aquatic habitat and aims to enable interaction and communication between human and non-human species.

In Amphibious Architecture, an interactive installation materialized through technological means such as tubes, sensors, media systems, and software, it can be argued that an attempt is made to establish a relationship between urban residents and the aquatic habitat based on sensory, cognitive, and ecological awareness.

Figure 2. Amphibious Architecture (2009)

Source: Chris Woebken Studio (2009).

The project involves interaction and the production of responses among living organisms, environmental factors, technological devices, and humans. The system operates as a communication interface through which data related to underwater natural and ecological life are collected and made visible through changes in color and light. This mode of visibility constitutes not only a physical element but also a dynamic and interactive materiality shaped through data flows, environmental feedback, and interspecies communication.

Accelerometers for monitoring water currents and ultrasonic sensors for tracking the presence and movements of fish were installed within the light-emitting tubes that constitute the principal components of the project. The lighting system was constructed from stacked LED light discs connected to a battery pack powered by photovoltaic panels that convert solar energy into electrical energy. Real-time data collected from the aquatic environment through the sensors produce variations across a color spectrum ranging from blue to purple and from hot pink to red, according to fish movements and changes in water quality. At the same time, these data could also be transmitted to the mobile phones of city residents through an SMS interface. In this way, city residents were able to respond via SMS through a diagrammatic narrative that explained, in a humorous manner, the signals received from the fish (The Living & Jeremijenko, 2013).

In this context, the materiality of *Amphibious Architecture* can be defined through its relationality and capacity to respond. The material is no longer passive or silent. Through its augmented materiality, it emerges as a sensing, responsive, and speaking actor. Data relating to invisible forms of life within the underwater ecosystem become materialized through the design object. As Harrison (2012) emphasizes, water does not function merely as an urban infrastructure or an aesthetic element, nor do fish appear merely as observed natural entities. Nature is positioned as an active and communicative component.

In conclusion, through its materiality, *Amphibious Architecture* demonstrates that the users of urban public spaces are not only humans but also non-human species. It provides an environment in which these species may be perceived as communicative entities. As a relational material interface that promotes environmental and ecological awareness, it proposes a new form of experience within urban public space. This experience creates an interactive form of materiality in which things correspond with one another. The colorful light displays appearing across the river surface throughout the night generate different visual images, contributing to the transformation of both the atmosphere and the experience of the materiality of public space.

2.4. *I'm Lost in Paris*

I'm Lost in Paris is a radical environmental experiment developed by R&Sie(n) through a critical approach to the relationship between nature and architecture. Realized on the façade of a building functioning as an urban interface within a courtyard whose location was deliberately concealed in Paris, the project was conceived as an ecosystem in which a primitive plant species originating from the Devonian period (*Dryopteris filix-mas*), microbial life (bacteria), architecture (the house), and technical and technological systems mutually sustain one another (new-territories, n.d.).

Figure 3. *I'm lost in Paris* (2009)



Source: New-Territories (n.d.).

Situated within a relational field of interaction among heterogeneous elements, *I'm Lost in Paris* operates as a self-sustaining and self-growing nature-technology hybrid organism. The nourishment and growth of the plants create continuously evolving patterns of time, space, and matter together with the architectural components.

The façade of the dwelling is covered by the installation itself. Within a steel mesh framework, 1,200 ferns—referred to by Roche as “dinosaur plants” and foreign to the climate of Paris—and 200 glass vessels produced through glass-blowing techniques, referred to as “beakers,” were installed (new-territories, n.d.). The system was completed by a heterogeneous functional membrane composed of digital feedback systems (Harrison, 2012).

The ferns covering the façade were nourished through a hydroponic pipe system utilizing rainwater collected from the roof. Solutions containing *rhizobia* bacteria, which possess water- and nitrogen-fixing properties, were added to the glass vessels placed among the ferns. When these solutions became suitable through interaction with sunlight, they were transferred to the substrate of the ferns, enabling the biological fixation of atmospheric nitrogen by the plants (new-territories, n.d.). Through this symbiotic form of life, both the ferns and the bacteria maintained their metabolic existence. The chemical components of the nutritional infrastructure required for the survival of the ferns were monitored, controlled, and adjusted by humans through digital monitoring systems (Harrison, 2012).

In *I'm Lost in Paris*, materiality is produced together with non-human entities. The ferns are neither merely natural elements nor decorative features. In other words, they are not passive components of the system. They are positioned as active subjects that guide the temporal evolution of the project's materiality, acting as decision-making and transformative entities that shape the materiality of the structure. They are also positioned

as contributors to the ecosystem. In Roche's words, *I'm Lost in Paris* opens the door to encounters with a third species and emerges from the convergence of the primitive and the technological (new-territories, n.d.). In this context, the project has been described by Javier Arbona (2010, p. 53) as a "mechorganic cyborg" and by Harrison (2012, p. 623) as a "vegetal cyborg."

In conclusion, it can be argued that the materiality of *I'm Lost in Paris* is shaped through a correspondence that enables non-human entities to participate in dialogue, where living and non-living, organic and inorganic, natural and technological "things" interact reciprocally within a relational topography. Within the project, architecture ceases to be something constructed solely for humans and instead becomes an open-ended choreography of correspondence shaped for and through non-human entities.

2.5. Air Bubble

Developed through a collaboration between EcoLogicStudio and Otrivin®, *Air Bubble*, realized in Warsaw, one of Europe's most polluted cities, is designed as a hybrid pavilion in which interactions among humans, microalgae, and atmospheric conditions are structured within a relational framework, emerging through the entanglement of biological and technological actors. Developed within the context of the COP26 conference, the project is grounded in the objective of integrating biotechnology into the built environment and incorporating "living architecture" into sustainable urban spaces (ecoLogicStudio, 2021).

Its materiality, supported by Photo.Synthetica technology, operates through the real-time interaction of human, technological, and ecological-natural actors. Responding to air flows and water exchanges, it can be activated as an "eco-machine" whose embedded machine intelligence functions to purify the air.

Figure 4. Air Bubble (2021)



Source: ©NAARO and ecoLogicStudio (2021).

Air Bubble is composed of transparent Thermoplastic Polyurethane (TPU) material, water, air, photosynthetic *Chlorella* colonies, glass reactors, full-spectrum grow LEDs, various sensors, microprocessors, software tools, and digitally fabricated components.

Consisting of a double membrane capable of filtering 100 liters of polluted urban air per minute, *Air Bubble* contains 6,000 liters of water and 200 liters of living *Chlorella* microalgae culture. The water within the double membrane functions as a fundamental balancing actor within the material system. The living microalgae culture is housed within 24 photobioreactors. The algae inside these bioreactors consume carbon dioxide and pollutants while producing oxygen through photosynthesis. Each photobioreactor possesses the carbon-capturing capacity of a mature tree and is capable of absorbing up to 90% of airborne particulate pollutants and NO_x (ecoLogicStudio, 2021). The filtration process is achieved through a responsive and interactive environment in which urban users, living organisms, digital-technological interfaces, and ecological agents interact.

Sensors embedded within the structure monitor human interaction and environmental changes (air quality, humidity, temperature, wind pressure, and artificial and natural light) in real time. Sensors installed within the inner membrane detect the presence and movements of visitors as well as air quality indicators (PM_{2.5} and PM₁₀, ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide levels), while an accelerometer installed within the outer membrane detects wind and vibrations. The data obtained from the sensors are processed through microprocessors and software tools, triggering the pneumatic system. Air from the surrounding environment is directed through the membrane into the photobioreactors, from which purified air is circulated within the bubble. The sound of air bubbles generated during the filtration processes of the algae creates a soothing background sound, masking surrounding urban noise and providing a calm atmosphere (ecoLogicStudio, 2021).

Within the project, algae function as active agents in the production of materiality. Human interaction within the environment activates the system that enables liquid and airflow within the bioreactors, thereby increasing the rate of photosynthesis and the capacity to absorb pollutants. LED lights, which are activated when natural light is insufficient, also function as active actors in the operation of the microalgae (ecoLogicStudio, 2021). It is possible to argue that the materiality of *Air Bubble* emerges through a network of biological, technological, and environmental connections, enabled by the correspondence among human and non-human, living and non-living, organic and inorganic things. At the same time, through a central biodigital interface, urban users were able to observe pollutant absorption levels and photosynthetic rates. Through its materiality, ecological action becomes a communicative interface.

Filtering carbon and organic particulates from the air and thereby functioning as a giant lung, *Air Bubble* is described by its designers as a “biotechnological organism.”

In conclusion, *Air Bubble* is not merely a public playground but a project that forms part of posthuman ecological action, in which the boundaries between nature, technology, and culture are materially reconfigured. Through the spatial structure it occupies and generates, together with its light reflections and the sounds of the air bubbles it emits, it transforms the materiality of the surrounding environment as atmosphere in an experiential sense, one that is not limited to a specific sensory modality.

2.6. Evaluation: The System of Correspondence in Public Installations

D-Tower, *Amphibious Architecture*, *I'm Lost in Paris*, and *Air Bubble* function as bridges between the material (physical) and the immaterial (digital) worlds, enabling human and non-human things to establish connections through networks. Within these new forms of materiality emerging in public spaces, the communicative dimensions of heterogeneous entities come to the fore. The invisible dialogues that take place within the system of correspondence among heterogeneous entities or the translation of conversations among “things” are descriptively summarized in the table below.

Table 5. Correspondence Among Heterogeneous Entities

	Mode of Correspondence		Mediator of Correspondence		Producer of the Final Outcome		Does communication occur in real time?
	How is dialogue/communication established between human and non-human entities?		Is the medium that enables dialogue/communication material (physical) or immaterial (digital)?		How is the resulting work produced through this dialogue?		
Structures			Material	Immaterial	Material	Immaterial	
	Direct	Indirect	Physical	Digital	Physical	Digital	
D-Tower		Sensory survey data regarding city residents		Software	Electricity and Light Source		NO
		Data-processing website			Projection		
Amphibious Architecture	Real-time data regarding water conditions	SMS interface indicating human presence		Software (Arduino IDE)	Tubes		YES
				Ultrasonic sensors	Battery pack connected to photovoltaic panels		
	Data regarding fish presence	Project website		LO-Fi Fish Sensors	Colored LED light sources		
	Data regarding water currents			Accelerometers			
I'm Lost in Paris	Ferns		Hydroponic system	Software	Plant growth		NO
	Rhizobia Bacteria		Electronic feeding cables	Digital feedback systems	Bacterial reactions		
	Sunlight				Glass vessels for chemical reactions		
	Rainwater				Mechanical-analog supports		

Air Bubble	Detection of human behavior and movement	Biodigital interface	Software Arduino IDE	TPU Membrane	YES
	<i>Chlorella</i> colonies		C/C++	Air Hemisphere	
	Water		Processing	Pneumatic Modules	
	Data regarding temperature, light, humidity, wind, and environmental conditions		9 DOF IMUs Sensoring System:	Aeration System	
			3-axis Accelerometers	Glass Algae Bioreactors	
			3-axis Gyroscopes	Neoprene Sheet	
	Data regarding airborne pollutants (PM2.5, PM10, O ₃ , NO ₂ , SO ₂ , CO)		3-axis Magnetometers	Water Ballest	
			ARM Cortex-M0-Microprocessor	Data Hemisphere	
				Full spectrum grow LEDs	
				Biochemical reactions	

Source: Own elaboration, 2026

At the beginning of the 2000s, *D-Tower*, the first interactive public structure in which internet-based digital technologies were integrated into architecture, constituted one of the earliest examples of forms of materiality interpreted as correspondence among “things” in public space. Functioning as an affective body and communication system that collected, processed, and reflected the sensory energy of the city, its materiality was constituted through the correspondence of the collective urban mood within public space. Demonstrating that urban public subjectivities are not limited to humans but also include non-human species, *Amphibious Architecture* emerged as an extension of the technological innovations that developed through the integration of Arduino technology into architecture. As a sensing actor, its materiality established a correspondence between urban users and the aquatic ecosystem within public space.

The projects *I'm Lost in Paris* and *Air Bubble*, in which the boundaries between nature and technology are materially reconfigured, were developed as part of posthuman ecological action. Their materialities emerged through the correspondences among biotic, abiotic, and digital-technological “things.” *I'm Lost in Paris* was realized through craft techniques, a hydroponic system, and early digital monitoring and feedback technologies. Its materiality, functioning as an urban public interface, became a communicative interface and a choreography of correspondence shaped for and through non-human entities. *Air Bubble*, representing the most advanced example of forms of materiality interpreted as correspondence among “things” in public space, was realized through advanced sensor and software technologies as well as the biodigital *Photo.Synthetica* technology developed in 2018. Compared to *I'm Lost in Paris*, the distributed agency of humans becomes more prominent within its system of correspondence among things. At the same time, through its central biodigital interface, it transforms ecological action into a communicative interface within public space.

Considering the technologies that transform systems of correspondence among heterogeneous entities, the following observations can be made:

- According to the increasing complexity of the technical and technological systems employed, the examined examples can be ordered as follows: D-Tower, *I'm Lost in Paris*, *Amphibious Architecture*, and *Air Bubble*. Correspondingly, as the diversity and number of digital and technological layers involved in enables communication/dialogue increase (Table 5), the structures/works become more dynamic in terms of active movement. The movement associated with materiality in *Air Bubble* is subject to human presence, environmental changes (air pressure, humidity, temperature, light, and carbon dioxide levels), and biochemical reactions; in *Amphibious Architecture*, it is subject to water currents and river waves; and in *I'm Lost in Paris*, to the growth of plants. D-Tower, by contrast, remains static.
- Differences also exist in relation to the temporal character of dialogue among things within systems of correspondence among heterogeneous entities. In *Air Bubble* and *Amphibious Architecture*, correspondence occurs in real time. In contrast, in *I'm Lost in Paris* and D-Tower, it does not occur in real time (Table 5). When correspondence takes place in real time, affective capacities, understood as the capacities of things to affect one another, and human experience of public space acquire a synesthetic character.
- Technical and technological innovations have endowed forms of materiality as correspondence in public space with a more responsive and performative character within a relational field of interaction.

In summary, these projects realized within public spaces demonstrate that materiality is no longer merely a physical phenomenon but has become an affective interlocutor. From a holistic perspective, the entire process can be understood as a dialogue among the material and the immaterial, and among human and non-human things. This communication among heterogeneous entities opens communicative action and sensory experience within public space, as a shared environment, to different species, systems, and scales.

3. Conclusion

This study examined new materiality through the intersection of two approaches: the material and the immaterial on the one hand, and the human and the non-human on the other. Through an anti-dualist and anti-hierarchical perspective, the entanglement of these two approaches suspends the subject-object distinction and is founded upon a framework that places the mutual dialogue and agency of things at its center. Drawing upon contemporary intellectual approaches such as new materialism, Actor-Network Theory (ANT), and posthumanism, the study proposes reading materiality as a form of correspondence.

Materiality as correspondence involves an ongoing dialogue—a form of conversation—among different species, systems, and scales. Attentive to non-human entities, this conversation is framed as an interspecies dialogical communication that opens onto a world beyond the subject. Here, materiality is neither merely something perceived through the senses nor simply a matter of what something is made of. Architectural structures/works and the materials that constitute their conditions of existence function not only through their physical presence but also through their “augmented” materialities as affective actors capable of communication. Materiality emerges through correspondences within interactive environments in which things communicate with one another under controlled conditions. Within this choreography of correspondence among various actors/things (humans, digital technologies, algorithms, data, environmental elements, materials, and others), every contact and every act of communication generates a response. Each response produces a new field of experience and perception. Materiality becomes the site in which correspondence takes place. It is defined within a reciprocal field of influence where things write to and respond to one another. It acquires meaning through the ways in which things interact and communicate.

Based on the examples examined in this study, it can be argued that designing a structure/ work within contemporary public space increasingly means designing an ecology —or a network of relationships— grounded in the reciprocal interactions of heterogeneous entities. Public spaces have become, and continue to become, heterogeneous and multi-actor fields of perception. The public spaces of the future, together with their associated design practices, will increasingly assume a relational, multi-scalar, and layered character involving non-human entities. In this regard, new forms of materiality in public spaces should be inclusive and capable of fostering new forms of social relations associated with our emerging modes of life and realities in the technological age.

By encouraging coexistence among different species and forms of life, new forms of materiality in public spaces provide a visionary foundation not only for public environments but also for future spatial design practices. As architectural practice employs evolving technical and technological possibilities, taking into consideration the local contextual elements specific to public spaces—both material and immaterial—and strengthening the permanence of works within public space constitute important factors in enhancing public actors' interaction with and attachment to place.

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