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An Architect visits the Laboratory. Research approaches at the "End of Theory"

Un Architetto visita il Laboratorio. Approcci di ricerca alla "Fine della Teoria"

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ABSTRACT AND KEYWORDS

An Architect visits the Laboratory
The essay reflects on the role of the Laboratory as a space for experimenting with a new Technological Culture in architecture and design disciplines, leveraging computational systems to define interdisciplinary, ecological, and knowledge-driven design approaches in response to the challenges of the Age of Entanglement and Transition. To support this reflection, the contribution presents a field experience conducted in a Northern European research laboratory, focused on developing a biomaterial made from waste for architecture and design. This opportunity highlights how a significative gap grows between empirical experimentation and theoretical validation, which might be attributed to a relative immaturity of the research, as well as a sign of the "End of Theory" (as notably forecasted by Chris Anderson) in the methods of digital technologies research themselves. Drawing on these remarks, the work attempts to trace the emerging features of the 'civilization of Laboratories' and discusses its critical aspects, particularly regarding the transferability of results and their impact on scientific practice, design processes, the transformation of the built environment, and society.

Keywords: research laboratories, entanglement, transitions, technological culture, enabling technologies

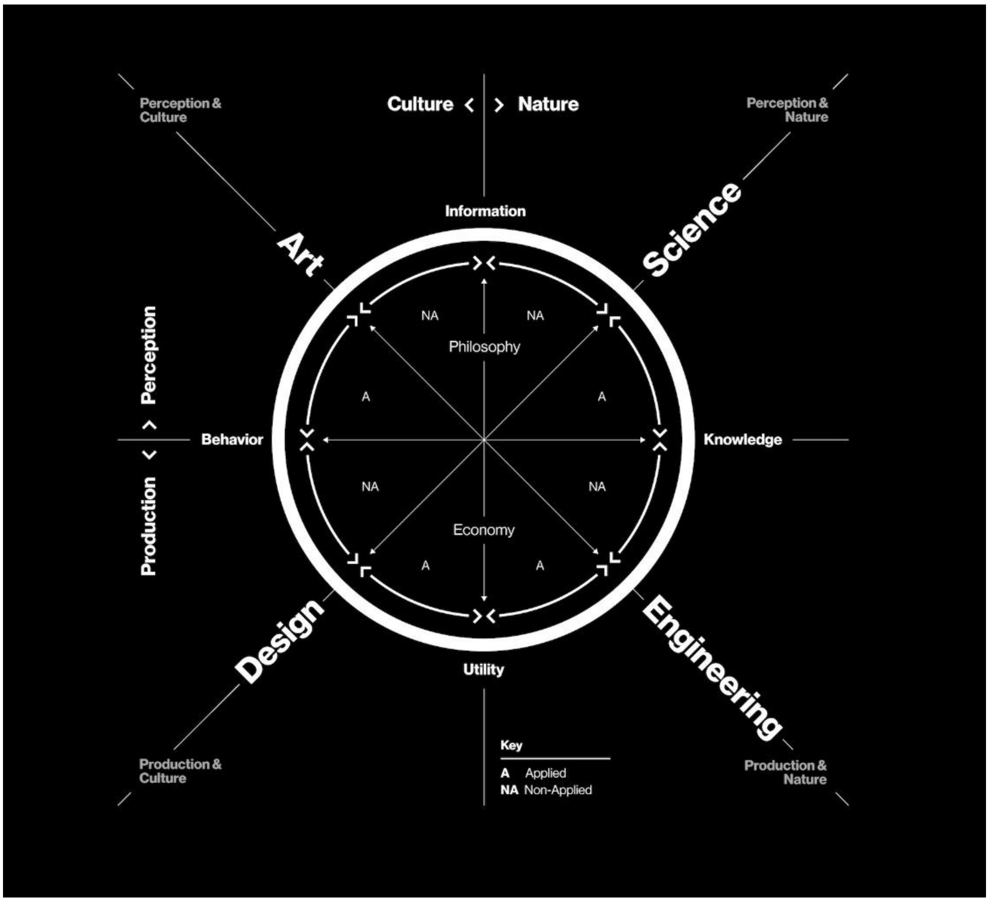
Un Architetto visita il Laboratorio
Il saggio riflette sul ruolo del Laboratorio come dimensione di sperimentazione di una nuova Cultura Tecnologica nelle discipline dell'architettura e del design, che fa leva sui sistemi computazionali per definire approcci progettuali interdisciplinari, ecologici e knowledge-driven, in risposta alle sfide dell'Era dell'Entanglement e della Transizione. A supporto di questa riflessione, il contributo illustra un'esperienza sul campo, svolta presso un Laboratorio di ricerca nord-europeo, incentrata sullo sviluppo di un biomateriale realizzato da scarti per l'architettura e il design. Questa occasione evidenzia come una distanza significativa stia crescendo fra sperimentazione empirica e validazione teorica, che potrebbe essere attribuita alla relativa immaturità di tali approcci di ricerca, così come a un segnale della "Fine della Teoria"(famosamente prevista da Chris Anderson) nei metodi stessi della ricerca sulle tecnologie digitali. Basandosi su tali riflessioni, infine, tenta di rintracciare i tratti emergenti della 'civiltà dei Laboratori' e ne discute gli aspetti critici, soprattutto in relazione alla trasferibilità dei risultati e dei loro impatti sulla pratica scientifica, sui processi di progettazione e trasformazione dell'ambiente costruito e sulla società.

Parole chiave: laboratori di ricerca, entanglement, transizioni, cultura tecnologica, tecnologie abilitanti

1. Introduction

In 2010, Scientific American asked ten experts to imagine the future of technology. For Danny Hillis, an engineer at MIT in Boston, this meant questioning the future of society. According to Hillis, digital technologies have evolved to a point where they are now impossible to control or even fully understand, and humanity is about to enter a new historical phase – the "Age of Entanglement": «Most people will just accept the complexity and learn how to cope with it. Others will try to live "off the grid", although few of them will give up Web access or cell phones or electric lights or penicillin [...]. Whether we like it or not, the dependencies are too strong to allow us to disconnect. Our destinies are 'entangled' with one another and with our technologies» (Hillis, 2010).
For Neri Oxman, living in the Age of Entanglement represents an opportunity to rethink the 'metabolic cycles' of creative and scientific activity (2016; Figure 1). Computational systems – such as Computational Design, Digital Fabrication, and Artificial Intelligence – are not merely a new set of tools that digitally update previous ones, nor are they 'neutral' toward design processes and their outcomes. Instead, they challenge established practices and (re)activate new synergies between seemingly distant fields of knowledge (Perriccioli et al., 2020).

Figure 1. Krebs Cycles of Creativity



Source: Neri Oxman, 2016.

As early as the second half of the 20th century, the introduction of the first computers for aided design and computational analysis triggered a profound transformation in the tools and organizational practices of design research (Wright Steenson, 2022). Among motherboards and monitors, an ecosystem of converging studies began to take shape, involving computer science, biology, and cybernetics. This enabled Technological Culture to gain scientific autonomy in design, assuming its own experimental and methodological significance beyond mere technical application (Freidman, 2000). As a result, research objectives increasingly shifted from the product toward the methods, processes, technologies, and materials of design.

Experimentation with computational systems has provided opportunities to develop methods that make design decisions more objective and evidence-based (Jones, 1970). New information management techniques have allowed a rethinking of the organization of design and construction processes. Comparative studies on the computational nature of organic and technological systems support the exploration of strategies that establish relationships between formal, productive, and material aspects. This helps redefine new ecological paradigms for habitat design, aligned with a more mature environmental consciousness (Maldonado, 1970).

These new possibilities find both their physical and epistemological context in the Laboratory. From early pioneering experiences, such as the Architecture Machine Group (Figure 2) – active at the Massachusetts Institute of Technology in Boston from 1967 to 1985 – today's laboratories are no longer just academic infrastructures but the very core of scientific activity[1].

Figure 2. Nicholas Negroponte with the Architecture Machine Group, Seek, (1969-1970)

Source: Cyberneticzoo.

From the US to Europe, Laboratories sprouted in every academic and research context to become the very core of anu scientific activity. In Italy, the general industrial and technological lag following World War II, particularly in construction, seems to have slowed the establishment of laboratories within research centers. Nevertheless, today, such laboratories are present in numerous national academic institutions (Lauria & Trombetta, 2016). In fact, research topics within these laboratories have become an integral part of Architectural Technology as a discipline, which has always addressed challenges arising from new industrial processes (Nardi, 2000). This field maintains a sensitivity toward the intricate relationships that technical action establishes with the environment and society.

Paradoxically, this delay has given Technological Culture deep methodological and critical roots, allowing it to analyze and anticipate the impact of technology – seen as a global cultural expression – on human life and its relationship with the environment (Ciribini, 1984). Technology is not simply a set of tools, nor does it adopt an a priori positivist stance. Instead, it aspires to be a realm of problematic research, aimed at defining specificity within a plurality of alternatives. It is the realm of method, where the focus is not merely on how (know-how) but on why (know-why) (Lovins, 1979).

In an era of entanglements and transitions, can the Laboratory serve as this realm? Starting from this question, the essay explores a Technology of the Laboratory through three lines of inquiry, aimed at understanding the scientific premises, ecological perspectives, and potential impact of new research practices in the laboratory. More in depth, the aim of this contribution is to explore a possible definition of the laboratory not in terms of its instrumental setup, but rather through its cultural characteristics, research approaches, and underlying objectives. Instead of focusing on the presence of machines, tools, or digital technologies, this perspective seeks to understand what makes a space truly operate as a "laboratory" by examining the epistemological frameworks it adopts, the types of questions it poses, and the ways in which it produces and validates knowledge. By shifting attention from the technical to the conceptual, this approach aims to uncover the deeper research logics that distinguish laboratories as spaces of inquiry and innovation.

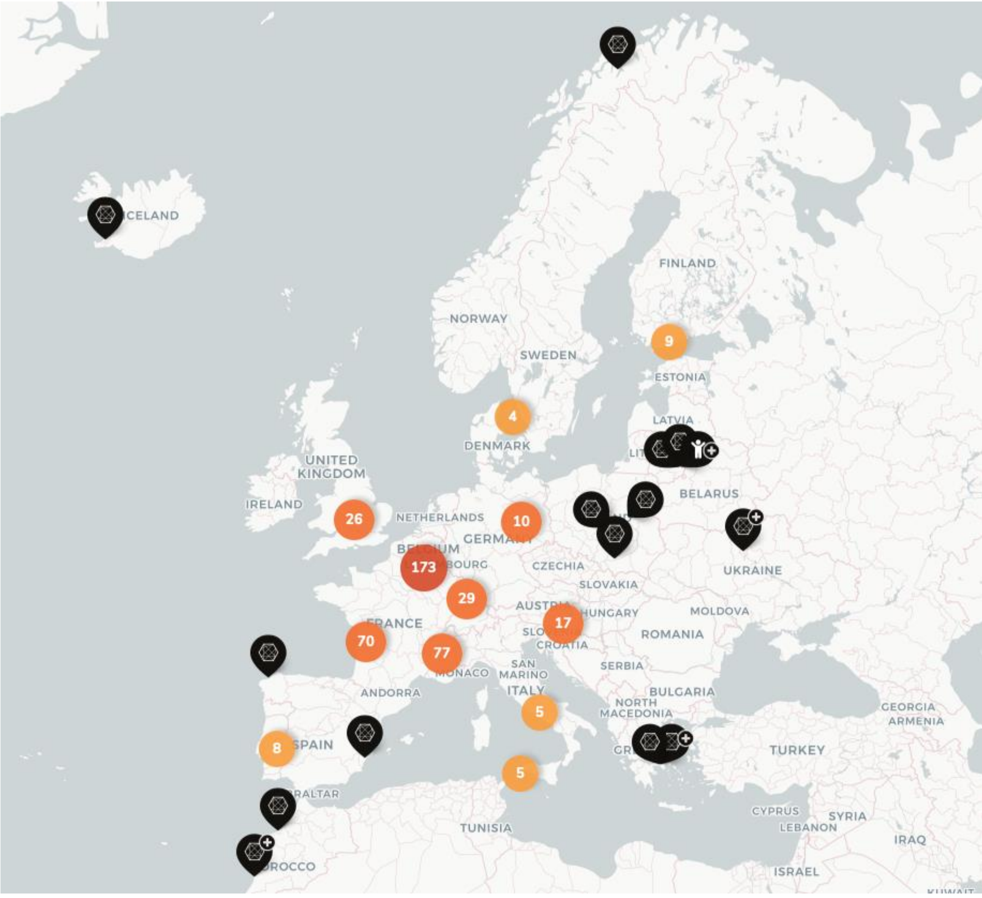
To this end, the paper presents and discusses a field experiment developed in collaboration with CITA (Center for IT and Architecture), a research center based in Northern Europe that explores the intersection of architecture, digital technologies, and material innovation. The experiment focused on the development of a biomaterial derived from recycled waste, serving as a case study to investigate how laboratory practices in architecture can be defined not by their tools alone, but by their research intentions, methodologies, and cultural frameworks. The analysis highlights how CITA's work operates within a laboratory logic that prioritizes material experimentation, iterative design, and interdisciplinary collaboration. In the Conclusions, the discussion is extended to identify key challenges associated with this cultural approach to the laboratory—particularly regarding the reproducibility and dissemination of results, and their potential impact on scientific practice, architectural design, environmental sustainability, and societal change.

2. Around the Laboratory: definitions of a research domain

The concept of the laboratory as described by Latour and Woolgar (1979) – as a social and technical space where facts are constructed rather than merely discovered – offers a compelling framework for understanding the rise of architectural research laboratories worldwide. These labs, increasingly equipped with CNC machines, robotic arms, and computational design software, do not simply test ideas; they actively construct new architectural knowledge through iterative making, scripting,

and material experimentation.
Much like scientific laboratories, these spaces blend human expertise with non-human actors – machines, algorithms, and digital models – to negotiate and validate architectural "facts" such as form, performance, and feasibility.
In Europe, for instance, laboratories serve as prestigious independent research centers, such as the IAAC - Institute of Advanced Architecture of Catalunya in Spain, DBT - Digital Building Technologies at ETH Zurich in Switzerland, ICD - Institute for Computational Design and Construction in Stuttgart, Germany, CITA - Center for IT in Architecture in Copenhagen, and CREATE in Aalborg, Denmark. Further examples can be found in the Netherlands (Delft and Eindhoven), Austria, and the United Kingdom (Figure 3).

Figure 3. Architecture and Design Laboratories in Europe



Source: Makery - https://www.makery.info/en/map-labs/.

Each laboratory represents a well-defined scientific community, but it is also part of a collective intelligence, with shared cultural references, principles, social practices, and material processes (Latour & Woolgar, 1979), as well as common rhetoric and storytelling (UIA, 2023). Their work is central to international conferences (Fabricate, ACADIA, Smart Geometry), academic publishing, and scientific journals (Architectural Design). Their research outputs—whether artifacts or inhabitable prototypes (pavilions)—are exhibited in art and design galleries, from MoMA to the Centre Pompidou, and documented in catalogs and exhibitions. In short, we are transitioning from the "civilization of Machines" to the "civilization of Laboratories"[2].
These research centers share a common reading list[3] rooted in the pioneering culture

of Design Methods from the 1970s, but also in evolutionary biology (D'Arcy Thompson), the philosophy of the fold (Deleuze and Guattari), the social anthropology of Tim Ingold, the sociology of science and ecology (Bruno Latour), and even more unconventional fields such as Ron Eglash's ethnomathematics or Albena Yaneva's cosmopolitics.
In this sense, the architectural lab becomes not just a site of technological innovation, but a socio-technical arena where new design paradigms are shaped and legitimized.

3. The Laboratory between science and technology

Immersed in an intrinsically digital matrix, Laboratory research has evolved through a first and second Digital Turn (Carpo, 2023), primarily focused on exploring new productive and formal opportunities enabled by digital tools and file-to-factory processes. By intersecting and incorporating advancements from various disciplines – biology, robotics, engineering, art, and science – Laboratories often adopt their methodologies, experimenting with an osmotic, innovative, and original approach. This approach leverages computational technologies to define ecological and knowledge-driven design strategies.
Shifting from epistemology to Entanglement, this new type of research follows a research by doing process, synthesizing the empiricism of bricoleurs – based on experimental trial-and-error cycles (Maldonado, 1998) – with the convergent, non-causal, and a-scientific approaches of cybernetics and artificial intelligence (Carpo, 2019).
Despite sharing methods and tools, Laboratory research diverges from the utilitarian goals of FabLabs (Gershenfield, 2012; Pone, 2022) and from the industrial criteria of R&D departments in major AEC (Architecture, Engineering, and Construction) corporations such as Arup and Buro Happold, as well as professional firms like Zaha Hadid Architects or SOM. Rather than supporting conventionally understood design projects, Laboratory work seems oriented toward a radical re-examination of the established relationships between research-design-experimentation, project-process-product, and material-form-fabrication – ultimately redefining the interactions between humans, nature, and technology.
Leveraging an ecosystem of enabling technologies – computational design, digital fabrication, 3D scanning, and Artificial Intelligence – Laboratories are reshaping how designers communicate and collaborate, analyze problems, simulate solutions, manufacture, and assemble (Tamke, 2019). As a result, Laboratory research is outlining a new kind of science in the design field (Wolfram, 2002) while simultaneously navigating the edges of research at the end of theory (Anderson, 2008; Carpo, 2023).
Faced with the growing volume of Big Data, traditional scientific methods prove inadequate in comparison to the non-linear, abductive, and statistical approaches of computational science. Design research, therefore, demands a co-evolutionary approach, both in processes and outcomes. Within this framework, the ability to formulate questions in radically new ways and to reduce the informational gap between design and production reshapes relationships between the various stakeholders in the process – between designer and design, as well as between researcher and research. This shift ultimately reverses the conventional sequential relationship between science and technology, between theoretical formulation and practical application.
This condition is not without contradictions. One issue lies in the lack of semantics in computational intelligence logic, which raises concerns about the non-

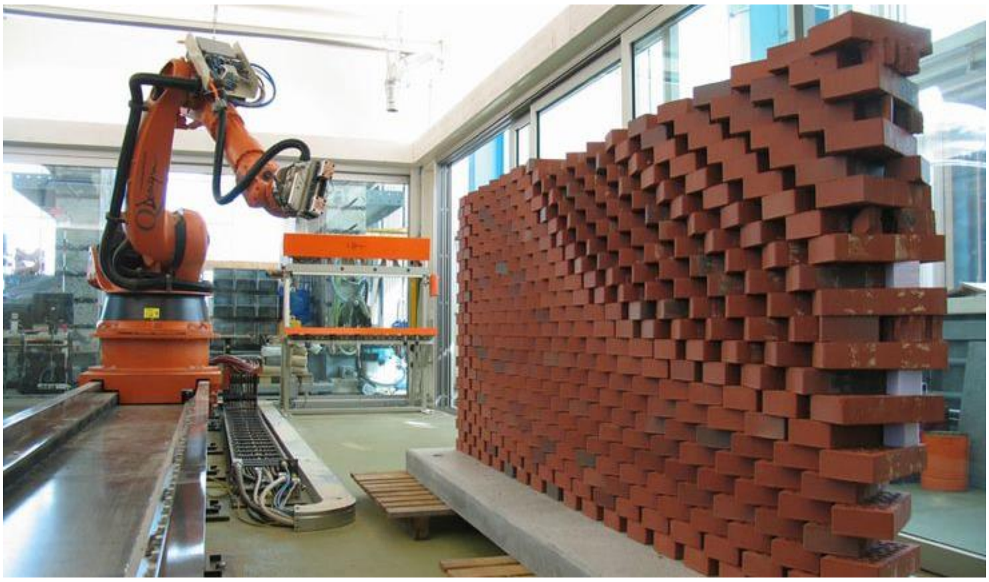
falsifiability and non-traceability of a-scientific computational processes (Stiegler, 2015). Another is the (seemingly) immaterial nature of information, which in reality demands energy-intensive and extractive processes, both in terms of data and resources (D'Abbraccio & Facchetti, 2021).

4. The Laboratory between materials and materiality

Within Laboratories, computational technologies serve as tools to address a material question in the digital age. Paraphrasing Ingold, this shift moves from the abstract materiality of modernist speculation back to the materials themselves (Ingold, 2007), exploring the intelligence, unpredictability, uncertainty, and non-linearity of bio-based, recycled, or repurposed resources. The digital acts as an informational interface, capable of penetrating the depths of matter and objects to investigate, intercept, and redirect nature's intrinsic intelligence—whether with emulative aims, reproducing its growth and form logics in production processes or final products (D'Arcy Thompson, 1952; Oyama, 1985), or with generative aims, reprogramming matter. This latter approach reverses the traditional power dynamic between impositional design and passive matter, instead aligning with the intrinsic aspirations of materials or selectively cultivating their preferred performance characteristics (Ratti & Belleri, 2020; Tucci & Ratti, 2023).

"Reprogramming nature" involves all designing organisms, both human and non-human (Figures 4-6), such as bees and silkworms (Oxman, 2020), mycelium, bacteria, and microorganisms (Dade-Robertson et al., 2024), up to the development of self-designing structures (Tibbits, 2021). Operating at the intersection of biohacking and genetic engineering, the material agenda of Laboratories includes agricultural and livestock industry waste, even synthetic meat (Benjamin, 2018), as well as traditional, natural, or artificial materials – wood, steel, stone, plastics, textiles, concrete, and clay – reprocessed robotically (Kohler et al., 2014; Ibañez et al., 2022), optimized, or reformulated for use beyond their conventional applications (Figures 7-9).

Figure 4. The Programmed Wall, ETH Zurich, CH



Source: Gramazio&Kohler, 2006.

Figure 5. HygroSkin-Meteorosensitive Pavilion, Orléans-la-Source, FR

Source: Achim Menges Architect, Oliver David Krieg, Steffen Reichert, 2013.

Figure 6. Silk Pavilion, MIT Media Lab, Cambridge, MA

Source: Neri Oxman, 2013.

Figure 7. MoMA PS1 Gallery Pavilion

Source: David Benjamin/TheLiving, 2014.

Figure 8. Maison Fibre, 17th International Architecture Exhibition – Venice Biennale 2021

Source: ICD/ITKE, 2021.

Figure 9. LivMatS Pavilion, University of Freiburg's Botanic Garden, Freiburg, GER

Source: IntCDC, University of Stuttgart/Robert Faulkner, 2022.

As resource scarcity and the need to reduce energy consumption and material exploitation drive the development of new design strategies (McDonough & Braungart, 2013), Laboratory research increasingly focuses on reuse and upcycling. Here, the unpredictability, uncertainty, and non-linearity of recovered materials—factors that hinder their industrial application—become creative opportunities for redesigning life cycles through innovative, information-based, and non-standard approaches. In this context, reclaimed resources are treated as a computational material: non-linear, complex, and uncertain (Galluccio, 2024). Since waste materials exhibit unpredictable performance and unstable supply flows, computational technologies become essential for managing their complexity and anticipating challenges, providing a deeper understanding of materials.
In this sense, computational practice closely resembles craftsmanship, as both follow an abductive, trial-and-error logic (Carpo, 2017; 2019), which is not geared toward general problem modeling (as in the scientific method) but rather toward formulating the specific (Ahlquist & Menges, 2011). Laboratories thus integrate the principles of the Circular Economy but reinterpret them critically through computation, challenging conventional methods of research and design. Rather than relying on

standard indicators and checklists, they position the regenerative capacity of design itself as the guiding force of technological development.

5. The Laboratory between speculation and sharing

The activity of the Laboratories exists in a ‘suspended’ dimension between ‘speculative’ design, aimed at providing directly useful solutions, and ‘affirmative’ design, with a broader scope (Oxman, 2016). From this position, the Laboratories develop critical perspectives on design, technology, and science.
Design serves as a mediating element between the various agencies of our habitat and represents the privileged tool for actualizing a specific vision of the world, where humans and non-humans, through technology, co-participate and co-evolve in shaping their relationships with ecosystems, communities, productive infrastructures, and social structures.
In this regard, the Laboratories engage with the same contradictions inherent in digital technologies: a ‘non-scientific’ science that proposes a return to materiality and craftsmanship through increasingly complex immaterial interfaces; that envisions a new rationality in resource consumption while relying on extractive and energy-intensive technologies; that aspires to an open-source sharing of information and decision-making processes but delegates these decisions to inscrutable algorithms and artificial intelligences (Ryamarczyk, 2020).
Within this complexity, there is undoubtedly an ability to carry out experiments that are «very smart, visually stunning, even breathtaking, and in different ways highly innovative […] But in relation to architecture […] function more as pure research or as prototypes with yet-uncertain applications in the creation of habitable structures» (Codgell, 2018, pp. 155-6). Although still in an embryonic stage, the research conducted by the Laboratories is supported by potential ecological implications for the transformation of the built environment. However, these implications often appear to be argued « on very narrow definitions of what counts as an environment, much less as an “ecology”» (Cogdell, *ibid*.).
The use of diagrams, computer simulations, and even the realization of full-scale prototypes sometimes «seems to function more as an effective means of communication with clients, the media, and the general public rather than as operative thinking tools within and for the project itself» (Corbellini, 2016, p. 46).

4. Inside the Laboratory. The Center for IT in Architecture (CITA) in Copenaghen

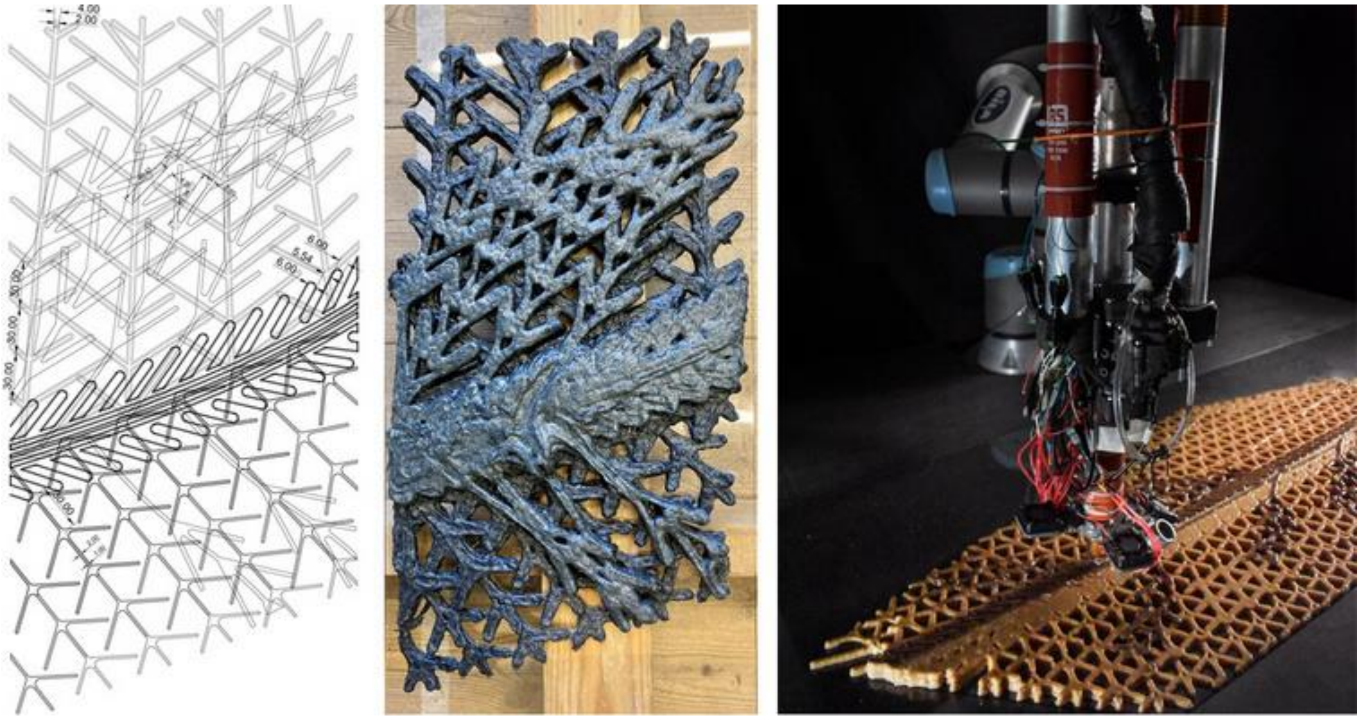
«When an anthropological observer enters the field, one of his most, fundamental preconceptions is that he might eventually be able to make sense of the observations and notes which he records. This, after all, is one of the basic principles of scientific enquiry» (Latour & Woolgar, 1979, p.43).
Starting from this premise by Latour, this contribution approaches the CITA - Center for IT in Architecture, Royal Danish Academy, Copenaghen (DK) as an “ethnographic” field site in order to understand how architectural knowledge is produced within a research laboratory setting. The fieldwork, based on direct engagement with an ongoing experiment focused on developing biomaterials from recycled waste, aims to examine the laboratory not through its technical equipment alone, but through the cultural logics, research orientations, and epistemological frameworks that guide its practices. By observing how tools, people, and ideas

interact within this context, the study seeks to make sense of the specific way in which CITA operates as a laboratory—how it constructs knowledge, frames research questions, and defines its relationship to design, technology, and environmental responsibility.

CITA conducts its scientific investigation at the intersection of architecture and digital technologies. CITA examines how design is influenced by new digital tools through a research-by-doing approach and through synergies with interdisciplinary partners in the fields of computer graphics, human-computer interaction, robotics, artificial intelligence, as well as furniture design, fashion and textiles, industrial design, film, dance, and interactive arts.

As part of the FoRWARD research project (NextGENEU – MICS, PE11, Spoke 4), the Department of Architecture at the University of Naples "Federico II" has been collaborating with CITA since 2023 to study new circular manufacturing practices for architecture and design, using biological waste, particularly from forestry activities. Specifically, the joint research aims to develop and experiment with a design methodology based on Life Cycle Assessment (LCA) to inform the development of circular supply chains and related digital manufacturing processes using additive techniques such as 3D printing and spraying (Galluccio et al., 2024). The experimentation focuses on refining a biopolymer based on plant fibers and collagen, itself a byproduct of the food industry (Rech et al., 2024).

Figure 10. The Radicant, Aedes Gallery, Berlin, 2022



Source: CITA, 2022.

This material was first used in the creation of the "Radicant" installation for the Aedes Gallery in Berlin in 2022. "Radicant" is a wall cladding system for indoor and outdoor applications, consisting of 24 panels 3D printed with a universal cobot. These panels are made from a formula composed of collagen, water, glycerol, and fibers such as wood flour, bark, algae, and cotton. Each panel contains a different proportion of the base mixture and fibers. Each panel, referred to as a "leaf," consists of two layers: the base layer uses wood flour as a reinforcing agent, at a concentration of approximately 15% per liter, while the upper layer incorporates cotton or bark waste as a filler, at around 9% per liter. These proportions vary depending on fiber type, coloration, or panel application (Ramsgaard Thomsen & Tamke, 2022; Figures 10-11).

Figure 11. The Radicant, Aedes Gallery, Berlin, 2022

Source: CITA, 2022.

The objective is to explore the formulation and production possibilities of 3D-printed biomaterials and analyze the potential for scaling up within material, design, environmental, and socio-economic contexts through a renewed relationship between form, material, and production (Figure 12).
Specifically, the research focuses on the study of advanced processes for the formulation, design, and experimental production of new materials derived from wood waste, intended for application in the fields of architecture and design (Galluccio et al., 2025). The study investigates three main aspects:

- the evaluation of the potential of digital fabrication technologies for these new materials, including strategies for customizing machines and/or materials;
- the definition of possible design configurations that respect both the technical constraints of the machines and the physical characteristics of the materials;
- the implementation of a Life Cycle Assessment (LCA) methodology for materials derived from bio-based waste (such as wood scraps, natural fibers, cellulose, etc.) and digital design and fabrication processes (including Artificial Intelligence and Machine Learning, Computational Design, and Robotic Fabrication).

Figures 12. Research moments between humans, materials and machines at CITA – Center for IT in Architecture, Royal Danish Academy, Copenaghen

Source: Giuliano Galluccio, 2024.

The goal is to explore the formulation and production possibilities of 3D-printed biomaterials, and to analyze opportunities for scaling up in terms of material, design, environmental, and socio-economic contexts, by rethinking the relationship between form, matter, and production.
The activity included the development and testing of LCA-based protocols to assess environmental impacts at the laboratory scale, along with mechanical testing of the material, conducted in collaboration with the Departments of Architecture and Engineering at the University of Palermo.
Preliminary results are currently limited to the verification of production processes and application potential (Saeli et al., 2025). While the composite shows promise for product design applications in dry, controlled environments, it still faces significant limitations under high humidity. Thus, its greatest potential lies in applications where biodegradability and structural lightness are prioritized. However, improvements in water resistance and biodeterioration prevention are needed for

broader adoption, especially in architectural contexts. To fully characterize the material's durability profile, further studies are required, including field testing in real conditions, accelerated aging under mechanical stress, and assessments of chemical resistance (e.g., exposure to pollutants or corrosive agents). The experimentation with the LCA methodology illustrates that, despite current uncertainties and the lack of sufficient data or analytical tools, bioprinting can be considered a competitive alternative to traditional wood waste recycling strategies. Transforming recovered wood into powder may prove especially useful for waste streams that are difficult to reintegrate into the market or reuse. In some cases, furniture or architectural components bioprinted at the lab scale have shown better environmental performance than their industrially produced counterparts.

5. Discussion: learning from the Lab

Besides technical results, the experimentation carried out in collaboration with CITA can be considered paradigmatic of the role of Laboratories in design scientific research and allows for theoretical reflections.

The optimization processes developed simultaneously consider parameters of shape, material, and production, each influencing the others: design may vary in porosity based on the material formula or production settings; the material may be reformulated based on structural criteria or printability (e.g., extrusion capacity relative to density); and the fabrication process itself sets certain printability limits but can be recalibrated in terms of speed or pressure. Material, design and fabrication are no longer linear aspects of architectural design, but they influence each other with informational feedback that implies designers to deal with unprecedent design inputs and constraints, deriving from the unique material performances and design conditions.

The laboratory approach developed with CITA stands situated between basic and applied research; it "stresses" the capabilities of computational technologies, enabling the design of materials, processes, and the very tools used to create them in a synergistic and integrated manner. This fosters an epistemological context of constant disruptiveness, where new frontiers are crossed daily, new hybridizations take shape, and emerging scenarios replace previous ones. It is not only the tool that acts upon the material, but the material itself also "guides" the technique, suggesting modifications best suited to its specific application.

In this sense, algorithmic software allows for the design of custom tools, making it possible to create almost any type of mechanical component. Devices are digitally designed from scratch and produced using CNC machines, with features determined by the material's properties (such as consistency, water resistance, or heat resistance) and the specifications of the tool used (e.g., extruder size, plunger pressure, extraction tube length).

Ultimately, the experimentation is highly exploratory: in the absence of established reference data or rigorous control instruments, the process relies on trial and error, with results often diverging from expectations. Visual analyses of physical prototypes—based on sensitivity and observation—are compared with advanced digital and computational simulations. In this context, despite the technological sophistication, the role of the human operator remains fundamental and indispensable, given the numerous unpredictable variables inherent in the process.

6. Conclusions. “Open” up the Laboratories to the Transition

With the increasing complexity and interdisciplinarity of the research conducted by the Laboratories, a growing divide can be perceived between theory and practice, academia and industry, science and society. As Beaucé and Cache (2003) point out, developing advanced computational tools is futile without the involvement of users, particularly architects, who understand how to employ them. This tension risks reflecting a fracture that already emerged with the definitive adoption of industrialized construction methods: a conflict between ‘diffused’ architecture and ‘monumental’ architecture, which, despite sharing the same roots in material culture, have become distinct positions in response to industrialization and the introduction of new materials (Alsopp, 1974; Nardi, 1986; Campioli, 1988).

As former MIT President Rafael Reif wrote to the academics of his institution in 2016, addressing urgent global challenges requires developing technological solutions that can find a concrete path to the market (Reif, 2016; Ratti, 2020).

In this sense, paraphrasing Emanuele Quinz, considering design research not only as a process but as an experimental condition means giving centrality to its spaces—schools, academies, laboratories, and development centers. However, it is also necessary to foster a collective, open, and instrumental research approach, one that can engage with the present in all its complexity by adopting diverse strategies and adapting to the various connections it mobilizes. This research can take multiple forms: it can explore artistic media, become a performance or a curatorial project, take the shape of a dystopian narrative, or evolve into a full-fledged inquiry using social and anthropological research methods to study behaviours and uses. Nevertheless, Quinz argues that one of the most effective models remains the workshop – an interdisciplinary exchange space where the confrontation between diverse knowledge and experiences creates the conditions for genuine cooperation.

The greatest challenge for the “civilization” of Laboratories is, therefore, to step beyond the carefully drawn boundaries within which they have learned to recognize themselves and collaborate.

If research is to serve as a tool for experimentation toward a more inclusive society, it must engage a broader audience, reaching beyond academia and institutional circuits. It must actively dialogue with society—not merely “publishing” results or showcasing processes as if they were theatrical performances, but instead exposing the entire experimental process to public scrutiny and participation. More radically, experimentation should be conceived as an ongoing dialogue with the Other—not only with other disciplines and human communities but also with matter and the living world—shifting from research that focuses on objects to research that involves an increasing number of subjects (Quinz, 2022).

If, as Chabot (2021) wrote, “Transition is a desired change,” then opening the doors of the Laboratory, following Latour’s call during the COVID-19 pandemic (2020), can help turn transition into a choice rather than an imposition. In this way, the Laboratory can become a space of Transition, a place where collective preferences are expressed.

Notes

1. The MIT School of Architecture in Boston alone hosts as many as sixteen Laboratories. See https://architecture.mit.edu/research-labs.
2. The reference is to the renowned journal Civiltà delle Macchine, founded in 1953 by Leonardo Sinisgalli with the support of Finmeccanica, aiming to foster a dialogue between humanistic culture, technical knowledge, and art.
   See https://www.fondazioneleonardo.com/civilta-delle-macchine.

3. As an example, the following is a list of recommended readings suggested by the Architectural Association School in London: https://www.aaschool.ac.uk/assets/Documentation/academicprogrammes/experimental/core-studies-course-handbook-2021_22_final.pdf.

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Conflicts of Interest
The authors declare no conflict of interest.

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