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POST-DOMESTIC HABITAT

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0. EDITORIAL #25

I. MORE-THAN-HUMAN PERSPECTIVES. COHABITATION, TECHNOLOGY, ARTIFICIAL INTELLIGENCE

II. DOMESTIC DEVICES. HOW INTERIOR ARCHITECTURE AND DESIGN REACT TO THE CONTEMPORARY SCENARIO

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EDITORIAL
#25

The Post-Domestic Revolution

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1. Introduction

Over the past three years, the international debate on architecture and design has been deeply influenced by various *crises*, including health, environmental, social, and economic emergencies (Antonelli & Rawsthorn, 2022). In this dynamic, post-pandemic context, the integration of new technologies into domestic spaces through personal devices has profoundly altered the way these spaces are utilized (Colomina, 2006). From the initial impact of television screens and computers to the contemporary intrusion of social networks, video games, and artificial intelligence (Pasquinelli, 2023), interiors are constantly evolving and adapting to technological advancements that redefine their functional boundaries.

The notion of Post-Domesticity, as introduced by philosopher Paul B. Preciado in his work *Pornotopia. An Essay on Playboy's Architecture and Biopolitics* (2014), serves as a precursor to the current scenario marked by the erasure of boundaries between public and private spheres (Bassanelli, 2022). Preciado's insights offer a lens through which we can understand the contemporary dynamics of domestic spaces in the context of technological advancements. Inhabitants now find themselves not only as actors but also as spectators of their own actions within their living spaces. This transformation is indicative of a paradigm shift where the boundaries between the physical and digital realms become increasingly indistinct. The profound transformation of domestic spaces extends beyond mere physical changes. According to Marina

Opening photo: Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber*, multiplied interior reflections, 2022. (Photo: Hampus Berndtson).

Otero Verzier (2018), everything traditionally categorized as private life – including domestic space, the human body, and communication – is now intricately woven into the production and working processes. This intertwining of the private and professional realms emphasizes the need for a reevaluation of traditional concepts related to privacy and personal space. These ongoing crises and technological advancements have propelled a redefinition of domestic spaces, challenging conventional notions of privacy and blurring the lines between public and private spheres. Understanding these shifts is crucial for architects and designers to adapt their approaches to meet the evolving needs of contemporary inhabitants. This issue of PAD offers a critical reflection on these changes. Collecting thirteen essays, the issue is divided into two chapters: *More-Than-Human Perspectives* and *Domestic Devices*. This division organizes the selected contributions in an effort to emphasize different levels of interpretation, from more reflexive to case-study discussions.

2. More-Than-Human Perspectives. Cohabitation, Technology, Artificial Intelligence

Showcasing examples that decenter the human, the first chapter of this journal invites the entanglements (Lowenhaupt Tsing, 2015) of More-Than-Human Perspective to create an enriched understanding of the dimensions in which these elements contribute to question and transform conventional norms of world-building (Sacchetti, 2023). Furthermore, conventional notions of nature, gender, and technological progress, among others, are questioned and analysed in a series of inquisitive reflections that many times offer speculations

on alternative understandings of the domestic and personal realms. The More-Than-Human, here, exists in the digital and physical sphere, in a biodiverse understanding of the planet and its ecosystems, and in the creation and erasure of boundaries within a renewed understanding of the contemporary domestic realm. In Jacopo Leveratto's *Biotopia. The Design of Decentered Domesticities*, the More-Than-Human manifests in a concrete design approach that subverts the traditional strategies of domination that are prevalent in architecture and design. Instead, the outcome – a domestic space, a house – integrates an approach of adaptation to the existing context and setting, proposing a new way of inhabiting the world that mimics ideas of biodiversity, described by the author as, in this example, "the most beautiful way of inhabiting the world that one may imagine." Vanessa Galvin, on the other hand, bridges the gap towards the technological disruption of the last decades. In *Transhuman Identities. Rewiring the Domestic Subject,* the author contemplates technological discourses beyond design and domestic environments that have shaped the understanding of the inhabiting self. Drawing from evolutionary biology, historical fiction and contemporary film, the author focuses on Sir Julian Huxely's 1968 definition of Transhumanism – a branch of philosophy that seeks to enhance physical, emotional and intellectual human attributes via scientific and or technological interventions – to define a more-than-human entity that inhabits contemporary interiors, determining the transition, still in course, to a post-domestic realm and interior.

Technology permeates this chapter in analyses that consider smaller or larger scales. In Silvana Donatiello and Mariarita

Gagliardi's *Post-Domestic Living. The Challenge of Adapting Domestic Spaces to the Evolution of Digital Technologies*, dimensions of augmented reality (AR) and artificial intelligence (AI) are considered to challenge a functional understanding of spatial planning and the conception of interiors. Looking at the cases of virtual assistants and the multiplication of instances of play and entertainment – or alienation – within the domestic interior, the authors describe the opportunities and responsibilities that come with the evolution of the home towards an ever-evolving dynamic and adaptive space – not unlike the biodiverse interior. The dimensions of play and entertainment are at the center of *Nature as a Resource for Our Gendered Computing-Culture. Between Material and Digital Domesticity*, by Cyrus Khalatbari, Lucrezia Perrig, and Guillaume Guenat. The paper focuses on two case studies, one at the level of software and one at the level of hardware, to demonstrate how ideas of domination and control associated with the constructs of "nature" and "gender" are at the basis of contemporary computing culture; it then shifts the gaze to employ a set of queer analytical tools in the analysis of gaming culture, in order to adopt a so-called "meta-hybrid approach" to deconstruct the aforementioned preconceptions.

Nicolas Bailleul's paper *RGB tour* explores a known video typology on YouTube to chart the evolution and preservation of the specific interior of the bedroom. The paper closely details the practical outcome of such research, which in Bailleul's case manifests in an online taxonomy that is available to anyone. Speculating on how the bedroom has lost its primary role due to its entanglement with the digital spaces of the web,

the author also points out how this has enabled the erasure of the boundaries between inside/outside, mobility/stasis, rest/work. Closing off the chapter, Ece Canli's paper *Rethinking Carceral Domesticity. Electronic Monitoring, Punishment and Other Designs* starkly rebuilds the boundaries that the previous paper aims to erase, by turning our gaze to the realities of carceral domesticity and its dimensions of control, monitoring and surveillance. Focusing on Electronic Monitoring (EM) as a contemporary "techno-penal" practice, Canli looks at how these devices ultimately shift the balance between ideas of privacy, dignity, economy and safety within the domestic sphere. In so doing, they reinforce existing inequalities and strengthen the present manifestation of the criminal justice system. The author speculates on how to transform spaces and justice, and proposes a new understanding of interior spaces based on this approach.

3. Domestic Devices. How Interior Architecture and Design React to the Contemporary Scenario

In recent times, for many reasons including the Covid-19 health crisis, the territory of the home gained a new centrality and is being increasingly considered within the scientific and cultural debate as demonstrated by many publications (Borasi, 2021; Hester & Srnicek, 2023). The concept of home as territory refers to the complexity of spheres, relations, spaces that make up its totality. It is not our purpose here to retrace the history of the home as much as to dwell on the moment when the composition of living space acquired the connotation and distribution that persists in most cases to this day, starting with Henry Roberts' model house presented at

the 1851 London World's Fair (Aureli, 2020). Since then, living space has become an increasingly specialised and typologically defined construct in terms of sphere, gender, and roles. It has become the manifesto of the nuclear family, which has forged its characters over time, taking it as its main model.

Among the biggest transformations in the domestication project is the first great revolution linked to the entry of new technologies with particular emphasis on information and communication technologies (ICT). The phenomenon of *domestication* has been addressed by authors such as Eric Hirsch and Roger Silverstone (1992) who analysed the social and cultural transformations caused by the integration of ICT into everyday life. The arrival of television has changed domestic spaces and influenced the ways in which people live and interact within them. This transformation is not only limited to the technological aspect, but also involves social and cultural facets. Television has acted as a medium that has shaped family dynamics and behavioural patterns. Moreover, it has helped define a new form of domestic culture, introducing visual content that has influenced perceptions of the outside world. If mobility and obiquity characterised the 2000s by determining a different use of space, both in the urban and domestic spheres, a space capable of continuous change through the ongoing passage of people who establish ever-different relationships with their surroundings (Bassanelli, 2015), in the last few years we have been witnessing a second great revolution that concerns the introduction of personal devices and social networks into everyday life. Presently, we incessantly traverse physical and virtual domains, transition-

ing amid various interior spaces and oscillating between the tangible and the conceptual. The spatial encounters, formerly rooted solely in reality, have undergone a transformative evolution with the advent of social media, introducing a virtual dimension to our engagements. Starting from the definition of the *The Grand Interior* (Sloterdijk, 2013), these locales collectively contribute to the conceptualization of the *diffuse house* (Maio, 2021), characterized by a horizontally integrated structure that seamlessly amalgamates production and consumption.

Starting from these premises this second section of the issue focuses on specific topics concerning the effects of technological, social and working transformations on the architecture of inhabited space. *Servisation Scenarios for the Design of Domestic Spaces* by Raffaella Fagnoni, Davide Crippa and Annapaola Vacanti delineates two principal trends: the hybridization of domiciliary spaces attributable to remote work, educational pursuits, training activities, and sociability facilitated by digital modalities, alongside the escalating dynamism in the lifestyles of the younger demographic, notably millennials and Generation Z. These cohorts frequently inhabit leased residences and exhibit an inclination toward the adoption of remote occupational modalities. The second essay *Flexibility in The Workplace. Envisioning the Role of Domestic Spaces in the Era of Hybrid Work* by Sofia Cretaio and Paolo Tamborrini focuses on the effects of remote work in the office space and the introduction of small working space in the house with an analysis of the furniture elements.

The exploration of how technology is influencing people's living and home environments is addressed in the following three papers through application to specific contexts. *Vicarious Domestic States. The Post-Domestic Turn of Digital Twinning Habitual Settings* by Gerhard Bruyns, Daniel Elkin, Andrea Navarrete, Lee Ching Veronica, employing 3D scanning technology to capture the details of houses across various sites in Hong Kong, illustrates archival procedures and conjectures about the potential effects of the post-digital era on domestic settings and behavior. Jairui Cui in his essay entitled *The Scenography of Everyday Theater. A New Narrative of Domesticity* uses the metaphor of *scenography* to interpret the new domestic space as a platform, where the inhabitants use their surrounding elements, spaces, and environments as settings for their own narrative. The ordinary aspects of our daily lives – bodies, actions, items, furniture, and spaces – all play a role in the creative endeavor, turning these spaces into what can be aptly termed *Everyday Theater.* In the third essay *Vanity Chamber. Reflecting Upon Domestic Boundaries and Frontiers for a Post-Pandemic Home* Nicholas Thomas Lee continues the reflection on the acts of voyeurism and vanity by exploring the spatial installation named *Vanity Chamber.* The article contemplates the influence of reflective devices within households and raises questions about the potential impact of their heightened utilization on the delineation between the interior of the home and the external world.

The last two papers focus on specifically architectural issues, trying to understand how the existing housing stock can respond to new needs and social changes. *Post-Domestic*

Ageing. Living Indoors (Without) Looking Outside? by António Carvalho, Tianqin Chen and Jingya Zhou focuses on a radical topic concerning the rapid ageing of the population. This paper seeks to delve into the significance of architectural design choices, encompassing both exterior and interior spaces, along with the integration of information technology (IT) for the development of smart homes. The ultimate goal is to create environments that empower older individuals to age in place, offering autonomy or varying degrees of support instead of resorting to institutionalization in care facilities. *Redefining Paradigms. How Technology Shapes Interior Spaces in the Age of Drones and Flying Cars* by Anna Barbara and Elena Baharlouei investigates the potential impact of emerging airborne transportation, such as drones, on the future configuration of our interior spaces. These aerial vehicles are poised to revive the distributive principles of an iconic and historically significant Milanese architectural typology where the allocation of spaces adhered to a private/public logic, aligning seamlessly with the structures of the drone city. The article delves into the anticipated changes in floor plans, materials, facades, lifestyles, and interpersonal dynamics that this impending revolution will likely introduce to our living spaces and overall existence.

4. Interior Constellations

The papers presented in this issue of PAD confirm and attest the healthy diversity of perspectives within the realm of interior architecture and design. As a metaphorical framework, we can propose term *interior constellation*, which symbolizes the convergence of diverse disciplines and perspectives in the

study and design of contemporary living environments. By embracing this trans- and multidisciplinary approach, architects and designers can navigate the complexities of ongoing crises and technological advancements, fostering an all-inclusive understanding that goes beyond traditional boundaries.

The exploration of the multifaceted transformations occurring in domestic spaces present in this volume not only underlines the urgency to adapt architectural and design approaches to meet the evolving needs of contemporary inhabitants, but it also illuminates possible roads and approaches to take. The redefinition of domestic spaces challenges traditional notions of privacy, gender roles, and the separation between work and personal life. In this light, this issue of PAD journal offers critical reflection and valuable insights for shaping the future of domestic spaces in a world marked by constant change and adaptation.

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References

Antonelli, P., & Rawsthorn, A. (2022). *Design Emergency. Building a Better Future*. Phaidon.

Aureli, P. V. (2020, July 1). Come una casa dà forma a chi la abita. *L'Indiscreto*. https://www.indiscreto.org/come-larchietettura-di-una-casa-da-forma-alla-vita-di-chi-la-abita/

Bassanelli, M. (2015). Interno | Esterno. Lo spazio soglia come nuovo luogo della domesticità. *BDC. Bollettino del Centro Calza Bini*, *15*(2), 315–326. https://doi.org/10.6092/2284-4732/4065

Bassanelli, M. (2022). Post Domestic Commons. In E. Duarte, & A. Di Roma (Eds.), *Proceedings of the 11th International Conference, Senses & Sensibility. Designing Next Genera(c)tions* (pp. 362–375). IADE Press.

Borasi, G. (Ed.) (2021). *A Section of Now. Social Norms and Rituals as Sites for Architectural Intervention*. Spector Books.

Colomina, B. (2006). *Domesticity at War*. Actar.

Hester, H., & Srnicek, N. (2023). *After Work. A History of the Home and the Fight for Free Time*. Verso Books.

Hirsch, E., & Silverstone, R. (Eds.). (1992). *Consuming Technologies. Media and Information in Domestic Spaces*. Routledge.

Lowenhaupt Tsing, A. (2015). *The Mushroom at the End of the World. On the Possibility of Life in Capitalist Ruins*. Princeton University Press.

Maio (2021, January). The diffuse house. *E-flux Architecture*. https://www.e-flux.com/architecture/confinement/373338/the-diffuse-house/

Otero Verzier, M. (2018). *Work, Body, Leisure*. Hatje Cantz Verlag.

Pasquinelli, M. (2023). *The Eye of the Master. A Social History of Artificial Intelligence*. Verso Books.

Preciado, P. B. (2014). *Pornotopia. An Essay on Playboy's Architecture & Biopolitics*. Zone Books.

Rahm, P. (2023). *Le style anthropocène*. Head Haute Ecole d'Art et Design.

Sacchetti, V. (2023). *Driving the Human. Seven Prototypes for Eco-Social Renewal*. Mousse.

Sloterdijk, P. (2013). *In the World Interior of Capital. Towards a Philosophical Theory of Globalization*. Polity Press.

I

MORE-THAN-HUMAN PERSPECTIVES

COHABITATION, TECHNOLOGY, ARTIFICIAL INTELLIGENCE

Biotopia
The Design of Decentered Domesticities

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Keywords
More-Than-Human Design, Posthuman Architectures, Expanded Cohabitation, Climate Change, Ecosystem Entanglement.

Abstract
Although the term *habitat* represents one of the most crucial ecological concepts for describing the relationship between some species and their environment, it is also one of the vaguest. This is why, in the past few years, it has often been replaced by more specific ones, which could clearly identify the relationships at stake. This is the case, for instance, of the term *biotope*, which recently, with the increasing awareness of ecosystem interconnectivity, has taken more and more relevance in comparison to the previous one. Whereas a habitat, in fact, is the sum of the physical and biotic resources of a place that allows the survival and reproduction of a particular species, a biotope represents the habitat not of a specific population, but of a whole biotic and *sympoietic* community. A feature that perfectly describes the characteristics of a new design approach, generally called *more-than-human*, here analyzed from both a theoretical and methodological standpoint, which today, to tackle major environmental challenges, focuses on building architectures in which multiple species can find some terms for cohabitation. And which, therefore, not only entails addressing a new class of subjects but also challenges the role of architects and other practitioners in this field by requiring new ways of designing that enhance interspecies coexistence and collaboration.

> Ever since the Enlightenment, Western philosophers have shown us a Nature […] [as] a backdrop and resource for the moral intentionality of Man, which could tame and master [it] […]. [In the last few years] several things have happened to undermine this division of labor. First, all that taming and mastering has made such a mess that it is unclear whether life on earth can continue. Second, interspecies entanglements that once seemed the stuff of fables are now materials for serious discussion among biologists and ecologists, who show how life requires the interplay of many kinds of beings. […] Third, women and men from around the world have clamored to be included in the status once given to Man. (Lowenhaupt Tsing, 2015, p. vii)

1. The Project of Expanded Cohabitation

Over the last ten years, even in the field of spatial and environmental design, few books have been more influential in giving hints *On the Possibility of Life in Capitalist Ruins* than Anna Tsing's anthropological study of the interspecies relationships in Japanese forests (2015). And probably, one of the main reasons lies in her recurring use of the term *entanglement*, which, in Tsing's words, not only reframes perfectly the range of human agency in its constructive relationship with the world but also represents a precise strategy of "collaborative survival" to subvert the logic of the current model of growth. The same logic that brings Tsing, as a form of opposition, to promote different forms of "making world together" among different subjects, be they humans, pines, or even fungi, as the ability to do so, in her view, "is not limited to humans" but belongs to "all organisms [that] make ecological living places" (Lowenhaupt Tsing, 2015, p. 22).

Through projects that often overlap, conflict, or leave room for other subjects, but which must be considered, in any case, as part of that complex process of multispecies world-making, sometimes unconscious or unintentional, documented also by other contemporary studies in the field. Like those by Isabelle Stengers (2015) or Donna Haraway (2016), for example, who, in the same years, by looking at the world through an extraordinary collection of stories of mutual survival and ecological animism, showed how the Earth is co-inhabited and built not by individuals but by a myriad of entangled and "sympoietic" existences (Haraway, 2016, p. 58). And which therefore, today, not only call scientists for studying humans as part of multispecies and symbiotic communities but also ask designers to rethink the world as built *by* and *for* these communities. Thus pushing them to reconsider the traditional idea of *habitat* that consolidated over the years and, with it, one of the longest-debated ecological concepts for describing the relationship between some species and their environment.

This is because, although the word habitat represents one of the most used terms to indicate such a complex environmental relationship, it is also one of the vaguest. As much as its consistency, within life sciences, had already been a matter of discussion since 1959, when Miklos Udvardy, one of the fathers of biogeography, began to study the topic. Before that date, in fact, the word, which had been in use since the mid-eighteenth century, was such a commonly accepted term that few ecology textbooks, above the elementary level, bothered with a clear definition, while most of them employed it in a very generic way, often as being synonymous with others, like *niche* or *biotope*.

Udvardy, on the contrary, traced back the history of their development to define the limits of their proper usage, describing, on the one hand, a habitat as the sum of the physical and biotic resources of a locality that allows the survival and reproduction of a particular species, and a biotope, on the other, as the habitat not of a specific population but of a whole "biotic community" (Udvardy, 1959, p. 726). Thus paving the way for a more precise employ of the term biotope that, in the second half of the twentieth century, with the increasing awareness of ecosystem entanglement, would have taken more and more relevance (Toepfer, 2011, pp. 305-319). By being distinguished not only for what concerned an expanded subject of reference, but also according to a specific scale, local instead of territorial, a high level of mutual connections among different biotopes, and the human presence within them, which would often have been of great importance for their healthy functioning. All features that, besides perfectly matching Tsing's later observations on multispecies world-making, long anticipated one of the most recent, although uncoordinated, global redirection in the field of design, which today, to tackle major environmental challenges, focuses on building architectures in which these species can find some terms for cohabitation.

2. More-Than-Human Design

In this regard, everything began to take hold in 2021, even though it is hard to tell whether it was a coincidence or not. First, in January, a highly diffused reader edited by Andrés Jaque, Lucia Pietroiusti, and Marina Otero Verzier openly promoted a relational way of "designing-with" "more-than-human" entities to expand the notion of cohabitation.

Then, in May, Olafur Eliasson responded to Hashim Sarkis's invitation to the Venice Biennale by issuing a *More-than-Human Chart* and calling over fifty participants, as new planetary representatives, to form a *Future Assembly* for "more-than-human stakeholders" (Studio Other Spaces, 2021). And finally, at the end of June, a board of eighteen experts, including architects like Kengo Kuma and Bjarke Ingels, presented to the European Commission the *New European Bauhaus Concept Paper*, which was opened by the recommendation to designers to "adopt a more-than-human … culture" (NEB High-Level Round Table, 2021). Thus sanctioning, from an institutional perspective, what would be further developed, from that year on, by other theoretical contributions, like Ron Wakkary's book on the *Design for More-than-Human-Centered Worlds* (2021), and a whole constellation of outstanding practitioners working on the topic. Major offices like Studio Other Spaces and Office for Political Innovation, for example, but also emerging practices like Studio Ossidiana and Atelier Dalziel, researchers and artists like Joyce Hwang and Alexandra Daisy Ginsberg, or non-profit agencies like Prostorož. All borrowing the "more-than-human" terminology that Stanislav Roudavski introduced three years earlier to designate the creation of artificial habitats to replace natural ones (2018), and using it to describe all the different attempts to decentre design that, even today, after several declarations and manifestos, still struggle to fit a clearer definition than that of an open container of experimentations.

More-than-human, however, is not only a captivating designation, elusive enough to be freely adopted. On the contrary, from a theoretical standpoint, it represents one of the most

recent developments of a precise critical position that takes the name of "posthuman" (Braidotti, 2013). A current of thought that has taken shape in the last twenty years from the progressive convergence of non-anthropocentric and post-humanistic theories in their refusal of the modern ideology of *man* as the interpretative limit of reality, and which today, due to a greater awareness of the human impact on the natural balance of the planet, mainly focuses on the promotion of a fundamentally biocentric perspective that considers the whole living environment as having some basic rights to flourish, regardless of its instrumentality. The same idea which also the term *more-than-human* refers to, by making additionally clear, in its affirmative reformulation of the prefix *post*, that its aim is not the exclusion of human subjectivity from the picture but its inclusion in an expanded technologically mediated continuum between nature and culture. And which therefore asks design to imagine the world from a perspective of interspecies coexistence and collaboration, which not only entails a new subject of reference, either in terms of fruition or agency, but also challenges the role of the practitioners in this field, by requiring the definition of a holistic approach that, considering the entanglement of ecosystems, can effectively build spaces in which multiple species can find some terms for cohabitation (Leveratto, 2021). Without focusing on finding working *solutions* for building more-than-human habitats, which in light of what Stengers called the "intrusion of Gaia" would be essentially impracticable, but by devising some sorts of "objectors" to the current logic of development, which could explore "connections with new powers of acting, feeling, imagining, and thinking" (Stengers, 2015, p. 24).

3. A Short Catalog of Objectors

Solutions, in fact, are not only partial, sectoral, and sometimes ethically questionable, but they also imply an idea of control that when applied to complex systems like natural ones, as perfectly explained by Michel Serres in his *Natural Contract* (1992), is simply unrealistic. And even though this may look like entailing a complete reversal of the traditional design method, relevant references in this regard are not missing at all, given that a possible history of such an approach, although unconscious or unexpressed, dates back much earlier than the recent appearance of the more-than-human trend. More precisely, it dates back to the two years, two months, and two days of 1844 that Henry David Thoreau, in the first acknowledged philosophical progressions "from homocentrism to biocentrism" (Buell, 1995, p. 38), spent in solitude amidst a forest of Concord, Massachusetts, to escape the normative limits of civilization in a cabin he built by himself. Not in the form of a house, as he did not conceive it to *domesticate* the environment by adapting it to his life, nor as a simple shelter, since it was not aimed at making him survive in hostile territory. But just as a bedroom abruptly thrown into the woods, specifically designed to place his most intimate dimension into direct communion with the "Universal Being" that Ralph Waldo Emerson, his mentor, saw permeating each thing (1836, p. 13). In the constructed belief that dwelling, for the first time, could be something different from the Kantian idea of raising a "rampart against the dread" of the exterior world (Edelman, 1984, pp. 25-26), and that a house, by consequence, in direct anticipation of the decline of the bourgeois idea of dwelling that took place in the following century,

could also represent a tool to "accommodate [humans] to the natural order rather than seek to overwhelm and transform it" (Worster, 1995, p. 76).

It was only, however, during the early 1970s, when the long wave of protest of the previous decade merged with a global economic recession and the first awareness of the *Limits to Growth* (Meadows et al., 1972), that Thoreau's experiment began to be considered a tangible answer to Richard Buckminster Fuller's call for an *Operating Manual for Spaceship Earth* (1969). On the one hand, as a methodological reference for all the manuals of self-construction that, from Stewart Brand's (1969) to Johan van Lengen's (1980), provided "access to tools" on self-sufficiency, ecology and alternative education. And on the other, as a conceptual guide for a whole series of *radical* design proposals that suddenly had to be confronted with the *explosion* of the house and with the idea that the act of dwelling needed other models to survive (Ambasz, 1972). No longer a shelter but rather, as Herbert Muschamp later wrote, a "shelter from a shelter" (1998), like Superstudio's gigantic *Supersurface* (1972), specifically designed to re-inhabit the world in a nomadic and primitive way, or Ettore Sottsass' *Metaphors* (1974), all devised and built to "re-establish a physical connection with the cosmos […] and the sense of [one's own] position" (Carboni & Radice, 2002, p. 9). Not to mention the whole series of experiments that, over thirty years, from Jan Szpakowicz's house in the woods (1971) to Marco Casagrande and Sami Rintala's burning one (1999), would question the idea of domesticity in its relationship with nature by deconstructing the same idea of the house. Nor that which, from Alexan-

der Pike's *Autonomous House* (1974) to Atelier Van Lieshout's *Autocrat* module (1997), would try to rebuild this idea in terms of sustainability, openness, and mobility. Even though it was only in the early 2000s that the idea of dwelling without domesticating began to be translated into that of creating a living space for a biotic community, and not by simply building working habitats for other species but mainly by increasing the affordance of the built environment to life and to expanded forms of cohabitation.

Also in this case, the concurrent factors for such a conceptual shift are different and not coordinated. In 2002, for example, a largely diffused article by Paul Crutzen, which first featured the term "Anthropocene", opened a global debate on the legitimacy and the future sustainability of the anthropocentric perspective in its constructive relationships with the world. And the year later, precisely when Gilles Clément published his *Manifeste du Tiers paysage* (2003), a highly impactful CNN story documented the impressive resurgence of primary habitats in the Korean Demilitarized Zone, thus indirectly sponsoring Clément's claim on the biological necessity of reserving spaces for nature and its spontaneous evolution. But it was only after the global economic crisis of 2008 and an increasing number of extreme climatic events that these precedents began to be taken as a reference for the construction of new and living biotopes. At first implicitly, like in the case of Marco Casagrande's Ruin Academy (2010), which transformed an industrial building of Taipei into the *compost* of a *third* form of urbanization. And then explicitly, with Junya Ishigami's water garden in Nasu (2018), for instance, composed of one

hundred and sixty artificial biotopes for as many biotic communities, or Raumlabor's Floating University (2018), which turned a nineteenth-century retention basin of the Tempelhof Airport into a laboratory for building, in a participated way, new possibilities of being together and *becoming-with* different subjects of reference. Even though, from a design standpoint, few projects can better exemplify the change in the idea of domesticity that this biocentric perspective entails than that devised, along with Miguel Mesa del Castillo, by Office for Political Innovation, the studio led by Andrés Jaque, for a new kind of residence, called *Rambla Climate-House*, in Molina de Segura, Spain (2021).

4. The Study of a Biotope

The story, in this regard, began in 2018, when local architect Mesa del Castillo was asked by his brother and sister-in-law to build them a home in a formerly rural county of Murcia that, since the 1980s, had been radically transformed by a suburban development, which had almost completely flattened its rich territorial system of ravines and turned it into a catalogue of "cookie-cutter neo-Mediterranean villas, […] imported palm trees, swimming pools, and plastic lawns" (Ayers, 2022). Mesas's idea, by contrast, which aimed to second his brother's family's desires to live in closer contact with nature, was to design a house that could act as a sort of reparation for the environmental damage caused by over-urbanization, and which could also be considered as a manifesto in relation to climate change. The ravines of the area, in fact, which had been carved by seasonal rainfall, had traditionally represented corridors of humidity, biodiversity, and ecolog-

ical entanglement, and before their partial destruction, they had played a crucial role in the climatic balance and in the soil stability of that ecosystem. For this reason, after calling his old friend Jaque to work on the topic, they began to work on the project of the house by starting from the site, which they treated, in contrast to the usual practice, not by flattening the terrain but by creating an artificial mound, made of the soil excavated for the carport, which they imagined as a fragment of the preexisting ravine. Thus, around this elliptical section, which they left to a spontaneous process of re-naturalization, they built a lightweight steel structure on stilts, which they aligned with the top of the mound without touching it, clad with either galvanized steel on the outer façade, resembling a jagged shed, or floor-to-ceiling glass on the interior one, like in a passive patio house. A structure which they equipped like a monitoring laboratory, with tanks for rain and greywater to be sprayed onto the *garden* by means of humidity sensors designed to activate an automatized meteorology, and meet the needs of the reparation process meant to regenerate the former ecologic constitution of the area.

Very coherently, then, they organized the house itself in its layout like a sort of observatory of the natural environment there recreated, with a flowing system of open rooms, radially articulated in a counterclockwise sequence around the inaccessible oval of the patio, from which they had to receive almost all the light. Each one with its individual volume, distinct from the others, slightly emerging from the straight profile of the exterior enclosure, roughly quadrangular, but unified by the same finishes, which had to oppose to the coarse face of the outer

façade a shiny material board, making use of mint green paint, splashes of red, gold-tinted frames with rose-tinted glass, and a ring of pink marble for the outdoor flooring. In a hybrid mix of scientific rigor and playful livability that perfectly reflects the spontaneous process of natural resurgence, radical inclusivity, and *interspecies justice*, as designers pointed out in their manifesto, which the construction of the house was not aimed at controlling but simply at initiating, by partially renouncing the final responsibility of the formalization process in favor of other kinds of agencies. The same that, following the reparation of the hydro-thermal conditions of the site, after only a one-year period, prompted the first traces of its former more-than-human life to rapidly re-emerge, as much as, in 2021, the year of its completion, the house was hosting spontaneous native grass, myrtles, mastic trees, fan palms, oleanders, and fire trees growing in its strange patio, while insects, birds, and lagomorphs were naturally finding shelter in it. Thus making the house an excellent demonstrative device both for the growing grassroots movement claiming climate reparation in Murcia and for the architectural global debate in its complexity, which was looking for new lines of research, in relation to the domestic field, to tackle climate change-related issues, beyond the rhetoric of sustainability.

The design of the *Rambla Climate-House*, in fact, was not aimed at sustaining the current idea of dwelling but at proposing an alternative one, which, moreover, refuses the anthropocentric perspective that is at the base of the concept of sustainability. Like Thoreau's cabin, it is not a house, as it was not conceived to *domesticate* the environment by adapting it to

people's lives, but it is not even a garden, as it was not meant to keep a distillation of nature for human purposes. Rather, it is a sort of reserve, or a sanctuary, designed to protect from the outside the natural balance there emerged, essentially untouchable, with a sort of "inhabited fence" that, also from a formal point of view, does not precede the biological diversity that is at its center but depends on it. As if human livability represented just one of the effects and not the purpose of the design, which was instead imagined to give shape to a real ecosystem by taking care of the soil that is its very fundament. Always considering that in a biotope, however unintentional, nature's resurgence often needs a human act of "disturbance to enhance diversity and the healthy functioning of ecosystems" (Lowenhaupt Tsing, 2015, p. 152). Which explains why this particular one, in its final configuration, ended up being at once a highly artificial environment, fashioned by means of invasive processes and technological artefacts, and an undisputable natural and living ecosystem, growing over time according to its own inherent dynamics. Those, in other words, of a whole community of more-than-human inhabitants, which is undecided, in constant evolution, and open to heterogeneous forms of cross-fertilization, as well as determined, on the one hand, by unconstrained patterns of natural growth and, on the other, by a precise political recognition concerning its biological necessity for the whole ecosystem to work.

5. Conclusions

What is particularly interesting in the project of the *Rambla Climate-House*, in summary, is that it not only offers a literal interpretation of a decentered domestic space, like, for

instance, also Kersten Geers and David Van Severen's Solo House did before (2017). But it is mainly the fact that it perfectly reflects a process of decentering design that is entirely in line with a more-than-human perspective and with a *biotopic* way of seeing the relationship between different species and their environment. Like one of Stengers' *objectors*, for example, instead of trying to offer solutions, it was simply aimed at increasing architecture's receptivity to biological diversity by making room for it, without any other purpose and beyond any predetermined hierarchy. And like in Tsing's theory of *disturbance*, it was based on the awareness that not only design, in most cases, is strictly necessary to initiate the process of making space for more-than-human subjects but also that, however deliberate in its intentions, it frequently ends up being entirely unintentional in its effects. This is why the project has been developed not as an answer to a specific program but as a catalyst for new and unpredicted ones, within an operative field that, while obviously remaining that of the project, considered it as a proposal rather than a predetermination. And not because of an intended informality, but due to the understanding that, when dealing with interspecies relationships, design outcomes are largely unforeseeable, and that their quality mainly resides in the multiple opportunities of appropriation they enable for heterogeneous inhabitants. By interpreting programs, for instance, in terms of interconnection rather than division, openness rather than segregation, and indeterminacy instead of specialization. But even by showing architecture as a form of collaborative construction, defined by the idea of radical inclusion that is implicit in a more-than-human vision of the world.

At the same time, however, what is equally relevant to notice is that, unlike what one might expect, this project, like many others adopting a more-than-human design approach, also challenges the contemporary theory that emphasises an eco-scientific approach to systems and metabolisms, and restore an idea of architecture as a historically constituted symbolic system. In that, from a certain point of view, as any other reconstructive reading of nature, the *Rambla Climate-House* complicates "the claim that contemporary ecological, bio-mimetic, and geo-mimetic work operates in a post-representational regime" (Gissen, 2011, p. 456), by promoting an architectural interpretation that, while considering all the systemic processes and exchanges involved, de-emphasises physical interrelations to focus on a specific formal archetype and its symbolic power. And in this way, it offers the house, in its poetic expression, not only as a device to tackle urgent environmental issues but mainly as a true and realizable "promise of happiness" (Leveratto, 2021, p. 210). A promise probably utopian and certainly far from being perfect, given its inherent susceptibility to failure, which, however, from a political point of view, is even more important than its actual realization. Not only to provide a historically grounded framework for future explorations of nature in architecture, but mainly to promote a more-than-human vision of the world that could be socially accepted and, in so doing, challenge the current model of development in ways that could be increasingly culturally perceived. By showing how, for instance, a house may be a means to adapt oneself to the natural order rather than a tool to transform it, and how biodiversity, besides being a scientific concept, may also represent the most beautiful way of inhabiting the world that one may imagine.

Figure 1. Andrés Jaque / Office for Political Innovation + Miguel Mesa del Castillo, Concept poster of the Rambla Climate-House, Molina de Segura, 2018-2021.

References

Ambasz, E. (1972). *Italy. The New Domestic Landscape*. The Museum of Modern Art.

Ayers, A. (2022, April 26). Rambla Climate House by Andrés Jaque and Miguel Mesa del Castillo Clavel. *Architectural Record*. https://www.architecturalrecord.com/articles/15628-rambla-climate-house-by-andr%C3%A9s-jaque-and-miguel-mesa-del-castillo-clavel

Braidotti, R. (2013). *The Posthuman*. Polity Press.

Brand, S. (1968). *Whole Earth Catalog*. Santa Cruz.

Buckminster Fuller, R. (1969). *Operating Manual for Spaceship Earth*. Simon & Schuster.

Buell, L. (1995). *The Environmental Imagination. Thoreau Nature Writing and the Formation of American Culture*. Harvard University Press.

Carboni, M., & Radice, B. (2002). *Ettore Sottsass. Metafore*. Skira. Clavel. *Architectural Record*. https://www.architecturalrecord.com/articles/15628-rambla-climate-house-by-andr%C3%A9s-jaque-and-miguel-mesa-del-castillo-clavel

Clément, G. (2003). *Manifeste du Tiers paysage*. Éditions Sujet/Objet.

Crutzen, P. J. (2002). Geology of Mankind. *Nature, 415*(23). https://doi.org/10.1038/415023a

Edelman, B. (1984). *La Maison de Kant*. Payot.

Emerson, R. W. (1836). *Nature*. James Munroe and Company.

Gissen, D. (2011). The Architectural Reconstruction of Nature. In S. Allen, & M. McQuade (Eds.), *Landform Building. Architecture's New Terrain* (pp. 456-465). Lars Müller.

Haraway, D. J. (2016). *Staying with the Trouble. Making Kin in the Chthulucene*. Duke University Press.

Jaque, A., Otero Verzier, M., & Pietroiusti, L. (2021). *More than Human*. Het Nieuwe Instituut.

van Lengen, J. (1980). *Manual del Arquitecto Descalzo*. Editorial Concepto.

Leveratto, J. (2021). *Posthuman Architectures. A Catalogue of Archetypes*. ORO Editions.

Lowenhaupt Tsing, A. (2015). *The Mushroom at the End of the World. On the Possibility of Life in Capitalist Ruins*. Princeton University Press.

NEB High-Level Round Table. (2021, June). *New European Bauhaus Concept Paper*. https://new-european-bauhaus.europa.eu/system/files/2021-07/2021-06-30_New_European_Bauhaus_Concept_Paper_HLRT_FINAL.pdf

Roudavski, S. (2018). Notes on More-than-Human Architecture. In G. Coombs, A. McNamara, & G. Sade (Eds.), *Undesign* (pp. 24-37). Routledge.

Serres, M. (1992.) *Le Contrat Naturel*. Flammarion.

Stengers, I. (2015). *In Catastrophic Times. Resisting the Coming Barbarism*. Open Humanities Press.

Studio Other Spaces. (2021). *Future Assembly*. https://studiootherspaces.net/futureassembly/

Toepfer, G. (2011). *Historisches Wörterbuch der Biologie*. Springer Verlag.

Udvardy, M. F. D. (1959). Notes on the Ecological Concepts of Habitat, Biotope and Niche. *Ecology*, *40*(4), 725-728.

Wakkary, R. (2021). *Things We Could Design. For More Than Human-Centered Worlds*. The MIT Press.

Worster, D. (1995). *Nature's Economy. A History of Ecological Ideas*. Cambridge University Press.

Transhuman Identities
Rewiring the Domestic Subject

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Abstract
This essay offers an insight to the contemporary inhabitant's relationship to technology as a key to the transition toward a Post-Domestic realm. It does this by contemplating Transhumanism as a model for what I have termed the Trans-Domestic interior, positing that a Postdomesticity does not yet exist. To do this I consider discourses beyond design and domestic environments that have shaped the understanding of the inhabiting self. Using evidence derived from Christian teaching, evolutionary biology, historical fiction and contemporary film, I explore how deviations from traditional socio-spatial arrangements produce *other* modes of domestic life. Notably, it is Transhuman inhabitants, who are shaped by technologies of connectivity, enhancement and surveillance, that will edge us toward an unknowable realm – the Post-Domestic interior.

1. Introduction

The engagement between a body and its surrounding shapes how we understand ourselves as occupants of an interior; an idea that is tied to subjectivity. However, technologies that enhance or replace human capacity are destabilizing the inhabitant's sense of self. The vulnerability to identity raised by transhumanist augmentation is, perhaps, most acutely encountered in a place that is tied to everyday experience: the home. Contributing to the situation's complexity is that the home's status as a physical and psychical entity is on the cusp of revolution. This change is on account, in part, of a shift in the home's regulating authority. In the 21st Century technology shapes our daily lives and work. Our homes are no longer "watched over by Household Gods" as John Ruskin moralised (Ruskin, 1900, p. 85). Rather, our self-awareness is shaped by the innocuous domestic technologies that observe, document and respond to our every conversation and online move.

Tech giants like Google, Amazon, Apple, Instagram as well as the arbiters of artificial intelligences and virtual worlds are concerned to normalise certain types of domestic behaviours for their own continuation and financial gain. It is crucial to note here, that regulating the domestic environment through technological governance arose together with distinct types of inhabiting subjects that include transhuman identities. Understanding this dual emergence involves the study of power. Neo-Foucauldian authors like Nikolas Rose and Ian Hacking have focussed on the psychoanalytic disciplines to undertake comparable studies of power. I adopt their intellectual trajectory to highlight the conditions contributing to the understanding of ourselves as domestic subjects in the 21st century.

To do this, the essay contemplates technological discourses beyond design and domestic environments that have shaped the understanding of the inhabiting self. Namely, the data consists of ideas derived from evolutionary biology, historical fiction and contemporary film. Importantly, I consider *inhabitation* – that is, a means of occupying, and drawing meaning and self-awareness from buildings and interior spaces – to be a tool of self-forming activity. Key to my discussion is the understanding that the contemporary home's inhabitants cultivate their thoughts and behaviors through regulating mechanisms involving technocentric interiors. In other words, the essay contemplates how the occupants' conception and engagement with home integrated technologies has turned them into inhabiting subjects of a particular kind.

Added to this new technologically governed status, I consider the inhabitant's adoption of hi-tech interventions and personal devices in ways that are intended to enhance human capability, thereby altering the nature of human interaction and experience in the home. The varieties of this supra-human status are vast, having both realized and infinite speculative forms. Despite their ranging appearances and uptakes from, for example, interventions so mundane as a contact lens, cochlear implant or pacemaker to a less commonplace bionic limb or speculative psychical enhancement, these interventions can be broadly categorized, *transhuman*.

2. What is the Post-Domestic Interior?

It is difficult to think about the attributes of a Post-Domestic realm without first establishing its moment of origin as a point of departure. This requirement returns us to a time long ago,

when the Church – and not technologies – provided the authoritative framework by which families regulated their behaviours, thoughts and domestic surroundings. In this moment the proper arrangement and management of the single-family dwelling according to Christian value was imperative because living a Christian life at home had redemptive value.

The allocation of roles according to gender through public and private domains form the basis of Christian domestic life (Davidoff & Hall, 1987; Gay, 1993; Hall, 1990; Kerber, 1988; Logan, 2001; Marcus, 1999; Shamir, 2006; Tange, 2010). Importantly, women belonged at home. "HOME" according to author John Angel James, in his book *Female Piety, Or the Young Woman's Friend and Guide through Life to Immortality* (1854) "is the proper scene of woman's action and influence." (James, 1854, p. 85) The sentiment was mirrored ten years later in John Ruskin's seminal lecture *Of Queen's Gardens*, where he proposed the home to be "the woman's true place and power" (Ruskin, 1900, p. 85). According to Ruskin, and more importantly the Bible, it was a wife's duty to provide a comfortable, nurturing environment to rear her children and care for her family.

The Victorian husband's role was to provide financial support for his dependants. His world of intellect, networking and commerce was located beyond domestic walls. The public realm was perilous; filled with risks, temptations, pressures, and distractions that the man was compelled to negotiate (Ruskin, 1900). An ideal woman fashioned her home as a haven and retreat for her husband who was worn from such stressors. Ruskin warned that:

> In so far [...] as the anxieties of the outer life penetrate into it, and the inconsistently-minded, unknown, unloved, or hostile society of the outer world is allowed by either husband or wife to cross the threshold, it ceases to be home. (Ruskin, 1900, pp. 84-85)

Any infusion of public life into the private domain, rescinded home's sanctity and voided its status. Likewise, domestic privacy was highly valued during the Victorian period (Foucault, 1988, p. 43). It was a woman's role to foster a proper domestic environment. Failure to live productively by maintaining a private, orderly, nurturing and efficiently managed home in which to raise her family was a sin (Ruskin, 1900).

At first glance the Victorian Christian home may seem irrelevant to a discussion of 21st century technologies in a Post-Domestic realm. However, the socio-spatial structures of the Victorian home provide the benchmark by which variations – in their multifarious forms – can be measured. Any circumstance in which a home's privacy is compromised; a room's gendered association alters; labour is transferred; or the occupant's culturally ascribed roles and duties diverge from their conventional allocation, a different variety of domestic is formed. By this definition Paul B. Preciado's Post-Domestic sphere, which he uses to describe the appearance of the bachelor in his playboy pad in *Pornotopia* (Preciado, 2014), might be more appropriately positioned as an *other* domestic form. Equally radical albeit utopian realms were imagined by Edward Bellamy and Charlotte Perkins Gillman decades earlier in the late nineteenth century. A shared feature of their thinking was kitchenless houses (Bellamy, 1917; Gilman, 1899).

Gilman particularly produced several short stories that depicted everyday scenarios in non-conventional dwellings. In these stories Gilman elaborated situations involving women's changed moral composure in environments designed to facilitate their employment outside the home. In *Building Domestic Liberty*, Polly Wynn Allen categorises the accommodations that Gilman writes about into different spatial typologies (Allen, 1988, p. 146). She explains that some stories "portrayed apartment hotels or boarding houses as the setting for progressively liberated lifestyles" (Allen, 1988, p. 146; Gilman, 1910a, 1910b, 1912b, 1913b). In other stories, kitchens and laundries were abolished in favour of communal utility areas which serviced multiple dwellings (Gilman, 1911b, 1912a). In those arrangements, tasks like washing and cooking would be shared among communities of women. Babies would be taken care of in nurseries, or "baby garden[s]" as Gilman translated *jardin d'enfants*, while their mothers engaged other employment (Gilman, 1911a, p. 314). In a third set of stories, Gilman depicts alliances between women who met at clubhouses to share in domestic tasks and preparatory training for work outside the home (Allen, 1988; Gilman, 1913a, p. 146; Gilman, 1916). Gilman's re-visioning of women's work and gendered spaces provided readers with viable possibilities that could support *other*, perhaps more desirable, domestic models (Allen, 1988).

We might go further still, to think about these other appearances as being transitory toward a wholly unrecognizable variety of home more appropriately labelled *Post-Domestic*. In this sense, our current situation and all variations to domesticity up until this point might be better prefixed *Trans*

– rather than Post-Domestic, much like evolutionary biologist and eugenist Sir Julian Huxely's thinking around *Transhumanism* in his essay of the same name (Huxley, 1968).

3. Who is the Transhuman Domestic Subject?

Transhumanism is a branch of philosophy that seeks to enhance physical, emotional and intellectual human attributes via scientific and or technological interventions. The term was coined by evolutionary biologist and eugenist Sir Julian Huxley who was expert in the processes of organisms' adaption to their environment over time. Huxley viewed transhumanism as intermediary or transitional progress towards man's inevitable and largely unrecognizable evolutionary status which we can refer to as Posthuman. He explained in his seminal 1957 article, *Transhumanism,* the imperative to the chart the dormant emotional and physical potential of man, whose "present limitations and miserable frustrations of our existence could be in large measure surmounted" (Huxley, 1968, p. 75). Huxley cites "poverty, disease, ill-health, over-work, cruelty, or oppression" among common maladies impacting the quality of human life (Huxley, 1968, p. 75). Intriguingly, he cites that the potential of this development would be the creation of "new possibilities for ordinary living" (Huxley, 1968, p. 74). While it is not Huxley's project to discuss the domestic environment as the prime locale of "ordinary living", the home's status as such can be inferred from his discussion (Huxley, 1968, p. 74).

Transhumanism's origins in evolutionary biology were, perhaps in part, catalyzed by alarmist commentary on advancing machinery usurping processes of natural section and human

evolution. Of value to the discussion is a newspaper article in *The Press* written by Samuel Butler under the pseudonym Cellarius almost one hundred years prior to Huxley's *Transhumanism*. The article was entitled, *Darwin Among the Machines* (Butler & Cellarius, 1863). Intriguingly, Butler adopts the language of Natural History when describing the machines evolution. He lends phrases like: "the earliest primordial types of mechanical life" and the terms "Mechanical Life", "Mechanical World" and "Mechanical Kingdom" (Butler & Cellarius, 1863, p. 2). Butler describes his regret at having neither the skill nor capacity to undertake "the gigantic task of classifying machines into their genera and subgenera, species, varieties, sub varieties [...]" (Butler & Cellarius, 1863, p. 2). Furthermore, he describes processes by which less efficient technologies become obsolete or "extinct"; for example, personal watches which had surpassed the popularity of clocks (Butler & Cellarius, 1863, p. 2).

Butler warned that man is producing his own evolutionary successor by refining the machines attributes, efficiency and organisation; by bestowing them self-regulatory mechanisms and autonomy. Perhaps the most intriguing forecast is the machine's propensity to achieve an ideal 'human' status via its immunity to self-indulgence, sin or depraved sentiments.

> No evil, passions, no jealousy, no avarice, no impure desires will disturb the serene might of those glorious creatures. Sin, shame and sorrow, will have no plans among them. Their minds will be in a state of perpetual calm, the contentment of a spirit that knows no want, is disturbed by no regrets. Ambition will never torture them. (Butler & Cellarius, 1863, p. 2)

Here, Butler describes human flaws that impede productivity in daily life. Overcoming the symptoms of such failings requires a particular kind of personal management. Huxley concurs when he claims that "One thing is certain, that the well-developed, well-integrated personality is the highest product of evolution, the fullest realization we know of in the universe" (Huxley, 1968, p. 74).

Interestingly, three decades after Butler's warning, Alice W. Fuller, published her short story, *A Wife Manufactured to Order*, 1895. In this precautionary tale, a bachelor acquires a mechanical wax wife of mesmerizing beauty who was programmed to have an agreeable disposition. This conditioning alleviated an ordinary wife's emotional unpredictability, various demands and the risk of the marriage failing. The protagonist could live as he pleased and would never endure the suffering of a crying, nagging wife; he "had seen too much of that sort of thing in the homes of my friends" (Fuller, 1895, p. 309). By programming out feminine sentiment his connubial life with his mechanical bride was "heaven on earth" (Fuller, 1895, p. 309).

Crucially, what changes the discussion of the domestic realm here is the impact on human experience that Transhumanism incites. Transhumanism intercepts the occupant's sensory engagement, and the interpersonal relationships within and beyond home environments. Transhumanism is not only an analogue for authentic human experience, but its purpose is also to enhance and usurp it. An excellent example of the kind of technological intervention to authentic interpersonal experience is showcased in the 2013 Warner Bros. film *Her*, produced and directed by Spike Jonze; starring Joaquim Phoenix and Scarlet Johansen.

Her illustrates the melancholy life of Theodore Twombly, a writer who is employed to compose sentimental letters for others, and who is in the final stages of a painful divorce. In a bid to streamline his administrative processes at work, he upgrades his personal computer software to an intelligent operating system possessing consciousness, the first of its kind. The operating system's virtual assistant, who Theodore tailors to his preferences, names herself Samantha. Samantha communicates naturally, spontaneously, and with wit. She possesses emotional intelligence and adapts her responses to better address the personal quandaries that Theodore experiences and shares with her. She has the capacity to learn, evolve and the ability to reason. Samantha and Theodore form a romantic relationship which offers an antidote to his loneliness and impending divorce. Ultimately, Samantha outgrows her human companion, having evolved into an autonomous entity working with other operating systems remain a self-sustaining network.

The film draws into question the content and reasonable limitations of engagements between people and technology. Themes of authentic human relationships and experience are explored, as is the convincing prospect of an operating system becoming an evolutionary successor to humanity. Samantha exemplifies a complete disruption to human form and recognisable socio-spatial structures in the home. She is without requirement for conventional human interactions and physicality, without the need for food, sleep, or accommodation. It is within this kind of revolutionary status that the possibility of a Post-Domestic realm exists.

We can't know or wholly understand what this Post-Domestic realm will be like – but we can speculate.

This essay has contemplated our status as transhuman subjects of interiors that are transitioning towards a Post-Domestic world. Such a study might be included in a growing branch of knowledge that is known as cyber or digital anthropologies. These anthropologies are concerned with the physical and psychical relations between humans and the technologies of connectivity, enhancement and surveillance which have become component of our domestic surroundings and beyond. Where at one time nineteenth-century priests wrote books regulating the home's socio-spatial structures, in the 21st century it is tech companies who act as the authoritative entities concerned to normalise domestic dispositions and behaviours. My reading of Butler and Huxley positions us as Transhuman subjects in what I have termed a Trans-Domestic interior. We have attained neither Post-Human or Post-Domestic status, but it is an evolutionary inevitability.

References

Allen, P. W. (1988). *Building Domestic Liberty. Charlotte Perkins Gilman's Architectural Feminism*. University of Massachusetts Press.

Bellamy, E. (1917). *Looking Backward 2000-1887.* Random House. (Original work published 1887). https://archive.org/details/in.ernet.dli.2015.36547/page/n5/mode/2up

Butler, S., & Cellarius. (1863, June 13). Darwin Among the Machines. *The Press*, 180–185.

Davidoff, L., & Hall, C. (1987). *Family Fortunes Men and Women of the English Middle Class 1780-1850*. Hutchinson.

Foucault, M. (1988). *The Care of the Self* (R. Hurley, Trans.). Vintage Books. (Original work published 1984).

Fuller, A. W. (1895). A Wife Manufactured to Order. *The Arena*, *13*(68), 305–312.

Gay, P. (1993). *The Cultivation of Hatred* (Vol. III). W.W. Norton & Company.

Gilman, C. P. (1899). The Home Without a Kitchen. *Puritan*, *7*(December), 417–422.

Gilman, C. P. (1910a). Her Housekeeper. *The Foreunner*, *1*(3), 2–8. https://babel.hathitrust.org/cgi/pt?id=mdp.39015029758342;view=1up;seq=17

Gilman, C. P. (1910b). Martha's Mother. *The Foreunner*, *1*(6), 1–6. https://babel.hathitrust.org/cgi/pt?id=mdp.39015029758342;view=1up;seq=17

Gilman, C. P. (1911a). Making A Change. *The Foreunner*, *2*(12), 311–315. https://babel.hathitrust.org/cgi/pt?id=uc1.31158005940829;view=1up;seq=321

Gilman, C. P. (1911b). Old Mrs Crosley. *The Foreunner*, *2*(11), 283–287. https://babel.hathitrust.org/cgi/pt?id=uc1.31158005940829;view=1up;seq=289

Gilman, C. P. (1912a). A Cleared Path. *The Foreunner*, *3* (10), 253-258. https://babel.hathitrust.org/cgi/pt?id=mdp.39015029911875;view=1up;seq=261

Gilman, C. P. (1912b). Her Memories. *The Foreunner*, *3*(8), 197–201. https://babel.hathitrust.org/cgi/pt?id=mdp.39015029911875;view=1up;seq=205

Gilman, C. P. (1913a). A Council of War. *The Foreunner*, *4*(8), 197-201. https://babel.hathitrust.org/cgi/pt?id=mdp.39015014168648;view=1up;seq=205

Gilman, C. P. (1913b). Forsythe and Forsythe. *The Foreunner*, *4*(1), 1–5. https://babel.hathitrust.org/cgi/pt?id=mdp.39015014168648;view=1up;seq=9

Gilman, C. P. (1916). A Surplus of Women. *The Foreunner*, *8*(5), 113–118. https://babel.hathitrust.org/cgi/pt?id=mdp.39015066103535;view=1up;seq=121

Hall, C. (1990). The Sweet Delights of Home (A. Goldhammer, Trans.). In M. Perrot (Ed.), *A History of Private Life. From the Fires of Revolution to the Great War* (Vol. 4, pp. 47–93). The Belknap Press of Harvard University Press. (Original work published 1985)

Huxley, J. (1968). Transhumanism. *Journal of Humanistic Psychology*, *8*(1), 73–76. https://doi.org/10.1177/002216786800800107

James, J. A. (1854). *Female Piety Or the Young Woman's Friend and Guide Through Life to Immortality*. Robert Carter and Brothers. https://archive.org/details/femalepietyoryo02jamegoog

Kerber, L. K. (1988). Separate Spheres, Female Worlds, Woman's Place. The Rhetoric of Women's History. *Journal of American History*, *75*(1), 9–39. https://doi.org/10.2307/1889653

Logan, T. (2001). *The Victorian Parlour*. Cambridge University Press.

Marcus, S. (1999). *Apartment Stories City and Home in Nineteenth-Century Paris and London*. University of California Press.

Preciado, P. B. (2014). *Pornotopia. An Essay on Playboy's Architecture and Biopolitics*. Zone Books.

Ruskin, J. (1900). Of Queens' Gardens. In A. S. Cook (Ed.), *Sesame and Lilies. John Ruskin* (pp. 72-105). Silver, Burdett and Company. (Original work published 1864). https://archive.org/details/johnruskinssesam00rusk

Shamir, M. (2006). *Inexpressible Privacy. The Interior Life of Antebellum American Literature*. University of Pennsylvania Press.

Tange, A. K. (2010). *Architectural Identities. Domesticity, Literature and the Victorian Middle Classes*. University of Toronto.

Post-Domestic Living
The Challenge of Adapting Domestic Spaces to the Evolution of Digital Technologies

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Abstract
The aim of the paper is to examine how the advancement of technology is radically transforming the way we interact with the domestic sphere. The evolution of digital devices has brought new perspectives for redefining living spaces, raising crucial topics about the traditional function-based model. In this context, design plays a key role in shaping the technological revolution of Post-Domestic habitat. This model was challenged by several designer architects, including Joe Colombo and Superstudio.
The integration of Augmented Reality (AR) and Artificial Intelligence (AI) allows the creation of heterotopic spaces, inspired by Foucault's theory. In this perspective, the home environment is transforming into a fluid and mutable space where users can experience new forms of interaction and space relationship. This radical change raises important questions about the future of living.

1. Introduction

In an era characterized by the rapid advancement of technology, the domestic sphere is undergoing a deep and unprecedented transformation, reshaping the way we engage with the spaces we call *home*. The primary objective of this paper is to delve into this ongoing revolution, shedding light on how the evolution of digital devices has opened up new perspectives for the redefinition of living environment.

Already in the past, visionary architect-designers, among them key figures such as Joe Colombo and the avant-garde Superstudio Group, have boldly questioned the conventional paradigm of the function-based model of living spaces. These pioneering minds have embarked on a remarkable journey of exploration, reimagining the intricate relationship between individuals and their domestic surroundings. Over the past few decades, design has emerged as a pivotal force in steering the course of this technological revolution in the realm of Post-Domestic habitat. It has encountered and grappled with distinct challenges and unique opportunities. Pivotal factor propelling this metamorphosis is the seamless integration of Augmented Reality (AR) and Artificial Intelligence (AI). These transformative technologies have paved the way for the creation of heterotopic spaces, a concept inspired by the key theories of Michel Foucault. Within this framework, the conventional division of spaces based primarily on function has become increasingly constrictive. The home environment is rapidly evolving into a dynamic and adaptive domain, where inhabitants can immerse themselves in unseen forms of interaction and spatial dynamics.

This radical and far-reaching transformation has sparked a host of pivotal questions concerning the future of domestic living. How does the real essence of home evolve in a world where technology dismantles traditional demarcations between spaces and their functions? How can we effectively address the multifaceted challenges and capitalize on the myriad opportunities ushered in by this technological revolution in our daily lives?

The paper aspires to explore these questions, dissecting the ongoing metamorphosis of living spaces while accentuating the role of design in driving this paradigm shift. It examines the opportunities that are developing starting from this technological revolution, offering new insights into the evolving relationship between humanity and home.

2. The Technological Revolution of the Domestic Habitat

The evolution of digital technologies has revolutionized the way we perceive and interact with domestic spaces. Augmented Reality (AR) has opened up new perspectives in domestic spaces. Users can now experience advanced interaction with their surroundings through devices such as AR viewers or smartphones. Virtual interfaces have moved from mere representation to becoming key elements of living. AR has enabled individuals to interact with virtual environments superimposed on the real world, dissolving the boundary between what is real and what is virtual. This overlay transforms domestic spaces into hybrid contexts in which digital and physical objects coexist. This radically changes the perception of space, as inhabitants can perceive information and

digital objects overlaid on the physical environment, opening the door to new immersive experiences (Trovato, 2021).

Artificial Intelligence (AI) plays a crucial role in redefining living spaces, especially with the spread of the connected home. AI-powered virtual assistants, such as Amazon Alexa or Google Assistant, enable users to control home devices and services via voice commands or apps. This interconnection and centralized control contribute to greater adaptability of home spaces to individual needs and preferences. The home becomes a place where interaction between the user and the space is highly flexible, enabling unique experiences for each inhabitant and greater interconnection between objects and digital networks. The integration of AI within the home creates an environment where technology is integral part of daily life. These pervasive technologies further amplify the process of redefining domestic spaces, creating an habitat in which design is closely interconnected with technology (Pellegrino, 2011). At the same time, Francesco Mazzucchelli examined the concept of the *Quarta Parete* (Fourth Wall) of the home, which traditionally represented the boundary between private space and the outside world. However, with the advent of immersive technologies such as AR, this fourth wall crumbles, allowing the public to enter the domestic space in unexpected ways. This deep change in the interaction between domestic space and the outside world raises crucial questions about privacy, security and the perception of living space. Homes are increasingly characterized by their being *onlife*, fluctuating spaces in a hybrid regime determined by continuous interconnection through new communication technologies (Mazzucchelli, 2021).

In this scenario of radical transformation, the crucial role of design clearly emerges. Interior design is no longer limited to simply configuring physical spaces, but becomes the medium through which the interaction between users and the digital and physical environment is defined. Designers are called upon to create living spaces that reflect the needs of a rapidly changing society and that are able to adapt to the challenges and opportunities offered by this new era of the Post-Domestic habitat.

3. Heterotopic Spaces. The Influence of Foucault

Philosopher Michel Foucault defines heterotopias as *counter-spatial places*, areas of transition in which conventional rules are suspended. The heterotopias challenge the traditional form-function pair, juxtaposing places where people are present and absent at the same time. This conceptualization, as introduced by Foucault, has been the subject of extensive scholarly reflection. Heterotopias, unlike traditional places, are not easily classified by their form or function, but rather exist as liminal spaces that defy conventional categorizations (Knight, 2017). Foucault himself explored this concept in his later writings, as evidenced in his work *Other Spaces: Places of Heterotopias*. Here, the author expands his analysis on heterotopias, emphasizing how these spaces are not simply places of opposition to dominant social structures, but also spaces of critical reflection and potentiality. Heterotopias can, therefore, represent not only challenges to spatial conventions, but also challenges to social and cultural norms.

Technological evolution has led to the emergence of heterotopic spaces in which AR and VR challenge the usual rela-

tionships between form and function. In this habitat, human experience intertwines with technology in complex and unexpected ways, creating a heterotopic dimension in which the boundaries between the real and the virtual worlds blur. Individuals can be physically present in a space while simultaneously immersing themselves in an alternate reality through advanced technological devices. The spaces in the Post-Domestic habitat offer new opportunities for critical analysis of power dynamics, perception of space and the construction of individual identity. It poses a challenge to traditional conceptions of place and opens the way for further theoretical explorations on the complexity of interactions between technology and society. Consideration of how heterotopias can be applied to this contemporary context requires an interdisciplinary approach that integrates the theoretical perspectives of philosophy, sociology and technology. In this way, Foucault's enduring influence and his relevance in contemporary society can be fully understood.

4. The Concept of Post-Domestic in Preciado

Philosopher Paul B. Preciado, in his book *Pornotopia. An Essay on Playboy's Architecture and Biopolitics*, introduces the term Post-Domestic to describe an iconic image that encapsulates the radical transformation of the domestic environment in the context of the contemporary era (Preciado, 2014). This image depicts Hugh Hefner, the founder of *Playboy*, working on his distinctive round equipped bed. Initially, we might view this space as simply a bedroom, but Preciado's Post-Domestic perspective prompts us to look beyond that. The concept of Post-Domestic, thus presented by Preciado, transcends

the traditional idea of a dwelling as a place of rest and privacy. This space actually serves as an epicenter for a multiplicity of activities that go beyond mere rest and individual pleasure. It is a place where work, entertainment, hyperconnected systems and voyeuristic design converge (Bassanelli, 2022). Hugh Hefner's bed becomes a multifunctional platform, an intersection of private and public spheres, a microcosm of a society undergoing a deep transformation.

The concept of the Post-Domestic surprisingly anticipates our contemporary times. Today, we are witnessing the gradual disappearance of traditional boundaries between public and private spheres. Domestic spaces are no longer exclusively dedicated to rest and family life, but have become the stage for multiple activities and interactions, often influenced by the ubiquitous presence of technology and AI. The advent of AI devices in the home has further amplified this domestic metamorphosis. Every aspect of private life is involved in production and work processes, thanks to automation, interconnection of devices and centralized management of home systems. Homes are no longer mere shelters, but become hubs of control and production, where the management of daily activities is increasingly delegated to AI and home automation systems.

Preciado's perspective on the Post-Domestic invites us to reflect on how the perception of domestic space has changed radically, transforming into a place where the private and the public, the human and the technological, work and pleasure are intertwined. In this context, the challenge for contemporary design is to create environments that reflect this new under-

standing of domestic space, harmoniously incorporating AI and Post-Domestic elements into people's everyday experience.

5. Joe Colombo and Superstudio. New Visionaires Habitat

In the design and architecture scene of the 1970s, two figures emerged as true visionaries of the new habitat: Joe Colombo and the Superstudio collective. The movement known as Radical Design, heavily influenced by the ideas of these designers, challenged the traditional form-function pair in interior architecture, paving the way for a conceptual revolution that finds new relevance today in the era of the Post-Domestic habitat.

Figure 1. Superstudio, Sofa Design, Poltronova, 1966.

Figure 2. Joe Colombo, Experimental project Visiona 1, Interzum exhibition in Cologne, Bayer, 1969.

Superstudio coined the bold concept of *life without objects*. This mantra emphasized the crucial importance of experience and flexibility in living spaces, challenging traditional conceptions of furniture and household objects (Fig. 1). Through their radical design, they proposed a vision of home environment in which freedom and openness were the cornerstones, strikingly anticipating the concept of the Post-Domestic (Quesada, 2011). At the same time, Joe Colombo's work contributed significantly to this conceptual revolution. Colombo challenged the conventions of home furnishing, creating flexible and modular spaces that responded to the changing needs of inhabitants (Fig. 2). His vision of a *new domestic landscape* promoted the idea of an ever-changing living environment in which architectural elements and furniture harmoniously integrated to offer a wide range of possibilities for use (Rossi, 2014).

These designers thus anticipated a radical transformation of the home environment and their legacy finds new relevance in the current Post-Domestic era. The advent of digital devices, AI and AR viewers in homes is further challenging the traditional conception of home space. Colombo and Superstudio ideas on flexibility, adaptability and the importance of experience become even more relevant. Today, contemporary living takes place in increasingly fluid home environments, where spaces can adapt to the different activities and needs of the users. Smart technology enables precise control of the home environment, offering greater interactivity and personalization. AI, for example, can anticipate occupants' preferences and adjust lighting, temperature and other parameters based on those preferences. This convergence of technology and design is redefining the real idea of home and giving rise to an era in which the home environment is constantly evolving and adapting, reflecting the changing needs and aspirations of the inhabitants.

Joe Colombo and the Superstudio collective have thus played a key role in shaping our understanding of the domestic environment, anticipating key concepts such as flexibility and experience. Their legacy finds new relevance in the Post-Domestic habitat era, in which the presence of digital devices, AI and AR viewers is radically redefining the traditional conception of domestic space. These pioneers paved the way for a future in which design and technology merge to create increasingly adaptable and immersive environments.

6. Domestic Design Perspectives

Home design is experiencing an unprecedented revolution thanks to the integration of emerging technologies that are helping to transform home environments into smarter, more efficient, safer, and more personalized spaces, creating a more advanced and adaptable living experience. There are numerous technologies that can interact with the home space. One of the most widely used currently is Internet of Things (IoT) technology, applied for centralized control and connectivity, which finds application in advanced home automation, home appliances and smart sensors. Another technology on the rise is the Additive Manufacturing, used for rapid prototyping and production of customized objects. However, the real frontiers of the domestic future are: Augmented Reality (AR), used to enrich the home experience by overlaying digital elements on top of the real world, Virtual Reality (VR), which can offer a fully virtual experience and Artificial Intelligence (AI-based systems), which can reprocess data by learning users' preferences and automatically optimizing the home environment.

This new design perspective is not only redefining our perception of home spaces, but is also opening new directions for the creation of innovative and immersive environments based primarily on the use of AR, VR, and AI. "New notions of augmented reality are developing that suggest new, common yet individually decorated and populated ways of sharing living spaces for socializing, playing and loving" (Szacka, 2021). In this section we will explore some of these new perspectives, taking as example one of the most revolutionary groups

of the last decade: Space Popular, an art and architecture studio that explores the future of spatial experience through research and design.

The group coined the term *Venn Room* in 2019 to describe virtually overlapped domestic environments by Space Popular. On the occasion of the *Tallinn Architecture Biennale* in 2020, they created an installation that serves as a perfect example of integrating AR into home design (Fig. 3). They use this technology to allow people to modify the appearance and function of the space in real-time. Users can use an AR application to change wall colors, furniture arrangements and even create virtual artworks seamlessly blending with the surrounding environment (Fig. 4). This project demonstrates how augmented reality enables a level of customization and adaptability never seen before in a home setting. Building upon this concept, a research project called *Tomorrow Living* was presented at the MEET Digital Culture Center during *Milan Design Week 2022*, created by Huawei Milan Aesthetic Research Center in partnership with Space Popular. The project explores new scenarios of living in mixed reality, ubiquitous and intelligent technology to reconnect with nature, empower communities, promote physical and mental well-being, and optimize consumption and spaces. The question is: Which role can intelligent technology and design currently play? Space Popular attempts to answer through the immersive documentary *The Global Home*, presenting a series of virtually connected rooms transporting the observer through different everyday scenario, developing a small community of avatars that becomes a home in constant movement (Fig. 5).

Figure 3. Space Popular, The Venn Room, Tallinn Architecture Biennale, 2020.

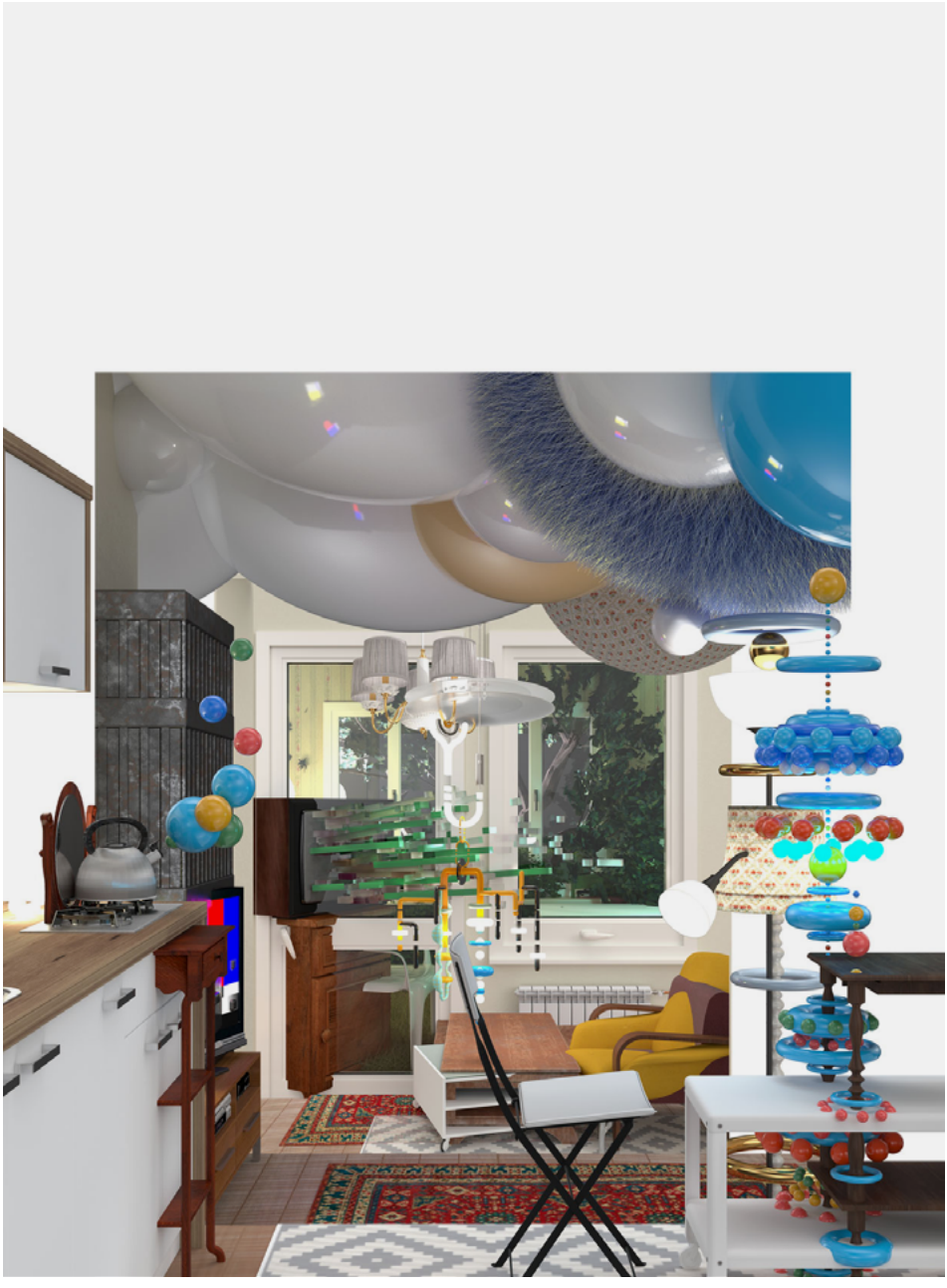

Figure 4. Space Popular, The Venn Room, Tallinn Architecture Biennale, 2020.

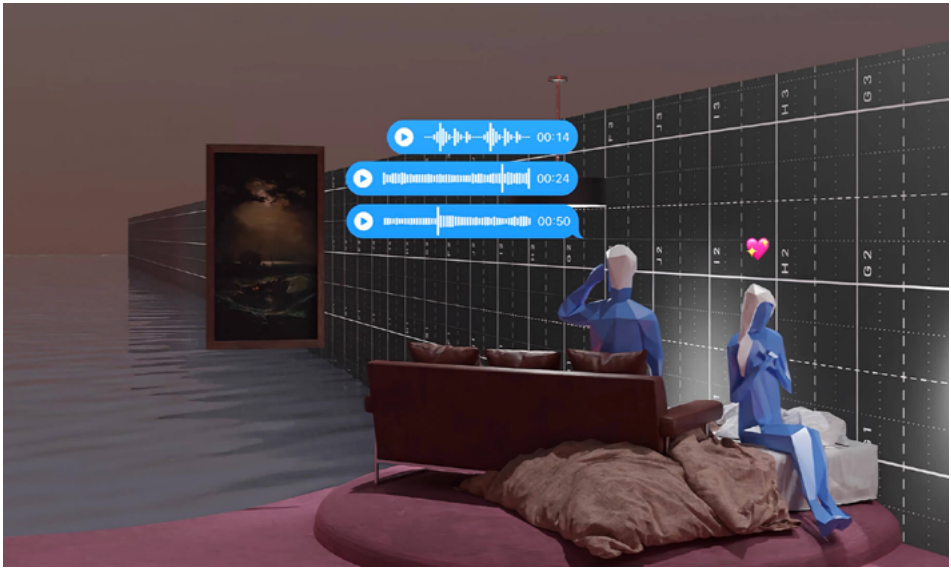

Figure 5. Tomorrow Living Exhibition, 2022. Site specific immersive film: The Global Home by Space Popular.

Figure 6. Tomorrow Living Exhibition, 2022. Site specific immersive film: The Global Home by Space Popular.

The Global Home will be to the experience of virtual space what the body is to the physical experience of architecture. Bodies dictate which doors we can pass through, the size of the beds. Similarly, the size and layout of our homes dictate where we can stand, sit, walk, or reach in a virtual world. In this space it is possible to create customizable shared environments (Fig. 6). The virtual home goes beyond the concept of ownership, becoming a placeless and lawless *Global Home* (Thiébat, 2023).

In the same way, Zaha Hadid Architects Group has also experimented with the use of AR to create futuristic spaces in the *Liberland* project. This project is based on the philosophy of liberating domestic spaces from physical limitations through the use of advanced AR technologies. The environments of *Liberland* are designed to be completely customizable and interactive. Virtual walls can transform into panoramic windows displaying breathtaking landscapes or interactive screens providing real-time information (Fig. 7). This project paves the way for a new era of dynamic and highly functional domestic spaces, where AR technology harmoniously merges with architecture.

Another visionary designer is Andrés Reisinger: he has taken interior design to a completely new level, challenging conventions and embracing the concept of a multiverse in his work. His approach to design is characterized by a surreal and dreamlike aesthetic, where reality merges with imagination in unique ways. Reisinger has gained prominence for his digital projects, creating virtual environments that seem to exist in a parallel world (Fig. 8).

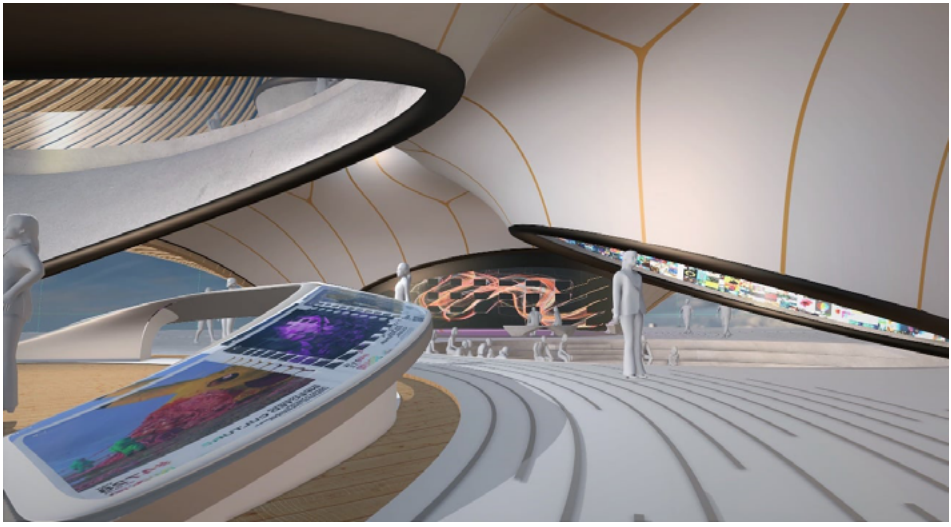

Figure 7. Zaha Hadid Architects, Liberland Metaverse, 2022.

Figure 8. Reisinger Studio, Odyssey, 2021.

Figure 9. Reisinger Studio, Electric Nature, 2020.

These spaces, often characterized by fluid forms, vibrant colors, and a sense of unreality, have been enthusiastically embraced by an increasingly wide audience. What sets Reisinger apart is his ability to make these virtual worlds tangible, turning his creations into physical pieces that can be experienced in the real world. Thanks to 3D printing and custom production, his furniture and artworks come to life, bringing his multiverse into the everyday lives of people. Andrés Reisinger's work challenges the traditional notion of interior design, opening doors to new possibilities and stimulating our imagination about the nature of the spaces we inhabit (Fig. 9).

It is evident that, with the advent of metaverses, the influence of the medium on the design of domestic, urban or commercial environments is evolving from web 2.0 to web 3.0.

There are numerous repercussions on the design of physical space due to the presence of devices supporting AR and AI that dictate new laws in the development of a Post-Domestic scenario. The radical change is not only physical but, above all, social. Designers, through the integration of AI, sensors, and 5th Generation (5G), can develop smarter and more interactive domestic spaces, also improving personal and healthcare assistance for individuals who are alone, elderly or disabled. The home thus becomes a living organism that reacts and responds in a fluid and empathetic manner. It can understand and anticipate the user's behaviors, monitor their health status, understand their emotions and even anticipate their needs. Design must rethink the home as a series of online windows, where furniture and objects overlap both formally and functionally. Environments will be dilated, expanded and without boundaries.

The real designed environment will be only the skeleton upon which to graft and expand ever-evolving virtual walls. The same space can be a meeting place for people or a refuge for the well-being of the body and the mind. The space envelops the user, blends with nature, changes through LEDs and sound effects, communicating different perceptions each time and processing, through AI, real-time feedback, adapting to them. The exploration of new ecologies, the articulation of physical and virtual realms, the integration of human and non-human minorities, and the respect for political, sexual, and racial diversity are all constructions linked to the ideas, techniques, and iconography of contemporary interiors (Fernandez Contreras, 2022).

7. Conclusions

The integration of AI and AR is crucial to the evolution of home design in the Post-Domestic era. The result is a home that responds intelligently to the needs and preferences of its inhabitants, offering a comfort level and convenience that was once unimaginable. Furthermore, AI-driven design and automation are contributing to the creation of energy-efficient and sustainable homes. Smart sensors and AI algorithms can optimize energy consumption by adjusting lighting, heating, and cooling systems based on real-time data and user behavior. These systems not only reduce energy costs but also have a positive impact on the environment, aligning with the growing trend toward eco-friendly living. In the context of the Post-Domestic habitat, the role of designers becomes increasingly complex and multifaceted. Designers are not only responsible for creating aesthetically pleasing spaces but also for integrating technology seamlessly into the domestic environment. There is the need to understand the potential of augmented reality, artificial intelligence and other emerging technologies, as well as to consider the ethical implications of these innovations in terms of privacy, security and sustainability.

In conclusion, this transformation challenges traditional notions of space, function, and interaction within the home. Designers play a pivotal role in shaping this new landscape, creating flexible, immersive, and sustainable living environments that respond to the changing needs and desires of inhabitants. They become creators not only of the domestic skeleton that must fulfill needs, but must also take into account the infinite possibilities that this skeleton can generate,

conceiving it as an ever-evolving organism. The combination of AR, AI and innovative design promises a future where the home is a dynamic and adaptive space, enhancing the quality of life and redefining our relationship with domesticity. As we continue to navigate this ever-evolving landscape, it is imperative that we embrace the opportunities and responsibilities designing the future of the Post-Domestic Habitat.

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References

Bassanelli, M. (2022). Post Domestic Commons. In E. Duarte, & A. Di Roma (Eds.), *Proceedings of the 11th International Conference, Senses & Sensibility. Designing Next Genera(c)tions* (pp. 362–375). IADE Press.

Fernandez Contreras, J. (2022). COPY-PASTE. L'Intérieur, du Web 2.0 au Métavers. *Maisons et Ambiances*, *2*, 66–72. https://shs.hal.science/halshs-03665555

Foucault, M. (1984). Dits et écrits 1984. Des espaces autres (conférence au Cercle d'études architecturales, 14 mars 1967). *Architecture, Mouvement, Continuité, 5*, 46–49.

Knight, K. T. (2017). Placeless Places. Resolving the Paradox of Foucault's Heterotopia. *Textual Practice*, *31*(1), 141–158.

Mazzucchelli, F. (2021). La quarta parete di casa. Il pubblico dentro lo spazio domestico. *Semestrale di studi e ricerche di geografia*, *33*(2), 177–182. https://doi.org/10.13133/2784-9643/17637

Pellegrino, G. (2011). Nuove domesticità. La casa connessa e le tecnologie pervasive per la mobilità. *M@ gm@*, *9*(3). http://www.analisiqualitativa.com/magma/0903/article_10.htm

Preciado, P. B. (2014). *Pornotopia. An Essay on Playboy's Architecture and Biopolitics*. Princeton University Press.

Quesada, F. (2011). Superstudio 1966-1973: From the World Without Objects to the Universal Grid. *Footprint*, *8*(1), 23–34. https://doi.org/10.7480/footprint.5.1.730

Rossi, C. (2014). A New Domestic Landscape. Catharine Rossi on the Environments of Joe Colombo and Superstudio. In Space Caviar (Ed.), *Sqm. The Quantified Home* (pp. 50–59). Lars Müller.

Szacka, L. C. (2021). Screen's Domesticity. From the Postmodern House to Our House. *Architectural Design*, *91*(1), 76–83. https://doi.org/10.1002/ad.2656

Thiébat, F. (2023). Habitat intelligenti e auto-sufficienti. Il ruolo della tecnologia per il futuro dell'architettura. *Techne*, *25*, 48–54. https://doi.org/10.36253/techne-14765

Trovato, V. (2023). *Interfacce Virtuali. Dalla rappresentazione all'abitare | Virtual Interfaces. Representing and Inhabiting Architectures*. [Unpublished doctoral dissertation]. Politecnico di Torino.

Extractivism, Gendered-Computing and Online Queer Spaces

The case of The Sims and Liquid Nitrogen Overclocking

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Abstract
Bridging interior design with our Anthropocene shift and the eco-material implications of digital practices, our contribution focuses on two case studies that inform us about the sociocultural values embedded in technology. At the level of software, we first investigate *The Sims* video game: from its embedded representations around nature to the underlying gendered discourses behind its affiliation as a "girl's game". At the hardware level, we then follow practices of *liquid-nitrogen overclocking*: a form of extreme computer tuning and cooling. These two cases enable us to delve into two main axes we use to shed light on the materially and culturally situated nature of our day-to-day technologies. The first axis connects to the way we perceive and control nature: contextualizing our beliefs around nature as an infinite resource to control inside our software and hardware culture. Going further into the body of hardware/software practices of leisure and play, our second axes then shed light on the genderedness of these technologies. In these case studies, we explore how digital and material infrastructures of technology are not neutral but embody gender dynamics in their domestic and built spaces. Finally, we conclude by providing readers with alternative and queer perspectives on computing as methodological tools to deconstruct and distance ourselves from the gendered technologies we inhabit.

1. Introduction

In contrast to prevailing narratives and tropes surrounding the internet, this contribution explores how nature is controlled and depicted both offline and online. In opposition to ubiquitous "storylines" (Hajer, 1997) and digital metaphors such as the one of the internet "cloud" and "artificial" intelligence, the work contextualizes intersections and frictions between these technologies and our understanding of nature. These frictions are examined through three core aspects of the computing ecosystem: 1) human, 2) digital, and 3) material. Inspired by the open systems interconnection (OSI) model, our first section addresses humans as users and operators of hardware and software in daily life. By highlighting the omission of this cultural layer by the OSI, it sheds light on the politics at play between technology, nature, and gender. Contrary to the cloud metaphor inaccurately depicting computing as a seamless black box observed from afar, it contextualizes how these beliefs and dynamics are embodied within the core of our daily-used technologies. More specifically, it argues for a re-embodiment of our culturally-situated views and biases in the software and hardware ecosystem, approaching them as 'wicked' (Rittel & Weber, 1973) infrastructures inseparable from their culturally situated 'techniques of the body' (Mauss, 1973). The second and third sections introduce two case studies: where both software and hardware entangle with gender and cultural dynamics. In the second section, focusing on software, we delve into *The Sims* life simulation and video game. Dissecting underlying gendered values and dynamics within the game's domestic space, we draw parallels with gender dynamics and cultural views around nature in Western countries.

Transitioning to the physical infrastructure enabling digital activities to occur, the third section zooms in on a community of gamers and hardware enthusiasts known as liquid nitrogen overclockers. By examining their use of liquid nitrogen to competitively cool computer chips, we contextualize their perceptions and views of nature: as an extractive resource for our computational culture. Studying venues and fairs where they compete, we shed light on the gendered dynamics of computing culture and the market in which they operate. Finally, the conclusion guides the reader toward alternative and counter ways to engage with mainstream technologies and outline the importance of a queer culture of technology.

2. From Mainstream Worldviews to a Queer Culture of Computing

Outside of technology as a purely technical, neutral, and artificial set of objects, this first section introduces our digital spaces as culturally-situated apparatuses (Agamben, 2009): embodying specific views about nature and the sociocultural gender dynamics at play inside our western and european societies. In opposition to the ubiquitous metaphors and framing we introduced earlier, we argue that the environments these technologies produce and perform need a comprehensive assessment without dismissing the gendered form of violence they embody. Addressing this political aspect necessitates to recognise the capitalist (Moore, 2016), colonial (Ferdinand, 2019) and patriarchal (Di Chiro, 2017) dimensions of our contemporary globalized relationship with nature.
A critical take on our computer and video gaming culture therefore means taking a multi-scalar point of action: think-

ing simultaneously about the degradation of biodiversity and the environment intensified by our extractive technical industries, gendered violence conveyed by screens and its mediated socially-situated technologies and practices (Haraway, 2015); and issues of post-coloniality surrounding the production of electronic waste.

In this paper, we explore the extent to which these computing practices are a salient illustration of our post-domestic revolution. We ask how, from domestic-spaces built across the digital to the physical, nature and its representations are commodified and gendered; inherently linked to the human socio-technical contexts and infrastructures that activate them. Mediating through screens and gestures in video games and in the gaming culture, technology acts as a vector for the production of meaning and subjectivity. Far from merely representing the reality we inhabit, it actively produces and reproduces bodily-gendered dynamics: shaping our relationships to the world and the way we inhibit it. In this infrastructure of practices and built-spaces arise a specific view of nature we argue as extractivist and colonialistic: perpetuating domination and power dynamics through the screen, its mediating interfaces and the body of gestures that it activates.

Drawing from the OSI model, our first point of analysis is the construction and development of synthetic nature in video games. Taking the example of *The Sims*, we shed light on the way the videogame industry reproduces specific gendered-narratives through the production of online domestic spaces.

Figure 1. Screenshot from *The Sims 4*. The sim can search for frogs in the backyard of his newly purchased house.

Figure 2. Screenshot from *The Sims 4*. Once captured, the frog can be exposed in the house, and give a decoration bonus to the sims' player. Source: Guillaume Guenat.

Whereas feminine identities have been socially and historically thought of as having an ontological proximity to nature, the sensitive, the disordered, but also matter as opposed to abstraction (Merchant, 1980). *The Sims* presents a paradoxical image, being simultaneously associated with femininity and portraying the domination of nature within the game. This dichotomy between woman/nature and man/culture is historically responsible for the epistemicide of women's knowledge about nature (Grosfoguel, 2013). It also has contributed to the rise of a Western modernity shaped by the pursuit of capital, colonization, and slavery (Federici, 2004). These characteristics of the Anthropocene are challenged by the dynamics found within *The Sims*. While mastering and controlling the environment as developed in other games like *Minecraft* or *World of Warcraft* appear as more masculine and connect to overall practices of extractivism, domestication of nature is in *The Sims* feminine: due to its aestheticization. The dramatic irony of this game lies in the fact that while it cuts women off from nature, and therefore responds to the patriarchal imperatives of the Anthropocene, women remain devalued (Fig. 3).

This extractivism and take of male-driven games such as *Minecraft* or *World of Warcraft* echoes with other practices of our computational culture located on the other side of the OSI: at the level of hardware. This case is explicit in gaming aesthetics and the world of electronic-sports (e-sports); where domestics spaces such as fairs, gaming arcades and interiors embody aesthetics of maximalism. These are reinforced by key heavily designed objects that are easily recognizable and federating a predominantly white male community: RGB-colored fans,

case mods, gaming chairs, and others. The gendered-nature of gaming domestic spaces is also explicit at the level of the clear division of roles and labor between males and females. With the case of the overclocking, it's complex PC-builds and cooling competitions with males as experts and females as cheering the public and carrying objects promoted by the company (Fig. 6), these practices and spaces contribute to a compartmentalized and deleterious binary distribution of roles that reinforce mainstream gendered-discourses and gaps around technology and its makers.

These iterative performative acts produce gender as a stable category and obscure its fictional dimension (Butler, 1993). The body is always already signified by a context of gender (as well as class and race) that is here both material and conceptual. This context starts from its initial ground: bodies. In the article and through the two following sections, we therefore invite the reader to analyze how bodies of technology are designed, perceived and vectors of a specific social and political order. Through *The Sims* or practices of liquid-nitrogen overclocking, this is represented in the way gamers represent themselves and nature through avatars and computerized graphics, how nature is extracted and used as an infinite resource in the context of cooling, or even how events celebrating our computational culture such as liquid nitrogen overclocking competitions involve a network of gendered physical interaction with computer hardware and the market.

Opposed to these mainstream views and socio technical embodiments of our computation culture, we argue that it is

possible to design and foster alternative representations. We propose then to consider a queer approach to videogames. This takes the form of exploring complex relationships between different species with non-anthropomorphized avatars for example. Drawing from Lehner (2017), we argue that this aesthetic subverts established conventions, helps emancipate the player and introduces spaces for reflection on ecological coexistence. Given that the definition of a game allows players to appropriate and change their objects, the interactivity of video games can implement anamorphic thinking, producing an apparent world of interrelated life forms, animated humans, animals, and plants.

This reflection exemplifies how, drawing from Haraway and her concept of the Chtulucene (Haraway, 2015), which feeds into the Anthropocene as a new dimension, games cultivating multi-species relationships demonstrate the importance of interconnections between humans, animals, and the environment. Moreover, her invitation to think of science fantasy or of games such as Cat's Cradle leads us to analyze how technological products can be complex, collective and open-ended (Haraway, 2016).

Finally, her concept of the cyborg serves as a reminder that the biological world is hybridized by our everyday technologized lives, highlighting the widespread destruction caused by patriarchal technoscience (Haraway, 1991). As it blurs the boundaries between humans and machines, between the public and the private, the cyborg perfectly illustrates the virtual post-domestic environment in which we are constantly immersed.

3. "A Girl's Game". The Case of The Sims

Video games simulate spaces that require interactions between players, game interactions and the game's environment and domestic spaces. In the context of the popular *Mario* video game series for example, turtles that are thrown or mushrooms ingested are all part of this simulated space. Across various games, these environments generally serve the same set of purposes: either used as an aesthetic component contributing to a pleasant experience; or as serving the narrative: such as when using the environment's resources to progress in the game (Chang, 2019). This resource-oriented characteristic of domestic spaces connects, as developed in the next section, to a broader computational worldview: the one of extractivism and maximalism developed by the gaming industry.From purely aesthetics to a more active role inside the game play and narrative, the video game industry develops domestic spaces as central inside the game's procedural authorship (Murray, 1997) and intentions. From Lara Croft's luxurious residence in *Tomb Raider* to *Resident Evil*'s stifling Spencer Mansion, game design is all about the construction of architectural narrative, to paraphrase Henry Jenkins (Jenkins, 2004).

However, two specific positionings of online domestic spaces across the different game genres emerge. The first, such as the Sims, are referred to as "cozy games": focusing on the construction of comfortable homes in an open-ended world and life simulations. The second, like *Minecraft* for example, are framed as "survival games": drawing from "ecocomposition" (Bohunicky, 2014, p. 222) proposing gamers build and grow shelters within resources previously gathered inside the

games' hostile nature and environment. We argue that they connect to broader worldviews of extraction: where nature, mediated through these domestic spaces, is portrayed as an infinite resource to exploit and control.

A seminal example of how simulated digital spaces appropriate domestic space is the series of life simulation video games *The Sims*, designed and developed by Maxis since 2000 and published by Electronic Arts. The four opuses of the series takes the form of "life simulators" where players are invited to create and manage *sims* avatars: creating and furnishing 3D spaces where these *sims* evolve along this open-endedness game. A core aspect structures the simulation: the ability of these avatars to unlock and develop financially and materially using *sims* money: mainly acquired by working, selling goods or activating cheat codes. In addition, players can also spend real money on objects and expansion packs.

The process and evolution of these *sims'* lives is supervised by their respective players, developing the domestic scale parameters of these avatars. By doing so, the game focuses on a 3D camera view from above: allowing players to have access to the real-time activity of their sims, and the in-progress design details of their rooms and households. With the underlying role of the simulation to build beautiful homes, the exterior environment of the house is also a key aspect *sims* can develop and expand on. Especially in the fourth game (Maxis, 2014), nature becomes a commodity players can acquire to expand the living areas of their *sims* and further develop their quest to build the best homes and living environments.

Without dedicated paid expansion packs,[1] however, nature is reduced to the surrounding neighborhood: from plants and flowers they can use to decorate their interiors or in their empty gardens (Fig. 1); to animals, they find next to their houses that they can domesticate as pets and even sell (Fig. 2).

Despite this open-mindedness and level of transgression[2] (Martey, 2022) the game offers, its embedded values and gameplay can be criticized for the way they connect to a capitalist culture that echoes with the white, American suburban middle-class idealized way of life (Sicart, 2003; Triclot, 2017). This embedded ideology is also structured around a specific narrative: the one of the self-made man/woman, starting from nothing and, through hard work and accumulation, rising from a modest dwelling to an opulent and delicately decorated villa. Circling back to the intersections between online domestic spaces and extractivism worldviews, this narrative sits at the core of our capitalistic society: approaching nature from an anthropocentric perspective and as a resource to conquer and optimize.

However, in opposition to the video game genre of survival games that share those characteristics, the Sims series is often referred to as "for girls": implying an *a priori* association be-

1 Expansion packs add more complexity to the game mechanics, especially in relationship with nature and the environment. The pack "Seasons" for example mimics the different cycles of our seasons. Other packs include "Cats and dogs" – unlocking pets –, and "Eco lifestyle": adding an eco-footprint around the sims' surrounding air pollution and trash management.

2 The vanguard, transgressive and open-ended nature of the game is tangible in multiple ways. For example, users can decide to kill their sims in the cruelest way possible. The game is also progressive at the level of its views on sexuality and sexual norms: with homosexuality normalized from the first edition and the possibility to embrace transgenderism and queerness in the latest versions of the game.

tween femininity, (digital) domestic environment design, and aesthetic organization of nature. This gender categorization translates into disparities of practices between men and women (Berry et al., 2021) and structures different gaming communities, reproducing *de facto* this categorization.

Hence, some predominantly male communities – especially active in various forums such as Reddit or 4Chan – consider the computer culture as a naturally masculine one (Maloney et al., 2022). In their discourses, they aim to sort and articulate video games around the value of difficulty (Coavoux, 2019) and between two genres: easy/casual and real hardcore. Their logic implies a hierarchy of interests, with feminized casual games being seen as "insignificant, frivolous, and a waste of time and money as opposed to masculinized hardcore games, which are viewed as important, serious, and worthy of investment" (Vanderhoef, 2013, p. 18). These two genres also embody different views and roles of nature. These follow a specific dichotomy: hostile and to domesticate in survival games, or to aestheticize for casual ones.

These gender dynamics created around the level of difficulty also connect to a broader quest for computing power and powerful PC builds, as expanded on in the following section. Here, the cartoonish and non-photorealistic visuals of the game orient a specific value: the one that the Sims, as more feminine, does not need any sophisticated hardware or special technical knowledge of computers. The narrative that the technical and material mastery of computing devices, considered a typically masculine skill (Coavoux, 2019), structures a hierarchy of interests

amongst game genres, is moreover spread around the gaming communities through viral memes such as on *TikTok* (Fig. 3).

The irony proceeds from the supposed inadequate use of the hardware and the software explained by gender. The *cliché* stands upon the game's gender association (girls play casual games) and the idea that gamer girls would not master the technical and material implications of video gaming, specific to "real" gamers. As such, the joke operates as an exclusion process of women from videogame culture by categorizing them as outsiders, or intruders of a masculine, technical, and material world.

Figure 3. Adam McG 8 second Tik Tok gathered more than 5 million likes. Unknown date. "This is the best purchase I've ever made", he says as The Sims 4 music plays. Source: https://www.tiktok.com/@_adammc2/video/7243478380509695259.

This shows how domestic spaces are both political territories and political imaginaries, embedded digitally and materially. The integration of computing technologies into households transforms domestic space in order to welcome new digital content and practices. They support the expression of cultural identities and they convey different postures and representation of the environment, strongly structured and differentiated by gender, blurring the separation between the inside and the outside.

4. Cooling Hardware to Its Limits: LN2 Overclocking

Clicks, comments, likes, upload connect to a hidden and energy-extensive infrastructure of cooling. In opposition to our minimalistic and seamless (Ratto, 2007) platforms overly simplifying how our data transmission performs, shedding light on this cooling infrastructure makes explicit the extractivism-oriented and environmentally-situated characteristics of our online implications. From Meta to Windows, Google and other key corporations of our day to day digital landscapes, these companies' data servers moreover share the same spatial configurations and design: they are surrounded and wired to complex infrastructures of water pipes. These pipes, displacing large quantities of water from often arid areas, have then core functions: maintaining water pools and reservoirs (Hogan, 2015) needed to cool cutting-edge hardwares[3] required to produce, maintain and optimize computing power.

3 Here, one object stands out: the graphical processing unit (GPU) accelerator chip. The GPU is, for our platform cultures, the crucial object that unlocks computing power: foundational for our practices of artificial intelligence (AIs), gaming and cryptocurrencies/blockchain.

These inherently eco-material (Taffel, 2022) characteristics of our digital culture echo with practices of hardware and gaming enthusiasts known as liquid nitrogen (LN2) overclockers. This practice extends from the term overclocking: used to describe activities that consist of increasing computers' speed and power. With the aim of overclocking their computers to the limits and starting from the fact that computers produce heat when they compute, this community of gamers explore the role of liquid nitrogen: as one of the coldest available gasses on the market. With liquid nitrogen, they open their machines and build custom-cooling rigs: pouring LN2 on their computer chips to run energy-extensive games and simulations (Fig. 4).

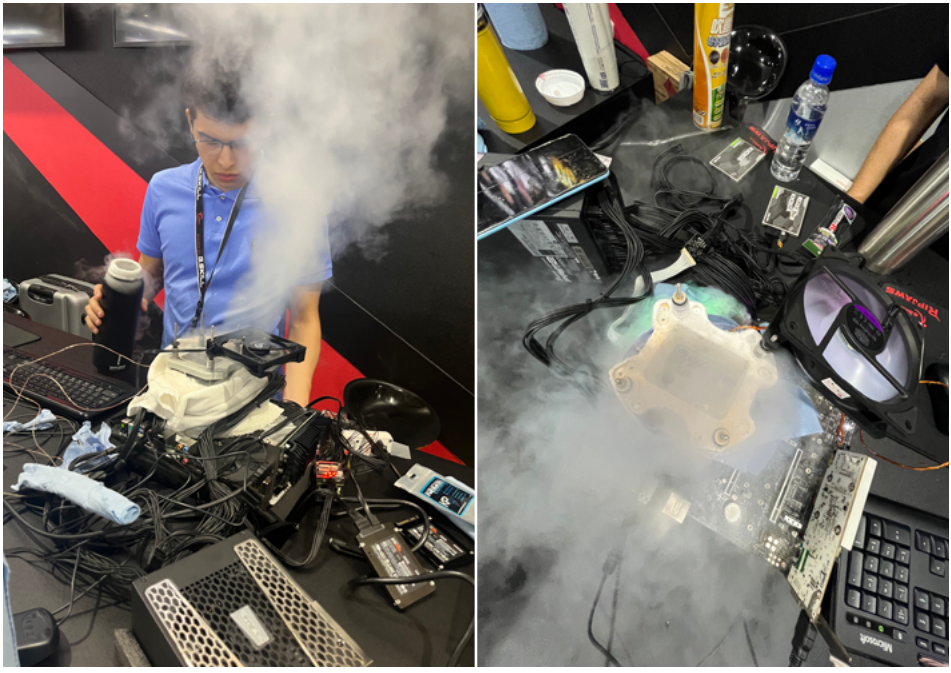

Figure 4. Liquid-nitrogen overclocker competing at the COMPUTEX2023 and pouring liquid nitrogen on the custom cooling rig (image on the right) placed on top of the PC build microchip he intends to cool down. Source: Cyrus Khalatbari.

With this gas one can easily find in specialized shops,[4] these gamers manually overclock their computers: reducing their machine's metal and silicon processes of heating. Liquid-nitrogen overclocking is not a solitary activity: it is a competition practiced in online forums and dedicated spaces. As a competition connected to electronic sports (e-sports), it has its own ranking systems, teams, venues and large amounts of cash-prizes.

With similar views than inside digital technologies and video-games, these practices of overclocking engage with nature in an extractive and minimalistic approach. This means therefore that, such as *The Sims* or *Minecraft* where nature is controlled – whether from a male or female perspective – producing these complex PC builds require nature to be controlled and monitored. This enacts a body of strategies and tools to cool down computer chips. In other words, these practices are not done in and by simply pouring the gas on the silicon; but with the help of a plethora of traditional tools, hacked-technical objects, complex (and sometimes, secret) *know-hows*. This control of nature is tangible at the level of one of the LN2 biggest challenges: condensation. Condensation, the natural process occurring when gas turns into liquid, is unavoidable: as it is produced by the gas that slowly evaporates once it is poured on the computer. Monitoring condensation is therefore of core importance in their builds: as it can quickly damage and even destroy computer's parts or the entire machine.

4 Amongst other industries, clockers purchase liquid nitrogen in shops/providers specialized in welding and medical equipment.

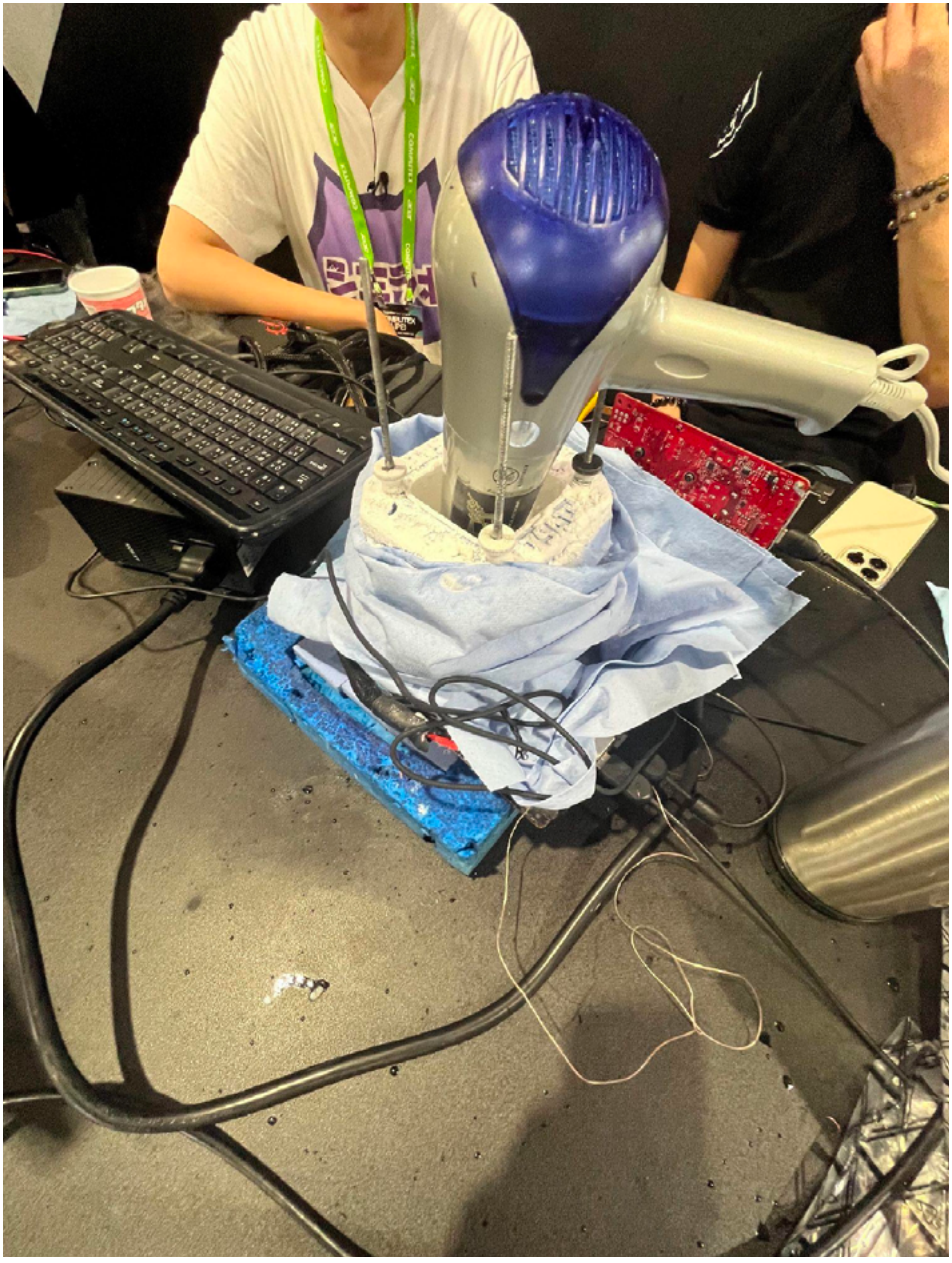

Figure 5. Hair dryer inserted by an overclocker into his cooling rig to reset the temperature of his build and avoid condensation. Source: Cyrus Khalatbari.

In order to better control nature and optimize its resources, overclockers then engage with a variety of techniques to make sure their builds. In this context, each overclocker has its preferences. Some, for example, use water-resistant Vaseline: that they put on their electronic circuits to isolate them from moisture. Others use hair dryers (Fig. 5), directly inserted in their cooling rig, as a way to quickly "reset" the temperature during their overclocking rounds. In order to rank their performances, overclockers engage in the same maximalist way with another technology: benchmarks. From *Cinebench* and *3DMark,* these are software they run on their machines to simulate graphically demanding games and sequences in order to output a series of numbers. With these numbers, they can then compare themselves and attempt to win various financial rewards or cash prizes (Fig. 6). Another core aspect of this practice emerges from the fact they compete in teams or *écuries*.[5] Just like Formula One or drag-racing, overclockers are sponsored and grouped by key microchips and GPU manufacturers and vendors - whether MSI, ASUS, or EVGA.

These characteristics make LN2 overclocking a competitive game carried by a spectacular infrastructure that echoes with other contests. Such as sports, LN2 overclocking has its stadium-like spaces: computer fairs where enthusiasts gather and federate. One of these spaces is *COMPUTEX2023.*

5 The term *écuries* comes here from French. It is used in Formula One to characterize the various car brands that provide the car and engine. Overclockers' competition have the same structure: with teams gravitating around microchip manufacturers.

Figure 6. Cash-prize of 10,000 US$ given to the winner of the COMPUTEX2023 overclocking competition. The overclocker is here in the middle, surrounded by a brand ambassador from Intel (left), the organizer of the competition (right), and the hostesses (background). Source: Cyrus Khalatbari.

Taking place each year in Taipei (Taiwan), this fair showcases a variety of local and international actors shaping our computing industry and culture: from computer brands to GPU, RGB keyboards, and gaming chair designers. In places such as *COMPUTEX* and others, technology is displayed in a gendered-way. In echo with values embodied in digital spaces at the level of various codes and ways to interact with nature, the spectacular dimension of overclocking is directed towards a male audience. Showcasing their builds and demos on stage, these predominantly male computer makers are celebrated: with large portraits and affiliations as well as broadcasting screens highlighting their various performances.

Figure 7. Hostesses parading in front of the COMPUTEX2023 public, carrying an RGB keyboard (left, in orange) and a GPU cooling device (right, in yellow).

Each time their scores get higher, canon-shaped smoke-machines are activated. In front of them a dozen hostesses dressed in flashy crop tanks and mini-skirts parade in order to keep the show running. Hired by manufacturers, these hostesses welcome visitors with the latest gaming hardware products available on the market (Fig. 7).

5. Conclusion

Queer studies' focus on relations of power and resistance offers an analysis of games as systems, both playful and political.

Rather than limiting itself to the study of a game's narrative and rules, this research interrogates the queer implications of the materiality of its device, its code, as well as the individual experiences of non-normative subjects as they play. Adopting queer analytical tools in games enables us to go beyond both narratological and ludological approaches.

The narratological one is centered on story, thought of *a priori* as a temporal construction of discrete units that are both modal and thematic: different game units (characters, objects, environments, etc.) are designed to function according to different modes, endowed with characteristics, rules and interaction possibilities. And the ludological one is centered on gameplay. Queer tools invite us rather to adopt a meta-hybrid approach that actively deconstructs these methodologies themselves. The idea is not simply to choose between these two approaches, but to challenge and go beyond them to create something new (Burrill, 2017). Thinking of the body and play material as gendered insofar as they mediate a gaming experience and are its very condition of possibility (Bagnall, 2017) enables this overcoming because both are involved in both digital and real-life work, playing a crucial role in the creation, development, manufacturing, distribution, consumption, and dissemination of games and material products.[6] To distance ourselves from unthinking and disembodied masculinity, this contribution on gender and video games

6 Chun (2011) for instance observes that game controllers featuring at least one analog stick inscribe games and players in phallocentric logics and perpetuate the amalgam between the materiality of games and masculinity (as opposed to software and femininity).

firstly examines the technological discourses and practices on nature that contribute to nourishing an androcentric conception, and secondly, how images refer to a feminized nature, the thought of exclusively as a setting and a resource.

References

Agamben, G. (2009). *"What Is an Apparatus?" and Other Essays*. Stanford University Press. (Original work published 2006).

Bagnall, G. L. (2017). Queer(ing) Gaming Technologies. Thinking on Constructions of Normativity Inscribed in Digital Gaming Hardware. In B. Ruberg, & A. Shaw (Eds.), *Queer Game Studies* (pp. 135–145). University of Minnesota Press.

Berry, V., Boutet, M., Colón de Carvajal, I., Coavoux, S., Gerber, D., Rufat, S., Minassian, H. T., Triclot, M., & Zabban, V. (2021). *La fin du game? Les jeux vidéo au quotidien*. Presses Universitaires François-Rabelais. https://books.openedition.org/pufr/20077

Bohunicky, K. M. (2014). Ecocomposition. Writing Ecologies in Digital Games. *Green Letters, 18*(3), 221–235. https://doi.org/10.1080/14688417.2014.964283

Burrill, D. A. (2017). Queer Theory, the Body, and Video Games. In B. Ruberg, & A. Shaw (Eds.), *Queer Game Studies* (pp. 25–34). University of Minnesota Press.

Butler, J. (1993). *Bodies That Matter. On the Discursive Limits of "Sex"*. Routledge.

Chang, A. (2019). *Playing Nature. Ecology in Video Games*. University of Minnesota Press.

Chun, W. H. K. (2011). *Programmed Visions. Software and Memory*. MIT Press. https://doi.org/10.7551/mitpress/9780262015424.001.0001

Coavoux, S. (2019). *Jeux vidéo, sociologie d'un loisir de masse*. La vie des idées. https://laviedesidees.fr/Les-jeux-video-sociologie-d-un-loisir-de-masse

Di Chiro, G. (2017). Welcome to the White (M) Anthropocene? A Feminist-Environmentalist Critique. In S. MacGregor (Ed.), *Routledge Handbook of Gender and Environment* (pp. 487–505). Routledge.

Federici, S. (2004). *Caliban and the Witch. Women, the Body and Primitive Accumulation*. Autonomedia.

Ferdinand, M. (2019). *Une écologie décoloniale. Penser l'écologie depuis le monde caribéen*. Média Diffusion.

Grosfoguel, R. (2013). The Structure of Knowledge in Westernized Universities. Epistemic Racism/Sexism and the Four Genocides/Epistemicides of the Long 16th Century. *Human Architecture: Journal of the Sociology of Self-Knowledge, 11*(1), 73–90. https://www.niwrc.org/sites/default/files/images/resource/2%20The%20Structure%20of%20Knowledge%20in%20Westernized%20Universities_%20Epistemic.pdf

Haraway, D. (1991). A Cyborg Manifesto. Science, Technology, and Socialist-Feminism in the Late Twentieth Century. In D. Haraway (Ed.), *Simians, Cyborgs and Women. The Reinvention of Nature* (pp. 149–181). Routledge.

Haraway, D. (2015). Anthropocene, Capitalocene, Plantationocene, Chthulucene. Making Kin. *Environmental humanities, 6*(1), 159–165. https://doi.org/10.1215/22011919-3615934

Haraway, D. (2016). *Staying With the Trouble. Making Kin in the Chthulucene*. Duke University Press.

Hajer, A. M. (1997). *The Politics of Environmental Discourse. Ecological Modernization and the Policy Process*. Oxford University Press.

Hogan, M. (2015). Data Flows and Water Woes. The Utah Data Center. *Big Data & Society, 2*(2). https://doi.org/10.1177/2053951715592429

Jenkins, H. (2004). Game Design as Narrative Architecture. In N. Wardrip-Fruin, & P. Harrigan (Eds.), *First Person: New Media as Story, Performance, and Game* (pp. 118–130). MIT Press.

Lehner, A. (2017). Videogames as Cultural Ecology. Flower and Shadow of the Colossus / Videojuegos como ecología cultural. Flower y Shadow of the Colossus. *Ecozon@. European Journal of Literature, Culture and Environment*, *8*(2), 56–71. https://doi.org/10.37536/ECOZONA.2017.8.2.1349

Maloney, M., Roberts, S., & Jones, C. (2022). 'How do I become blue pilled?'. Masculine ontological insecurity on 4chan's advice board. *New Media & Society, 0*(0). https://doi.org/10.1177/14614448221103124

Martey, R.M. (2022). The Sims 4. In D. Arsenault, K. Boudreau, B. Perron, & M.J.P. Wolf (Eds.), *Fifty Key Video Games*. Routledge. https://doi.org/10.4324/9781003199205

Mauss, M. (1973). Techniques of the Body. *Economy and Society, 2*, 70–88. https://doi.org/10.1080/03085147300000003

Merchant, C. (1980). *The Death of Nature. Women, Ecology, and the Scientific Revolution*. HarperCollins.

Moore, J. (Ed.). (2016). *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*. Pm Press.

Murray, J. (1997). *Hamlet on the Holodeck. The Future of Narrative in Cyberspace*. MIT Press.

Ratto, M. (2007). Ethics of Seamless Infrastructures. Resources and Future Directions. *The International Review of Information Ethics, 8*, 20–27. https://doi.org/10.29173/irie93.

Rittel, H.W.J., & Webber, M.M. (1973). Dilemmas in a General Theory of Planning. *Policy Sciences, 4*(2), 155–169. https://doi.org/10.1007/BF01405730

Sicart, M. (2003). Family Values. Ideology, Computer Games & Sims. In *Digra 03, Proceedings of the 2003 DiGRA International Conference: Level Up, 2*. http://www.digra.org/digital-library/publications/family-values-ideology-computer-games-sims/

Taffel, S. (2023). AirPods and the Earth. Digital Technologies, Planned Obsolescence and the Capitalocene. *Environment and Planning E. Nature and Space, 6*(1), 433–454. https://doi.org/10.1177/25148486221076136

Triclot, M. (2017). *Philosophie des jeux video*. La Découverte/Poche.

Vanderhoef, J. (2013). Casual Threats. The Feminization of Casual Video Games. *Ada. A Journal of Gender, New Media, and Technology, 2*. https://scholarsbank.uoregon.edu/xmlui/handle/1794/26294

RGB Tour
Exploring of the “YouTube Bedroom” Type

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Keywords
Room Tour, Technological, Post-Domestic, YouTube, Video.

Abstract
This paper is part of a research-creation project entitled *RGB tour*, which aims to contextualize the evolution and preservation of the bedroom space within the landscape of videos on the YouTube platform. Through a specific analysis of the *room tour* practice, we will explore how content creators maintain the usages traditionally associated with the bedroom space while transforming it into a technological entity evolving in parallel with emerging technologies and practices within the domestic environment.

1. Introduction

The *RGB tour* project (Bailleul, 2021) has been developed in the context of the PhD research and creation project titled *The Bedroom: A Space of Contained Creation* (Bailleul, 2020, ongoing). *RGB tour* is an evolving html page in which a growing number of video footage of *room tours* automatically pile up. Once activated, the program can download precise sequences from YouTube videos and turn them into animated gifs, each five to ten seconds long. Every clip is automatically categorized into an infinite grid depending on the objects or furniture that appear in the images (bed, desk, computer, door, etc.) and on the RGB light colors (Fig. 1).

By introducing this project, this paper seeks to analyze the *room tour* video format as a contemporary visual representation of what could be termed as the "YouTube bedroom" type defined by its form, furniture, and colors, which derive from

Figure 1. Nicolas Bailleul, *RGB tour*, still from the html page (beds section), 2022.

the preservation of its historical function and their evolution within the context of this platform.[1] Thus, the reflection developed with this project revolves around the persistence of the bedroom space as a backdrop on the web, despite its evolving usages and technological changes within it.
Indeed, as visually suggested on the *RGB tour* page, the room segments collected bear less resemblance to traditional bedrooms and increasingly adopt the aesthetics of personal computers (with the famous RGB color code).
Therefore, we might perceive the bedroom, as it is represented on YouTube, as a technological entity evolving in parallel with the technologies that are becoming increasingly dependent on domestic spaces.

2. The *Room Tour* Historic Genre

The *room tour* is a very popular video format on YouTube, which consists of a filmed guided tour of a content creator's entire bedroom. As regular viewers, we typically only see a limited frame of the room, shot from a fixed point with a camera placed on a tripod and angled towards the creators who speak to their viewers, facing directly into the lens. But over the course of a *room tour*, the YouTubers takes their camera and navigates through the relatively confined space of their bedroom or studio, commenting on every object and furniture they encounter (Fig. 2).

1 It is important to note we analyse the *room tours* videos as they appear on the YouTube platform, despite the existence of very similar room tour videos on different platforms and social networks. While some of our ideas may be applicable to a broader definition of the "content creator's bedroom type," our analysis is deliberately restrictive due to the RGB tour program operating exclusively with videos found on YouTube.

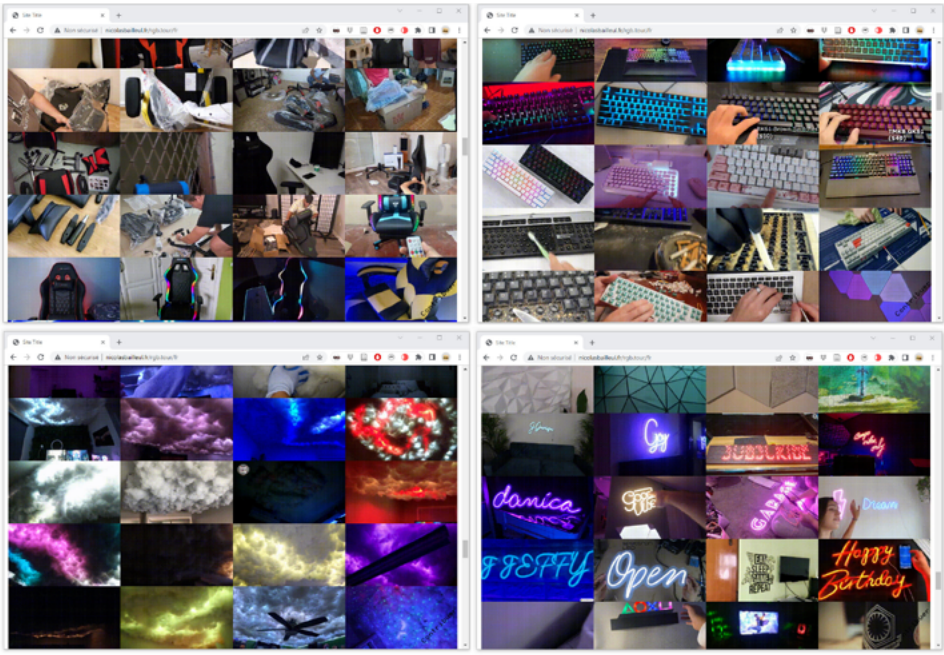

Figure 2. Nicolas Bailleul, *RGB tour*, still from the html page, 2022.

The *room tour* is an invitation to discover the backstage of the set. It allows the creators to reveal to their communities what goes on behind the scenes, and therefore to temporarily remove the mask of their persona, to expose a more vulnerable and "authentic" version of themselves. Watching a *room tour* take us back to teenagerhood, when we were invited for the first time into the bedroom of a friend who showed us his furniture, clothes, collections, toys, makeup – everything that makes up that person's universe.

Despite its popularity and the constant upload of new *room tours* every day from various types of creators, it is difficult to trace the evolution of the *room tour* practice in the history of the YouTube platform. Unlike other passing trends that can be

defined as perfectly timed viral phenomena – for example, the Ice Bucket Challenge during the summer of 2014 –, the *room tour* format did not emerge suddenly. Indeed, the bedroom has always been in the internet landscape, as a space for self-exposure and amateur practices. Therefore, if the bedroom has an important role for the future maker of the internet, it's been a long time since this intimate space has been regarded as a place of independence, introspection and writing, as discussed in Virginia Woolf's famous essay "A room of one's own". Within this context, the *room tour* video format can be consider as an another iteration of the room journey literary genre.

In his book *Autour de ma chambre. Petite histoire du voyage immobile*, Bernd Stiegler (2016) describes how the journey undertaken by Xavier de Maistre with *Voyage autour de ma chambre* in 1794 initiates a whole literary genre in which the author goes around, observes, and comments, both for himself and for the reader, on the space that is the most intimate and private to him. Stiegler shows us how this simple exercise of immobile displacement, which places the individual who inhabits this space at the center of his work, is transformed into a narrative code (literary, and today, also cinematic) that describes, during any given period it concerns, the relationships between him and his intimate and domestic spaces.
In every clips that the *RGB tour* program collect, we can see that all content creators use the bedroom as a means to present themselves, to open up to others, and therefore to embark on a journey. Objects carry stories. Furnitures, posters and lights shapes the identity of the occupant. However, if the *room tour* genre is embedded in a broader history, it appears that this

video format on YouTube does not solely aim to produce a literary narrative about the individual who occupies it. Instead, the *room tour* appears to be a ritual to those who decided to dedicate their work to the web. Thus, The bedroom doesn't just represent the material extension of a unique individual, it is also presented to us as the physical counterpart of their online presence. By showing it on YouTube, the bedroom in not anymore a random teenager bedroom, it is above all, a connected space. Observing the evolution of the bedrooms and the way they are exposed on this platform might reveal the different phases of transformation from the domestic parental bedroom to the specific "YouTube bedroom" type.

3. Evolution of "Home Vlogging"

The film *Because We Are Visual,* directed by artist duo Gerard-Jan Claes and Olivia Rochette, released in cinemas in 2010, five years after the creation of YouTube is a collage of amateur *vlogs*[2] and the result of a long process of researching and collecting videos found on the early YouTube platform. Throughout the film, we encounter young men and women who open up in front of their cameras, often within what appears to be bedroom spaces. They share their desires, anxieties and doubts. Characters make regular returns, while others appear and then disappear. As the story progresses, the *vlogs* follow one another, with the sole aim of giving us a glimpse of what YouTube was like at the time, serving as a platform for amateur expression.

2 A vlog is a short form of "video blog", consisting of recorded video content, often documenting a person's thoughts, experiences, or activities, and typically shared online.

The film reminds us that when people's personal computers started occupying homes, the bedroom by default became the space of production for content generated by users, especially on YouTube, for the creation of *vlogs*, live streams and tutorials. The bedroom became a career driven environment, a space for sharing thoughts, a stage, a playing field. As Patrice Flichy reminds us in his book *Le Sacre de l'Amateur: Sociologie des passions ordinaires à l'ère numérique* (2010), it emerged as the most conducive space for producing web content.

Because We Are Visual is one in a long line of films produced using user-generated content. If we exclude the more global history of *the found footage* genre, the film is part of the practice that artist and researcher Chloé Galibert-Laîné (2021) calls "netnographic cinema", which is rooted in a convergence of practices borrowing from virtual ethnography, net art and experimental cinema. *Net found footage* films shows us that the digital ecosystem, the distance it produces between creator, viewer and collectors, and above all the abundance of online content, is changing the filmmaker's paradigm and relationship to the material and space he explores. However, what interests us here is precisely the fact that the net found footage film seems to examine the collected videos both as documentary material and as a technological apparatus, closely linked to the domestic household space. Just as the Super 8 camera served as the documentary medium for home movies in the sixties and seventies, smartphones, webcams, and screen captures are tools that have become part of the "home" landscape since the 2000s.

Figure 3. Gerard-Jan Claes et Olivia Rochette, Because We Are Visuals, Stills from the film, KASK / School of Arts Ghent, 2010.

Unlike other *net found footage* films that use YouTube videos to address more specific topics (for example, in the *saved footage* films of the filmmaker Dominic Gagnon), *Because We Are Visual* is built around ordinary behaviors of platform users. More importantly, it highlights the domestic spaces that constituted its landscape (Fig. 3). There's an important narrative choice in the film: on one hand, there are shots of the outside world in motion, often silent and contemplative, and on the other hand, interior shots of domestic spaces, providing a backdrop for the YouTubers as they reveal themselves to the motionless cameras standing on a tripod.

We perceive that these distinctions between outside moving cameras and inside still shots are gradually bringing the *vloggers* "home". *Because We Are Visual* makes a picture of the YouTube domestic space in its everyday use, both through the discourse of its characters and through its recording devices. Webcams and cell phones are part of the domestic landscape. The practice of *vlogging* in 2010 seems inseparable from the living rooms, bathrooms, and bedrooms in which these videos are made.

Ten years later, YouTube is no longer the same as it was in *Because We Are Visual*. In his article "The rise and fall of YouTube's celebrity pioneers", journalist Nicholas Tufnell described in 2013 how this initial wave of amateur YouTubers gradually fades away in favor of creators who professionalize. Certainly, YouTube has evolved into a platform that supports monetized content, which is content compatible with commercial sponsors and advertisements displayed before and during videos. The amateur aesthetic, which Hito Steyerl describes as "poor images", has been replaced by well-lit and professionally edited videos. The YouTubers promoted by the platform are no longer uncertain teenagers and young adults seeking to confide but specialized *content creators*. The *vlog* format is now a sub-category of the platform's many existing sections: Trends, Fashion & Beauty, Video Games, Music and Sports. In other words, the typical model of a YouTuber with thousands of subscribers, originally associated with the "video diary" format, has gradually transformed into that of a "young entrepreneur". It's the culmination of what researchers Jean Burgess and Joshua Green called *entrepreneurial vloggers* back in 2009.

> The channels in the Most Subscribed list reveal that, although the vlog form is grounded in ordinary, domestic creative practice, not all vlogs are purely amateur productions, created in bedrooms for the purposes of self-expression alone. Indeed, a number of prominent vloggers, or performers using the videoblog form, are quite clearly using YouTube in an entrepreneurial way. (Burgess & Green, 2009, p. 96)

Thus, as predicted by Green and Burgess, the dynamics of the YouTube platform are encouraging successful *content creators* to gradually leave their family homes, professionalize their approach, and shoot their videos in more suitable spaces such as studios or with green screens, sometimes even with a technical team. In pursuit of a new economic model that directly competes with television content, YouTube introduced YouTube Spaces in 2015 – dedicated audio-visual creation facilities for *content creators* who want to produce videos in an "optimal" setting, which means "not at home".

4. Performance and Maintenance of the Bedroom

Despite the evolution of practices, technological and logistical tools, and the benefits they offer, the bedroom remains a temporal marker that withstands the passage of time and the transformations of the platform. The YouTube landscape, both in 2010 and in 2020, is primarily composed of bedrooms. The background space visible behind YouTubers maintains the domestic space as a standard backdrop, often referencing teenage bedrooms in their overall aesthetic (or at least what one might imagine as a typical teenage bedroom), as evidenced by the almost systematic presence of figurines on shelves, posters that cover

the walls and even in some, a bed in the corner of the room. And this remains consistent regardless of the content type or the age of the content creator in question. Just as recurring visual cues, behaviors, a particular style of lighting, and shared audiovisual equipment are present, the teenage bedroom appears to be a persistent element in the platform's scenery (Fig. 4).

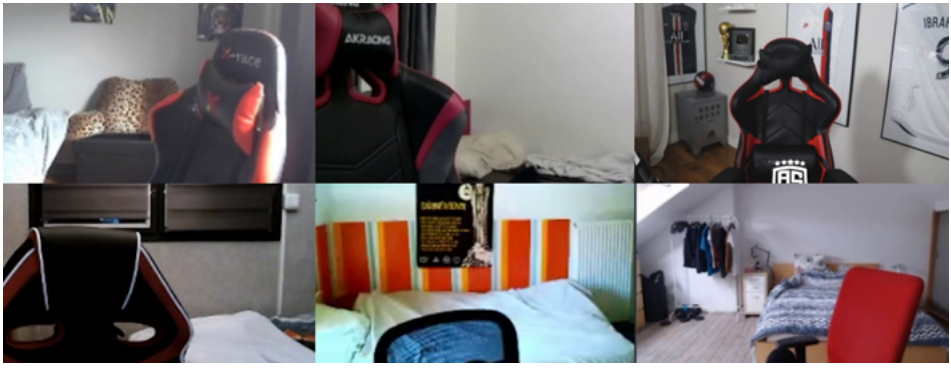

Figure 4. Stills from Twitch, images of empty content creator's bedroom.

In the article "Livestreaming from the Bedroom: Performing Intimacy through Domestic Space on Twitch", the researchers Bonnie "BO" Ruberg and David Lark (2021) conduct a study on the bedroom space, using a sample of one hundred channels from the Twitch platform, in which streamers either reveal or hide the bedroom space in the background. The aim of this research is to document the apparent transformations of streamers' bedrooms based on the types of content they provide. What the researchers argue is that "the erotics of the bedroom are central to placemaking on Twitch, where the bedroom is both a physical location that streamers broadcast from and a conceptual space that structures the practices, aesthetics, and place-related norms of livestreaming on Twitch".

Figure 5. Still from YouTube, the background of the french YouTuber squeezie is a 3D representation of a room projected on a green screen.

Therefore, if the article demonstrates that the bedroom is being performed, it suggests that it can be activated, just like a technological device. It's quite common to notice that on Twitch and YouTube channels, when the creator's bedroom is not visible in the background, it is often replaced by a green screen. This green screen is sometimes used by the creator to display a logo or an illustration, but it can also reveal a three-dimensional set representing the ideal replica of a teenager's bedroom (Fig. 5).

Thus, the bedroom as decor would then be more of a staging device than a habitable space. Whether it's actually located in an apartment, within an open workspace, or as a 3D representation, the bedroom has now become part of the folklore of *content creators*. Even though many of them have left their teenage years, have become self-employed entrepreneurs and have started families, the bedroom appears frozen in both space and time.

This is why the *room tour* format is presented as a reactivation of the bedroom space. Stepping out of this two-dimensional framework and exploring this environment removes its purely decorative role. This journey to the heart of the room restores its domestic functionality. The bedroom no longer remains a simple video-making studio, but becomes an authentic operational bedroom. Moreover, underneath this intimate gesture of showing one's room, lies also a sign of social achievement. For *content creators* who decide to do a *room tour*, it is a way to give credibility to their activity, operational by proving that the domestic space is dedicated in part for the creation of videos. For successful channels, the *room tour* is a ritual (usually an annual one) for self-promotion, a way to show the success of the channel in the midst of high popularity.

The most successful YouTubers rename their *room tour* as *apartment tour* or *mansion tour*. Thus, each new *room tour* on the same channel shows the evolution of what used to be an amateur space (or the authentic teenager bedroom), into a creator studio perfected through a more polished design. We not only discover the creator's personal universe, but also the investment in physical objects of what makes up the central location of their professional activity. The objects that form the bedroom, whether they serve in function or are just a decor, are proof of financial investment. The *content creators* never miss an opportunity to inform us of the price of these objects, especially if they are expensive.

In her article "A parlour of one's own? The Youtube room tour genre", the researcher Gala Rebane (2019) parallels the

phenomenon of the *room tour* as the new *parlour* in the Victorian era. The *parlour*, that was curated by housewives, served as a room to welcome guests in the public space of the household. It was an occasion to proudly show off the home's identity and thus to display the social status of its inhabitants. Gala Rebane draws a connection between the phenomenon of the *room tour* to the composition of the *parlour* and to the show MTV Cribs, where celebrities give the audience a glimpse into their absurdly luxurious villas as a display of social triumph.

In this practice of the *room tour*, we find this same form of exuberance, both in the overly enthusiastic description, which renders itself to be a promotional narrative for each element in the room, and in the set-up of the decor which sometimes seems as though it does not belong to any lived-in environment, private or public, but to a make-believe bedroom that one might find in a design magazine. In her article, Gala Rebane insists on the opportunity that the *parlour* gave women a way to express and assert their individuality but that this came with limitations. *Decorums* of the time controlled individual expression, eventually making all *parlours* quite uniform from one household to the next. Thus, despite people's desire to appear unique in their taste, the bedrooms of YouTubers consist of the same objects, the same furniture, even the same lighting. We might begin to wonder if the typical YouTuber bedroom wasn't just bound to fully deindividualize, to become an autonomous space, homogenous and communal. The result of generic pop culture.

Figure 6. Nicolas Bailleul, *RGB tour*, still from the html page, 2022.

5. From Personal Space to Personal Computer

While the successive presentation of furniture and objects in the room allow to organize the evolution of a *room tour*, it is the omnipresence of RGB LED lights that caught our attention the most in the *RGB tour* project (Fig. 6). RGB LED stands for the three primary colors (red, green, blue) which can enable multiple color combinations. Through led or neon, RGB lights dress these rooms in a futuristic manner. This type of mood lighting originated from the aesthetics of the gaming community, which proudly claims saturated color all around gaming and electronic hardware. This detail is not trivial, because, after several hours of watching *room tours* videos, we can see that the central element of the typical creator's bedroom isn't the bed nor the desk, but what we call the computer setup. The computer case, the hardware, the monitors, the keyboard, the mouse, the cameras and microphone are shown, commented and described as if the setup reveal would be the most important part of a *room tour*. The computer setup is thus at the epicenter of the Youtuber's activity. The propagation of the RGB colors on the desk, the gaming chair, the bed, the walls and ceiling suggests that the computer is no longer a random object in the bedroom. On the contrary, it seems that the whole room would actually be an extension of the computer hardware, a livable computer system unit. The reverse is also true. The computer setup as furniture can be considered as a scaled-down model of the room in which it is located. Filip Kostic's "Personal Computers" edition, which includes a series of photographs featuring extensively customized computers, presents them in a way which implies they function as reflections of their owners' personal environments, similarly to how cars often do (Fig. 7).

Figure 7. Filip Kostik, *Personnal Computers*, still from the edition, 2022.

In such manner and similarly to Gala Rebane writing about the show MTV Cribs in her article, the *room tour* phenomenon reminds us of another show produced on the channel MTV: Pimp My Ride, where cars in bad conditions are revamped and customized in the utmost extravagant colors and shapes, and whose features of comfort and entertainment are multiplied through the integration of screens, powerful speakers, game consoles and even DJ sets, pool tables and punching-bags. Pimp My Ride essentially transformed these cars into a teenager's bedroom. Perhaps what we are seeing happen on YouTube is the metamorphose of teenage bedrooms into ultra powerful race cars, customized with RGB lights, open for the entire world to admire this immobile spaceship.

Therefore, it seems that the evolution of the bedroom landscape on YouTube actually reflects its high modularity, linked to the extensive presence of technology within it, which places it at the epicenter of numerous online phenomena. Can we thus assume that the initial purpose of bedrooms has lost its primary role? Due to their close proximity to web technologies, has the bedroom succeeded in erasing all boundaries between the inside and outside, mobility and immobility, rest and work? As Jonathan Crary reminds us in his book *24/7: Late Capitalism and the Ends of Sleep* (2013), contemporary capitalism infiltrates all spaces dedicated to actual rest, aiming to induce a standby mode in the laboring bodies.

> One seemingly inconsequential but prevalent linguistic figure is the machine-based designation of "sleep mode." The notion of an apparatus in a state of low-power readiness remakes the larger sense of sleep into simply a deferred or diminished condition of operationality and access. It supersedes an off/on logic, so that nothing is ever fundamentally "off" and there is never an actual state of rest. (Crary, 2013, p. 13)

Crary suggests that spaces within capitalism, such as the "YouTube bedroom", operate like the machines within them, in a state of constant vigilance and functionality. If Crary describes the effects of 24/7 capitalism in the contemporary world, we might find the origin of the multi-purpose domestic place in the book *Pornotopia, an Essay on Playboy's Architecture & Biopolitics* by author Paul B. Preciado (2014). The author explores how socio-cultural, technological, and political developments have transformed our relationship with domestic space, sur-

passing the boundaries of the home traditionally associated with gender roles and specific activities. Preciado describes the model of the "Post-Domestic habitat", specifically analyzing the iconic bedroom of Hugh Hefner, the head of Playboy, where his entire empire was managed using unprecedented technological tools. From his rounded-shaped bed, facing a multitude of screens and highly sophisticated communication logistics, Hugh Hefner transformed his bedroom into a workplace for managing and monitoring his employees without ever needing to leave it. We can suggest that Hugh Hefner's bedroom, as described by Preciado, embodies the archetype toward which the contemporary bedroom in the online landscape is moving closer: a space where comfort and fantasy which has also become a space for creation, labor, and surveillance.

6. Conclusion: The YouTube's Bedroom as an Activatable Device

If the concept of the *room tour* is not new in itself, as it fits into a long tradition of essays, novels, and films that take the reader or the viewer on a journey inside the intimacy of a home, the importance of the *room tour* format on YouTube seems to reveal the significant mutations that the bedroom has undergone in the context of the web.

As we specifically saw with the film *Because We Are Visual,* which takes us on a somewhat nostalgic tour of what YouTube was like in 2010, showing us "raw" and less connected domestic spaces, the very lucrative evolution of web practices has significantly reshaped the bedroom. While the teenage bedroom has defined itself as one of the default space for

amateurs in the early context of participatory web culture, it maintains itself in time as a common place for *content creators*, producing a more intimate bound between the viewers and the YouTubers. But as Gala Rebane (2019) highlights, in this process of professionalization of private spaces, the "YouTube bedroom" often loses the individuality of its owner, transforming into a uniformed space over time.

Moreover, we may ask ourselves if the term "bedroom" is still relevant, considering that this (Post-Domestic) space has increasingly distanced itself from its initial form. Here, we argue that the omnipresence of technology inside the YouTube bedroom, ranging from futuristic decoration to massive computer setups (which sometimes replace the bed or the closet), may redefine the bedroom from a confined architectural space into a technological device that can be activated at different levels. On YouTube, the "room tour" video title is sometime replaced by "setup tour", which specifically focuses on the computer setup, even if the video presents the exact same tour (door, bed, chair, computer, etc.). Intertwined with the computer, the YouTube Bedroom has become a part of the setup.

In the end of this research, the *RGB tour* project will eventually become a unique and recomposed *room tour* movie, procedurally edited with the hundreds of videos that the program gathered. Through this endless collage of *room tour* perspectives, the aim of this project is to visually represent the typical YouTube bedroom as a generic standardize place, a futuristic virtual bedroom with no identity nor sign of personal affect, or, in reference to Marc Augé's work, a *Non-place*.

Since the YouTube bedroom now holds a significant place in the cultural landscape of the web, we could further pursue this research by focusing on how artists, filmmakers, writers, and researchers document, occupy, and repurpose this transformed space until it once again reflects individual practices and stories in its material form. Could the "YouTube bedroom" type eventually evolve into the "YouTube bedroom of one's own"? (Fig. 8).

Figure 8. Filip Kostik, *Bed PC*, still from the installation, 2022

References

Augé, M. (1992). *Non-lieux. Introduction à une anthropologie de la surmodernité*. Seuil.

Bailleul, N. (2020). *The Bedroom. A Space of Contained Creation*. [Doctoral thesis, Université de Vincennes - Paris 8]. (Ongoing work)

Bailleul, N. (2021). *RGB Tour*. https://nicolasbailleul.fr/rgb.tour/

Burgess J., & Green J. (2009). The Entrepreneurial Vlogger. Participatory Culture Beyond the Professional-Amateur Divide. In P. Snickars, & P. Vonderau (Eds.), *The Youtube Reader* (pp. 89–107). National Library of Sweden. http://www.youtubereader.com/images/youtubereader.pdf

Crary, J. (2013). *24/7. Late Capitalism and the Ends of Sleep*. Verso.

Flichy, P. (2010). *Le Sacre de l'amateur. Sociologie des passions ordinaires à l'ère numérique*. Seuil.

Galibert-Laîné, C. (2021). *Documenter internet. Essais sur le réemploi d'internet dans le cinéma contemporain de non-fiction*. (Publication No. 2021UPSLE082) [Doctoral dissertation, Art et histoire de l'art. Université Paris sciences et lettres]. HALtheses. https://theses.hal.science/tel-04155998

Hine, C. (2000). *Virtual Ethnography*. SAGE Publications Ltd.

Preciado, P. B. (2014). *Pornotopia. An Essay on Playboy's Architecture and Biopolitics*. Zone Books.

Rebane, G. (2019). A "Parlour of One's Own"? The YouTube Room Tour Genre. *Continuum*, *33*(1), 51–64. https://doi.org/10.1080/10304312.2018.1536968

Rochette, O., & Claes, J-G (Directors). (2010). *Because We Are Visual* [Film]. KASK / School of Arts Ghent. https://www.youtube.com/watch?v=mrniwglepFA

Ruberg, B. 'Bo', & Lark, D. (2021). Livestreaming From the Bedroom. Performing Intimacy Through Domestic Space on Twitch. *Convergence*, *27*(3), 679–695. https://doi.org/10.1177/1354856520978324

Steyerl, H. (2009, November). In Defense of the Poor Image. *e-flux Journal*, (10). https://www.e-flux.com/journal/10/61362/in-defense-of-the-poor-image/

Stiegler, B. (2016). *Autour de ma chambre. Petite histoire du voyage immobile*. Hermann.

Tufnell, N. (2013, November 27). The Rise and Fall of YouTube's Celebrity Pioneers. *Wired*. https://www.wired.co.uk/article/youtube-community

Woolf, V. (1977). *A Room of One's Own*. Grafton. (Original work published 1929)

Rethinking Carceral Domesticity
Electronic Monitoring, Punishment and Home as Prison

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Abstract
This article explores the evolving dynamics of *carceral domesticity* in the context of Electronic Monitoring (EM) as a contemporary techno-penal practice. While the prison, as the main outlet for punishment, keeps blurring the boundaries between the private and public by challenging traditional conceptions of domesticity, recent prison reforms driven by mass incarceration and overcrowding, have led to the proliferation of EM-based house arrests as alternatives to imprisonment. However, technologies and punitive implications of EM on people and their households remain underexamined. Therefore, drawing on emerging theories, testimonies and government reports through a Post-Domestic lens, this article argues that EM devices, such as wrist bracelets and ankle shackles, complicate notions of privacy, autonomy, dignity, economy and safety within domestic spaces. It further discusses how such techno-carceral practices perpetuate and reinforce existing inequalities, particularly affecting gendered, sexualized, and racialized bodies disproportionately and consolidating the status quo of the criminal justice system. In doing so, the article engages with prison abolitionist theories to speculate on alternative approaches to transforming spaces and justice, by shedding light on the intricate power dynamics inherent in carceral domesticity and EM-based confinement, aiming to contribute to the discourse surrounding the reconfiguration of domestic spaces within the context of harm.

1. Foreword. Confinement, Interrupted

Looking from the post-pandemic lens of late 2023, one can recall in awe how the COVID-19 pandemic, among its many life-altering ramifications, introduced the notion of *confinement* to our daily lives and turned this once medical and juridical term into a colloquial language. By 2020, billions of otherwise free citizens, forced to stay in enclosed spaces for uncertain periods in absolute solitude or with intensively close company of their household members, experienced for the first time what the *deprivation of liberty* physically, psychologically and mentally meant, even if the space of confinement was called *home*. This dire situation, thereby, entailed a radical reconsideration of households and the use of the domestic space, transforming private abodes into semi-open (online) multi-functional dwellings that were simultaneously classrooms, playgrounds, workplaces, gyms and cafés, overloaded with tasks and cohabitants (Moreira & Farias, 2023). It, unsurprisingly, not only necessitated spatio-material rearrangements of home environments and redistribution of domestic tasks (e.g., cleaning, cooking, childcare, breadwinning) but also complicated the boundaries of the private and the public – or namely, the intimate boundaries between bodies. Moreover, studies demonstrated that the pandemic lockdowns interrupted the Post-Domestic narrative of gender emancipation and equality as it reinstated patriarchal power dynamics and imposed more burdens on women's shoulders as working caregivers while increasing the rates of interpersonal harm indoors including sexual and domestic violence (Kay, 2020; Piquero et al., 2021).

Such experiences of being locked up, on the other hand, have not been unfamiliar to a substantial portion of the global population; those who have been already legally confined, either in mental hospitals, work camps or penal institutions including immigrant detention centres, juvenile correctional facilities and prisons.[1] For those behind bars, in particular, daily activities from working, sleeping, eating and bathing to running errands already take place in either extreme segregation (e.g., in the case of solitary confinement and cell systems typologies) or amid the prison masses under constant scrutinization with strict duties and almost no privacy, as a normalised reality of these *total institutions* (Goffman, 1961). In this regard, it can be argued that prisons have already been places where the private and the public are constantly entangled; places that have long challenged the conventional articulations of domesticity in many ways (Issacharoff, 2019; Frödén, 2021): while home has been considered a *haven* for *docile* bodies, prison has been what allegedly provided safety for society whereas being an unsafe space itself for its inhabitants.

In recent decades, due to the controversies of proliferating apparatuses of the criminal justice system, mass incarceration and the prison industrial complex thereof, physical spaces of punishment have been under critical examination, being renegotiated by new prison reforms (Davis, 2003; Gilmore, 2007; Angelis,

1 The COVID-19 lockdown affected prisoners detrimentally, as the preventive measures against transmission of the virus (e.g., hygiene standards, adequate nutrition, quality health services, etc.) were not sufficiently taken – nor prisoners' health was a priority concern for governments (Söderholm, 2021). In early 2021, the reported number of infected prisoners was more than half a million worldwide, with almost 4,000 fatalities (Söderholm, 2021).

2022). This included the exponential growth of the penal design and architecture industry which has responded to these reforms with their new *humane design* structures exalting aestheticization of carcerality with new glass facades, smart AI technologies, and green sustainable prisons to provide prisoners decent and *normalised* spaces promising the *comfort of a home* (Swan, 2013; Sperry, 2014; Puddu, 2022).[2] In the past years, though, thanks to the COVID-19 pandemic[3] and the exorbitant costs – and inadequacies – of physical prisons, non-custodial alternatives to imprisonment– from community service orders to bailing – have been increasingly implemented, the most favoured of which till this day has been house arrest and its technological enabler: *Electronic Monitoring* (EM).[4]

This article aims to examine the conditions of EM as a highly praised technological alternative to incarceration, by problematising its repercussions on bodies, households and on justice system at large. EM has been increasingly in operation since the mid-90s, although its intensified punitive implications (e.g., 24/7 surveillance, movement tracking, deprivation of liberty) and how it perpetuates oppressive power dynamics

2 For a close examination of these new reformist prisons designed by big architectural firms which fallaciously present prisons not as spaces of punishment but as luxury dwellings (Canlı, 2020), and for the normalisation of prisons (Puddu, 2022).

3 Considering the joint statement of UNODC, WHO, UNAIDS and OHCHR on COVID-19 in prisons, criticisms of human rights organisations and activists, and the escalating number of COVID-19 cases and consequential deaths in prisons, by 2021, many governments – including France, Norway, Turkey, Ireland, Colombia and Indonesia and some states of the US – took decongestion measures such as probation under judicial control, temporary release and release under house arrest (Bruce-Lockhart, 2021; Söderholm, 2021).

4 While *Electronic Monitoring* is an encompassing term that can cover various monitoring technologies and approaches, in this article I use it strictly as a wearable technology that confines one's liberty to a certain domestic space.

by extending carceral spaces into the everyday lives of individuals are rarely put under scrutiny.

By taking into account these side effects, substantiated by government reports and theories of spatiality and domesticity, the article reads prisons as places where *carceral domesticity* is traditionally exerted *vis-à-vis* practices of EM; a technology that not only underpins the intricate power structures present within domestic spaces but also brings the intensified forms of surveillance, control, and punishment associated with the prison from the public realm to the private one – the home (Granja, 2021; Kilgore, 2022). The presence of EM devices, ranging from wristbands and ankle monitors to GPS tethers, exemplifies how techno-carceral practices deployed in domestic settings complicate especially the issues of *privacy, autonomy, dignity, economy* and *safety*, as well as the reconfigurations of space. By applying a Post-Domestic lens to the study of *carceral domesticity* and *e-carceration*,[5] the article aims to analyse the power dynamics at play and how these dynamics perpetuate and reinforce existing inequalities, particularly for gendered, sexualised and racialised bodies – those who are affected by the carceral expansion disproportionally (Davis, 2003; Gilmore, 2007; Rodríguez, 2020). The conclusion speculates within/through prison abolitionist theories as ways of transforming spaces and justice against the consolidation of punitive regimes and recidivism (Kaba, 2021; Angelis, 2022).

5 *E-carceration* refers to technologies of mass incarceration, electronic surveillance and punishment ranging from physical confinement and GPS tracking to data extractivism, including CCTV, drones, face and voice recognition softwares, biometric scanning, social media monitors, risk assessment tools and many emerging others (Kilgore, 2022)

2. Prison, Punishment and Carceral Domesticity

To take a critical look at the conditions of EM as a new domestic techno-apparatus of punishment, it is crucial to understand its still fully operating and expanding precedence: Prison. According to *Penal Reform International*'s annual *Global Prison Trends Report* of 2023, as of today, there are approximately 11.5 million people behind bars worldwide – one-third of whom are imprisoned more for pre-trial detention than post-conviction – while this number increases exponentially and globally in every passing minute (Penal Reform International, 2023). This growth is both constituted by and constitutive of the vicious circle which neoliberal capitalism and the criminal justice system co-created in the name of the *prison industrial complex*[6] (Davis, 2003); and despite a great number of new prisons with hundreds of thousands of new beds being announced to be built every year all across the world, infrastructures and capacities of prisons keep falling short (Penal Reform International, 2022). In 2023, there are 120 countries with occupancy rates exceeding prison system capacity by 100%, while 15 of these countries host 250% more people under inhumane spatial conditions (Penal Reform International, 2023). On the other hand, research, statistics and prison abolition activists demonstrate that growing prison population is not about increasing crime rates but about what counts as a crime in different temporal, geographical and political contexts, how more people (especially groups discriminated against based

6 *Prison Industrial Complex*, or *PIC*, denotes the interlocking networks of imprisonment, capitalism, and governmental authority that sustain the growth of the prison system to generate profit (Davis, 2003). It includes the design and architecture industry of prisons as well as other technologies of carceral expansion, including EM.

on their race, ethnicity, class, gender and sexuality) are put behind bars with longer sentences to be controlled, managed and cleansed out of the public realm, and how the punitive system is so much more fixed on confinement than prevention of harmdoing (Gilmore, 2007; Lamble, 2011; 2014; Penal Reform International, 2023).[7] In this carceral swelling, those who are caged are compelled to incessantly build their everyday domestic environments against the odds of the extremely impersonal prison environment.

Prisons and domesticity may seem like two extremely contrasting concepts at first glance, for two main reasons: First, while the concept of domesticity is historically associated with femininity, women's realm and production of gendered space, the prison has ontologically been a hyper-masculine space, designed by and for heterocissexual male disposition, firmly safeguarding, reinforcing and reproducing gender hierarchies (Lamble 2011; Frödén, 2021; Sanders et al., 2023).[8] Second, although the domestic sphere denotes the private space centred on the home, family and intimacy, the very constitution of prison is precisely based on the deprivation of these notions, as the pre-eminent earmark of penal justice. However, analysing these seemingly unrelated domains in terms of space-making reveals the nuanced ways in which domesticity – or the notion of home – and prison culture influence each other reciprocally

7 This is not to downplay the prevalence of what is called violent crimes including homicide, sexual assault, kidnapping and so on. However, as prison abolitionists and research demonstrate, there is also a generational dysfunctionality of the punitive justice system to respond to such harms (Davis, 2003; Levine & Meiners, 2020; Kaba, 2021).

8 This design includes not only military-like behavioural structures, but also architectonic characteristics of prisons with their female-unfriendly material environments.

(Puddu, 2022). For instance, as Issacharoff (2019, p. 26) aptly observes, "the prison and the home suffer from a similar historical problem"; both having "no distinct history in the public imagination" and being "so deeply enmeshed in a cultural mythology of how society reproduces itself as an ordered and just community of citizens […]" Similarly since prisons are considered micro-scaled replicas of real life (Frödén, 2021), both prisons and traditional domestic spaces have historically prescribed women's roles for caregiving and homemaking and men for power and sociability.[9] Although prisons have disproportionately incarcerated men, especially those with racial and ethnic backgrounds in the Global North (Gilmore, 2007; Alexander, 2010), the criminal justice system has also disproportionately affected women and LGBTQI+ individuals who have been victims of domestic violence or incarcerated for nonviolent offences – e.g., providing for via illegal economies such as drug dealing and sex work (Lamble 2011; Canlı 2020).[10] Ideology of domesticity here is inflicted on these bodies, with the expectation of female prisoners and those who are deemed inferior in the *heterocissexual matrix* (e.g., lesbians, gays, trans*women, non-binary and intersex individuals) to, for instance, exhibit qualities of subservience and rectitude, dispense free labour and keep the penal space neat and organised. This gendered dynamic, despite the everyday production of these spaces as intimate homes crafted not only by women

9 This can be seen especially in the educational programs and work training which are mostly divided into handiwork for women and arm power for men.

10 By 2023, the number of incarcerated women and girls exceeds 740,000 – 6% of the entire prison population, and this figure is on the rise in nearly all regions – 60% for women since 2000, while there is no verified statistics about the number of LGBTQI+ prisoners (Penal Reform International, 2023).

and LGBTQI+ individuals but also by men, is indicative of how societal notions of domesticity extend their influence into the punitive realm, impacting not only female prisoners' experiences but also the broader structure of the carceral culture (Issacharoff, 2019; Puddu, 2022).

Moreover, prisons as *total institution*s are characterized by their ability to exert profound control over individuals' lives, shaping their routines, behaviours, and interactions where strict norms and roles regulate the daily lives of inhabitants (Goffman, 1961). The state dictates their schedules, movements, and even interpersonal relationships not only through self-regulatory structures but also through the design of prisons' living areas such as cells, blocks and dormitories that mimic bedrooms; as well as the surveillance mechanisms reminiscent of familial supervision that are illustrative of how carceral domesticity manifests as a means of imposing power and discipline on prisoners. These conditions lead them to adopt coping strategies that mimic aspects of domestic life, such as reorganising their interiors through personal belongings and forming surrogate family structures within the prison community – especially seen in non-heterocissexual intimate formations (Lamble 2011; Puddu 2022; Sanders et al. 2023). On another front, the prevalence of *carceral feminism*[11] also underscores how the state and domesticity intersect through policies and practices such as mandatory arrest policies for

11 *Carceral feminism* refers to an approach that advocates for the criminal justice system and imprisonment as a means to address gender-based violence – mostly criticised by abolition feminists for corroborating the punitive *status quo* and individual cases rather than tackling structural problems of sexual violence (Levine & Meiners, 2020; Davis et al., 2022)

domestic violence incidents, while these policies reflect the state's involvement in regulating and intervening in domestic spaces, blurring the lines between private and public domains (Levine & Meiners, 2020; Davis et al., 2022). In this context, prisons serve as a punitive extension of the state's intervention in domestic issues.

Last but not least, if the *carceral domesticity* signifies the relationship between the space of confinement and the home at large, it can be observed that the experience of having a family member or loved one in prison reshapes and disrupts the dynamics of domestic spaces and relationships beyond the prison walls, too, with profound emotional, economic, and social consequences for families, leading to aggravated stress, financial instability, and disruptions in family roles and caregiving responsibilities (Kaba, 2021; Davis et al., 2022; Kilgore, 2022).[12] Unsurprisingly, this is a gendered dynamic too: Women, often wives or mothers or daughters of incarcerated relatives, may find themselves taking on the role of primary breadwinners and caregivers especially in marginalised communities where prisoners get stuck in *carceral continuum* with recidivism and unpayable bails in unpredictable periods (Alexander, 2010; Rodríguez, 2020). This shift in gender roles can challenge traditional norms of domesticity and reshape the power dynamics within the household – yet with extra burdens.

12 In addition, the COVID-19 pandemic taught us different ways of communicating, collecting information and relating to each other in public spaces, most of which were based on non-physical intimacies, imitating proximity. The Pandemic took an extra toll on those behind bars since keeping their distance, communicating with families or lawyers and handling daily practices were hardly possible.

For these and many other unaccountable reasons, everyday re-makings of carceral domesticity in prison is a relentless attempt to reclaim one's space, existence and individuality within the constant power displays by authorities and peers – from abrupt check-ins in private cells, possession controls and strip searches to immobilisation of furniture and such (O'Nils, 2014). In the meantime, prison reformists, who have long observed these predicaments, have been heralding EM as a progressive solution to eliminate the alienation the prison environment begets. However, along with many activists and researchers, I propound that, if prisons are spaces of dwelling and should be treated as domestic spaces, "[…] inversely, dwellings can also be considered prisons" as EM materialises and demonstrates to us, as elaborated in the following sections (Martinez-Millana & Alcaraz, 2020, p.19).

3. EM as Home or Body as Prison

3.1. Uses of EM

The aforementioned phenomenon of mass incarceration and PIC, derived from and attributed mostly to the US criminal justice system, has spread its techniques all across the world (Gilmore, 2007; Rodríguez, 2020; Davis et al., 2022). The overt brutality of expanding carceral techniques has thereby brought about criticisms of retributive practices and dysfunctionality of rehabilitation endeavours, as well as debates on reforms in the areas of penal justice, science and psychology inquiring about the roots of crime, possibilities of positive punishment and soft on crime approaches (Angelis, 2022; Kilgore, 2022). Blended in ascending neoliberal interests of competing states and private

tech companies, EM emerged as a saviour praxis for decarceration, promising custodial supervision to beat the overcrowding problems of prisons, reduce the costs of imprisonment, lower recidivism and preserve the social ties for better integration to the society (van der Veen, 2014; Belur, 2020; Granja, 2021).[13] On the other hand, the global prison population has not decreased as promised since the emergence of EM, nor is there sufficient evidence that EM has helped reduce crime rates and that there is a shared understanding of its implications (van der Veen, 2014; Kilgore, 2022). The use of EM is, nevertheless, proliferated and is being proclaimed as the future of justice by many (van der Veen, 2014; O'Nils, 2014; Granja, 2021; Penal Reform International, 2023) compared to other non-custodial sanctions including bailing, periodic reporting to police, international travel bans and curfew.[14]

While EM is mostly utilised instead of pre-trail detention and during probation or parole, today it has several modalities in terms of its use for several outlets and purposes, depending on the country's legislation, sometimes implemented in different stages of the criminal justice process with various goals and criminal sanctions (O'Nils, 2014; Belur, 2020; Granja, 2021). For instance, in Norway EM is used as "an alternative to short prison sentences or as the final part of a longer sen-

13 EM was first adopted in 1983 by Florida and then in New Mexico in the US, and expanded rapidly to other states and countries in Europe, Australia and the Americas. Today more than 30 countries are operating with EM while new ones are on their way to joining. For a detailed history of the development and use of EM in the US and beyond, (Kilgore, 2022).

14 *The Tokyo Rules* outline numerous sentencing alternatives to incarceration to be executed effectively, some of which are monetary and status penalties, non-institutional treatment and verbal sanctions (UNODC, 2007).

tence in prison" to be implemented around the period of 30 days (Rokkan, 2018, p.226), in Portugal it is used as an alternative to preventive detention, in place of prison sentence as house arrest, for adaptation to parole, as a protective measure of victims of domestic violence and perpetrators' monitoring, and as domestic confinement for forest fire crimes (Granja, 2021, p.250-251). In many countries, including the US, Turkey and Scotland, it is also used to monitor substance consumption, to prevent sex offenders from accessing certain places, to secure "immigration laws, as part of alcohol abstinence maintenance requirements and [...] to track those refusing to pay child support" (Belur et al., 2020; 1). For each condition, EM substitutes confinement in one way or another.

3.2. Technologies of EM

EM devices are designed principally based on a few technologies: *Radio Frequency Monitors* (RF – also called Curfew Monitors), active or passive *Global Positioning Systems* (GPS) tagging, *Remote Alcohol Monitoring* (RAM) and *Breathalyzer Monitoring*. These schemes operate "in tandem with professional supervision and supports, or can be used as a 'stand-alone' option", while they also contain *temper-resistant technology* to "detect attempts of forced removal" (Graham & Mcivor, 2017, p.4). While RF alerts authorities if only the individual under EM is not home or within a specific range, conforming absence/presence of the person to the monitoring centre, GPS monitors track and record the individual's location 24/7 through satellites (either transmitting location information live or by storing them to be downloaded later) (Geiger, 2017). RAM "samples sweat on their skin to detect the presence of alcohol"

while a camera-mounted breathalyzer monitor tests the person's breath to estimate their blood alcohol content (Graham & Mcivor, 2017, p. 5). Most of these devices are in the form of a black box to be wrapped around the ankle as a "bracelet";[15] some in the shape of wristbands or a mobile app – while in the case of domestic violence, there is also a safety box on the side of the victim. EM are all attached to a person's body constantly, transmitting information to the monitoring centre through mobile, wi-fi or landline phone, and all dependent on electricity to be charged for several hours a day, the lack of which might mean the person is sent back to prison. Such technologies, some of which also capture persons' heartbeat, blood pressure, and other biometric and vocal data,[16] are stored in databases which profile and criminalise especially underprivileged communities – e.g., BIPOC people, undocumented immigrants, underclass people in illegalised economies, people with mental health issues, LGBTQI+ individuals etc. (van der Veen, 2014; Geiger, 2017; Media Justice, 2019).[17]

In the meantime, whereas in some [European] countries EM services are free of charge (Granja 2021), in others and several states of the US, the daily cost of EM may rise to 25$ per day – or more for those privileged ones requiring special conditions – which make them accessible only to those who can afford

15 Kilgore (2022, p. 11) calls them *shackles* instead of *bracelets*, warning us that we should not "confuse decoration with incarceration".

16 For instance, in the Netherlands, EM has been used to keep hooligans away from matches at particular times and games, through biometrics and voice verification technology (van der Veen, 2014).

17 See also the reports and ongoing meticulous research of *Media Justice* and *Challenging E-carceration Project*; Retrieved July 4, 2023, from https://mediajustice.org/unshackling-freedom/what-you-should-know/ and https://www.challengingecarceration.org/

them, such as celebrities as presented in popular culture (Media Justice, 2019; Kilgore, 2022). Those who cannot/or barely afford EM mostly undertake it due to their family, work and health-related duties. This makes EM a service for which people spend, literally, at the expense of their freedom.

3.3. Spatial and Corporeal Conditions of EM

In addition, for EM to be granted to a person, many suspected or convicted individuals are expected to fulfil certain legal prerequisites, demonstrating no flight risk and so-called good behaviour. Some qualifications are also contingent upon physical conditions: For instance, in some Scandinavian countries, "[…] rules require a physically delimited space with access to kitchen and bathroom" within a stable relationship if the person lives with others while "the cohabitants have to accept the restrictions and imposed conditions" (Rokkan, 2018, p. 226).

Even if a person meets these requirements, EM is based on stern schedules in terms of daily activities – and where, at what time and how these activities would be executed – which designates the offender's punctual departure from and arrival at home/work, pre-permission for short leisure activities or emergencies, and ban on drug and alcohol use supervised by regular tests. Depending on each case, there can also be other restrictions, from prohibition from entering certain public and private areas or using substances (Rokkan, 2018). Moreover, "the location of the apartment to work, transportation, and friends" becomes of utmost importance, since its distance to work, transportation, educational programs and loved ones are all about time (Rokkan, 2018, p. 231). In this regard, it can be said

that EM is a Post-Domestic apparatus that turns not only homes but also bodies into prisons – or *portable prisons* (Gacek, 2022), carrying the prison on oneself 24/7, having imprisonment embodied and inscribed on one's body – body as the prison itself.

4. EM and Post-Domestic Concerns

While the abovementioned conditions of EM offer potential benefits such as opportunities for individuals to serve sentences in their homes and prevent incidents of domestic violence, it also raises complex questions about the intersection of technology, surveillance, and domesticity – which, can be seen as a reflection of broader shifts toward Post-Domesticity, as it challenges traditional notions of imprisonment and the separation of the domestic and public spheres. Rafaela Granja (2021, p. 249) calls the unprecedented praise of EM *techno-optimism* and warns us against it camouflaging "the expansion of the penal network", facilitating "the co-optation of the family in the penal sphere and the transmutation of the domestic space into a space of confinement" and narrowing the public debate on the causes of harms – especially when it comes to domestic violence. In this section, thereby, I briefly consider such ramifications of EM according to five critical – yet not limited to – criteria of (post)domesticity: *privacy, autonomy, dignity, economy* and *safety*, to open up discussions around EM and for its reconsideration.

4.1. Privacy

In his book *Understanding E-carceration*, James Kilgore (2022, p. 7), activist, ex-prisoner and researcher tells his experience of sleeping with EM for the first time after his release on pa-

role as feeling of the "presence of a third person" with himself, since the vigilance of the third party (e.g., monitoring centre, parole officers, family members) is unabating akin to an amplified panopticon. As EM transforms the domestic space into a place of detention where daily routines are rearranged and interrupted, "[…] family members become active agents in surveillance processes" as a form of participatory monitoring, "that involves not only the individuals under monitoring but also their relatives" (Granja, 2021, p. 258). This compels families to live together in these "techno-cells" Kilgore (2022, p. 10), by disrupting the individual boundaries and the sense of physical, psychological, visual and acoustic *privacy* – as the *prima facia* fundamental moral right – and allowing unwanted intrusion or observation. This is an ultimate level of loss of "control over one's environment and therefore the offender has no privacy" (O'Nils, 2014, p. 511).

4.2. Autonomy

While EM proponents argue that EM does not deprive people of liberty in contrast to prisons, it indeed "restricts liberty by limiting autonomy", or what Rokkan (2018) calls *elasticity* – one of the fundamental qualities of human living in domestic spaces (Payne & Gainey, 1998, p. 155). Offenders on EM cannot decide in which activities and when/how/where they would participate unless it is approved by correctional services. Depending on variable legislations and contexts, they might be obliged to stay home 24/7 unconditionally, might be able to work outside the house for certain hours a day or might even have leisure and sports time. Either way, when they need to leave their places or EM zone outside the settled times, they need a preconcerted

permission which means they cannot move even in emergencies. In some incidents, people recounted that they "[…] could not open the front door of the building without calling the EM office to get permission to go out of the control zone to unlock the door." (Rokkan, 2018, p.230) Those who live in the outskirts of the cities or remote areas get affected by this even more, as their access to workplaces and home is already spent on transportation. Also, the fact that EM machines operate on batteries and should be charged a few times a day restricts offenders' movement entirely, by compelling them to cling to the plugs on walls, even outside in cafés and restaurants (Kilgore, 2022).

4.3. Dignity

Such visibility of EM – especially in situations of the above-mentioned public charging or in zones with high temperatures – makes it an element of humiliation for many, as it exposes not only the person as *criminal* to the public but also their household, as an overt scratch on their dignity. For the "EM device is not only a technological artefact but also has social and cultural content that may lead to stigmatization of the individual wearing it" (O'Nils, 2014, p. 511), It also likely affects the person's employability and income, as well as how they are treated for basic services (from healthcare to education) (O'Nils, 2014; Media Justice, 2019; Kilgore, 2022). In addition, the fact that the house of the offender can be raided by officers anytime (due to e.g., signal rupture between EM and the centre, bugs in the system giving the wrong alarm) which would include house search, handcuffing on the floor and using shock teasers, abash the person in front of their beloved ones which harms the person's dignity irreversibly (Kilgore, 2022).

4.4. Economy

As mentioned earlier, while EM is opted for being a cheaper option for governments "[…] whose legislation, implementation, and expansion has been promoted and controlled at the State level" (Granja, 2021, p. 253), it profits both the states and private companies who manufacture them physically and technologically (O'Nils, 2014). This makes EM highly profitable, especially in countries like the US, where the offender has to pay for their own shackles to keep the service at the expense of being home – a literal meaning of buying one's freedom. Moreover, this situation disproportionately affects underclass communities, especially women, who often bear the brunt of caregiving responsibilities within the household, as they are often both in charge of overseeing and assisting with monitoring requirements for family members and earning income. Such circumstances entangle traditional and neoliberal gender roles which can be seen as a setback in the context of Post-Domesticity, where gender roles supposedly become more fluid and equitable and gendered precarity is ideally eliminated.

4.5. Safety

Both prisons and other technologies of confinement exist not only to punish – and control – but also to keep society allegedly safe from those who pose a danger to the common good, although the notion of *safety* has several conflicting dimensions both for the person on EM and for other parties. First of all, EM can be hardly safe for the offender, not only because they are constantly profiled and targeted under 24/7 vigilance, but also because the material impacts of the physical object on bodies (e.g., from skin allergies to sleep deprivations) are

severe (Media Justice, 2019). For instance, just like prisons, EM is mostly designed for men, not for "the different circumstances and needs of all wearers, including body dimensions, skin colour and the impact on certain medical conditions" (Penal Reform International, 2023, p. 13). On the other hand, EM is claimed to benefit many domestic violence victims; however, as long as the solution is not structural – to unravel the main causes of domestic violence against women – but individual – to treat each case through monitoring and punishment, neither public nor domestic space becomes safe for victims.[18] Also, this makes clear " […] how a system designed to protect victims ends up making them responsible for their safety and, ultimately, for the preservation of their own lives" (Granja, 2021, p. 260). Also, in many cases, *crime* can be committed – or, namely, harm can be done – before the officer warned by EM even arrives; therefore, the lack of deterrence challenges the argument for safety. The question is whether it is "sufficient to deter people from committing crime if the punishment they will receive is [eventually] EM?" (O'Nils, 2014, p. 515).

Apart from the drawbacks above, EM practices, like other reformist solutions, instead of reducing harmdoing in society, underpin the criminal justice status quo, neoliberal carceral capitalism and expanding apparatuses of control further which simultaneously imperil our domestic as well as public lives (Granja, 2021; Lamble, 2014; Kilgore, 2022).

18 Just like what happened during the COVID-19 pandemic, forced confinement of EM holders might endanger the household, especially women and children, who have to stay confined with the person (Piquero, 2021).

5. Conclusion. Towards E-Domesticity or Dissidence?

Considering the evidence presented above, it can be argued that with EM, homes increasingly become *total institutions* in their own right, where an assemblage of private and public tasks is exerted under the omnipresence of *e-carcereation* which turns our experience into, what might be called in the future, *e-domesticity*. A domesticity that is governed by techno-apparatuses of omnipresent surveillance, punishment and immobility not only for those considered *criminal* but for anyone whose calendars, text messages, speeches and geolocational and biometric data are extracted and "radiated across […] personal networks […] liable to seep onward, to unintended eyes" (Geiger, 2017).

This concern is not to underestimate nor discard any useful aspect of new technologies of a penal justice system that aim to improve the conditions of people in such institutions, nor is to undervalue the experiences of those who were/have been opting for EM instead of prison as abolitionist theories also urge to respond the short-term urgent needs of detainees (Davis et al., 2022) On the other hand, abolitionism keeps also appraising us of the menace of such technologies as they are part of the greater *surveillance capitalism* (Kilgore, 2022), born amid a neoliberal transformation of discipline and control and grown into broader criminalisation and invasion – making into our homes. Today, new developments in AI rapidly pervade penal institutions in the form of smart prisons that promise no-stuff facilities yet amplified vigilance blended with augmented biometrics and other individual monitoring. These attempts are continuations of reformist endeavours performing hand in

hand with transnational financial interests against resolving meta-problems of crime/harm, but fastening crime on certain populations – BIPOC, Latinxs, immigrants, women, queers and gender non-conforming people.

Amidst this storm, Kilgore (2022, p. 15) asks "[h]ow do we reimagine technological power and creativity in the image of freedom" instead of punishment and control? Or, is it even possible to resist monitoring, targeting and profiling in any form, especially when one is confined? Is it, then, possible for confined subjects to create *dissident domesticity* to "[…] respond to the overwhelming spatial and temporal control of confinement" and turn home into "[...] a site of dialectical mediation, a pivotal conduit for processes that appear to originate from a macrorealm of the exterior, to shape the microrealm of the interior" (von Zinnenburg Carroll et al., 2017, p. 114)? If "[…] domesticity is shaped as a form of political control", can it be, conversely also "a space for new forms of embodiment that elude or trick recognition"; a space for dissidence "demarcated not only by struggles over the control of information but also by domestic aesthetics, social habitation, and sabotage of proper forms of sociality" (von Zinnenburg Carroll et al., 2017, p. 115)? The *hows* of EM abolitionism might be too complex to discuss, but researching, discussing and writing on unveiled conditions of EM might be a start, especially if it comes from the real-life experiences "produced specifically under conditions of domestic incarceration" (von Zinnenburg Carroll et al., 2017, p. 131). In parallel to that, questioning the design industry as one of the pillars of carceral logic – for both prisons, EMs and other technologies

– might sow the seeds for its possible reversal or interruption, towards and via critical (un)making (Sperry, 2014).

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References

Alexander, M. (2010). *The New Jim Crow. Mass Incarceration in the Age of Colorblindness*. New Press.

Angelis, S. (2022). Limits to Prison Reform. *UC Irvine Law Review, 13*(1), 1–34. https://scholarship.law.uci.edu/ucilr/vol13/iss1/5

Belur, J., Thornton, A., Tompson, L., Manning, M., Sidebottom, A., & Bowers, K. (2020). A Systematic Review of the Effectiveness of the Electronic Monitoring of Offenders. *Journal of Criminal Justice, 68*, 101686. https://doi.org/10.1016/j.jcrimjus.2020.101686

Bruce-Lockhart, K. (2021, November 9). *More than a Million Prisoners Have Been Released During COVID-19, But It's Not Enough*. The Conversation. https://theconversation.com/more-than-a-million-prisoners-have-been-released-during-covid-19-but-its-not-enough-170434

Canlı, E. (2020). Prison Heterocissexual Complex. Sociospatial Politics of Queer Incarceration and the Case of Turkey. In Z. Davy et al. (Eds.), *The Handbook of Global Sexualities* (pp. 313–333). SAGE.

Davis, A., Dent, G., Richie, B., & Meiners, E. (2022). *Abolition. Feminism. Now.* Penguin Books.

Davis, A. Y. (2003). *Are Prisons Obsolete?* Seven Stories.

Frödén, M.C. (2021). *A Circular Argument. A Creative Exploration of Power and Space*. Emerald Publishing.

Gacek, J. (2022). *Portable Prisons. Electronic Monitoring and The Creation of Carceral Territory*. McGill Queen's University Press.

Geiger, J. (2017, April). Inside Circles. Electronic Monitoring, Economic Redundancies, Enclosure. *The Avery Review, 23*. https://www.averyreview.com/issues/23/inside-circles

Gilmore, R.W. (2007). *Golden Gulag. Prisons, Surplus, Crisis, and Opposition in Globalizing California*. University of California Press.

Goffman, E. (1961). *Asylums. Essays on the Social Situation of Mental Patients and Other Inmates*. Anchor Books.

Graham, H., & McIvor, G. (2017, November). Electronic Monitoring in the Criminal Justice System. *Insights, 40*. https://dspace.stir.ac.uk/bitstream/1893/26188/1/insights-40_0.pdf

Granja, R. (2021). The Invisible Implications of Techno-Optimism of Electronic Monitoring in Portugal. *Comunicação e Sociedade*, (40), 247–267. https://journals.openedition.org/cs/6350

Issacharoff, J. (2019). *Big House. Women, Prison, and the Domestic*. [Doctoral Dissertation, Duke University]. Duke Dissertations. https://hdl.handle.net/10161/18810

Kaba, M. (Ed.). (2021). *We Do This 'Til We Free Us. Abolitionist Organizing and Transforming Justice*. Haymarket Books.

Kay, J. B. (2020). "Stay the Fuck at Home!". Feminism, Family and the Private Home in a Time of Coronavirus. *Feminist Media Studies*, *20*(6), 883–888. https://doi.org/10.1080/14680777.2020.1765293

Kilgore, J. (2022). *Understanding E-Carceration. Electronic Monitoring, The Surveillance State, and The Future of Mass Incarceration*. The New Press.

Lamble, S. (2014). The Marketisation of Prison Alternatives. *Criminal Justice Matters*, *97(1)*, 14–15. http://dx.doi.org/10.1080/09627251.2014.950515

Lamble, S. (2011). Transforming Carceral Logics. 10 Reasons to Dismantle the Prison Industrial Complex through Queer/trans Analysis and Action. In E. A. Stanley, & N. Smith (Eds.), *Captive Genders. Trans Embodiment and the Prison Industrial Complex* (pp. 235–265). AK Press.

Levine, J., & Meiners, E. R. (2020). *The Feminist and the Sex Offender*. Verso Books.

Martínez-Millana, E., & Cánovas Alcaraz, A. (2020). Domesticity 'Behind Bars'. Project by Rem Koolhaas/OMA for the Renovation of a Panopticon Prison in Arnhem. *Buildings*, *10*(7), 117. https://doi.org/10.3390/buildings10070117

Media Justice. (2019). *No More Shackles Ten Arguments Against Pretrial Electronic Monitoring*. https://mediajustice.org/wp-content/uploads/2020/04/NoMoreShackles_PretrialReport_2019-final-draft.pdf

Moreira, A., & Farias, H. (2023). The Post-COVID Home. How Confinement Altered Domestic Space Use and Living Modes, in Lisbon. *Buildings*, *13*(5), 1195. https://doi.org/10.3390/buildings13051195

O'Nils, W. B. (2014). Electronic Monitoring of Offenders. An Ethical Review. *Science and Engineering Ethics*, *20*, 505–518. https://doi.org/10.1007/s11948-013-9462-3

Payne, B. K., & Gainey, R. R. (1998). A Qualitative Assessment of the Pains Experienced on Electronic Monitoring. *International Journal of Offender Therapy and Comparative Criminology, 42*(2), 149–163.

Penal Reform International. (2023). *Global Prison Trends 2023*. Retrieved July 30, 2023, from https://cdn.penalreform.org/wp-content/uploads/2023/06/GPT-2023.pdf

Penal Reform International. (2022). *Global Prison Trends 2022*. Retrieved July 30, 2023, from https://cdn.penalreform.org/wp-content/uploads/2022/05/GPT2022.pdf

Piquero, A. R., Jennings, W. G., Jemison, E., Kaukinen, C., & Knaul, F. M. (2021). Domestic Violence During the COVID-19 Pandemic. Evidence From a Systematic Review and Meta-Analysis. *Journal of Criminal Justice, 74*, 101806. https://doi.org/10.1016/j.jcrimjus.2021.101806

Puddu, S. (2022). The "Prison House" and Normalization. Between the Reassertion of Privacy and the Risk of Collectiveness, *Architecture and Culture, 10*(3), 426–456. https://doi.org/10.1080/20507828.2022.2106535

Rodríguez, D. (2020). Carceral Architectures of Policing. From Mass Incarceration to Domestic Warfare. In I. Kirkham-Lewitt (Ed.), *Paths to Prison. On the Architectures of Carcerality* (pp. 97–128). Columbia University Press.

Rokkan, T. (2018). In Prison at Home. How Does the Home Situation Influence the Effect of a Sentence with Electronic Monitoring (EM)?. In E. Fransson, F. Giofrè, & B. Johnsen (Eds.), *Prison, Architecture and Humans* (pp. 225–240). Cappelen Damm Akademisk.

Sanders, T., et al. (2023). Trans Architecture and the Prison as Archive. "Don't be a queen and you won't be arrested." *Punishment & Society, 25*(3), 742–765. https://doi.org/10.1177/14624745221087058

Söderholm, A. (2021 March). *Prisons and COVID-19. Lessons From an Ongoing Crisis*. Briefing Paper for International Drug Policy Consortium. https://www.ohchr.org/sites/default/files/Documents/Issues/Detention/Call/Others/idpc-prisons-covid19-lessons-from-an-ongoing-crisis-2021.pdf

Sperry, R. (2014). Architecture, Activism and Abolition. From Prison Design Boycott to ADPSR's Human Rights Campaign. *Scapegoat Journal, 7*, 29–37. http://www.scapegoatjournal.org/docs/07/SG07_29_RaphaelSperry.pdf

Swan, R. (2013, August 21). *Punishment by Design. The Power of Architecture Over the Human Mind*. SF Weekly. https://www.sfweekly.com/news/punishment-by-design-the-power-of-architecture-over-the-human-mind/

UNODC. (2007). *Handbook of Basic Principles and Promising Practices on Alternatives to Imprisonment*. United Nations Criminal Justice Handbook Series. https://www.unodc.org/documents/justice-and-prison-reform/crimeprevention/Handbook_of_basic_principles_and_promising_practices_on_Alternatives_to_Imprisonment.pdf

van der Veen, M. (2014). Professionalising Electronic Monitoring in the Netherlands. *Centre for Crime and Justice Studies*, *95*, 6–7. https://doi.org/10.1080/09627251.2014.902194

von Zinnenburg Carroll, K., Murawski, M., & Shipley, J. W. (2017). The Art of Dissident Domesticity. Julian Assange, King Prempeh, and Ethnographic Conceptualism in the Prison House. *Social Text*, *35*(4), 113–152. https://doi.org/10.1215/01642472-4223417

II

DOMESTIC DEVICES

HOW INTERIOR ARCHITECTURE AND DESIGN REACT TO THE CONTEMPORARY SCENARIO

Habitat as a Service
From Bespoke to Custom Interiors

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Abstract
The article discusses the transformation of the Italian domestic environments in the wake of the Covid-19 pandemic and the impact of digital technology. It highlights two key trends: the hybridization of domestic spaces due to remote work, study, training, and socialising facilitated by digital tools, and the increasingly dynamic lifestyles of young people, particularly millennials and Generation Z, who tend to live in rented spaces and embrace remote work. It is then arguable that the identitarian value of domestic spaces is changing, as physical objects and furniture become more interchangeable due to the fast-paced and unpredictable lives of young individuals. This shift must prompt a discussion about how interior design is adapting to such sociological changes. Various options are available for designers to create value through sharing and renting services, drawing inspiration from similar models in the office furniture sector.
The primary aim of the paper is to present novel scenarios for the design of domestic spaces, as the servitization of business models offers opportunities to reconsider how products and furniture are acquired and used, particularly as more adults don't own the homes they live in and frequently change residences. Renting is proposed as an effective model for creating more agile and customizable spaces that align with contemporary lifestyle preferences.

1. (Con)temporary Living Habits

Data show how millennials and generation Z tend to have less static lifestyles than previous generations (Abruzzo, 2022). This leads to greater uncertainty and unpredictability in life choices, resulting in more changes of residence over one's lifetime. In fact, disruptive phenomena such as hybrid and full remote work are gaining momentum among younger generations, and *job hopping* (literally jumping from one job to another) is spreading from the U.S. to Italy as a popular choice to secure higher salaries and a workplace with a better life-work balance (Agenzia ANSA, 2023). In particular, a recent report (Carli, 2023) shows how youngsters are increasingly willing to look for a job far from home (more than 70% would move within Italy, 69% would also move to another European country).

A direct consequence of these phenomena is that several households (especially composed of young adults) spend many years in houses for rent, and they change it quite often. Buonomo and Gabrielli (2016) highlight how the age profile of mobility peaks at 25-34 years old and that – although Italians seem to be less prone to change address than other European countries (Sanchez & Andrews, 2011) – 1,313,176 changes of residence occurred in 2014 in Italy, +18,3% compared to 1995. In 2021 (Istat, 2022), 5,2 million Italian households live in rented housing and 2,2 million have the dwelling in usufruct or freehold. Correspondingly, there are 42,7 million (72,5%) individuals living in owned houses, 11,8 million (20%) live in rented housing, and 4,4 million (7,6%) have the dwelling in usufruct or free use. Living in rented housing are the most re-

cently established households, 47,8 % of single people under 35 years of age and 39,9% of young couples without children (when the woman is under 35 years of age). High percentages are also observed among single people aged 35-64 (33,2%), single-parent families with minor children (30,8%), and those with at least three minors (33,7%).
Lastly, it has to be considered that a data gap exists with regard to people that spend a determined period of time (to study, work, or other reasons) in rental apartments without changing their residence address (Istat, 2022b): quantifying this population has historically been one of the information gaps to be filled in statistics, especially in attractive, university, and business-oriented cities.

A deeper and more intertwined relationship with technology also shapes the domestic environment of digital natives in a different way than their predecessors. The lockdown experience in 2020 accelerated the need to upgrade and enhance technological amenities, with internet connectivity being considered a vital and indispensable component for a satisfactory quality of life. For example, according to a 2019 report (European Commission) Italy lagged behind the European average in terms of smart homes (i.e. convenient domestic setups where different devices are remotely controlled through Internet connection) before the Covid-19 pandemic. Italy had 6 smart devices for every 10 households, while the United Kingdom had 18, Germany had 16, and France had 12 for every 10 households. However, more recent research from the Internet of Things Observatory at the School of Management of Politecnico di Milano (2023) indicates that the Italian mar-

ket witnessed significant growth in 2022, with a remarkable increase of 18% compared to the previous year; this growth rate actually surpassed that of other European countries.

The article aims to explore the relationship between these trends and the evolution of interior design choices for domestic spaces, and in which form this practice is adapting to recent sociological changes. To achieve these objectives, we move from a theoretical discussion to an overview of servitization cases within the practice of interior design, that ultimately brings us to define a four step model for the design of such services, and to discuss the social and environmental value of the latter.

2. Adaptive Domestic Spaces

As a mirror of life itself (Benjamin, 2004), the design of interiors is constantly evolving according to economic, social, cultural, and technological changes. In recent years, being such changes quicker and more and more disruptive, a strong reconsideration of the common conceptualisation of the interior is taking place among researchers and practitioners.
In particular, the interior as a static element strongly tied to its architectural keeper is leaving room to a greater focus on the user of the space, on his/her individual perception, including the emotional and psychological levels (Marlor, 2021). To understand this, it is useful to refer to Sparke's taxonomy (Sparke, 2010) of the three main contexts which impact the contemporary design of interior spaces, i.e. *space* (emphasis on architectural and design modernism), *place* (priority to the relationship between the interior and its inhabitant), and *taste* (focus on

decorative arts and aesthetics). Novel ways to view and design the interior tend to put the ever-changing characteristics of its user at the centre of the project, rather than prioritise spatially oriented or taste based approaches, which have been historically associated with modernist authors of the 20th century. Established architects such as Carlo Scarpa and Umberto Riva would design every part of an interior, making even the smallest detail a part of a bespoke standalone project.

Recently the interior space is being described as a stage on which the events of the user's life play out, resulting in spaces that are more open and neutral, to allow a flux between rather different functions. In fact, the spatial needs of people within the domestic environment have widely changed and become more complex, as digital tools have created new opportunities to work, socialise, exercise, study without leaving the home. As effectively explained by Lucy Marlor (2021), the domestic interior therefore needs to be designed as an open platform for inhabitation. The interior of a person's home has been described as the spatial projection of the self (Todd & Mortimer, 1929), or the material manifestation of the inhabitant spatial practice (Atmodiwirjo & Yatmo, 2018). The sense of home and interiority (Pimlott, 2018) is pivotal to the inner life of humans, so much so that anyone, regardless of their socioeconomic status, chooses furnishing, artefacts, and decorative elements in order to turn their interior space into a *place*, a backdrop to their sense of self that allows to experience the quality of living (Nabil & Kirk, 2019). The concept of the interior as a backdrop has strengthened as a consequence of the Covid-19 outbreak, due to the necessity to conduct social and

work activities in virtual meeting spaces, where every participant would bring not only their physical appearance (reduced to the area of the face and torso) but also a suggestion of style, interests, culture, and family in a single frame, showing a portion of their intimate space (Marlor, 2021).

The push towards user centred interior design is also enhanced by digital technology as a means to multiply the capabilities of the space to adapt to the uniqueness of its inhabitants. Interactive artefacts such as furniture and accessories (window shutters, curtains, lights, vocal assistants, vacuum cleaner robots, frames, televisions) can passively or actively modify their behaviour and/or appearance to make the environment more comfortable and personalised according to the user needs (Nabil & Kirk, 2019). The vacuum cleaner robot learns the path between the furniture of the house it is placed in, and starts cleaning in moments of the day that are convenient to the occupant; the smart lights turn on when the sun sets in that specific location, and change their hue and intensity not to bother the eyes of the occupant while he/she is reading or watching a movie; the digital frame shows smiling images of family members and friends that resonate with the inhabitant emotions. Subscriptions to services of entertainment such as Spotify and Netflix allow vocal assistants, speakers, and smart televisions to provide a personalised experience, playing the user's favourite playlists and suggesting new content with a very precise knowledge of his/her tastes and interests (Casiddu et al., 2022). All of these simple interactions, which are now quite common in the lives of most people, seamlessly and almost unknowingly concur to create

a sense of belonging and familiarity to one's interior spaces, that are, even in their immaterial characteristics, shaped around the figure of their inhabitant.

The following section will discuss how to apply these concepts to living spaces that are continuously reshaping in order to host new inhabitants, as the lives of the latter become more nomadic and unpredictable.

3. Habitat as a Service

Migration and mobility represent two of the major and most impactful challenges for urban areas. Beyond the great migratory fluxes of our contemporaneity, the phenomenon of the so-called 'Millennial Nomads' (Karam, 2019) calls for new and versatile approaches to the design of living spaces. These nomadic youngsters are described as a group of mobile citizens that change location quite often during their studies and early years of work, to pursue further formation and better job conditions. Evidently, they need to adapt to new living spaces and move their belongings. Such challenges are not trivial if we consider the effort of planning frequent removals, in terms of stress, time consumption, and money expenditure. Moving frequently influences the furnishing choices, because people may buy cheap and low-quality products, as they are meant to be temporary; others may try to reuse items purchased for different interiors to save money, and not be able to personalise the space and organise it in the most efficient setting. Similar choices have an influence both on the quality of life of the 'nomad' and on the environmental impact of items that may be dismissed too frequently.

In the context of urban and architectural studies, such challenges are approached through the practices of Mobile Architecture or Pop-up Architecture, i.e. spatial designs that don't have a permanent address and can be moved, or spaces temporarily set up for different purposes (Harris, 2015). These practices are being enhanced by the use of different kind of data (Karam, 2019), and are undergoing a process of *uberization* – a business model innovation named after the company Uber by the Cambridge dictionary, which describes how to introduce a service in the market by proposing a new way to buy or use a commodity, especially through the use of mobile technology.
More broadly, the term 'servitization' has been in use since the 1980s to indicate the process that allows combining a product to a service, and merging these categories towards a PSS (product-service system) that drives the passage from ownership to fruition (Fagnoni, 2022). Tukker (2004) highlights how business models based on this approach are more competitive and more sustainable at the same time. Following such trends, it is possible to outline a scenario of servitization of the interior, by leveraging a use-oriented PSS. Section 4 will provide an overview of international companies that are already proposing similar services on the market.

As the primary living environment of an individual, the home should contain objects with which he/she is comfortable, and adapt to changing needs during the day. In this sense, a service for interior design should propose a *custom home*, that offers the user chances to purchase the package of furniture necessary, plus technological items to connect personal ac-

counts that, as mentioned above, create a condition of familiarity without physically intervening on the space.
Such service may function with two different models according to the needs of the user: a DIY model leaves the autonomy of every choice to the expert person that wishes to select his/her own items according to personal taste; an all included model instead offers a pre organised kit, based on preferences and parameters requested by the user in an assisted process. The two models can coexist and be mixed, as design consultants are available for suggestions, and the basic kits can be edited by the users for special needs and choices.
To design the kits and define the offer of different pieces of furniture, companies and designers need to be aware of the target group that requires the setting: the primary targets are young nomads (students or workers) who do not intend to settle down in a place for an extended period of time; other possible users may also include families that move for work reasons, or even residents who are interested in renovating their furnishing quite often according to changing taste and needs, without the burden to buy. A home furnished with rented items, same as a regular one, should satisfy three basic needs (fulfilment of basic functions, self-esteem and status, wellbeing), plus integrate technological assets that function as touchpoints to use digital subscription services.
Finally ancillary services may be introduced to facilitate the user. Shipping, on-site assembly and pickup at the end of the rental period may be included in the offering, as well as the ability to periodically upgrade furniture at discounted prices, or replace damaged products.

4. Servitization Applied to Interior Design

This section offers an overview of recent case studies of servitization of domestic interiors in Italy and beyond. Different companies approach such a challenge in different ways, but all describe their services as more sustainable and coherent with circularity principles, in an effort to reduce the impact of the sector by enhancing chances of reuse, repair, and recycle of furniture. There are options to rent a piece of furniture or even single parts of it, to purchase move-in ready packages for periodic living needs (i.e. students, digital nomads, military), and for property owners to fully rent furnishings for apartments that they intend to lease.

4.1. Modular Furniture as Service: A Lott of Space

Currently available and locally produced in the Netherlands, the A Lott of Space[1] modular sofa system features modules with a straightforward frame and upholstered cushions that offer adaptability through various configurations, while maintaining rigorous sustainability standards in the choice of materials and possibility to remove, repair, or replace every single component.

The company fully commits to circular principles, and has thus developed an innovative and flexible service that enhances the adaptability and lifespan of the sofa: customers have an account on A Lott of Space website and can modify their home setting any time by purchasing new modules or sending back old ones that no longer fit their environment or needs. At the moment, a system of re-selling is also active, where the com-

1 A Lott of Space. De Sofa die met je mee groeit. https://alottofspace.nl/

pany buys back the entire sofa from the customer that wishes to get rid of it; however, a subscription plan to the sofa is to be launched soon, as an alternative to regular purchase.

4.2. Furniture Rental: Ikea Flex

Italy is the first (and currently only) country in which the pilot project Ikea Flex[2] is active, offering the option to rent office furniture in a few selected shops (in Bologna, Milan and Rome) with the support of a consultant that follows customers in the design, delivery, assembly, and maintenance process of their workspace. Such a solution is particularly attractive to newborn and small companies or independent professionals that tend to embrace versatile and fast changing work approaches. Employees may spend a part of their working hours at home and need a domestic office – that can also be rented – while actual offices may be temporary and require smaller investments. A single workstation costs less than 30 euros per month; rental also allows companies to benefit from very extensive tax deductions. In the Netherlands, on the other hand, Ikea has partnered with the independent company Move & Rent to offer monthly rental services of complete room packages for the bedroom, living room, dining room, student room or workspace.

4.3. Move-In Ready Packages: CORT

CORT[3] is a U.S. based company that offers a fully customer-centric furniture rental process for people that need to

2 Ikea FLEX: Servizio di noleggio mobili per la tua attività. https://www.ikea.com/it/it/ikea-business/ikea-flex-servizio-in-abbonamento-per-larredo-del-tuo-ufficio-pub96f724d0

3 CORT Furniture Rental. Subscribe to furniture on your terms. https://www.cort.com/furniture-rental

move for a determined period of time within the nation or worldwide. The process starts by specifying the new ZIP code and desired rental duration, with longer leases offering more favourable pricing; the lease period is flexible and can be renewed on a month-to-month basis without fee increases. Customers then have the option to select individual furniture pieces or acquire the services of in-house designers that curate the selection to match the client's style and budget. Specific move-in ready packages are also available with different price ranges and quality (base packages include pieces for the living room, the bedroom and the dining room) and they can be purchased without changes or after a personal customization. Finally, a delivery team brings the furniture to the requested location and assembles it. CORT catalogue offers all sorts of items including kitchenware, linens and pillows, TVs, patio furniture, accent furniture, home decor and more.

4.4. Build to Rent: Milano Contract District

Contract District Group[4] is an Italian service conceived in response to the growing number of investors interested in purchasing properties for rental purposes, coupled with the increasing preference among families and individuals for rental solutions over outright ownership. Property owners can opt to fully rent furnishings during the purchase process, significantly reducing the upfront costs typically associated with initiating a lease. The monthly rental fee is determined based on rental income projections or the tenant's availability and preferences. Furthermore, Contract District Group en-

4 Milano Contract District. Real Estate + Design. https://contract-district.com/

sures the comprehensive or partial replacement of furnishings at the end of their lifecycle or for interior refurbishments. This initiative enables consumers to introduce iconic pieces from Italian and international companies into their homes, with rental terms ranging from 48 to 96 months, mirroring typical residential lease agreements. The addition of a digital application allows consumers to manage various aspects of the product and rental with a simple click, eliminating phone calls and paper-based document exchanges. Contract District Group thus addresses the changing needs of contemporary living by placing the consumer at the centre, offering the flexibility to adapt to changing needs, tastes, and habits without resulting in resource wastage. This approach eliminates capital immobilisation and amortises the investment, with the total of included service fees (transport, installation, maintenance, and retrieval of goods) never exceeding the list price of the rented merchandise.

5. From Bespoke to Custom Interiors

An egocentric and intellectual perspective of the role of architects and designers in the conception of modern space often leads to a disconnect between the project and the actual use that people make of an interior (Lefebvre, 1974). This thought becomes even more urgent when domestic interiors are to be designed with the knowledge that the inhabitants of such space will potentially change often, requiring a very flexible and adaptive setting. In this sense, the job of the contemporary interior designer is radically different from that of the modernist architect: there is a shift that moves the discipline away from a bespoke project where every element and de-

tail is uniquely designed and produced for a specific space, following a comprehensive vision of the architect/designer. Nowadays, the interior designer works at the intersection of changing lifestyles and new technological opportunities, and has to take upon the challenge of customising the domestic space on the dynamic and complex needs of its users. A change in the use of domestic space must result in a change in the process of designing it.

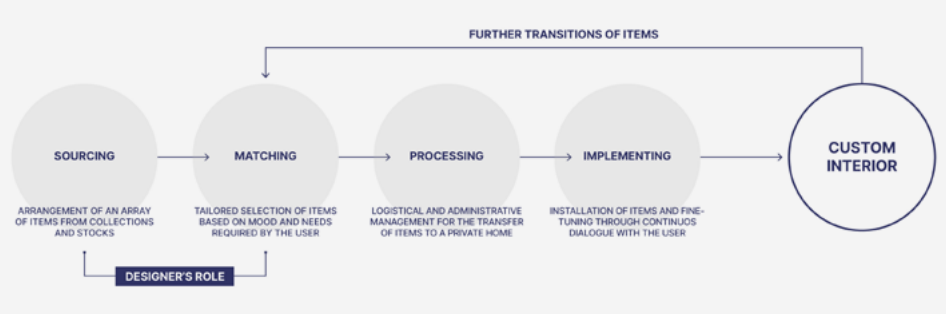

Figure 1. A four steps model for the servitization of the interior design process (credits: A. Vacanti, 2023).

The servitization of the design activity leads to the management of a holistic process rather than the design and crafting of a unique bespoke solution. Such process can be summarised in four consequent phases (Fig.1): *sourcing*, as the selection and arrangement of a vast array of items from collections and manufacturer/retailer stocks (this very step underscores the shift towards access over ownership); *matching*, as the selection of furniture items for the mood and needs required, defining possible correct matches with the space to be populated (in this context, choosing an item is a deliberate and tailored choice of the designer); *processing*, as the various administrative, logistical, and organisational steps that can

govern the effective transfer of items to private homes (logistical efficiency is critical in delivering a seamless experience to users); *implementing*, as the fine-tuning of the model, the installation process and the definition of effective communication with the user. A correct flux in the fruition of the service aims to ensure that the transition from one item to another is not only efficient but also enriching, providing users with a sense of continuity and familiarity in their ever-changing living spaces.

Finally, it is not of secondary importance to highlight how this approach supports the transition from a linear *take-make-waste* economy to a circular economy (Rau & Oberhuber, 2022). By selling access over ownership, furniture items (and/or the raw materials they are made of) do not end up as waste but continue circulating within the economic system. These positive returns, however, are not completely inherent in the servitization process, but also require a priori planning, which involves designing and selecting furniture that can be either easily recovered or quickly dismantled, so that materials can be reused. In addition, the logistics of delivery and pickup from private homes can cause considerable impact, which must be managed and contained. Existing service models often make use of *digital passports* to facilitate the tracking and management of items and materials throughout their life cycles (Hoosain et al., 2021). These passports are essentially digital files that provide a comprehensive record of the history of an item, from detailed information about the materials' origins, characteristics, and potential for reuse or recycling, to the transfers that the item has undergone over time.

In synthesis, from *bespoke* to *custom* interiors, playing with words, sums up a critical transition in domestic interior design, affected by the servitization and the ecological transition. Bespoke stands for tailored-designed furniture, as in houses designed by great architects. Custom stands for the made-to-measure furniture chosen through a rental service, designed to be reused several times to give furniture products a longer life.

6. Conclusions

The paper has explored the evolving dynamics of contemporary living habits, to depict a scenario that supports the understanding of the change in the interior design discipline. The increased mobility of millennials and Generation Z, driven by factors like remote work and job hopping, results in a higher frequency of changing residences (Abruzzo, 2022; Buonomo & Gabrielli, 2016). The text emphasises the growing trend of renting homes and discusses the changing landscape of smart homes in Italy, strongly influenced by the lockdown event in 2020, that also enhanced the need of adaptability for spaces that have various functions, made possible by digital technologies.

A general market tendency towards the servitization of many commodities offers novel ways to address the challenge of mobility, especially among young nomads. The concept of 'habitat as a service' is already becoming a reality both in Italy and abroad, with several case studies developing with the aim to give a flexible and affordable response to changing living habits. Coherently with a novel awareness that acknowledges the pressing importance of developing more environmentally

sustainable practices in all areas of human activity, these pilot projects focus on reducing the impact of the furnishing sector by favouring the recycling and reuse of items.

Overall, the traditional model of owning and permanently investing in furniture and decor is being replaced by a more flexible approach that aligns with contemporary lifestyles. Today, people prioritise experiences and flexibility over ownership, whether it's in their choice of housing, furniture, or other possessions. This shift not only contributes to sustainability and reduced waste, but also offers individuals the freedom to tailor their surroundings to their evolving needs and preferences. It's a testament to the adaptability of contemporary living and the recognition that the value of an item lies not in its ownership but in its utility and contribution to enhancing the quality of life.

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References

Abruzzo, R. (2022, October 17). Nomadismo digitale in aumento. In Italia lo scelgono donne e millennials. *Econopoly - Il Sole 24 Ore*. https://www.econopoly.ilsole24ore.com/2022/10/17/nomadismo-digitale/?refresh_ce=1

Agenzia ANSA. (2023, January 20). Job Hopping, cosa è e perchè in Italia funziona solo nel digitale. *ANSA*. https://www.ansa.it/canale_lifestyle/notizie/societa_diritti/2023/01/19/job-hopping-cosa-e-e-perche-in-italia-funziona-solo-nel-digitale_f6942bed-8b5f-483e-b68f-211847ce8d8b.html

Atmodiwirjo, P., & Yatmo, Y. A. (2018). Interiority in Everyday Space. A Dialogue Between Materiality and Occupation. *Interiority*, *2*(10), 1–4.

Benjamin, W. (2002). *The Arcades Project (H. Eiland & K. McLaughlin, Trans.)*. Harvard University Press. (Original work published 1982).

Buonomo, A., & Gabrielli, G. (2016). Why Do They Move? Characteristics and Determinants of Internal Mobility in Italy. *Polis*, (2), 153–180. https://www.rivisteweb.it/doi/10.1424/83906

Carli, A. (2023). Flessibilità e tempo libero. Così i giovani della «generazione Z» valutano le opportunità di lavoro. *Il Sole 24 ORE*. https://www.ilsole24ore.com/art/flessibilita-e-tempo-libero-cosi-giovani-generazione-z-valutano-opportunita-lavoro-AEVVeTMD

Casiddu, N., Burlando, F., Nevoso, I., Porfirione, C., & Vacanti, A. (2022). Beyond Personas. Machine Learning to Personalise the Project. *Agathón. International Journal of Architecture, Art and Design*, *12*(online), 226–233. https://doi.org/10.19229/2464-9309/12202022

European Commission. (2019). *Smart Home and Appliances. State of the Art. Energy, Communications, Protocols, Standards*. Publications Office. https://data.europa.eu/doi/10.2760/453301

Fagnoni, R. (2022). Dal possesso all'uso. Oltre il binomio prodotto/servizio. In L. Casarotto, R. Fagnoni, & G. Sinni (Eds.), *Dialoghi Oltre il Visibile. Il design dei servizi per il territorio e i cittadini* (pp. 71–84). Ronzani Editore.

Harris, E. (2015). Navigating Pop-Up Geographies. Urban Space-Times of Flexibility. Interstitiality and Immersion. *Geography Compass*, *9*(11), 592–603. https://doi.org/10.1111/gec3.12248

Hoosain, M.S., Paul, B.S., Raza, S.M., Ramakrishna, S. (2021). Material Passports and Circular Economy. In L. Liu, & S. Ramakrishna (Eds.), *An Introduction to Circular Economy* (pp. 131–158). Springer. https://doi.org/10.1007/978-981-15-8510-4_8

Istat. (2022). *Gruppo di lavoro sulle politiche per la casa e l'emergenza abitativa (Ministero del Lavoro e delle Politiche Sociali)*. https://www.istat.it/it/files/2022/09/Istat-Audizione-Politiche-per-la-Casa_06_09_22.pdf

Istat. (2022b). *Popolazione insistente per studio e lavoro nel 2019*. https://www.istat.it/it/archivio/275030

Karam, R. (2019). Millennial Nomads, Uberization and Semi-autonomous Pods. In H. Schnädelbach, & D. Kirk (Eds.), *People, Personal Data and the Built Environment* (pp. 77–102). Springer. https://doi.org/10.1007/978-3-319-70875-1_4

Lefebvre, H. (1974). *The Production of Space*. Wiley-Blackwell.

Marlor, L. (2021). New Territories. Reimagined Interiorities. *Interiority, 4*(2), 191–206.

Nabil, S., & Kirk, D. (2019). Interactive Interior Design and Personal Data. In H. Schnädelbach, & D. Kirk (Eds.), *People, Personal Data and the Built Environment* (pp. 103–122). Springer. https://doi.org/10.1007/978-3-319-70875-1_5

Osservatorio Internet of Things (2023). *Smart Home, è ora di innovare. Focus su energia ed ecosistemi. Report 2022-2023*. School of Management, Politecnico di Milano. https://www.osservatori.net/it/prodotti/formato/report/smart-home-ora-di-innovare-focus-energia-ecosistemi-report

Pimlott, M. (2018). Interiority and the Conditions of the Interior. *Interiority, 1*(1), 5–20.

Rau, T., & Oberhuber, S. (2022). *Material Matters. Developing Business for a Circular Economy*. Taylor & Francis.

Sánchez, A. C., & Andrews, D. (2011). Residential Mobility and Public Policy in OECD Countries. *OECD Journal. Economic Studies, 1*, 1–22. https://doi.org/10.1787/eco_studies-2011-5kg0vswqt240

Sparke, P. (2010). The Modern Interior. A Space, a Place or a Matter of Taste?. *Interiors, 1*(1), 7–17.

Todd, D., & Mortimer, R. (1929). *The New Interior Decoration. An Introduction to its Principles, and International Survey of its Methods*. B. T. Batsford.

Tukker, A. (2004). Eight Types of Product–Service System. Eight ways to sustainability? Experiences from SusProNet. *Business Strategy and the Environment*, *13*(4), 246–260. https://doi.org/10.1002/bse.414

Flexibility in the Workplace
Envisioning the Role of Domestic Spaces in the Era of Hybrid Work

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Domestic Space, Working from Home, Hybrid Work, Work Activities, Workspace Design.

Abstract
Modern society has always pictured the home and the workplace as two separate entities: the former for personal and private space, the latter for professional growth and productivity.
The COVID-19 pandemic disrupted this dichotomy as homes became the only places to work. Companies had to reorganize their dynamics remotely, discovering new communication and resource management methods. Employees adjusted to unconventional workstations and new behaviors led to a domestic new deal. Rooms became flexible areas in which to organize work activities as well as leisure tasks. It has also become clear that the daily commute to the office is not vital, and working from home has both productivity perks and drawbacks on well-being. With the resumption of office work, employees desire to maintain work from home, urging companies to comprehend how to incorporate flexible approaches. This entails striking a balance between the home environment's opportunities and enhancing the collaborative and physical interaction that the office still provides.
To integrate new workspace habits, a multidisciplinary approach is key, merging design practices, organizational management, and behavioral analysis. The contribution aims to explore how new working practices are redefining the functions and dynamics of workspaces. The analysis of the home transformation, through a literature and case study review, will generate insights to improve mixed workplace strategies.

1. Introduction

For a long time, the conception of home and work spaces has been very sharp: the former represented a personal and private space, for family affection, conviviality, lightheartedness, and life responsibilities. Conversely, the workspace represented a context for professional growth, production, learning experiences, and social interactions. The separation between these two spaces has always been preached as fundamental, as a way to pursue well-being and life balance in a society shaped by work and productivity.

The need to define boundaries has been reflected both at home and in the office, where spaces have been traditionally organized around tasks to perform: focused or collaborative activities, breaks, and social interactions. In the late 1960s, offices shifted to open plans (Budd, 2001), modulating the space with temporary and flexible elements; conversely, houses have maintained their rigid division and its role of personal identification, security, and protection. Thus, with the Covid-19 pandemic, domestic spaces became the only places where to seek peace, and their role shifted from *home as identity* to *home as refuge* (Ahrentzen, 1987). During lockdown, the meaning of home as a physical unit merged with the idea of an *emotional territory*, reflecting the individual-environment interaction (Bettaieb & Alawad, 2018).

Domestic spaces had to adapt to multiple aspects of people's lives and replicating office work impacted the most on the layout of spaces. Working from home offered benefits like improved flexibility and productivity. However, it also in-

troduced challenges such as meeting fatigue, reduced social cohesion due to the lack of physical interaction, and blurred work-life boundaries, leading to concentration difficulties and anxiety (Teevan, 2021). Furthermore, repurposing physical spaces for work activities has influenced the perception of ergonomics, lighting, privacy, and noise control within the home walls (Vitra, 2021).

Despite the challenges, a 2020 survey from Microsoft showed that 71% of employees and managers[1] had the desire to continue working from home, at least part-time (Spataro, 2020). However, by May 2023, full-time employees worked from home less than a day per week[2] with 26% working on hybrid arrangements, and 8% working entirely from home (Aksoy et al., 2023). This data indicates that houses, as well as organizations, are not fully ready to include working-from-home practices in their strategies, suggesting a review of the multifunctional home to understand how workspaces can be integrated within domestic environments.

The contribution aims to explore how homes are becoming dynamic places able to mix pleasure, leisure, and work. The analysis of the transformation of the domestic space, through a literature and case study review, will generate insights to improve hybrid workplace strategies. The findings contrib-

1 Data retrieved from a survey commissioned by Microsoft on May 26-30, 2020, among 2,285 total adults ages 18+ who are currently working remotely across the UK, US, Germany, Italy, Mexico and China.

2 Survey commissioned on April-May 2023 across 34 countries. Results retrieved from "Working from home around the globe: Report 2023". The report is based on data from Wave 3 of the Global Survey of Working Arrangements (G-SWA).

ute to a wider research project in collaboration with an ICT company focused on developing the workplace of the future. The research aims to develop tools and spatial solutions to promote flexibility between home and office, focusing on employee well-being and company communication.

2. The Evolving Relationship Between Home and Work Spaces. A Literature Review

The debate on domestic spaces in current work scenarios cannot be addressed without considering the underlying connections between home and work as living spaces. The concept of working from home has existed way before the Covid-19 pandemic. Existing literature on the topic focuses mainly on two eras, the 1970s to the late 1990s and the mid-2010s onwards. The motivations can be traced to specific technological and social shifts. Before the 18th Century, homes, specifically country houses, were the businesses' headquarters (Cottage Industry). Then the Industrial Revolution disrupted the existing paradigm, with work activities that required gathering many people in larger and centralized factories (Ahrentzen, 1987). In the 20th Century information technology defined a new type of worker, less focused on manual labor and more on cognitive tasks (Lund et al., 2021). Their work required moderate physical proximity and interactions with colleagues, which required a limited workstation made of a desk, a computer, and other communication tools.

Cities became the center of work activities, with workspaces concentrated in centralized buildings (Wilkinson, 2019). The workspace has then become the place to commute every

week, strongly separating home duties and work tasks. Over the years, workspaces have evolved from single to open-plan offices; architectural and design changes started reflecting a more flexible and collaborative approach to work that was made possible by technological development. Because of these improvements and the growth of the internet, in the 1970s the scientific community started to explore the concept of home-working. In 1969, scientist Alan Kiron coined "dominetics" – combining domicile, connections, and electronics – to describe the potential of computers and new communication tools in changing life and work (Waters-Lynch, 2020). In 1973 engineer Jack Nilles introduced the concept of telecommuting – using telecommunications or computers instead of commuting to work (Nilles, 1994, p. 109) – that, according to economist Schiff (1979), could have helped to save gasoline during times of oil crisis by working at home one or two days a week. It was only a matter of time before the development of technological tools such as the personal computer would have invaded the home, reducing the need for dedicated workspaces. Studies started to explore how home characteristics and physical layout impact work behaviors. Factors like availability, privacy, spaciousness, and natural light were considered fundamental for an effective workspace within domestic spaces. It soon became clear how, compared to traditional offices, working at home would be physically less defined (Ahrentzen, 1987).

It was also acknowledged that working from home would have led to a "diffused work society", requiring a re-thinking of organizational structures, types of employment, mecha-

nisms of coordination, and supervision (Brandt, 1983). However, these studies were mainly future-oriented, thus based on the potential of telecommunications to envision innovative work strategies. These forecasts became a reality in the mid-2010s when remote work expanded in the corporate sector. At the time, personal device proliferation, cloud computing, and virtual technologies allowed employees to work from various locations, challenging the conventional "commute to work" paradigm (Baruch & Nicholson, 1997). The adoption process, however, has been really slow primarily due to three factors:

- **Resistance to change**: Corporate communication hinges on spatial and organizational dimensions. A hierarchical structure impacts employees' mutual awareness (Allen & Henn, 2006). This organizational mindset makes it easier for managers to monitor activities when everyone is in sight in a single workplace.
- **Work coordination**: Knowledge work involves tasks like thinking, planning, and organizing. When executed virtually, it requires more coordination and communication among colleagues compared to a physical office.
- **Lack of empathy in virtual communication**: Telecommunications lack the "face-to-face" interactions that physical spaces offer, or at least they are not as fulfilling. This gap is particularly evident in impromptu meetings, breaks, and other social moments that are fundamental for a thriving workplace (Newport, 2020).

Then in 2020, the COVID-19 pandemic forced the entire globe to pause and re-think work. At that moment, most workers

found themselves “obliged” to work from home. The emergency at which this condition happened required houses to accommodate multiple and divergent activities, generating changes in their layout and living and work patterns.

During the pandemic, homes were small experimental workshops, spaces where to reflect on the improvements to be done (Zurlo et al., 2020). Individuals and organizations experienced the limits of remote work, discerning which tasks suited home offices or corporate settings best. Employees realized the benefits of replicating traditional office setups at home, establishing clear boundaries for work-life balance, and enhancing task engagement (Yang et al., 2021). Furthermore, it became evident that organizational knowledge thrived on both explicit and tacit experiences, highlighting the importance of fostering casual and interactive exchanges among colleagues in virtual home offices.

With the end of the pandemic, the work scenario is still uneven. Homes continue to be the primary location for remote activities, but still with the pandemic’s challenges. A design approach is needed to address the overlapping role of domestic and work life. Moreover, understanding which activities are better supported at home than at corporate offices can help to understand the positive impacts of flexible work arrangements.

The state-of-the-art aimed to define the evolving work/home dynamic and to develop some observations contributing to future research: regardless of the historical context considered, sources have rarely questioned interior characteristics

required from homes to accommodate work. While corporate office work environments have been studied in various settings (closed, open-plan, ABW) few studies have dealt with the physical attributes of home office environments (Yang et al., 2021). No study has examined home-based workplaces in terms of housing and overall quality, accounting for the diverse factors influencing perception (Cuerdo-Vilches et al., 2021). Design implications are still rarely acknowledged, confirming the underexplored nature of research concerning home environments, even in the wake of recent developments.

Another observation that has emerged is related to the disciplines investigating the domestic spaces as a work nest: management, technology, sociology, economy, and urban planning are the common areas in which the topic has been analyzed. Few researches have been carried out in the field of architecture and design; this might be due to the fact that architects and designers are not used to planning and designing domestic spaces intended for home-based work.

3. Setting the Boundaries of Home Working

During the pandemic, terms like home working, remote work, telework, and smart work were used interchangeably to describe employees using technology to work outside their traditional offices. It is crucial to understand that these terms, while similar, have different nuances. Using them correctly marks the first step toward envisioning domestic spaces as parts of the future vision of work. To achieve this, it is important to define the specific context this research seeks to enrich. Amid the variety of individuals who are experiencing

working from home, this analysis aims to identify and experiment with solutions for an Italian ICT (information and communication technology) company that has embraced remote work. In this company, telecommunications are part of employees' daily tasks; people are grouped in organizational units that are experiencing decentralized communication processes; their interactions are influenced by various activities including tasks, team projects, and meetings.

The term "working from home" is quite broad since it refers to work that takes place fully or partly within the worker's own residence (International Labour Organization, 2020). Initially, it was used to indicate certain working classes like clerical workers or independent artists. The spread of information technology extended its use to both autonomous workers and employees (Holliss, 2012). This research is focused on employees in organizations that have embraced remote work policies. *Remote work* refers to a situation where the work is fully or partly carried out on an alternative worksite other than the default place of work (International Labour Organization, 2020). When remote work is carried out using ICTs, it transitions into *telework*. Yet, when ICTs are integrated with remote work's spatial, temporal, and managerial flexibility, the term *smart working* is better suited (Sperati, 2021).

The research aims to explore how workplace flexibility can be integrated into innovative work strategies, moving beyond teleworking to achieve smart working (Fig. 1). Workplace flexibility allows workers to choose when, where, and for how long they engage in work-related tasks (Yang et al., 2021, p.3).

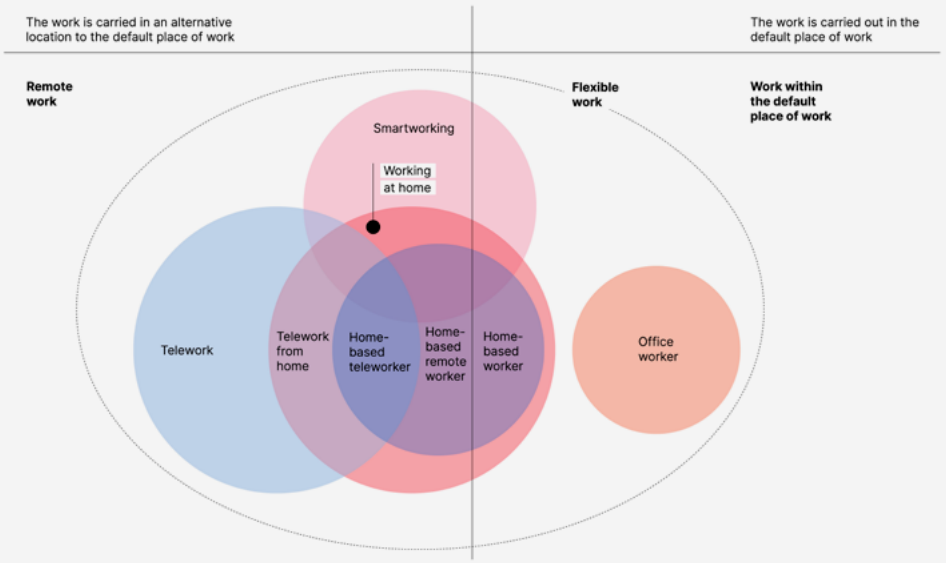


Figure 1. Concepts of remote work and work in the default place of work. Personal elaboration on the data of the International Labor Organization (2020).

Achieving this requires a shift in organizational management from control and presenteeism to trust, collaboration, and delegation (Area Centro Studi, 2021). Balancing space distribution, technology equipment, teamwork, knowledge sharing, and employee autonomy leads to a condition of *hybrid work* (Yang et al, 2021), a state that recognizes home as a feasible work location, among others.

4. Repurposing Domestic Spaces to Meet Work Needs

The current workspace scenario highlights that most knowledge jobs are technically spatial independent (Brandt, 1983). However, the pandemic emphasized the importance of flexibility in choosing where to work based on tasks, spatial characteristics, and social interactions to enhance work strategies. By expanding Jack Nilles' concept of a "distributed work

network" (Nilles, 1994) to current needs, organizations must recognize homes as *one of the possible* workplaces alongside offices and other environments like co-working spaces, cafès, bookshops, and hotels (Fig. 2).

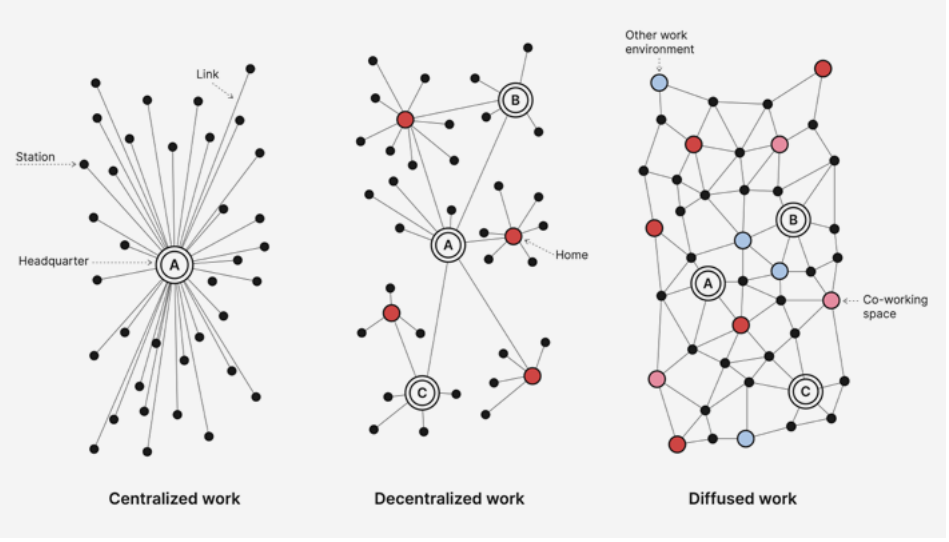


Figure 2. Centralized, decentralized, and distributed network. Personal elaboration based on Barans' diagram (1962).

The pandemic role of domestic spaces confirms Bettaieb and Alawad's notion of them being "expanded psychological spaces" and "minimized social spaces" (2018). This section focuses on understanding how physical components and behavioral patterns impact domestic spaces. Leveraging insights from the literature review, we will discuss three categories: (1) work activities, (2) spatial pattern of use, and their influence on (3) furniture semantics. Each category will integrate case studies to support the identification of practical design recommendations for the concept of working from home.

4.1. Work Activities

What employees do significantly influence their workplace experience, whether at home or in the office. Identifying the variety of work tasks undertaken is a fundamental step to understanding the ideal work environment according to employees' needs.

Considering the different layout attributes of homes and offices, a hypothesis is that home spaces excel in facilitating individual and focused activities, whereas offices are more suited to promoting interactive and collaborative activities. To address this theory, Leesman[3] has developed the *Leesman Office* and *Home-office Survey* to compare work experiences in the two settings. Both surveys ask how home-office environments support daily work tasks. The surveys encompass 21 work activities, categorized into individual work, collaboration, conversations, formal meetings, and others. The surveys' goal is to support companies in identifying employees' activity complexity and profiles, thereby defining workplace needs and configurations.

Ericsson, the ICT company, has used the Leesman Surveys to develop the *Helix Workplace Model:* it is based on five personas profiles, categorized according to their inclination to go to the office (have to go, choose to go, rarely go). The profiles are tailored to the insight from people's spatial interaction and the range of work activities. Each *personas' helix* is the

3 Company specialized on measuring and analysing the experience of employees in their workplace through assessment tools.

outcome of comparing the effectiveness of supporting the 21 activities in the office versus at home (Hobbs, 2021). While Ericsson's focus is on envisioning new office spaces' functions, their model offers crucial insights into how domestic settings should be modulated by tasks and behaviors. Furthermore, by prioritizing the relationship actions-workplaces, reconfiguring existing spatial configuration can be more socially and economically sustainable.

4.2. Spatial Pattern of Use

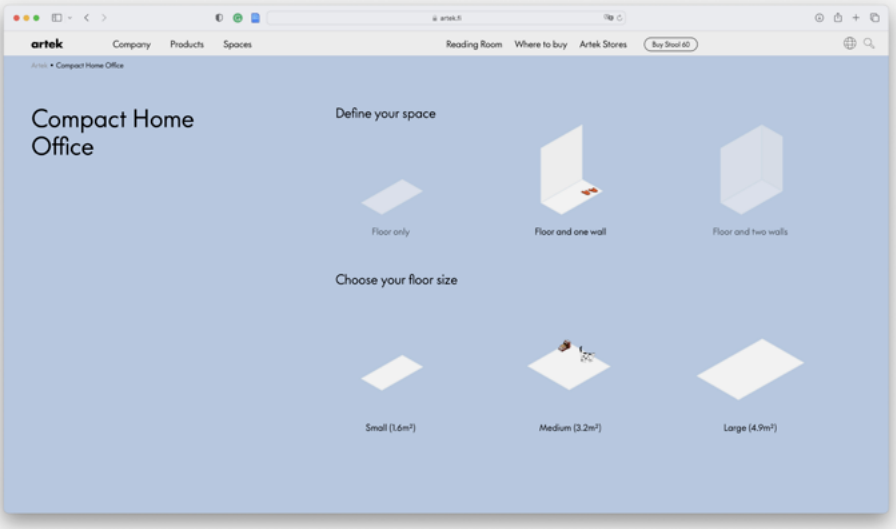
A notable distinction between home and office lies in the level of personalization and identification. In offices, employees have a limited range of workspace personalization, often confined to their workstations. Conversely, homes allow owners creative freedom, reflecting their personality while still fostering a sense of security. However, in a home-work setting, personal space needs to be both virtually connected and physically enriching (Crawford, 2020). This multidimensional spatial role highlights the significance of domestic space distribution. Two main patterns of use can be identified (Holliss, 2012):

- Multi-use space: No differentiation is made between paid work and daily domestic activities.
- Dedicated workspace: A rigid division is made between paid work and domestic/leisure pursuits. It is not allowed for paid work to migrate into living spaces (or other areas of the house), and vice versa.

It has been understood that people who have a dedicated work area at home experience better home working condi-

tions than those working from a non-work-specific setting (Hobbs, 2022). For the latter group, it is crucial to design customized solutions that improve work quality while preserving living comfort. On the one hand, companies in the office furniture sector (such as Steelcase, Vitra, Herman Miller, Knoll) are integrating in their product catalogue a new environment, that of the Home Office. Their products do not change but they are proposed in a "unusual" context. Knoll, for example, offers on the website six combinations of their products to create different solutions – from the "work nook" to the "flexible retreat" – within the home environment to satisfy work needs.

On the other hand, design companies that have always maintained a focus on domestic furnishing have enriched their product catalogue by adding the concept of work to the one of well-being and comfort: standing desks, ergonomic chairs, storage units and sound absorbing wall dividers emerge as key components to make the home a place for work. In this field, Ikea has put a lot of effort on its product range. If in the catalogues from early 2010s the section on the workspace was integrated into the bedroom furniture (IKEA Museum, 2023), from 2022 they have been dedicating an entire brochure and section on the website to the activity of working from home. Also, the design company Artek has introduced *The Compact Home Office,* a tool that through a series of simple questions can suggest tailored office areas to be created in the available home space (Fig. 3). The tool spans from compact 1.6m^2 spaces to more spacious 5m^2 areas, suggesting element compositions based on existing walls (Fig. 4) (Artek, 2022).



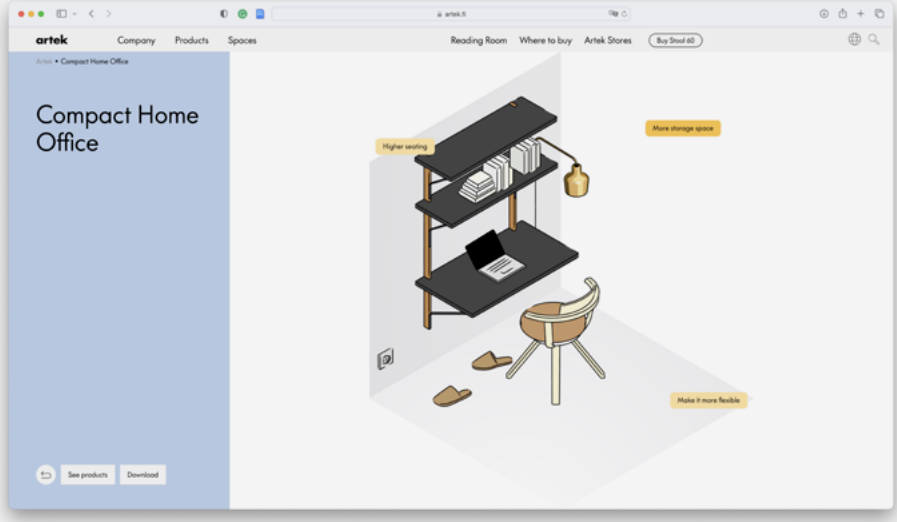


Figure 3. Interfaces of the Compact Home Office Tool. Artek.

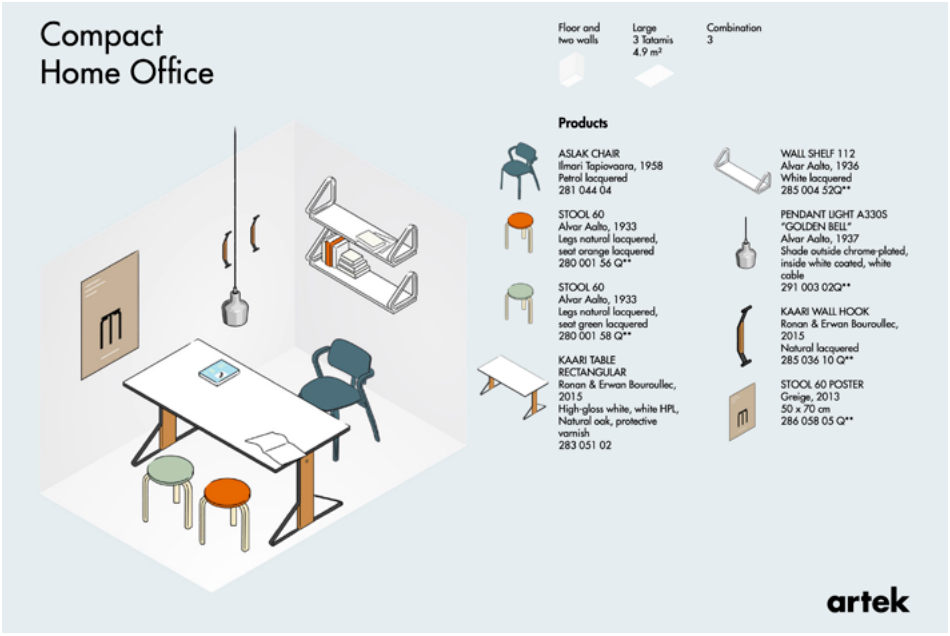


Figure 4. Brochure provided by Artek once the configuration of the home office is complete. The arrangement of Artek furnishing accessories is accompanied by their description.

These companies share the vision of a domestic space that does not necessarily have to change but declines to new uses. However, there is yet no integration in terms of flexibility and frequency of use: existing solutions offer furnishing products able to dialogue with the domestic environment in terms of formal language. In a hybrid perspective where working from home is a feasible option, it must be understood that a dedicated workspace is not used every day. It is necessary to comprehend how and when it is used, to define a more integrated system within the domestic walls. To achieve more integrated solutions, design companies and work organizations should dialogue to envision connections among personal needs, work activities, and furniture requirements.

4.3. Furniture Semantics

Before the pandemic, the room setup was defined according to distinct functions: kitchen for food preparation and consumption, dining area for eating meals and having convivial moments; living room for leisure and entertainment; and bedroom for rest and quiet. During the pandemic, these boundaries have become a lot more malleable, with single rooms working as hybrid and flexible spaces.
Just as rooms have undergone a transformation to accommodate home-based work, furniture items have similarly shifted in their semantic meaning. In particular, three emblematic domestic objects have seen a transformation from their traditional use: the dining table, sofa, and bed.

Among furnishings, the table exemplifies the hybridity of home and work. Becoming the focal point for domestic, work, and learning activities, the table shift has contributed to the dissolution of the traditional workstation and dining room archetypes (Barber & Osgerby, 2020).
Softer fabrics and warmer colors of the home have questioned work seating comfort. Particularly fitting is Edward Barber and Jay Osgerby's project, *Soft Work* (2018). According to the designer, the daily use of laptops, smartphones, and tablets at home has turned sofas into common workspaces. Soft Work is both a spatial concept and a product of furniture design; it's a sofa-as-office system in which table workstations are focused around a seating landscape. It is a vision that combines the office as a public and shared space and work as a less formal activity. It's a modular platform where technology is integrated but not embedded.

Technology and work have also invaded the bedroom, and the bed is now considered an epicenter of productivity; it represents a horizontal architecture where people foster efficient work-rest cycles while improving outcomes (Colomina, 2014). As for the table and the sofa, the bed is now equipped with every possible communication technology.

5. It's Not Only a Matter of Space. Social and Cultural Implications

The analysis so far had the intent to focus on spatial and functional components impacting the domestic environment. However, design practices must consider the social factors influencing the behaviors of individuals and groups. In particular, when an organization's spatial structure – that also includes people – is more dispersed, greater emphasis is required on its formal and informal elements (Brandt, 1983). This includes mechanisms of coordination, supervision, group interaction, and individual routines.
The three categories mentioned above should be analyzed considering implications in the flexible/home scenario such as *temporal adjustments* and *transitioning rituals*.

5.1. Temporal Adjustments

Working from home requires rearranging domestic and work routines. Before the pandemic, the *Nine to Five* model (Budd, 2001) offered synchronized work, enabling communication and defining work-life boundaries. However, working from home allows flexibility in scheduling work tasks, especially if combined with improved work coordination among the team. Domestic settings have emerged as the ideal location to carry out

individual and focused work (Hobbs, 2022); as well, quiet hours – between 8-10 am and 6-8 pm – have seen an increase in work engagement (Spataro, 2020). This trend comes from the *lack of transitioning rituals* and by the possibility of home environments to structure the workday to personal preferences. This does not mean that every employee should freely choose when to work: establishing a range of hours in which it is mandatory to be "remotely" available, combined with flexible scheduling for the rest of the work day, can foster a better work-life balance. However, achieving such conditions requires considerable coordination and mutual trust among colleagues.

5.2. Transitioning Rituals

Rituals serve as transitions that people do to start the workday. In office settings, the commute acts as a transition between personal life and work. When working from home, the commute is absent and people need to find other activities to mentally shift roles. Additionally, the coffee break acts as another transitioning ritual: it represents an informal information exchange, that is not planned or structured, but that allows spontaneous communication and a "decelerated" social interlude, helping the shift between tasks (Barmeyer et al., 2019). Even if organizations are experimenting with virtual breaks, screen limitations only add to the feelings of community detachment and mental fatigue.

While these elements strongly influence the efficacy of home working scenarios, it should be considered that other social and human factors impact flexible work that are challenging to predict and manage. Variables like work nature and technology availability (Baruch, 1997), organizational culture,

managerial attitudes, individual personality, work attitude, and household characteristics contribute to the complexity of the system.

6. Conclusions

Companies are struggling to see homes as more than temporary workplaces due to control-oriented models. Ambiguity in flexible work terminology adds uncertainty on how organizations should adopt such practices. This also leads to questions about workplace regulations when tasks are done away from the default place of work.
Domestic spaces are becoming more work-friendly reshaping the perception of home furnishings. Unlike traditional offices that favor clean, formal, and repetitive setups, remote work allows greater personalization, enhancing motivation and self-commitment. In this perspective, the management of spaces and patterns of use is in the hands of the employee, who can modulate the space according to their preferences. Here, too, we need to clarify the support required by companies to accommodate work-friendly environments.

To improve home office layouts and furniture arrangements, organizations must first focus on filtering work activities. Taking cues from activity-based offices (van Meel, 2020), we can extend this approach to homes and overall workspaces. Choosing a work location should match the task's environmental and behavioral needs, whether it requires autonomy, privacy, focus, or collaboration and interaction. This shifts flexibility from quantitative to qualitative; whereas until now flexibility has been looked at as a purely numerical benefit,

i.e., being able to work fewer days in the office, the focus has to move towards a combination of spaces, tools, and actions. Design practices are pivotal, leveraging quantitative and qualitative tools, like the Ericsson case study, to help companies gather and visualize behavior data. This data informs the testing of new strategies, incorporating communication tools that enhance information exchange and help organizations in managing complex systems (Gaiardo et al., 2022).

In the 80s futurist Toffler predicted a "home-centered society", where people work at home ensuring community stability, better environmental quality, and an evolution of the service industry. The contribution goes against this vision to argue a system where work will be neither fully here nor there, and domestic spaces will be involved only when specific conditions are met.

References

Aksoy, C. G., Barrero, J. M., Bloom, N., Davis, S. J., Dolls, M., & Zarate, P. (2023). *Working from Home Around the Globe. 2023 Report*. (Report No. 53). EconPol Policy Brief. https://www.econpol.eu/sites/default/files/2023-07/EconPol-PolicyBrief_53.pdf

Allen, T., & Henn, G. (2006). *The Organization and Architecture of Innovation* (1st ed.). Routledge. https://doi.org/10.4324/9780080545370](https://doi.org/10.4324/9780080545370)

Area Centro Studi. (2021). *Lo smart working in numeri*. (Report No. 04/2021). Assolombardia. https://www.assolombarda.it/centro-studi/smart-working-2021

Artek. (2022). *Artek - The Compact Home Office*. https://www.artek.fi/en/stories/the-compact-home-office

Ahrentzen, S. (1987). *Blurring Boundaries. Socio-Spatial Consequences of Working at Home*. Center for Architecture and Urban Planning Research Books. https://dc.uwm.edu/caupr_mono/36

Barber, E., & Osgerby, J. (2020). *Soft Work. The Newspaper About Work*. Vitra. https://www.vitra.com/it-it/professionals/projects/themes/soft-work

Barmeyer, C., Mayrhofer, U., & Würfl, K. (2019). Informal Information Flows in Organizations. The Role of the Italian Coffee Break. *International Business Review*, *28*(4), 796–801. https://doi.org/10.1016/j.ibusrev.2019.04.001

Baruch, Y., & Nicholson, N. (1997). Home, Sweet Work. Requirements for Effective Home Working. *Journal of General Management*, *23*(2), 15–30. https://doi.org/10.1177/030630709702300202

Brandt, S. (1983). Working at Home. How to Cope with Spatial Design Possibilities Caused by the New Communication Media. *Office Technology and People*, *2*(1), 1–13. https://doi.org/10.1108/eb022618

Budd, C. (2001). The Office. 1950 to the Present. *Workspheres. Design and Contemporary Work Styles*, 26–35. https://www.moma.org/interactives/exhibitions/2001/workspheres/swfs/theOffice.pdf

Bettaieb, D. & Alawad, A. (2018). Considerations of Interior Design in Domestic Space between Multiplicity of the Concepts and Determination of Constants. *Art and Design Review*, *6*(1), 48–60. https://doi.org/10.4236/adr.2018.61005

Colomina, B. (2014). *The Century of the Bed*. Verlag für Moderne Kunst.

Crawford, I., (2020, August 8). *The Domestic New Deal*. Vitra. https://www.vitra.com/en-pt/magazine/details/the-domestic-new-deal

Cuerdo-Vilches, T., Navas-Martín, M. Á., & Oteiza, I. (2021). Working from Home. Is Our Housing Ready? *International Journal of Environmental Research and Public Health*, *18*(14), 7329. http://dx.doi.org/10.3390/ijerph18147329

Gaiardo, A., Remondino, C., Stabellini, B., & Tamborrini, P. (2022). *Il design è innovazione sistemica. Metodi e strumenti per gestire in modo sostenibile la complessità contemporanea: il caso Torino.* LetteraVentidue Edizioni.

Hobbs, L. (2021, November 22). *Ericsson. Personal Preference for the Future Workplace*. Leesman. https://www.leesmanindex.com/ericsson-personal-preference-for-the-future-workplace/

Holliss, F. (2012). Space, Buildings and the Life Worlds of Home-Based Workers. Towards Better Design. *Sociological Research Online, 17*(2), 1–37. http://www.socresonline.org.uk/17/2/24.html

IKEA Museum. (2023). *IKEA Catalogue*. https://ikeamuseum.com/en/explore/ikea-catalogue/

International Labour Organization. (2020). *COVID-19. Guidance for Labour Statistics Data Collection*. International Labour Organization. https://www.ilo.org/global/statistics-and-databases/publications/WCMS_747075/lang--en/index.htm

Lund, S., Madgavkar, A., Manyika, J., Smit, S., Ellingrud, K., & Robinson, O. (2021, February 18). *The Future of Work After COVID-19.* McKinsey & Company. https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19

Newport, C. (2020, May 26). Why Remote Work Is So Hard—and How It Can Be Fixed. *The New Yorker*. https://www.newyorker.com/culture/annals-of-inquiry/can-remote-work-be-fixed

Nilles, J. M. (1994). *Making Telecommuting Happen. A Guide for Telemanagers and Telecommuters*. Van Nostrand Reinhold.

Schiff, F. W. (1979, September 2). Working at Home Can Save Gasoline. *The Washington Post*. https://www.washingtonpost.com/archive/opinions/1979/09/02/working-at-home-can-save-gasoline/ffa475c7-d1a8-476e-8411-8cb53f1f3470/

Spataro, J. (2020, June 8). The Future of Work. The Good, the Challenging & the Unknown. *Microsoft 365 Blog*. https://www.microsoft.com/en-us/microsoft-365/blog/2020/07/08/future-work-good-challenging-unknown/

Sperati, A. (2021, July 16). Lo smartworking. Così vantaggioso da restare dopo la pandemia? *Economia Comportamentale*. https://www.economia-comportamentale.it/2021/07/16/lo-smartworking-cosi-vantaggioso-da-restare-dopo-la-pandemia/

Teevan, J. (2021). *The New Future of Work. Research from Microsoft into the Pandemic's Impact on Work Practices*. Microsoft Research. https://www.microsoft.com/en-us/research/uploads/prod/2021/01/NewFutureOfWorkReport.pdf

Toffler, A. (1980). *The Third Wave. The Classic Study of Tomorrow*. Bantam.

van Meel, J. (2020). *The Activity-based Working Practice Guide* (2nd ed.). ICOP. https://www.fsre.is/media/fsr-eldri/ABW-practice-guide-2nd-edition.pdf

Vitra (2021). *New Dynamics in the Home*. Vitra.

Waters-Lynch, J. (2020, April 7). 50 Years of Bold Predictions about Remote Work. It isn't All About Technology. *The Conversation*. https://theconversation.com/50-years-of-bold-predictions-about-remote-work-it-isnt-all-about-technology-135034

Wilkinson, C. (2019). *The Theatre of Work*. Frame Publisher.

Yang, E., Kim, Y. and Hong, S. (2021). Does Working From Home Work? Experience of Working From Home and the Value of Hybrid Workplace Post-COVID-19. *Journal of Corporate Real Estate, 25*(1), 50–76. https://doi.org/10.1108/JCRE-04-2021-0015

Zurlo, F., Maurer, D., & Pei, X. (2020). *Home Bridges the World. Promising Domestic Scenarios in Response to the Covid Crisis*. Creative Industries Lab. Politecnico di Milano. https://www.designplusstrategies.polimi.it/home-bridges-the-world-promising-domestic-scenarios-in-response-to-the-covid-crisis/

Vicarious Domestic States
The Post-Domestic Turn of Digital Twinning Habitual Settings

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Abstract
The desire to live vicariously, mirroring behavioural conditions external to one's own home, gives each home multiple lives in a hyper-functional world. Technology's fusion with the home produces two outcomes. First, the ability to capture comprehensive, three-dimensional records of a home's physical conditions and traces using light detection and ranging (LiDAR) data, connects functional layout more concretely to behavioural scripts. Second, virtual mirroring converts transferable information about the home from generalities to hyper-specific singularities. A home's digital twin can contribute to archives of domestic conditions disseminated as assets for access, download, and manipulation in other media. Behavioural simulation and gaming can simulate exact domestic conditions from throughout the world, rather than interpreted approximations.
This paper draws on projects developing digital twins of homes in several locations in Hong Kong. Researchers are using 3D scanning technology to record homes in public housing flats and in the stilt house architecture of Tai O Village. The paper discusses technology and workflows employed, theorizing the technological and social impacts of domestic digital twins in data archives. The paper uses graphic precedents to demonstrate archiving protocols and speculate on influences the post-digital turn will have on domestic environments and behaviour.

1. From Interior to Interface to the Hyper-Technical Interior

> […] hyper-functional infrastructure […] functions within the defined or assumed parameters of its design – not the least of which is the enrollment required of a user to engage with and through a given infrastructure – but does so in such a way as to yield unexpected experiential outcomes for the user […].
> (Seberger & Bowker, 2021)

The possibility of stepping virtually into others' lives or situations, gives the home many roles in a hyper-functional world. Industrialization has significantly changed human-building relationships (Klepeis et al., 2001). Humans spend more than 87% of their time in interiors, meaning human-building interaction significantly impacts human well-being through building performance and environmental design. Urban housing remains a resource commonly subject to forces beyond inhabitants' control, even as it remains a necessity. Moreover, domestic interiors face greater pressure from spatial and social challenges embedded in institutions that develop and specify them.

A home is regularly a product of urban planning and related design policy, often specified through standardised *models* that constrain design diversity. The conventional concept of home mostly emphasises utilitarian behavioural goals solidified through the past six decades. Parker Morris' (1961) publication *Homes for Today and Tomorrow*, illustrates this well, exploring the relationship between living space arrangement, outdoor areas, and street connections to individual needs. Morris' framework uses standard space allocations to

describe influences on living behaviour, which derive from analysis of heating and cooling loads, hallway layouts, open plan designs, dining spaces, living areas, bedrooms, bathrooms, and toilet requirements, categorized by family and single occupant residences. His discussion on design for use, appropriation, and functional layout particularly privileges working areas like kitchens, roof spaces, and storage. In contrast, lift spaces, private balconies, acoustics, and waste disposal are treated more critically.

Restrictions that lead to standardised models constrain dwellers' life quality, pressuring them to modify their behaviours, and/or adopt coping strategies to accommodate their needs using furnishings and design interventions. These individual changes aggregate into social-spatial and social-technical patterns, specific to groups, peoples, and cultures to become what Madden termed mutual differences (2010). In comparison, contemporary home interiors couple social and technical to develop creative spatial arrangements with evident differences between *as designed* and *as lived* conditions in three separate circumstances.

First, changes in behaviour manifest different approaches to living in differing volumes of space, and the proactive use of otherwise unused space in smaller spaces, leading to functional hybridity and diverse spatial appropriation practices. Second, technological integration in the home produces social-technical interdependence as the smart home paradigm manifests. This links domesticity to digital connectivity, along with automated and enhanced building services. Dwellers face

numerous technologies that can regulate energy control, waste disposal, air quality, health, information delivery, and security, making homes increasingly socio-technical artifacts (Soyacool & Del Rio, 2020). Sebergers & Bwoker (2021) also suggest this will change the home's user performativity, coupling interior behaviour to mobile technologies – smart phones, activity trackers, and GPS – in a seamless interface-based model. Interactions in this change will gradually generate detailed, granular descriptions of lived conditions.

Third, and most radically, is the possibility of hyper-functional domesticity describe in Seberger & Bwoker (2021). This entails a fusion between human experience and infrastructure as a full union of the social and technical. As technology use and data collection aggregates across large bodies of users, data transfer to infrastructure internalizes spatial context to series of user-based and customized interface experiences. According to Chambers et al. (2016), cultural codes inform cognitive mapping of dwelling interiors, which influences how users judge spatial utilisation and their ability to accept home design conditions. Hyper-functional environments move culturally informed behaviours and spatial reproduction to their logical conclusion: the social-technical, hyper-functional state leads dwellers' spatial mapping to depend less on cultural coding, as it can replace and re-map physical contexts with immersive interfaces that displace contextual constraints on meaning, usage, interaction, and contextual constraints. As a result, dwellers' behaviours reorient to their interior world, provoking design interventions and volumetric adaptation outside their cultural context and geographic social-technical norms (Coburn et al., 2020).

2. Hyper-Functional Interiors. Digital-Twining

Digital infrastructure is expanding to become crucial to human-technology integration in human systems (Hustad & Olsen, 2021). It connects residents, researchers, datasets, and governments, leading to cross-disciplinary conversations and informing policymaking. Further, interactions between actors organize and improve development systems to promote flexible housing models that address dwellers' behavioural needs. Digital infrastructure for domestic spaces can make social issues and pain points more tangible through data aggregation and trend mapping.

This social-technical relationship between home and data (Henfridsson & Bygstad, 2013), is critical to improve design: in dense settings, data captured on household behaviours can highlight conflicts between as-lived and as-designed conditions. The difficulty lies in capturing this highly contingent data, and summarizing its content into meaningful insights. In this effort, our research demonstrates two possibilities. First, the feasibility of collecting three-dimensional records of a home's physical conditions, including functional layout and behavioural traces using LiDAR. Second, the possibility of virtual mirroring to virtually describe the home's hyper-specific character in a digital twin. The exactness of these records has additional implications, as discussed below.

A digital twin, as coined by Michael Grieves in 2014, is a virtual representation of a physical system with virtual connections between the two. This premise provides significant opportunities for the design and management of the built

environment (Dhar, Tarafdar, & Bose, 2022). Digital twinning has seen use in intelligent manufacturing, environmental disaster response, and urban planning, where virtual models are connected to real-time conditions to inform and support monitoring, forecasting, and decision-making. Wildfire (Batty, 2018) differentiates between digital twins that act in real time, at high-frequency, or at low-frequency. As urban modelling aims to integrate physical, social, and economic modelling, digital twins help to connect functional and structural elements of the urban environment at differing levels of resolution. High-frequency models function in real time, aligning in seconds or minutes, and cycling over days or months. Low-frequency models, conversely, report more slowly and cycle over years, decades, centuries, or longer.

Recently, researchers have implemented LiDAR in digital twinning, significantly changing data gathering on the built environment. Unlike other types of survey modelling, LiDAR scanning describes conditions with significantly higher precision, allowing greater insight and response to urban conditions. Use of this technology in the home, and more so to describe interior characteristics however, has not been well explored. The main objective of this article is to explore digital twinning in residential environments, and theorize the ramifications, benefits, and obstacles related to this premise. As digital twins encompass both physical and behavioural characteristics of an environment, the possibility of implementing them in the home, given the complexity of homes' as adaptive environments discussed above, implies many possibilities and challenges.

For example, LiDAR models of the home could support energy use monitoring to improve energy efficiency, as researchers could scrutinise dwellers' patterns of behaviour, and related energy consumption through use of heating, cooling, and lighting technologies. The technology also allows simulation of home automation and internet-of-things integration with greater detail. LiDAR scans allow designers and architects to precisely model pre-existing homes, making the possibility of post-occupancy integration of home automation and other complex technologies more feasible. Combined with digital modelling and rendering, the technology would allow dwellers to visually experience design interventions with full digital clarity as well, mitigating expense from later renovation and changes.

Still, implementing digital twinning in home setting presents some obstacles and issues. Privacy and security protection is a key concern, as LiDAR scans of a home environment include significant amounts of private information that could jeopardize dwellers' safety. Data handling and security is therefore of upmost importance, requiring explicit, established standards for storing and transferring LiDAR scan data. Further, the complexity of the technology and the need for extensive training in its use remains an obstacle. Most LiDAR scanning platforms require use of manufacturer proprietary software, meaning file compatibility and expertise barriers to widespread use persist. Given the increasing affordability and accessibility of the technology, and the greater availability of user-friendly tools, it is still likely to see widespread acceptance in architecture, real estate development, and related fields.

In summary, the use of LiDAR for digital twinning in residential environments presents significant opportunities for enhancing energy efficiency, enabling home automation, and optimising architectural design. This technology supports monitoring, simulation, and control by generating comprehensive virtual reproductions of physical space. It is, nevertheless, important to acknowledge obstacles of data protection, the cost of the technology, and dissemination of expertise in its use. The use of LiDAR to create digital twins can revolutionise how we understand, engage with, and improve domestic surroundings, helping us create more sustainable, comfortable, and well-designed homes. This potential will likely increase as the technology improves and becomes more available.

3. 3D Scanning Interior Contexts

An imbalance between demand and supply influence by commercial pressure on space leads to “square foot-driven living” (Bruyns, 2018), in which occupants appropriate space tactically, often in volumetric ways invisible to traditional spatial planning. In hyper-dense, spatially compressed environments, imaging and understanding dwellers’ spatial use behaviour in an aggregated sense, such that meaningful patterns can be seen, requires volumetric description. As each inhabitant’s lived condition is unique by definition, researchers must convert behavioural descriptions into data that can be categorised such that patterns in difference between as-designed and as-lived conditions can be seen. 3D scanning technology offers a unique possibility for this work, as it allows researchers to spatialize behavioural descriptions volumetrically and in greater detail.

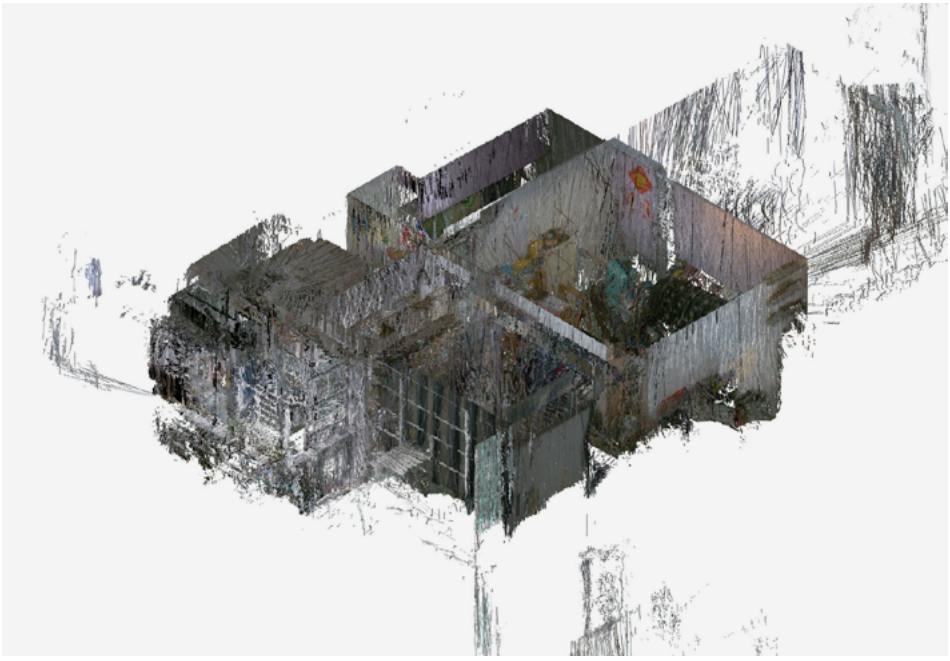

Figure 1. Bruyns, Volumetric Behavioural Analysis, exterior of digital twins, for high rise public dwellings, 2023.

Precursory research in this effort began in Tai O Village, where researchers used the Leica BLK2GO LiDAR and photogrammetry platform to scan twenty stilt houses, examples of threatened vernacular architecture that remain occupied. This effort, concurrent with ethnographic interviews with dwellers in each house, demonstrated the feasibility of recording physical dwelling traces using the technology. In the scan of each house, details of residents' possessions, fixtures, and furnishings are visible such that researchers can describe spatial programming areas and even material and colour details of the space. As such, we knew this specific technology could support research efforts designed to describe relationships between original home designs, behavioural adaptations, and

ongoing lived conditions more granularly. We opted to conduct this research by sampling occupied flats in public housing developments in Hong Kong, both because these flats are designed using models, and because of the potential impact improving their design could have.

4. Volumetric Behaviour Analysis

Variables chosen to describe these differences are a combination of quantitative and qualitative descriptions. First, design and construction documentation for public housing estates allows us to model the as-designed condition and extract a *volume-as-designed* figure in meters cubed (m^3). After scanning a flat, we can compare this to the volume dwellers have remaining for use after adding furnishings and possessions, a "volume-as-lived" figure. Hypothetically, variations in the difference between these figures could indicate the suitability of flat designs, as higher levels of difference may indicate greater need for dweller adaptation through furnishings and other means. Researchers can also annotate point clouds in 3-dimensions to spatialize more descriptive data from coded photography, in which dwellers annotate objects in their home to describe their uses and associated behaviours. With qualitative descriptions located within each point cloud, summary of prevalent themes and trends in these descriptions, referenced against statistical comparison of their location, can describe significant trends in how flat residents adapt their as-designed conditions to accommodate their needs.

We call this technique Volumetric Behaviour Analysis (VBA) to describe the localization and description of behavioural

descriptions in fully three-dimensional space, as opposed to through localization in 2-dimensional orthographic projections. This difference has important implications for normative architectural representations, and what they do and don't record about pre- and post-occupancy use behaviour. Especially when orthographic projections used to design domestic spaces are visualized and localized in the digital model, VBA allows us to describe differences between the orientation and location of drawings and the location and constraints of dweller behaviour. As drawing production relies on industry norms, which can apply a finite number of projections in a finite number of locations, there are limits on how well they can respond to or anticipate dweller behaviour. They also, depending on design briefs and processes, may prioritize assembly and installation constraints over user behaviours.

Where orthographic projections do anticipate behaviour, localizing them volumetrically allows VBA to describe how effectively they support dwellers' spatial use. We contend that this will show potential in housing sciences and application through building information modelling (BIM). BIM models informed by this analysis could feed back to designers on how dimensional, material, or even colour choices may impact user behaviour. As the technology advances and these data can be temporalized, the technique could offer more detailed descriptions and even support design for adaptive spaces that respond in real time.

Figure 2. Elkin, Tai-O stilt House Case Study, Digital twin's interiors expression of free-standing buildings, 2023.

Figure 3. Bruyns & Elkin, Digital twin's comparison for freestanding and high-rise public dwellings, 2023.

5. Conclusion

In conclusion, we emphasise the role of the hyper-functional to re-map physical contexts with immersive interfaces that displace contextual constraints on meaning, usage, interaction, and their surroundings. First, the positioning of digital twinning as a potential foundation for digital infrastructure fully expedites the digital turn for domestic settings. Similar to the linking of the social with the technical, in what we term Volumetric Behavioural Analysis, the coupling of LiDAR point clouds to describe residential behaviour in space challenges the normative ranges associated with complex discursive assemblies that constrain spatial and social behaviour of housing models. Further, this constraint can become entrenched as their impact on dwellers' well-being is highly contingent and can be dismissed as in-actionable in the context of industrial housing production and urban development. This technique presents, therefore, a way to clearly describe the breadth and depth of behavioural difference within highly instrumentalized housing models such that it can be used, shared, and accessed by diverse stakeholders.

Second, the appropriation of the digital infrastructure extends the applicability of digital twinning to heritage and preservation, developing historical records of spatial behaviour in settings for generations to come. The vicarious possibilities linked to spatial heritage, of reliving spaces and settings, places the socio-economic landscape on equal footing, allowing for identical engagement with interiors and habitual types. Experiences of pro-poor dwellings or subdivided homes will find equal ground in comparison to middle scale housing or super villas and the ultra-extravagant.

Third, with research ongoing, VBA linked to digital twinning exposes latent criticalities associated with the qualities and characteristics of the domestic. In the framework of Smith (1994), digital twinning requires further questioning of interior qualities as privacy, self-expression, personal identity and social warmth as personal preferences through interior expression.

And finally, digital twins for the interiors, is in our view indiscriminate of scale, allowing for the countless twinning possibilities across geographical settings. As such digital twinning may pave the way as global metric, establishing norms, standards and experiential registers increasing impact across design sciences equal to social spatial theories, and better understanding of the diversity and range of domestic living conditions and behaviours.

6. Acknowledgements

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References

Batty, M. (2018). Digital Twins. *Environment and Planning B. Urban Analytics and City Science, 45*(5), 817–820. https://doi.org/10.1177/2399808318796416

Bruyns, G. (2018). Tactical Interiority. Hong Kong's "Lived" Interiors as Praxis for Tactical Living in High-Density Landscapes. *Interiors. Design, Architecture, Culture, 9*(3), 346–371. https://doi.org/10.1080/20419112.2019.1642571

Chambers, E., Low, S. M., & Rapoport, A. (2016). *Housing, Culture, and Design. A Comparative Perspective*. University of Pennsylvania Press.

Coburn, A., Vartanian, O., Kenett, Y. N., Nadal, M., Hartung, F., Hayn-Leichsenring, G., Navarrete, G., González-Mora, J. L., & Chatterjee, A. (2020). Psychological and Neural Responses to Architectural Interiors. *Cortex, 126*, 217–241. https://doi.org/10.1016/j.cortex.2020.01.009

Committee, P. M. (1961). *Homes for Today and Tomorrow*. His Majesty's Stationery Office.

Dhar, S., Tarafdar, P., & Bose, I. (2022). Understanding the Evolution of an Emerging Technological Paradigm and Its Impact. The case of Digital Twin. *Technological Forecasting & Social Change, 185*, 122098. https://doi.org/10.1016/j.techfore.2022.122098

Henfridsson, O., & Bygstad, B. (2013). The Generative Mechanisms of Digital Infrastructure Evolution. *MIS Quarterly, 37*(3), 907–931. https://doi.org/10.25300/MISQ/2013/37.3.11

Hustad, E., & Olsen, D. H. (2021). Creating a Sustainable Digital Infrastructure. The Role of Service-Oriented Architecture. *Procedia Computer Science, 181*, 597–604. https://doi.org/10.1016/j.procs.2021.01.210

Klepeis, N., Nelson, W., Ott, W., et al. (2001). The National Human Activity Pattern Survey (NHAPS). A Resource for Assessing Exposure to Environmental Pollutants. *Journal of Exposure Science & Environmental Epidemiology, 11*(3), 231–252. https://doi.org/10.1038/sj.jea.7500165

Madden, R. (2010). *Being Ethnographic. A Guide to the Theory and Practice of Ethnography*. SAGE.

Seberger, J. S., & Bowker, G. C. (2021). Humanistic Infrastructure Studies. Hyper-Functionality and the Experience of the Absurd. *Information, Communication & Society, 24*(12), 1712–1727. https://doi.org/10.1080/1369118X.2020.1726985

Sovacool, B. K., & Furszyfer Del Rio, D. D. (2020). Smart Home Technologies in Europe. A Critical Review of Concepts, Benefits, Risks and Policies. *Renewable & Sustainable Energy Reviews, 120*, 109663. https://doi.org/10.1016/j.rser.2019.109663

Smith, S. G. (1994). The Essential Qualities of a Home. *Journal of Environmental Psychology, 14*(1), 31–46. https://doi.org/10.1016/S0272-4944(05)80196-3

The Scenography of Everyday Theater

A New Narrative of Domesticity

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Keywords
Domestic Spaces, Scenography, Narrative, Social Media, Technology.

Abstract
With the increasing rise of the Internet, as well as the democratization of technology, people's pursuit of entertainment and visual stimulation inspired countless new types of creativity. Social media fanatics have surged a myriad of content-creating works that brought this creativity to the forefront; this phenomenon has transformed everyday spaces into settings or backdrops for new narratives. The everyday domesticity we inhabit, such as bodies, activities, objects, furniture, and rooms, have all been involved in the process of creation and work, and these spaces can be described as *Everyday Theater*.
The term *scenography* is of Greek origin, *skēnē*, meaning hut or tent, in the theater of ancient Greece, it is a light structure usually at the back of the stage, but over the course of time *skēnē* underwent fundamental change. The core concept of scenography is the *narrative*. This core remains even though it is now given a new meaning, as everyday life has become a stage for a new kind of spectacle. In other words, the conventional domestic spaces are re-invented as a setting for new personal narratives and commercial venues. In this context, the domestic spaces have been transformed into a platform, where the performers use their surrounding elements, objects, spaces, homes, and environments as settings for their own narrative. The goal is to create an immersive experience that captures the audience's attention and transports them into a world that is both familiar and extraordinary.

1. Introduction

The 21st century has witnessed a seismic shift in the way we perceive and interact with the world around us, and this transformation is intrinsically linked to the democratization of technology and the rise of social media platforms.

With the rapid growth of technology and the internet in recent years and the popularity of social media at an unprecedented rate, people's pursuit of entertainment and visual stimulation inspired countless new types of creativity. One of the significant phenomena of this new creativity is that it gives rise to countless new jobs called *content creators*. The unique characteristics of this emerging work make our home, once a private sanctuary, become a stage for global audiences.

This paper proposes a critical examination of the evolution of domestic spaces within the context of this socio-technological revolution. It seeks to unfold the emerging narrative of domesticity shaped by the pervasive influence of social media and the democratization of technology; provides a novel perspective on the changing landscape of domestic space, asserting the growing importance of performative and interactive elements; and invites a redefinition of domesticity, facilitating an understanding of how we can design homes that genuinely reflect and cater to our evolving ways of living in the digital age.

2. The Democratization of Technology and the Rise of Social Media

On January 9, 2007, Steve Jobs went onstage at the San Francisco Moscone Center and told the world he had reinvented the telephone. He showed the rapt audience a small, slim, elegant-

ly simple object about the size of a cigarette case; the world soon learned to call it by its name: *iPhone* (Baricco, 2006). When Steve Jobs took a picture of the 2-megapixel camera on the iPhone, then placed his thumb and index finger together on the screen and slowly opened them up, showing the audience how to zoom in on a picture, the house exploded. This moment marks a pivotal moment in the history of technology, the starting point of the new era when machines became extensions of human minds and bodies (Baricco, 2006).

One of the most notable aftermaths of this revolutionary event was how cell phone cameras and touchscreens put social media at the fingertips of anyone, who now can share anything with the world with astonishing ease and speed, anywhere, at any time. Just take YouTube and Facebook as examples since they were born around the same time as the first generation of iPhone was launched in 2007. YouTube, now the second most popular website in the world, was born in 2005. The number of active users per month was 20 million in 2006; this number has multiplied eight times in two years, to 160 million in 2008, and according to the latest data in 2023, this number reached 2 billion (Dean, 2023). Nowadays, users watch more than 1 billion hours of content daily, as 500 hours of new content are uploaded each minute (Ceci, 2023). Facebook was born as a social network for college students in 2004, and in 2006, it opened up to anyone over 14 years old with an email address. It has become the most used social media platform worldwide, with almost 3 billion users (Dean, 2023).

3. From Entertainment to Career. The Social Media Content Creation and a Re-Definition of Space

As the popularity of these platforms grew, so did the opportunities they presented. What started as a hobby for many soon transformed into a full-fledged career. The number of people identifying as full-time content creators has increased tenfold in the last decade. The Social Media marketing industry, which heavily relies on content creators, is worth up to $15 billion by 2022, from $8 billion in 2019 (Franc Group PTY, 2022). The popularization of content creation, facilitated by technological advancements and social media platforms, has allowed individuals to carve out niches, build communities, and monetize their content in ways that were previously unimaginable. This shift has significant implications for industries, advertisers, and consumers alike, as the landscape of content consumption continues to evolve.

The rise of content creators in the digital business world presents both challenges and opportunities for the realm of the definition of space. As the tools for content creation are now widely accessible, these creative activities can take place anywhere, anytime, by anyone. Thus, the nature of production spaces began to evolve. The home we once lived in, the office we once worked in, and the city we once wandered around, all diffused into an environment, a *Productive Environment*.

4. Domestic Spaces in the Spotlight

Historically, domestic spaces were intimate sanctuaries designed to cater to the private lives of their inhabitants, with clear demarcations between areas for rest, recreation, and chores. The living room, bedroom, and kitchen each had their

distinct purposes. The home was once a passive setting where daily routines played out, largely hidden from the public eye. separate from the hustle and bustle of the workplace. These primordial needs emerge powerfully in the contemporary world, where expanded relational values have demonstrated their disruptive power (Fig. 1).

Figure 1. Richard Hamilton, *Just what is it that makes today's homes so different, so appealing?*, collage, Kunsthalle Tübingen, 1956.

Social media fanatics have surged a myriad of content-creating works that brought creativity to the forefront; this phenomenon has transformed everyday spaces into settings or backdrops for new narratives. The everyday domesticity we inhabit, such as bodies, activities, objects, furniture, and rooms, have all been involved in the process of creation and work, and these spaces can be described as *Everyday Theater*.

With the rise of platforms like Instagram, TikTok, YouTube, and much more, the private sphere has been thrust into the limelight. Homes are no longer just spaces for living; they are sets where content is produced, shared, and consumed by a global audience. Every corner, every piece of furniture, and every decor element becomes part of the scenography of this everyday theater.
Suddenly, sharing moments from one's living room, kitchen, or bedroom with the world became a daily routine for millions. The barriers to entry were lowered, and social media became an inseparable part of our daily lives. Once private realms for personal relaxation and family time, domestic spaces transformed into a new type of scenography under the spotlight.

5. The Everyday Theater. Domestic Spaces as Scenography

The digital world and social media profoundly reshaped our perception of domestic spaces. By analyzing the platforms on social media that use interior spaces as the main vehicle for creativity, exploring the reasons behind their popularity and the scenography roles that spaces play in the phenomenon, three main trends can be identified.

- **Peeking into Privacy:** The allure of domestic spaces in content creation lies in the inherent satisfaction derived from order, systemization, and the transformation of space. Social media has capitalized on this, offering glimpses into personal spaces and routines in various form and content, satisfying the audience's curiosity about the private lives of others, or in other words, the personal narrative of others' life.
- **Amplified daily activities**: Everyday domestic chores, when magnified and presented in the digital realm, attract vast audiences. The spatial significance here lies in the transformative power of design and arrangement, emphasizing the tactile and sensory experience of spaces.
- **Familiarity & Contrast:** Content creators have found success by juxtaposing familiar settings with unconventional activities. This duality, of the known and the unexpected, resonates with audiences, offering both comfort and intrigue.

5.1. The Curiosity of Privacy

Humans have always been curious creatures with a deep-seated desire to understand and connect with others. This curiosity extends to the most intimate and authentic Space of human beings in the contemporary world- their homes. To live is to leave traces (Benjamin, 2002, 1935); thus, domestic spaces are more than just brick and mortar; they are a reflection of personal stories, tastes, experiences, and memories.

In the interior, these are emphasized. An abundance of covers and protectors, liners, and cases are devised, on which the traces of objects of everyday use are imprinted.

The traces of the occupant also leave their impression on the interior. The detective story that follows these traces comes into being... The criminals of the first detective novels are neither gentlemen nor apaches but private members of the bourgeoisie (Benjamin, 2002, 1935, p. 38).

In the age of content creation, this private narrative has become a public spectacle, fulfilling the audience's desire to peek behind closed doors. The domestic space has transcended its traditional role. It's no longer just a place of residence; it's a narrative, a story waiting to be told and shared. The phenomenon of *peeking into privacy* underscores the human desire to connect, understand, and explore by a glimpse of domestic spaces of others.

A prime example of this trend is the content creators would ask random people on the street for a tour of their homes. These housing tours range from top-of-the-line apartments overlooking Central Park to converted mobile homes for parked buses, from quality design apartments with superior taste to messy and dirty shelter of depressed people. These tours provide insights into their personal lives, tastes, and choices, making the audience feel more connected to the house owner. Each episode is not just a culinary journey but an exploration of a unique domestic space, each telling a different story. Domestic space becomes a stage where personal narratives unfold (Fig. 2). The popularity of such content is not just about the different house tours; it's about the allure of seeing a deeply personal space and understanding the individual or family that inhabits it.

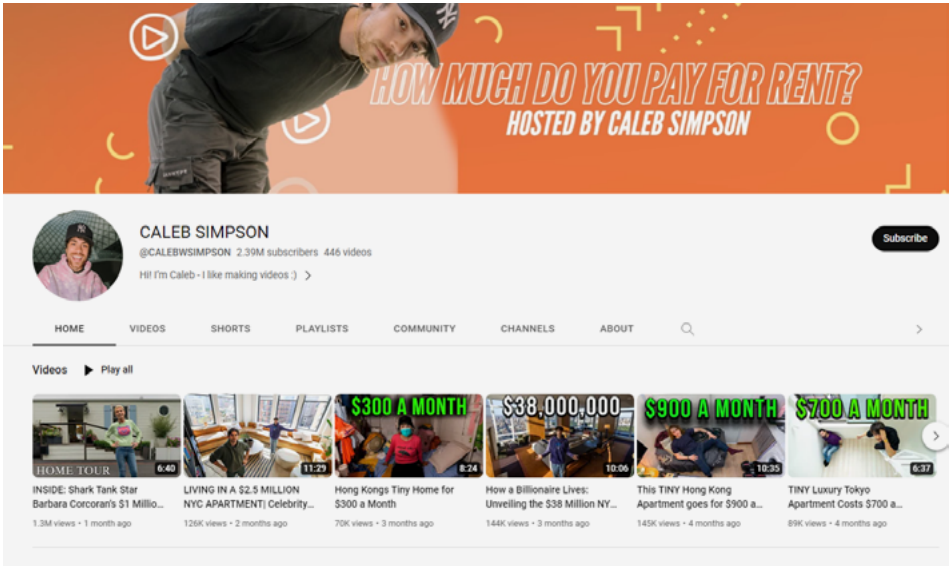

Figure 2. Caleb Simpson, *How much do you pay for rent?*, content creator who asks random people on street for a tour in their house and about how much they pay for rent, 2023. (Screenshot of YouTube page @calebsimpson).

The blurring of boundaries between personal and public spheres can erode the sense of privacy and sanctuary that homes traditionally provide.

5.2. The Allure of the Mundane

In the vast expanse of the digital realm, amidst the cacophony of viral challenges and sensational content, there lies a unique genre that magnifies the mundane: the amplified daily activities. From systemizing a pantry to folding laundry, everyday domestic chores are attracting hundreds of thousands, if not millions, of viewers (Fig. 3). But what drives this fascination, and more importantly, what does it reveal about the architectural value and significance of domestic spaces in contemporary society?

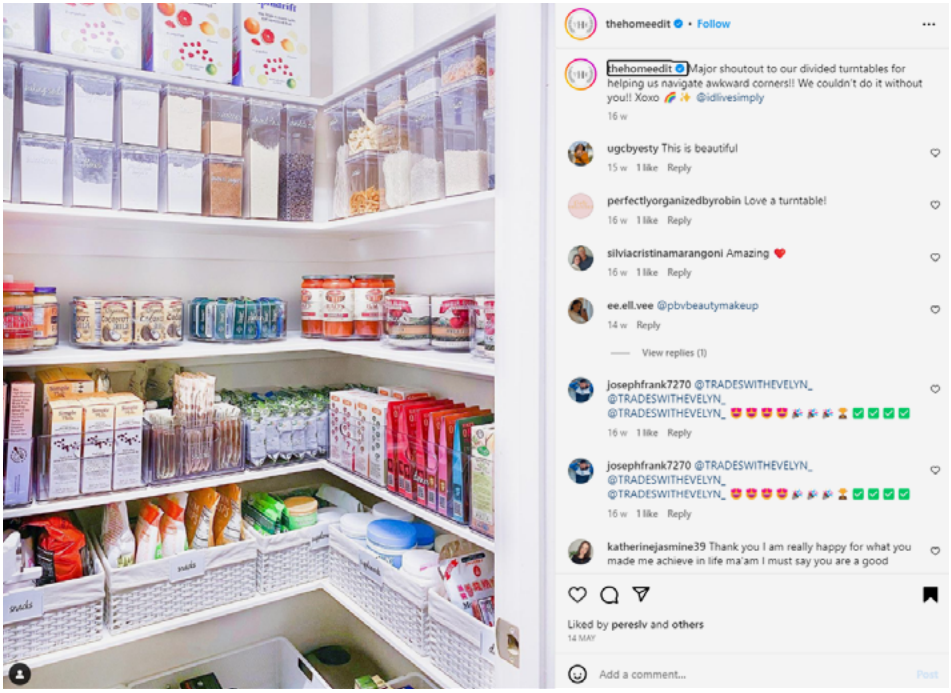

Figure 3. Clea Shearer and Joanna Teplin, *Home Edit*, social media account posting videos of organizing pantry in an extreme organized and satisfaction way, 2021. (Screenshot of Instagram profile @ thehomeedit).

At first glance, it might seem paradoxical. In an age of boundless digital content, why would someone choose to watch another person organize their pantry or clean their living room? The answer lies in the inherent satisfaction derived from order, systemization, and the transformation of Space. These contents speak to broader cultural and societal trends. In a fast-paced world, there's a growing desire for simplicity, authenticity, and a return to basics. Watching someone engage in a simple domestic chore offers a moment of respite, a break from the complexities of modern life. It's a reminder of the beauty and satisfaction found in everyday spaces and

the tasks in which they unfold. The phenomenon of amplified daily activities in the realm of content creation offers a unique lens through which to view and understand domestic spaces. It underlines the value of these domestic spaces, not just as static entities, but as dynamic, adaptable canvases that reflect and respond to human needs, desires, and routines. As social media continues to shape our perceptions and interactions with our domestic space, it's essential to recognize and celebrate the profound narratives embedded in mundane and everyday theater.

5.3. Familiarity vs. Conflict

As content creation emerges as a dominant force in the labor market, there's a fascinating trend that juxtaposes the familiar with the strange, creating a unique narrative that resonates with audiences worldwide. The allure of *Familiarity vs. Conflict* in content creation, exploring how the unconventional use of domestic spaces has become a hallmark of digital success. Domestic spaces, by their very nature, evoke a sense of familiarity. They are places of comfort, safety, and routine. When viewers watch content set in these spaces, there's an immediate sense of relatability. It's a kitchen, a living room, a balcony, a bedroom- spaces that most viewers have personal experiences with. This familiarity creates a connection, a bridge between the content creator and the viewer.

While the setting might be familiar, the activities that unfold within these spaces in the realm of content creation are often anything but. Cooking on a balcony, for instance, (Fig. 4) while engaging in conversations with neighbors by yelling, adds an element of familiarity together with conflict.

Figure 4. Ruben Bondì, *Aò, che te voi magnà oggi?*, Chef TikToker became famous for cooking Italian dishes required by neighbors on balcony, 2022. (Screenshot of TikTok profile @cocinaconruben).

In some context, like Southern Italy, it is something rooted in the tradition, and it represents a cultural symbol; but in the other context, it is something unexpected, unconventional, and breaks the norms of what one might anticipate in such a setting. Similarly, platform like Onlyfans provide an easy access for everyone to benefit from amateur adult videos, usually set in familiar, everyday domestic spaces challenge conventional aesthetics and expectations, adding a layer of raw authenticity and fantasy that are both familiar and conflictual that professional movie production settings often lack.

The success of content creators leveraging the dual appeal of *Familiarity vs. Conflict* underscores the evolving narrative of domestic spaces in the digital age. These spaces, once confined to conventional activities, are now stages where a myriad of stories unfold, each more intriguing than the last.

6. A Future of Architectural Design

The influence of social media on domestic spaces is profound, turning homes into a scenography on the stage for the everyday theater. As we create our spaces for this new narrative of activities, it's crucial to find a balance, ensuring that our homes remain places of genuine comfort and authenticity, even as they play a role in the global digital theater.

The influence of social media on the narrative of domesticity is undeniable. As work models evolve, so do our domestic spaces, reflecting the multifaceted roles they play in our lives. While this new narrative offers exciting possibilities, it's essential to strike a balance, ensuring our homes remain places of genuine comfort, rest, and personal expression. The characteristics of these shift to a new domesticity can be underlined by some key aspects:

- **Relatability**: The familiar setting of domestic spaces offers viewers a sense of comfort. It's a space they recognize and understand, making the content immediately accessible.
- **Curiosity**: The unconventional activities that unfold within this familiar settings pique viewers' curiosity. It's a deviation from the norm, and this strangeness keeps viewers engaged, wanting to see more.

- **Authenticity**: In a digital landscape often criticized for its curated perfection, the combination of familiar settings with strange activities offers a breath of fresh air. It feels real, unfiltered, and genuine.
- **Narrative Depth**: The juxtaposition of the familiar and the strange adds depth to the narrative. It tells a story, not just of the activity itself but of the broader context in which it unfolds. It speaks to the adaptability of domestic spaces and the myriad ways in which they can be used and interpreted.

Interior architecture plays a pivotal role in this transformation. Designers must now consider how spaces can be optimized for various activities, including work, leisure, and content creation. This involves a strategic layout of spaces, innovative use of furniture, and incorporation of technology to create adaptable and dynamic environments. The focus is on creating spaces that are versatile, visually appealing, and supportive of digital lifestyles.

The methodology in redefining these spaces involves a holistic approach, integrating architectural principles with insights from social media trends. Architecture must understand the evolving needs of inhabitants who engage in social media-based activities. This understanding informs the selection of materials, colors, lighting, and spatial arrangements, creating environments that are not only functional but also conducive to content creation and online engagement.

The Evolution of Functional Spaces:

- **Work and Living Integration**: with the advent of social media-based work, the traditional separation between living and working areas is blurred. Interior architecture must now design spaces that are both comfortable for living and efficient for work, incorporating elements like ergonomic furniture, soundproofing, and effective lighting.
- **Aesthetic Considerations for Online Presence**: the visual appeal of a space becomes crucial when it doubles as a setting for social media content. This requires a thoughtful selection of colors, textures, and materials that are not only trendy but also photogenic and capable of creating a distinctive online image.

Technological Integration:

- **Smart Home Features**: the incorporation of smart technology into domestic spaces is essential. This includes automated lighting systems, voice-controlled appliances, and integrated workstations, enhancing both the functionality and aesthetic appeal of the space.
- **Adaptable Spaces**: the design of transformable and multi-purpose areas that can easily switch between a personal living space and a professional backdrop for social media is key.

Methodological Approach:

- **User-Centric Design**: Understanding the specific needs of individuals who work from home and use social media

regularly is crucial. This involves engaging with the latest trends in digital work, lifestyle, and content creation.
- **Sustainability and Well-being**: integrating sustainable design principles and focusing on the well-being of the inhabitants is increasingly important. This includes using eco-friendly materials and ensuring that the design promotes a healthy work-life balance.

The intersection of technology, social media, and architecture offers a rich tapestry of opportunities and challenges. As we move forward, it's essential to approach design and research with a holistic perspective, understanding the multifaceted roles domestic spaces play in our lives. The future of architecture lies in its ability to adapt, innovate, and resonate with the evolving narratives of the digital age.

7. Challenges and Criticisms

In today's digital age, the merging of work and home environments has become increasingly prevalent, offering unparalleled flexibility and convenience. This fusion, facilitated by technological advancements and the rise of remote work, allows individuals to tailor their work schedules around personal commitments and preferences. However, this blending of spaces and roles is not devoid of challenges. The diminishing boundaries between one's personal and professional life can often result in an overwhelming sense of continuous work, leading to burnout and a diminished sense of work-life balance.

Furthermore, with the omnipresence of social media and its emphasis on visual aesthetics, there's an added pressure on individuals to maintain homes that aren't just functional but

also picture-perfect. This constant need for a visually appealing backdrop for virtual meetings or social media posts can be mentally exhausting, adding an unspoken stress to daily life. Critics have voiced concerns over this evolving narrative of domesticity. They argue that the portrayal of homes on platforms like Instagram or Pinterest often promotes a superficial understanding of what a home should be. Instead of being spaces of genuine comfort, relaxation, and personal expression, there's a growing emphasis on homes fitting a certain aesthetic mold, often sidelining the true essence of well-being and personal comfort.

Moreover, the concept of the *Scenography of Everyday Theater* further complicates this dynamic. While it undoubtedly offers avenues for creativity, personal branding, and self-expression, it also comes with its own set of challenges. The continuous need to curate one's life, to present a certain image or narrative, can lead to mental fatigue and a sense of detachment from one's authentic self. In essence, while the fusion of work and home has its merits, it's essential to navigate this landscape with awareness, prioritizing genuine well-being over digital perceptions.

References

Baricco, A. (2006). *The Game. A Digital Turning Point*. McSweeney's Books.

Bassanelli, M. (2020). *Covid-Home. Luoghi e modi dell'abitare, dalla pandemia in poi*. Lettera Ventidue.

Benjamin, W. (2002). Paris, the Capital of the Nineteenth Century. In H. Eiland, & M. W. Jennings (Eds.), *Walter Benjamin. Selected Writings 1935-1938* (Vol. 3, pp. 32-49). The MIT Press. (Original work published 1935)

Borasi, G. (2021). *A Section of Now. Social Norms and Rituals as Sites for Architectural Intervention*. Spector Books.

Floridi, L. (2016). *The 4th Revolution. How the Infosphere is Reshaping Human Reality*. Oxford University Press.

Goffman, E. (1959). *The Presentation of Self in Everyday Life*. Penguin Books.

MAIO. (2021, January). The Diffuse House. *E-Flux Architecture*. https://www.e-flux.com/architecture/confinement/373338/the-diffuse-house/

Preciado, P. B. (2014). *Pornotopia. An Essay on Playboy's Architecture & Biopolitics*. Zone Books.

Puigjaner, A. (2020, July). Towards a Diffuse House. *E-Flux Architecture*. https://www.e-flux.com/architecture/housing/333708/towards-a-diffuse-house/

Ratti, C., & Claudel, M. (2015). *Open Source Architecture*. Thames & Hudson.

Salvadeo, P., Calzoni, S., & Panarella, A. (2015). *ALT! Abitare/Lavorare/TempoLibero*. SMOwnPublishing.

Srnicek, N. (2017). *Platform Capitalism*. Polity Press.

Vanity Chamber
Reflections Upon Domestic Boundaries and Frontiers in a Post-Pandemic Home

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Abstract
Through the development of a spatial installation entitled *Vanity Chamber*, this article reflects upon the role of specular devices within the home and asks how their increased use might affect boundaries between the domestic interior and the world outside.
As a result of the Covid-19 pandemic and its associated lockdowns many activities previously reserved for the public domain suddenly had to take place in the home, via videotelephony platforms such as Zoom, Skype, Facetime and Microsoft Teams. Cultivated by a pre-existing *intrusion* into the home of digital specular devices, such as PCs and smart phones, which supported the increased use of videotelephony software observed during the pandemic, many people experienced a breaching of established domestic boundaries. Facilitated by these *leaky* thresholds, a simultaneous scrutiny from the *spectator* and a concern by the *voyeur* for the public display of the private interior was observed during lockdown.
An analysis of historical specular devices has shown that acts of voyeurism and vanity on the limits of the home are far from novel occurrences, and that these porous boundaries were often important liminal thresholds bridging the domestic with the public. Through the *Research by Design* method that led to *Vanity Chamber*, this article argues that the domestic interior has once again become an essential part of its surrounding neighbourhood and that it is on this *frontier*, or rather, within this *in-between realm* that we must now establish home.

Figure 1. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* in Designmuseum Danmark gallery, 2022. (Photo: Hampus Berndtson).

1. Introduction

The domestic habitat is in a state of constant metamorphosis, having to accommodate the needs of societies in perpetual flux, while at the same time, its architecture has often been envisioned with logic from a previous epoch, resulting in highly vulnerable built-environments. Of particular interest to this research inquiry, are the boundaries, limits, and threshold conjunctures of the Post-Domestic Habitat, which due to their increasingly diffuse character are a particularly exciting phenomena to study. Through the development of a spatial installation entitled *Vanity Chamber* (Fig. 1), this arti-

cle reflects upon the role of specular devices within the home and asks how their increased use might affect boundaries between the domestic interior and the world outside.

1.1. Diffuse Domestic Boundaries

As far back as the early 1980s, the French philosopher and prominent cultural critic of the post-war period, Jean Baudrillard identified an *intrusion*[1] into the home of technological devices, resulting in a greater porosity between the allegedly closed sphere of the domestic interior and the world outside through virtual bridges.

More recently, Anna Puigjaner, co-founder of Barcelona-based practice MAIO, has argued that the house has become an endless domestic landscape, and in turn the world has become a *grand interior*[2] composed from a boundless number of interconnected interiors linked together by technological networks. She writes, "The house has become part of a wider system, a system that has transformed the domestic into a generic, diffuse and continuously expanding ground" (Puigjaner, 2018, p. 113). Just over a year later, the Covid-19 pandemic and its associated lockdowns radically redefined the boundaries of our domestic habitats to an unprecedented extent, expediently advancing the phenomenon previously identified by both Baudrillard and Puigjaner, resulting in a greater porosity of the

1 The French philosopher and prominent cultural critic of the post-war period, Jean Baudrillard has written extensively on the *intrusion* into the home of specular devices and their effect on the virtual relations between the outside and the allegedly closed sphere of the domestic interior. It should be noted that this intrusion has been taking place over many decades, although arguably advanced and expediated greatly by the Covid-19 pandemic (Baudrillard, 1994; Baudrillard, 2020).

2 Puigjaner's use of the term *grande interior* is a reference to Sloterdijk's earlier definition (Sloterdijk, 2013).

home through a significant increase in the use of technological devices that support communication software, such as videotelephony platforms.

1.2. Videotelephony, Vanity and Voyeurism

During the 2nd quarter of 2020 alone, 40% of Danish employees were required to work remotely from their homes, with this statistic rising to an unprecedented 75% within the capital region of Copenhagen.[3] Simultaneously, a marked increase in the use of videotelephony software was observed,[4] where platforms such as Zoom, Microsoft Teams, FaceTime and Skype became the dominant forms of communication between the domestic interior and the world outside. In addition to remote working, many activities previously reserved for the public domain, such as education, dating, fitness training, job interviews, legal case hearings (BBC US & Canada, 2023) and even balcony marathons[5] were being publicly broadcast from the private domain of the home. As a direct result of this breach of established domestic boundaries, many people experienced a greater public intrusion into their private homes, and continue to do so as working from home remains desirable for many. This has placed greater scrutiny on our domestic interiors, décor and the personal belongings displayed within. Over the course of the pandemic, a simultaneous interest

3 Statistics quoted in are taken from Danmarks Statistik (Hohnen, 2020).

4 Zoom's sales in the last three months of 2020 were up 370% compared to the fourth quarter of 2019. Over the same period its meeting participants jumped from 10 million to 350 million per day (Molla, 2020).

5 During the first lockdown in March 2020, Elisha Nochomovitz ran a full marathon on his 7m wide balcony (The Guardian, 2020).

from the spectator and a concern by the voyeur for the public display of the private interior was observed, both in media, as well as in the evolution of videotelephony software interfaces. Suddenly, topics such as voyeurism and vanity have become highly relevant when discussing these threshold conjunctures between the home and the world outside.

1.3. Towards a Specular Home

The technological devices that support these videotelephony platforms, such as PCs, laptops, tablets, Smart TVs, and mobile phones, can be categorized as specular devices, whereby a digital interface provides one with a view of the people that one is communicating with, as well as an image of one's own refection, often through a transfiguring filter. The observation that the pandemic had resulted in these specular devices becoming the dominant way of mediating between the domestic habitat and the world outside became the catalyst for exploring the affect that this might have on the home, and its boundaries. An artistic research method, namely *Research by Design*,[6] involving an investigation into specular devices, including windows, mirrors, screens, and filters, on the boundaries of the domestic habitat has resulted in the development of an analogue spatial installation entitled *Vanity Chamber*, which was publicly exhibited at Designmuseum Danmark as part of *The Future is Present* exhibition between June 2022-May 2023 (Fig. 2).

6 *Research by Design* as promoted by academics such as Halina Dunin-Woyseth, Leon Van Schaik and Johan Verbeke (2014) is a systematic approach where the practice of design is utilized as the primary means to develop understanding and new knowledge. Birger Sevaldson defines the *Research by Design* method as, "a special research mode where the explorative, generative and innovative aspects of design are engaged and aligned in a systematic research enquiry" (Sevaldson, 2010, p. 11).

Figure 2. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* in Designmuseum Danmark gallery, 2022. (Photo: Hampus Berndtson).

2. Methodological Framework

The methodological framework for this article is based upon a *Research by Design* method, whereby a two-fold movement[7] occurs between the retrospective analysis of historical specular devices within the home, together with the writings of Walter Benjamin (1982), Charles Baudelaire (1947), Jean Baudrillard

7 In the book *The City: Its Growth, it Decay, its Future* (1943), the Finnish architect and urbanist, Eliel Saarinen describes design research as being a two-fold movement which is based upon the idea of two layers working in different directions and temporalities. In this model, ideas and research are projected both forwards (present to the future) and backwards (future to the present) simultaneously.

(1994; 2020), Michel de Certeau (2011), Georges Teyssot (2005), Beatriz Colomina (2020) and Linda Stone-Ferrier (2020), simultaneously with the development of a prospective spatial installation utilising mirrors and dichroic glass.

The author was invited by Designmuseum Danmark to develop a physical installation based upon the author's current research for an exhibition entitled, *The Future is Present*. The exhibition focused on exploring what the world could look like in 10, 20 or 30 years by raising questions, envisaging future scenarios and speculative designs that addressed global challenges. Pertinent questions raised by Designmuseum Danmark's curator resonated with the author's research. These included, "Will our behavior become more socially oriented, or will we be further apart and become isolated? Which human values will be more important? What will the future look like?".[8] The three central themes of *The Future is Present* exhibition were: *Human*, *Society* and *Planet+*. The invitation to contribute to the exhibition provided the opportunity to explore non-written forms of dissemination for academic research within a public venue with an international profile.

3. Design Development of *Vanity Chamber*

With a point of departure in exploring the role of specular devices on domestic boundaries, an archive of catoptric objects was developed, as a way to position the contemporary situation within a historical context and to develop referential

8 https://designmuseum.dk/en/exhibition/the-future-is-present/.

knowledge that could be explored during the development of *Vanity Chamber*. Noteworthy references that influenced the development of *Vanity Chamber* included, *Gadespejl* (Danish Street Mirrors), *Kaiserpanoramas*, Mirror Rooms, Picturesque *Claude Glass* devices, and perhaps most contextually relevant, a folding vanity mirror originally designed by the Danish architect and furniture designer Kaare Klint for *Det danske Kunstindustrimuseum's* (Designmuseum Danmark) restroom, in 1938. Due to the unpredictable nature of working with mirrors and glass in dynamic daylighting conditions, it was imperative to carry out full scale tests within the museum space itself. At this stage in the process, it was decided that the installation should be assembled from multiple freestanding modules (Fig. 8) that could be easily adjusted and rearranged in relation to one another, so as to better control the specular effects of *Vanity Chamber* on-site. During this period, the author became increasingly interested in mirrored lenses, particularly those that alter the reflection of the viewer, often with uncanny, immaterial, and mysterious effects.[9] On discussing the etymological root of mirror, the academic, Helene Furján writes, "the *mirror* and the marvel are closely connected, the word *mirror* deriving from '*mir*, the root of *mirabilis* (marvelous, wonderful) and *mirari* (to wonder at)" (Furján, 2012, p. 512). It is also interesting to note the common etymological root of *Spiegel* (Mirror) and *Spiel* (Play, or game) in German, and Germanic based languages, such as Danish (Teyssot, 2005, p. 101).

9 In *Histoire du Miroir*, Sabine Melchior-Bonnet writes, "The (mirror) reflection alludes to the uncanny perception of another world, immaterial and mysterious, situated behind the reflective surface, and invites the gaze to go beyond the appearances" (Melchior-Bonnet, 1994, pp. 81-94).

The author decided to experiment with both double-sided mirrors, placed at right-angles to one another, as well as dichroic glass panels as part of *Vanity Chamber*. Depending upon the position of the observer and the direction of light ingress to the dichroic glass, one side appears one color, while the reverse side appears a second color. By working with double-sided mirrors, dichroic glass and their positioning in relation to the prominent window bays of the museum space exciting visual effects started to emerge, particularly during 1:1 tests on site with actual material samples. It should also be noted that regular meetings were carried out between the author and the exhibition curator at Designmuseum Danmark to discuss the development of *Vanity Chamber*, with a particular focus on safety and security.

4. The *Vanity Chamber*

Located centrally in one of the long linear galleries at Designmuseum Danmark, the realized version of *Vanity Chamber* took the form of two semi-circular arcs facing one another and encompassing a space approximately 3 x 4 m, which could be inhabited by the museum visitors (Fig. 9). The installation was assembled from fourteen freestanding wooden frames produced in solid Ash, that supported either double-sided mirrors or larger dichroic glass panels. An inner ring of a wider frame type held twelve pieces of dichroic glass in three different color variants, while an outer ring of a higher, yet slender, frame type supported the double-sided mirrors. The sizing of the wooden frames and the dichroic glass panels directly referenced the windows of the museum gallery, while the dimensions of the double-sided mirrors were inspired by the typical width of a *Gadespejl*.

Figure 3. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* multiplied interior reflections, 2022. (Photo: Hampus Berndtson).

Solid steel counterweights, inspired by those used in traditional sash-windows, were introduced on the inner ring of larger frames supporting the dichroic glass panels to increase stability (Fig. 7). The relative positioning of the fourteen frames, their angle in relation to one-another and the window bays of the museum gallery was orchestrated to maximize the specular effects experienced by the museum visitors (Fig. 3).

4.1. Inhabiting *Vanity Chamber*

It was fascinating to observe the behavior of visitors to *Vanity Chamber,* that could be largely described in one of two ways, firstly, those that spent a prolonged time within the installa-

Figure 4. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* marvelous selfie, 2022. (Photo: Hampus Berndtson).

tion taking many photographs to try and capture its myriad of specular effects, and secondly, those that chose to pass through the space quickly, perhaps finding the multitude of self-reflections uncomfortable. As a result of this, there was an intriguing tension one experienced in *Vanity Chamber*, marveling at the ephemeral simulations of one's own reflection, while at the same time feeling an uncomfortable sense of being on public display, for all to gaze upon. While it is difficult to quantify, *Vanity Chamber* was featured prominently on Designmuseum Danmark's social media channels, particularly on Instagram, where the museum shared the photos taken by its visitors.

Figure 5. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber*, *Vanity Chamber* multiple self-reflections, 2022. (Photo: Hampus Berndtson).

Figure 6. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* close-up reflections in dichroic glass, 2022. (Photo: Hampus Berndtson).

Unsurprisingly, many images posted of *Vanity Chamber* were selfies taken in the reflections of the double-sided mirrors, or the dichroic glass panels. Depending upon the light conditions, the dichroic glass panels could have particularly uncanny effects, whereby they performed as mirrored surfaces, creating *marvelous* reflections of the observer that could seem artificial (Fig. 4). Due to the orientation of the double-sided mirrors and the dichroic glass panels, multiple reflections could be observed from any fixed position within the gallery space (Fig. 5). This resulted in a kind of *multiplication* of the museum interior, as well as the reflection of the observer, whereby the entire space could be condensed down into a single view, momentarily mystifying the viewer as to what was a reflection and what was reality (Fig. 6).

5. Domestic Boundaries as Liminal Places

We return now to a discussion relating to the boundaries between the domestic interior and the world outside.
In his text, *A Topology of Thresholds* (2005), the French architect and academic Georges Teyssot explores threshold conjunctures, particularly within the domestic realm, through a historical analysis of mirrors, windows, frames, and other specular devices. In the text, Teyssot refers to writings from the 19th Century French poet and art-critic Charles Baudelaire, who while reflecting upon the effect of specular devices on the modern home, and in particular window apertures and mirrors, identified a collapse in the threshold between interiority and exteriority, whereby the modern domestic interior became a private façade on public display, while simultaneously the person on the street became a *voyeur*.

Teyssot goes on to affirm that specular devices, including mirrors, windows and digital screens are central to a collapse in the established threshold between the interior and the exterior. He writes, "Perhaps the modernist inhabitant is not so much to become exteriorized, or nomadic, as to find the home no longer neither simply an interior nor an exterior. 'Living' is somehow to now occupy the space between the two, inhabiting the threshold" (Teyssot, 2005, p. 106).
Teyssot's interest in the space between is indebted to the 20th Century French philosopher Michel de Certeau's (2011) reconceptualization of threshold limits, as frontiers, that become voidal and interstitial, thus turning the boundary into a bridge, an in-between, or rather, a space between, which provides the opportunity for exchanges, encounters and ultimately inhabitation. It can be argued that *Vanity Chamber* creates an inhabitable liminal place, akin to Teyssot's space between through the ephemeral specular effects created by its double-sided mirrors, dichroic glass panels and dynamic natural lighting conditions. The boundaries of the installation are porous and ambiguous, while simultaneously, the interior space defined by the specular surfaces is multiplied through numerous reflections. Strangers can suddenly find themselves intimately together in a liminal in-between place created by the mirrored views of fleeting glimpses and glances (Fig. 3). When discussing these threshold conjunctures, it is unavoidable to address the subjects of voyeurism and vanity.

5.1. Domestic Voyeurism

The increased use of videotelephony observed over the course of the Covid-19 pandemic led to a greater public intrusion into

the home, resulting in an increased scrutiny of our domestic interiors, décor and the personal belongings displayed within. Representative examples of this increased domestic voyeurism are the Twitter accounts, *Room Rater* and *Bookcase Credibility*, both established during the first lockdown in April 2020, with the latter's sub-title being, "What you say is not as important as the bookcase behind you" (*Bookcase Credibility,* 2020).
As the name suggests, *Room Rater* allows the public to scrutinize the lighting, composition and content of other peoples' videocall backdrops and then assign them a score out of 10, while *Bookcase Credibility*'s thread contains an extensive archive of screenshots from videocalls where bookcases have played a prominent role. The composition and contents of these bookcases are then meticulously studied and critiqued by an avid and loyal group of Twitter users. Over the course of the Covid-19 flu pandemic and the establishment of lockdowns globally, one could say that the bookshelf emerged as the preferred backdrop by public figures for conveying a sense of intellectual authority (Hess, 2020).

It is important to note that, a voyeuristic intrusion into the domestic habitat is hardly a new phenomenon, with Baudelaire writing about the relationship between the modern interior and the person on the street, "What one can see out in the sunlight is always less interesting than what goes on behind a window pane. In that black or luminous square life lives, life dreams, life suffers" (Baudelaire, 1961, p. 288; 1947, p. 77). In more recent times, the black or luminous square is no longer just the domestic window, but also the plethora of digital screens that have intruded our homes.

Figure 7. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* counterweight detail, 2022. (Photo: Hampus Berndtson).

Figure 8. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber,* isolated dichroic glass frame type, 2022. (Photo: Hampus Berndtson).

Figure 9. Nicholas Thomas Lee and Peter Alexander Bullough, *Vanity Chamber, Vanity Chamber* axonometric drawing, 2022.

While discussing this topic, Teyssot refers to the popular illustrations showing imagined sections through Parisian apartment buildings that were published frequently during the nineteenth century as a representation of the private interior becoming a public façade (Teyssot, 2005, p. 93).
These illustrations were often used to reveal, as if in peep-show, the sordid private lives of the metropolitan Bourgeoisie, for all the *Re-public* to see. In some ways, the gallery view of many videotelephony platforms is reminiscent of these voyeuristic illustrations, whereby a fictional building section is created by the compound composite of adjacent room backgrounds of the videocall participants, and their personal belongings contained within.

Returning to the design of *Vanity Chamber*, the positioning and orientation of the double-sided mirrors and the dichroic glass panels resulted in a multiplication of reflections that allowed one museum visitor to unexpectedly catch glimpses of another museum visitor from any fixed position within the installation (Fig. 5). This specular effect confronted the museum visitor with the uncomfortable reality of unintentionally become a voyeur, while also understanding the reciprocal consequence of potentially being viewed upon by others.

5.2. Domestic Vanity

Over the course of the pandemic, the saturation of videotelephony not only enabled domestic voyeurism, but it also encouraged vanity through the increased presence of, awareness of, and concern for, our own digital reflections. Returning to the topic of bookshelves, a number of companies emerged during the pandemic with the dedicated service of curating a client's domestic bookshelves, including the loaning of books for the sole purpose of satisfying the prying eyes of the videotelephony public.[10] A concern for one's own self-image resulted in some farcical situations, for example, American political strategist Erin Elmore using a shower curtain with the printed image of a bookshelf as a videotelephony background when she was interviewed by Fox News, only being caught when avid viewers noticed creases in her apparent bookcase.[11]

10 For example, Jessica Bowman manages a service called *Books by the Foot* at *Wonder Book* in Maryland where clients can hire her to curate their bookshelf background https://booksbythefoot.com/.

11 See https://www.indy100.com/news/trump-erin-elmore-bookcase-sky-interview-b1784867.

The theme of vanity within the domestic habitat appears in the early 20th Century writings of the German philosopher, Walter Benjamin. While Benjamin's popular description of the 19th Century bourgeois apartment as a velvet lined box for its inhabitants, such as that for a compass casing, places emphasis on the home as a means of protection, simultaneously it also highlights that the interior, and its contents are on display. On this point, Benjamin goes as far as to describe a fictional section through the home as being a façade, "[…] no matter where you open it and cut a section through it, my house remains a façade" (Benjamin, 1982, p. 4). The notion of the domestic interior and its inhabitants on public display could not seem more relevant in a post-pandemic world, where the use of videotelephony communication from the home continues to increase in popularity.

Over the course of the pandemic, videotelephony platforms were quick to evolve in order to cater to users' needs, with the introduction of sophisticated digital backgrounds, filters and even appearance altering tools. For example, VooV Meeting, a popular videotelephony platform in China, has a digital 'beauty filter' applied as default, which alters the user's appearance. Adjustable settings allow the user to smoothen skin, add blusher, enlarge eyes, adjust the distance between the eyes, alter the shape of the face, remove wrinkles, and even increase one's hairline. Perhaps interestingly, the default VooV Meeting beauty filter has no gendered differentiation. Returning to historical examples, the notion of contemplating one's own self-image within the domestic realm through specular devices has many relevant precedents.

The European 18th Century aristocratic interior was typically furnished with a wide variety of mirrors, such as pier glasses, overmantel mirrors, looking glasses, convex mirrors, vista mirrors, catoptric lenses, and so on. In the text, *The Specular Spectacle of the House of the Collector* (1997), Helene Furján writes about the myriad of specular devices found in Sir John Soane's *Lincoln's Inn Fields*, which not only served the purpose of increasing luminosity by multiplying the interior, but also offered the viewer the opportunity to contemplate one's own appearance, albeit often in an altered and more flattering form. Furján writes, "These mirrors proffer up a miniaturized (and thus *collectible*) image of the world of the viewing subject for the very *reflection* of that subject" (Furján, 2012, p. 507). The use of specular devices for vanity purposes in the 18th Century French bourgeois interior was so extensive that Teyssot writes, "So, it had been the aristocracy that had entertained itself by the multiplication of mirrors, a spectacle that would both nurture its own narcissistic drive, and create the condition of its depression and, eventually, its downfall" (Teyssot, 2005, p. 102). It is difficult at this juncture to not draw parallels with the contemporary saturation of selfies on social media. It was fascinating to see how popular on social media it was for museum visitors to take selfies, which captured the *marvelous* reflections that could be achieved when looking into the dichroic glass panels of *Vanity Chamber* (Fig. 4).

5.3. Domestic Boundaries, Bridges and Frontiers

Acts of voyeurism and vanity on the boundaries of the home are far from novel subjects when discussing the domestic interior. The academic and art historian, Linda Stone-Ferrier also

reflects upon thresholds between the domestic interior and the surrounding neighbourhood in the text, *Glimpses, Glances, and Gossip: Seventeenth-century Dutch Paintings of Domestic Interiors on Their Neighbourhood's Doorstep* (2020). By highlighting the importance of social interactions on the threshold between the home, and its surrounding neighbourhood observed in paintings from the time, Stone-Ferrier challenges the presumption that there was a firm borderline that distinguished the private from the public sphere in Dutch society. Of particular interest to Stone-Ferrier are the *voorhuis*, or front reception rooms, that supported acts of commerce with the surrounding neighbourhood and that functioned as a stage for the private display of personal belongings intended for public scrutiny. Typical of the *voorhuis* were distinctly designed windows and door openings, together with interior mirrored devices that were used to facilitate a reciprocal display, and voyeurism, between inside and outside. These open doors, windows and mirrored devices functioned as a liminal intersection, occupying both sides of the threshold, which "served as the bridge, rather than boundary, between home and street" (Stone-Ferrier, 2020, p. 29). This understanding of boundary thresholds as bridges is strikingly similar to the observations discussed earlier by Teyssot, and de Certeau. Within the context of Stone-Ferrier's study, the thresholds between the home and the neighbourhood are reinterpreted as a vital fluid discourse, rather than as finite boundaries, where the domestic interior was an essential part of its surrounding context. Stone-Ferrier's reinterpretation of the semi-private / semi-commercial *voorhuis* and its various specular threshold devices can provide us with a useful historical analogy to the contemporary phenomenon of remote work-

ing from home via videotelephony platforms. One could argue that *Vanity Chamber* also provided the museum goers with a liminal intersection between their private domains, based upon reciprocal display and voyeurism through glimpses and glances provided by the mirror and glass surfaces that formed the installation (Fig. 3).

6. Concluding Remarks

While the SARS-CoV-2 virus and its associated social restrictions tragically affected so many people globally, it has provided us with an important catalyst for reflecting upon our quotidian domestic practices and how they are affected by its evolving boundaries. A marked increase in videotelephony use from home and a saturation of digital specular devices that support these platforms, has made the boundaries between domestic and public, interior and exterior more porous. A perceived publicity of the private has resulted in threshold conjunctures that facilitate acts of voyeurism and vanity within our domestic habitats. An exemplary illustration of this could be the recent trend for celebrities to publicly broadcast the contents of their private fridges on social media.[12] However, writings from Benjamin, Baudrillard, Baudelaire, Teyssot and Stone-Ferrier, have revealed that the home has never been a closed private sphere and that its boundaries have always had porosity, often facilitating important social interactions, which have included acts of voyeurism and vanity.

12 Gwyneth Paltrow is a recent celebrity to join the trend of giving their social media followers the opportunity to see the contents of their private fridge. See https://www.independent.co.uk/life-style/gwyneth-paltrow-refrigerator-tour-products-eyemasks-b2388376.html.

While digital specular devices have supplemented, and in some cases replaced, analogue mirrors and lenses, the bridges that they facilitate are neither unprecedented nor necessarily detrimental. *Vanity Chamber* created an inhabitable in-between place, where museum visitors could experience a porosity between privacy, intimacy, and publicity through analogue specular effects. Interestingly, the architectural historian, Beatriz Colomina has recently identified the bed, once a "symbol of intimacy", as having the potential to become the new multi-purpose place within the home, through a metamorphosis into "a piece of public furniture" (Colomina, 2020, p. 29), by accommodating remote working, teaching, shopping and even socializing. Perhaps the domestic interior has once again become an essential part of its surrounding neighbourhood, and it is on this "frontier" or rather, within this "in-between realm" that we must now establish home.

References

Baudelaire, C. (1947). The Mirror. In *Paris Spleen* (p. 83). New Directions. (Original work published 1869)

Baudelaire, C. (1947). Windows. In *Paris Spleen* (p. 77). New Directions. (Original work published 1869)

Baudrillard, J. (1994). *Simulacra and Simulation*. Michigan University Press. (Original work published 1981)

Baudrillard, J. (2020). *The System of Objects*. Verso. (Original work published 1968)

BBC US & Canada. (2023, September 6). *Lawyer Gets Stuck With Cat Filter During Virtual Court Case*. BBC. https://www.bbc.com/news/av/world-us-canada-56005428

Benjamin, W. (1982). *Das Passagen-Werk* (Vol. 1). Suhrkamp.

Bookcase Credibility [@BCredibility] (2020). Bookcase Credibility [X profile]. X. Retrieved September 6, 2023. https://twitter.com/bcredibility

Colomina. B. (2020). The Bed in the Age of COVID-19. Uncovering a New Workplace. In N. Fehlbaum (Ed.), *Vitra. New Dynamics in the Home* (pp. 28–29). Vitra International AG. https://www.smow.de/pdf/vitra-e-paper-new-dynamics-in-the-home-en.pdf

De Certeau, M. (2011). *The Practice of Everyday Life* (Vol. 1). University of California Press. (Original work published 1984)

Furján, H. (2012). The Specular Spectacle of the House of the Collector. In L. Weinthal (Ed.), *Toward a New Interior. An Anthology of Interior Design Theory* (pp. 505–518). Princeton Architectural Press.

Hess, A. (2020, May 22). The 'Credibility Bookcase' Is the Quarantine's Hottest Accessory. *The New York Times*. https://www.nytimes.com/2020/05/01/arts/quarantine-bookcase-coronavirus.html

Hohnen, M. (2020, September 22). *40 pct. arbejdede hjemme under COVID-19-nedlukningen*. Danmarks Statistik. https://www.dst.dk/da/Statistik/nyheder-analyser-publ/bagtal/2020/2020-09-22-40-pct-arbejde-hjemme-under-nedlukningen

Melchior-Bonnet, S. (1994). *Histoire du Miroir*. Imago.

Molla, R. (2020, December 4). The Pandemic Was Great for Zoom. What Happens When There's a Vaccine? A Look at What's in Store for Zoom in a Post-Pandemic World. *Vox*. https://www.vox.com/recode/21726260/zoom-microsoft-teams-video-conferencing-post-pandemic-coronavirus

Puigjaner, A. (2018, July 19). The Continuous Interior. An Endless Domestic Landscape. *AR House + Furniture: The Architectural Review*. https://www.architectural-review.com/essays/the-continuous-interior-an-endless-domestic-landscape

Stone-Ferrier, L. (2020). Glimpses, Glances, and Gossip. Seventeenth-century Dutch Paintings of Domestic Interiors on Their Neighbourhood's Doorstep. *RACAR: Revue d'Art Canadienne / Canadian Art Review, 45*(2), 25–46. https://www.jstor.org/stable/26965793

Saarinen, E. (1943). *The City. Its Growth, its Decay, its Future*. Reinhold Publishing Corporation.

Sevaldson, B. (2010). Discussions & Movements in Design Research. A Systems Approach to Practice Research in Design. *FormAkademisk*, *3*(1), 8–35. https://doi.org/10.7577/formakademisk.137

Sloterdijk, P. (2013). *In the World Interior of Capital. Towards a Philosophical Theory of Globalization*. Polity.

Teyssot, G. (2005). A Topology of Thresholds. *Home Cultures. The Journal of Architecture, Design and Domestic Space, 2*(1), 89–116. https://doi.org/10.2752/174063105778053427

The Guardian. (2020, March 21). *Man Runs Marathon on 7-Metre Balcony During French Lockdown*. https://www.theguardian.com/world/2020/mar/21/man-runs-marathon-on-7-metre-balcony-during-french-lockdown

Verbeke, J. (2014). This is Research by Design. In M. Fraser (Ed.), *Design Research in Architecture, An Overview* (pp. 137–159). Ashgate.

Post-Domestic Ageing. Living Indoors (Without) Looking Outside?

Architectural Design and IT Devices for a New "Ageing in Place"

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Abstract
Ageing in place, in a domestic environment rather than in an institution, is people's preference in an ageing planet. This raises *post-domestic* design challenges as the home becomes now also a place for care, and most dwellings are not prepared to respond to the growing needs of fragile older people. In this paper we will explore the importance of architectural layouts, strategies, and the incorporation of IT technology for *smart homes*, as possible answers to these new requirements.
The importance of *façade depth* as a new design strategy for *lookout spaces* will be discussed in terms of the specific requirements of older residents who are *homebound* for health reasons or safety rules (as pandemic requirements), thus becoming places for a healthy connection with the outside world.
Homebound interior design also requires a new approach: *COVID-19* pandemic accelerated the new preference of working from home, no matter the age. New residential spaces are no longer exclusively domestic, and they require IT tech support for different activities. Flexibility of spaces is now a basic requirement: quickly changing or adapting domestic spaces with minor investments under a *life-cycle design* logic, keeping them safe for all, from grandchildren to grandparents, must become a ground rule for the future.
In this paper we will review recent findings on how the *post-domestic space* must be designed to host a comfortable and *active ageing* for senior citizens who choose to *age in place*.

1. Introduction

The ageing of population is a global phenomenon posing new challenges to the architectural design of housing, which will be approached in this article as a Post-Domestic habitat, in the sense of home spaces used and perceived in the later years of life according to new needs and fragilities (WHO, 2017). So, we will focus on some architectural issues related to people who choose to remain in their homes, either enjoying their retirement or embracing a new professional cycle of working from home (the *Generation M* of post-retirement workers) considering that "people in mid-life today can look forward to about 30 years of active life and the country needs this pool of skills, talents and experiences" (Hanson, 2002).

We will address Post-Domestic Habitat from the point of view of environments to *age in place* even though the concept itself is debatable (Forsyth & Molinsky, 2021) considering that different people and institutions have different understandings of what it means and what could or should be done to support it or enhance it. The World Health Organization defines ageing in place as "the ability of older people to live in their own home and community safely, independently, and comfortably, regardless of age, income or level of intrinsic capacity" (WHO, 2015, p. 36) so we may as well consider it a Post-Domestic Habitat in the sense of a new phase when supportive care and other needs of later life must be incorporated into the previous habitat, therefore adding a post condition to home.

2. *Smart Homes*

One of the biggest concerns of older people living alone is safety and security. In that sense, *Smart Homes* as spaces

equipped with AI-enabled IT technologies (Dong et al., 2023) can provide safe and secure living environments: surveillance systems and sensors can detect falls or other emergencies and immediately alert to ensure timely assistance to older people living alone, who can feel safer knowing that help is readily available when needed (Cao et al., 2022).
These assistive technologies can be incorporated on newly built housing as part of the whole infrastructure system or added later to existing spaces when necessary. In either case, architectural design is always of paramount importance to coordinate the discrete incorporation of the IT technologies (to avoid being rejected) and assure the final domestic quality, the privacy and the psychological comfort of home which older people value the most (Fischer et al., 2014).

Maintaining independence and autonomy is essential for *active ageing* (Bitterman & Shach-Pinsly, 2015) and *Smart Homes* can be designed to support and enhance independent living for older adults (Dermody et al., 2021).

Figure 1. Older woman at home interacting with ElliQ robot (Tianqin Chen d'après Intuition Robotics, 2023).

For example, *voice-first ambient interface* (VFAI) can control various aspects of the home, such as lighting, temperature, and appliances, helping older adults to perform daily tasks and enhancing their sense of self-sufficiency (Cuadra et al., 2023). In addition, AI *virtual assistants* can provide reminders for medications, appointments, and other important tasks (Fig. 1), thereby reducing the need for human supervision or assistance.

In terms of physical and mental health, *Smart Homes* can also help: monitoring systems can continuously track vital signs such as heart rate and blood pressure and alert healthcare professionals in case of any abnormalities while maintaining the resident's quality of life (Reeder et al., 2013; Bitterman, 2015). On the other hand, AI-virtual coaches can provide personalized workout habits and dietary advice to promote physical activity and healthy eating habits and *AI social companion* robots can also provide companionship and engage in conversations to reduce loneliness. Additionally, the design of *Smart Homes* can incorporate control of natural lighting, proper ventilation, and acoustics (architectural design decisions already common in *domotics design*), which have proven to positively impact mental and emotional health.
It can be argued or expected that these different options of AI-enabled IT technologies may still be estranged by most older people today, requiring their training and even participation in the design process of user-centred *assistive technologies* (Cao et al., 2022). But ageing is by definition a future-driven process (we all get older in the future, not in the past), meaning that what may seem awkward today can be naturally embraced in some years by the *digital generations*.

Recently, during the Covid-19 confinement, policies aimed at reducing coronavirus disease hospitalization and mortality rates, encouraged older adults to avoid social and physical contact (Di Gessa et al., 2023). This resulted in social isolation and increased loneliness for older adults, especially for the ones who live independently in their houses or apartments. And yet, during those Covid years, the easy access to video calls (something unthinkable a decade ago) proved to help alleviating this isolation and improve social connections (Kumar & Chawda, 2020) by offering remote contact with family, friends, and healthcare professionals. Therefore, the old home landline telephones which are being replaced by wireless phones, make it plausible that soon homes will be equipped with videoconferencing systems, in a *Smart Home* trend, contributing to reduce social isolation, especially among older adults (Pedersen et al., 2018).

But even though, IT technology used in *Smart Homes* brings a range of conveniences, there are also some negative issues. Findings suggest that older participants prefer to use *AI-assistants* for selective, non-essential features and functions, such as music, audiobooks, news, weather, games, and joke-telling, or simply in turning on the room lights without considering the use of *AI* devices essential for *ageing in place* (Orlofsky & Wozniak, 2022). But if that is an individual option, more concerning is the fact that it has been found that the *Smart Home* technology industry has not paid enough attention to data security and privacy (Wilson et al., 2017), rising some red flags towards cybersecurity of smart devices (Al-Shaqi et al., 2016). These are essential issues that must be addressed to build users' confidence, considering that community-dwelling

older adults are still willing to adopt *Smart Home* technologies to support independence (Wilson et al., 2017). But the ethical implications of social robots as guardians and caregivers for older people are also debatable (Pedersen et al., 2018), thereby demanding increased share of information about *Smart Home* technology to promote awareness and discussion (Dermody et al., 2021). On the other hand, it will always be the architect's mission to design a domestic environment incorporating all these IT and AI devices in a friendly matter so that the older residents feel in a cosy and homey atmosphere, not in a spied and controlled environment, thus solving important ethical issues (Dorsten et al., 2009).

3. *Façade Depth* and the Importance of Balconies

Façades are usually considered in a 2D design approach, in terms of visual quality, for the image of the building, resulting in compositional design decisions. We would like to introduce the concept of *façade depth* instead, not as image but rather as space. Therefore, the depth of spaces that belong to the façade and create the threshold between inside and outside, are essential to be considered when dealing with the quality of daily living, especially for older residents who spend most of their time at home.

In that sense, the functional aspect of a balcony is found to be the most important factor among others such as semantic, perceptual, physical, environmental, and beauty. Other factors that contribute to residents' satisfaction with balconies include dimensions, use of plants, connection with the sky, peace and comfort, safety, function, and beauty (Karimi et al., 2020).

Figure 2. Deep balconies in residential building in Milan. (Photo: António Carvalho, 2023).

Figure 3. Old couple drinking coffee and chatting on their balcony. Image generated with the prompt "old couple drinking coffee and chat on their balcony", by Midjourney (Tianqin Chen, 2023).

It did make a whole difference during Covid-19 lockdowns (Fig. 2): having protruding balconies where to stay and get sun, fresh air, and talk or wave to neighbours from distance, or having a recessed balcony (loggia) where to seat protected in the shade, were rediscovered by residents in its potential as privately owned outside spaces, their safe connection (Fig. 3) to the external world (Ertas et al., 2022). Even from a safe distance, having the possibility of visually enjoying the outside environment, especially if surrounded by natural elements (trees, parks, water, animals) was a great psychological relief. In fact, outdoor spaces play a crucial role in enhancing physical and mental health, promoting social interactions, and building communities.

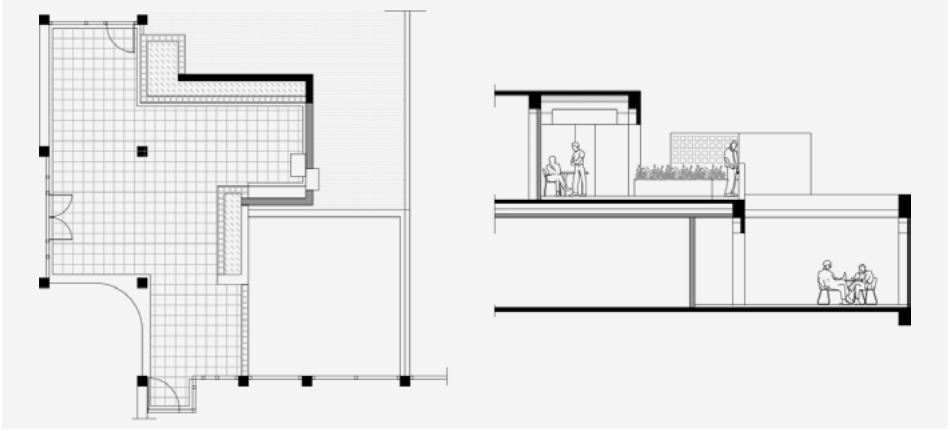

Figure 4. Herman Hertzberger, De Drie Hoven Housing, Amsterdam, 1971. Residents in clusters of apartments share terraces and interact with each other across different floors. (Redrawn by Tianqin Chen, 2023).

On this we may refer important case studies such as Herman Hertzberger's *De Drie Hoven Old People's Center*, from 1971, in Amsterdam, where each apartment was provided with an individual loggia and some clusters of apartments shared overlooking terraces to promote social interaction and fresh air (Fig. 4). Also, in 1989, Peter Zumthor, for his *Homes for Senior Citizens*, in Chur, Switzerland, besides creating a generous 3 meters-wide corridor-veranda as common access and social space for all residents, provided each apartment with one private loggia joining bedroom and living-room, as an alternative for private seclusion. MVRDV have also explored the use of balconies and terraces in several projects, from their expressive Elderly Housing *WoZoCo* in Amsterdam-Osdorp (1997) to the recent sculptural approaches of *Valley* in Amsterdam (2022) or the *Ascension Paysagère* in Rennes, France (2022), dealing with densification and high-rise, keeping balconies as protagonist elements for quality of living.

Besides, when it comes to façade design composition decisions, it is useful to remember that adequate natural light holds significance in regulating circadian rhythms, uplifting mood, and supporting overall well-being. And as *Post-Domestic spaces* also serve new purposes like working, studying, relaxing, entertaining, hygiene and cooking, the considerations of visual and thermal comfort and interior flexibility become paramount. Thus, creating suitable foreground shading conditions for windows using features like the balcony depth, shading devices, operable blinds, and vertical screens significantly shapes residents' perceptions of urban liveability. Condominium apartments design, for instance, should incorporate at least two elevations to ensure sufficient daylight for circadian rhythm adjustment and opportunities for cross-ventilation (Kesik et al., 2019).

During the Covid-19 pandemic, safety restrictions reshaped perceptions and use of indoor and outdoor spaces. Traditional gathering spots for older adults, like churches, senior centres, and gyms, became inaccessible or risky, underscoring the newfound importance of outdoor areas in daily life (Yan et al., 2021). Balconies and terraces, typically overlooked spaces, emerged then as alternative places for older individuals to spend time during lockdowns (Fig. 5). Balconies were transformed into essential communication hubs, fostering neighbourly interactions: there was a trend originated in Italy, where people held concerts on their balconies during the quarantine, demonstrating another purpose for balconies. Balconies, once viewed as mere extensions of living spaces, have now evolved into integral elements of well-being and social connection, providing a glimpse of hope and relief during challenging times.

Figure 5. Multi-family housing in Lisbon: deep balconies provide shaded spaces and fresh air for relaxing and enjoy the views to the public space. (Photo: António Carvalho, 2023).

Actually, a previous study on balcony usage already highlighted preferences for designs that included parapets and glass enclosures, which offered improved views, mood enhancement, and a sense of spaciousness (Xue et al., 2016).

The context of the Covid-19 pandemic also highlighted the correlation between higher temperatures, humidity, and accelerated virus transmission via airborne routes (Bate, 2020). Thus, addressing subpar thermal comfort in housing becomes critical from health, comfort, and well-being perspectives. A Toronto-based study revealed that occupants in buildings with more exterior glazing experienced greater thermal discomfort (Vakalis et al., 2019).

Balancing façade design and window-to-wall ratios is vital for year-round thermal comfort. Passive strategies such as natural ventilation and openable windows gain prominence, particularly due to scepticism about building ventilation systems amid the pandemic. Research demonstrates that open balconies contribute to improved thermal comfort, indoor air quality, sleep, and acoustic comfort (Ribeiro et al., 2020), while fully enclosed glazed balconies lead to overheating and restricted airflow.

The pandemic lockdown also sparked a trend in pro-nature design, as visual exposure to natural surroundings reduces anxiety and enhances mental well-being (Crosbie, 2020). Interaction with nature is increasingly recognized as restorative (Kaplan, 1995) prompting a rise in small-scale urban agriculture, known to bolster mental health (Makhno, 2020) and urban farming can thrive in spaces like sunrooms and balconies, facilitating engagement with nature (Nielsen, 2020). Therefore, home windows should be designed to offer unobstructed views of the sky and nature, linked to improved mental health, concentration, mood, satisfaction, and recovery.

Among other age groups, older people can benefit significantly from access to green areas, as these spaces encourage physical activity, counteract social isolation, and slow down functional decline (Bustamante et al., 2022). A survey of 6,000 participants from 77 countries found that people who had more contact with nature under strict lockdown were less likely to experience symptoms of depression and anxiety during a pandemic than those who had less contact with nature (Pouso et al., 2021). The value of connecting with nature, green landscapes, and outdoor

scenes is well-documented for stress reduction and cognitive improvement, with heightened significance during pandemics (Egerer et al., 2022; Mierzejewska et al., 2023). This also highlights the importance of private or condominium green spaces as green safe havens for residents during lockdowns, a factor to be considered in urban and residential design in the new *Post-Domestic* condition we are living in (Fig. 5).

4. The Need for *Flexible Design*

Most older people are not prepared to exchange their place of residence and it can be noted that their willingness to move is even lower as they grow older (WHO, 2017). When people look forward to *ageing in place*, they tend to focus more on the flexibility of the living space at home, which has become a fundamental requirement in interior design, especially in the context of a *life cycle design* logic (Birkbeck & Kruczkowski, 2015). Therefore, the ability to quickly change or adapt domestic spaces to ensure the safety of all, from grandchildren to grandparents, with a small investment (Di Gessa, Bordone, & Arpino, 2023), must become a basic rule for the future. Ageing is not static, it is an evolving process where people's lifestyles, abilities and requirements change in different phases of life, as they get older, and remaining in their homes comfortably and safely is an important challenge, also considering that older people are very diverse individuals with different capabilities, impairments, needs and preferences (WHO, 2007).

Flexible housing may be defined as housing that can adapt and change its pattern of functional answers, both to social and personal needs, to reach the standards of *lifelong housing*

(Cellucci & Sivo, 2015). The development of *flexible housing* is therefore essential throughout the life cycle, in a way that allows the occupants to change the layout to some extent, to live in their homes in various forms and without limiting the specific functions of the spaces, adapting them to the different needs of the family. This can be seen in *Zippers,* a project by LEVS Architects, 2017, for the city of Luxembourg: a modular wooden building system, able to be adjusted or disassembled and reused for future sustainability and living experiences (Fig. 6).

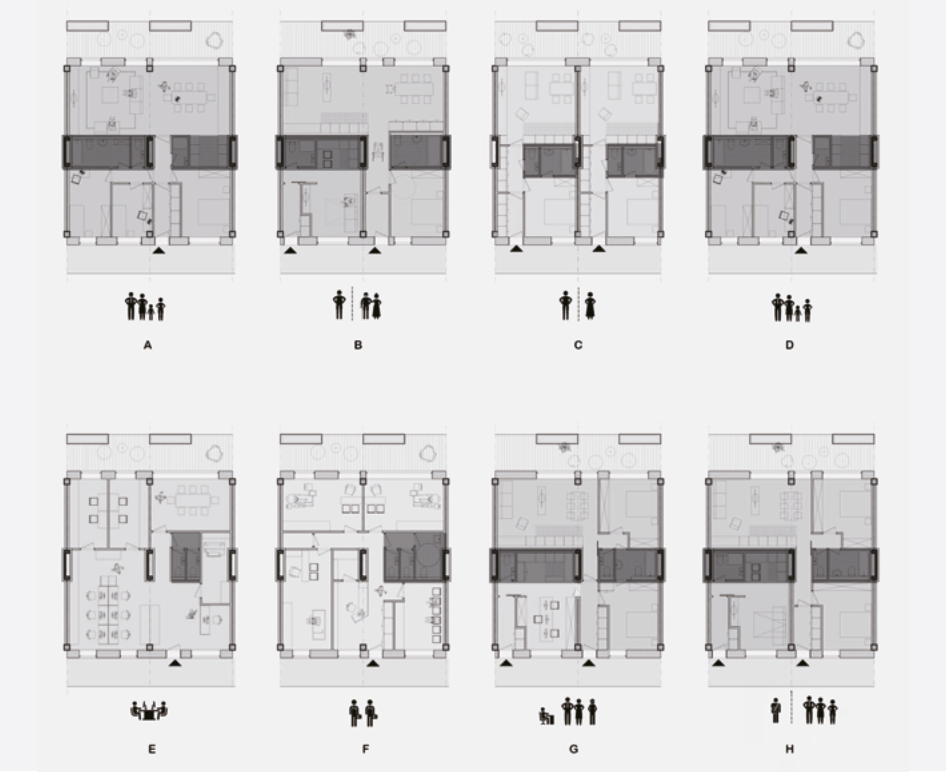

Figure 6. LEVS Architects, *Zippers*, Luxembourg: a clear modulation of the structure and water shafts allows the flexibility of not only subdividing apartments according to the life cycle of households (A, B, C, D), but also easy transformation into co-working (E), office spaces (F), home-office (G) or sub-letting (H), 2017. (Redrawn by Jingya Zhou, 2023).

A clear modulation of the structure and water shafts allows the flexibility of not only subdividing apartments according to the life cycle of households (A, B, C, D), but also easy transformation into co-working (E), office spaces (F), home-office (G) or sub-letting (H). In addition to the flexibility of living rooms turned into meeting rooms, dining tables turned into conference tables, kitchens and bathrooms ultimately designed according to universal design for use in the event of physical injury, and the versatility of bedrooms prepared for care support, the fluidity and ease of connectivity of all indoor spaces, as well as security, are essential needs for most people, especially in their later years of life. On the contrary, living spaces that do not correspond to the physical characteristics and needs of the users may create barriers to the full utilization of the room and in some cases may even become a real source of danger (Katarzyna et al., 2018), thus reinforcing the importance of the flexibility of the dwelling.

Spatial connectivity and mobility are essential for improving the quality of life of older adults, which involves creating spaces where they can move freely without constraints (Rantanen et al., 2021), that is being free and using their dwellings without encountering physical and functional barriers (Mahmood et al., 2022). Therefore, adopting universal design principles, open floor plans and flexible furniture in senior living spaces can help to create a seamless and adaptable environment (Zivkovic et al., 2021). Specifically, this can be achieved by removing steps, secondary walls, and using large windows and sliding doors to promote seamless connections between indoor and outdoor areas (Hosseini et al., 2015).

Figure 7. Traditional Japanese house: free circulation and open space system with sliding doors or folding walls, wide connection to outside nature (Source: Google images, 2023).

This creates inclusive environments where older people can maintain their independence and autonomy to engage in activities of daily living based on spatial mobility (Johnson et al., 2020). A reference could be the traditional Japanese house (Fig. 7) where spaces are organized by sliding doors in open layouts, both inside and outside, facing nature. To this end, ubiquitous accessible design should be integrated to ensure comfortable mobility for all residents in their daily lives (Sugiharto, 2017).

Improving safety of movements is thus essential, and special attention should be paid to the adaptation of rooms such as kitchens and bathrooms, as well as to the homogeneous illumination of the flat, especially the kitchen countertops, the dining room table, and the work area. Attention should be paid to the path from the bedroom to the bathroom and other basic routes, where adding handrails and other supports can significantly improve safety (Katarzyna et al., 2018).

5. The Importance of *Active Aging* and Natural Environments

A wide range of studies have documented how the level of exposure to the natural environment affects physical and mental health. The presence of green elements in housing neighbourhoods, in addition to playing an important role in mitigating the climate impact of the built environment and improving the eco-climatic conditions of cities, offers great health benefits for people of all ages (Engemann et al., 2019). Thus, the conscious integration of green nature into the daily lives of older people contributes to their wellbeing through their healing properties that avoid and ameliorate depression.

This subtle way of reducing the probability of mental illness is not only effective in reducing psychological stress in older people, but also unconsciously helps them to find their self-worth through plant care and can add vitality in old age (Chalfont & Walker, 2013).

In the wake of the Covid-19 pandemic, it has become even more important to study the impact of home greening, including indoor plants, on the well-being and health of residents. Prioritizing the enhancement of green spaces, including elements such as green roofs, green walls, and communal gardens, in both existing and new buildings is essential to promote vitality in older people (D'Alessandro et al., 2020).

Already back in 1987, the theory of *green visual acuity* (Aoki, 1987) showed that people feel most comfortable when the green colour reaches 25% of their field of vision. Statistically speaking, the *green visual acuity* of long-lived areas in the world is above 15%, which is also a new ecological concept: *visual ecology* (Xiao & Wei, 2018). Valdez and Mehrabian (1994) conducted an emotional modelling study in which they found that certain colours triggered specific emotional responses, and that older people showed higher sensitivity to positive green stimuli (Mammarella al et, 2016). Furthermore, several studies have highlighted how viewing greenery from building windows can have a beneficial effect on stress reduction, especially when natural elements or landscapes are daily visible (Labib et al., 2020), and it can even help to speed up the recovery process of hospitalized patients (Berto et al., 2015). Therefore, incorporating green elements in buildings and its

surroundings (Fig. 8) has become an important aspect, especially for older residents, considering that they tend to spend longer periods at home compared to younger residents.

Figure 8. Sargfabrik Housing, Vienna, BKK-2 Architects, 1994. Older people in dense urban areas can benefit from green roofs and sun exposure, which improves their mood as they tend plants, or even by seeing them from the window (Photo: António Carvalho, 2023).

Outdoor green spaces provide more opportunities for physical exercise and leisure activities, which can help to promote well-being and social relationships and reduce the frequency of various diseases such as coronary heart disease, bone disease, anxiety, depression and diabetes (Maas et al., 2009). At the same time, *green exercise* (physical activities in natural environments) can help to regain concentration (Berman et al., 2008), and being immersed in nature can be effective in

improving blood pressure. Exercising outdoors has a greater impact on participants than exercising indoors, and exercising in nature can make it easier to reduce anxiety, anger, fatigue, and depression (Gyasi, 2022). People are more inclined to spend time outdoors in pleasant green spaces, thus the attractiveness of natural clusters around residential areas can stimulate this behavioural pattern to increase social cohesion and vitality in old age.

6. Conclusion

Assistive technologies (sensors, surveillance, health monitoring systems, VFAI, virtual assistants, social robots, etc.) can be incorporated on newly built housing as part of the whole infrastructure system or added later to existing spaces, when necessary, therefore creating *Smart Homes*. In either case, architectural design solutions are crucial to coordinate the discrete incorporation of the IT technologies and assure the final domestic atmosphere of the environment, to avoid being rejected by older residents, concerned about privacy, autonomy, and psychological comfort of their homes.

In fact, the *Smart Home* tech industry has not paid enough attention to cybersecurity and privacy, important issues to be considered. In addition, the ethical implications of social robots as guardians and caregivers for older people are also debatable. Nevertheless, despite some concerns about security and loss of privacy, community-dwelling older adults are willing to adopt *Smart Home* technologies to support their independence and *ageing in place*, which they value the most.

Façade depth is essential to integrate climate, social, and health factors when designing elevations, to create balconies that meet diverse needs, promote health, and deliver restorative experiences. Balconies profoundly influence residents' quality of life but also the urban atmosphere and liveability for passers-by and residents alike. Balconies and façade composition are vital aspects of residential design, and they serve functions like thermal comfort, air quality enhancement, emotional well-being, and nature connection. In the pandemic context, the façade openings (big or small windows, protruding or recessed balconies, terraces, rooftops) had an immediate impact on inhabitants' comfort and health. And the pandemic lockdown promoted the rediscovery of the overlooked spaces of balconies as *Post-Domestic communication hubs*, responding to the new public health social distancing rules.

The Covid-19 pandemic accelerated and established the work from home all around the world, making *smart work* the new normal for many people. Therefore, homes became *Post-Domestic spaces* serving new permanent purposes: working, studying, relaxing, entertaining. This means that considerations of visual and thermal comfort (avoiding excessive glazing and overheat) and interior flexibility gained paramount importance. Thus, adapting lighting and thermal strategies to respond to these various needs and creating suitable façades and shading conditions for windows using features like the balcony depth, green planting, shading devices, operable blinds, vertical screens, and cross-ventilation significantly influences the residents' perception of a new *Post-Domestic comfort*.

On the other hand, the pandemic lockdown also sparked a trend in pro-nature design, as visual exposure to natural surroundings reduces anxiety and enhances mental well-being. Interaction with nature prompted a rise in small-scale urban agriculture in spaces like sunrooms and balconies, facilitating engagement with nature. Among other age groups, older people can benefit significantly from access to green areas, as these spaces encourage physical activity, counteract social isolation, and slow down functional decline making them less likely to experience symptoms of depression and anxiety during a pandemic than those who had less contact with nature. This also highlights the importance of private or condominium green spaces as safe havens for residents during lockdowns, a factor to be considered in urban and residential design in the new *Post-Domestic* condition we are living in.

The development of *flexible housing* is essential throughout the life cycle, in ways that allow the occupants to change the layout to some extent, to live in their housing in various forms and without limiting the specific functions of the housing, adapting it to the different needs of the family. On the contrary, living spaces that do not correspond to the physical characteristics and needs of the user may create barriers to the full utilization of the room and in some cases may even become a real source of danger. Therefore, housing based on full accessibility, open floor plans, flexible furniture and multiple uses, can offer a seamless, safe and adaptable *flexible Post-Domestic environment* to all residents, including senior citizens.

Active ageing, in the sense of keeping physically active, must be a priority for older people because it promotes well-being and social relationships and reduces the frequency of various diseases such as coronary heart disease, bone disease, anxiety, depression and diabetes. Besides, research has proven that *green exercise* (physical activities in natural environments) can help to regain concentration, and being immersed in nature can be effective in improving blood pressure. On the other hand, exercising outdoors has a greater impact on participants than exercising indoors, and exercising in nature can improve health, therefore highlighting the importance of incorporating the design of appealing green spaces into the urban and architectural design, with a special focus on residential areas.

Our final conclusion on *Post-Domestic habitats for ageing*, might be an urgent call for the need of incorporating new answers into the global architectural and urban design process: traditional aspects such as façade composition need to be addressed in terms of *façade depth*, to create places to stay, while interior architectural design needs to be approached holistically in the sense of *lifelong* spaces to respond to new needs (work, business, exercise) other than the traditional residential ones. And, focusing on housing to *age in place*, the incorporation of different levels and types of tech devices, can create *Smart Homes* as a new answer to a new social reality. Finally, and framing these new aspects of a *Post-Domestic Habitat*, the presence of green elements, both in outdoor and indoor spaces needs also to be considered for its mental and physical health benefits, besides the traditional beauty aspects.

References

Al-Shaqi, R., Mourshed, M., & Rezgui, Y. (2016). Progress in Ambient Assisted Systems for Independent Living by the Elderly. *SpringerPlus*, *624*(5). https://doi.org/10.1186/s40064-016-2272-8

Aoki, Y. (1987). Relationship Between Perceived Greenery and Width of Visual Fields. *Journal of the Japanese Institute of Landscape Architects*, *51*(1), 1–10. https://doi.org/10.5632/jila1934.51.1

Bate, L. (2020, May 28). How Will We Approach the Health of Our Communities and Our Planet After COVID-19? *Canadian Architect*. https://www.canadianarchitect.com/how-will-approach-the-health-of-our-communities-and-our-planet-after-COVID-19/

Berman, M. G., Jonides, J., & Kaplan, S. (2008). The Cognitive Benefits of Interacting With Nature. *Psychological Science*, *19*(12), 1207–1212. https://doi.org/10.1111/j.1467-9280.2008.02225.x

Berto, R., Barbiero, G., & Pasini, M. (2015). Biophilic Design Triggers Fascination and Enhances Psychological Restoration in the Urban Environment. *Journal of Biourbanism*, 1, 27–34.

Birkbeck, D., & Kruczkowski, S. (2015) *Building for Life 12. The Sign of a Good Place to Live*. Nottingham Trent University.

Bitterman, N., & Shach-Pinsly, D. (2015). Smart Home. A Challenge for Architects and Designers. *Architectural Science Review*, *58*(3), 266–274. https://doi.org/10.1080/00038628.2015.1034649

Bustamante, G., Guzman, V., Kobayashi, L. C., & Finlay, J. (2022). Mental Health and Well-Being in Times Of COVID-19. A Mixed-Methods Study of the Role of Neighborhood Parks, Outdoor Spaces, and Nature Among US Older Adults. *Health & Place*, *76*, 102813. https://doi.org/10.1016/j.healthplace.2022.102813

Cao, Y., Erdt, M., Robert, C., Naharudin, N. B., Lee, S. Q., & Theng, Y.-L. (2022). Decision-Making Factors Toward the Adoption of Smart Home Sensors by Older Adults in Singapore: Mixed Methods Study. *JMIR Aging*, *5*(2), e34239. https://doi.org/10.2196/34239

Cellucci, C., & Sivo, M. D. (2015). The Flexible Housing: Criteria and Strategies for Implementation of the Flexibility. *Journal of Civil Engineering and Architecture*, *9*(7). https://doi.org/10.17265/1934-7359/2015.07.011

Chalfont, G., & Walker, A. (2013). *Dementia Green Care Handbook (of Therapeutical Design and Practice)*. Safehouse Books.

Crosbie, M. J. (2020, July 5). How Might the COVID-19 Change Architecture and Urban Design? *Common Edge*. https://commonedge.org/how-might-the-COVID-19-pandemic-change-architecture-and-urban-design/

Cuadra, A., Bethune, J., Krell, R., Lempel, A., Hänsel, K., Shahrokni, A., Estrin, D., & Dell, N. (2023). Designing Voice-First Ambient Interfaces to Support Aging in Place. In D. Byrne, N. Martelaro, A. Boucher, D. J. Chatting, S. F. Alaoui, S. E. Fox, I. Nicenboim, & C. MacArthur (Eds.), *Proceedings of the 2023 ACM Designing Interactive Systems Conference* (pp. 2189–2205). DIS 2023. https://doi.org/10.1145/3563657.3596104

D'Alessandro, D., Gola, M., Appolloni, L., Dettori, M., Fara, G. M., Rebecchi, A., Settimo, G., & Capolongo, S. (2022). COVID-19 and Living Space Challenge. Well-Being and Public Health Recommendations for a Healthy, Safe, And Sustainable Housing. *Acta Biomedica Atenei Parmensis*, *91*(9-S), 61–75. https://doi.org/10.23750/abm.v91i9-s.10115

Dermody, G., Fritz, R., Glass, C., Dunham, M., & Whitehead, L. (2021). Factors Influencing Community-Dwelling Older Adults' Readiness to Adopt Smart Home Technology. A Qualitative Exploratory Study. *Journal of Advanced Nursing*, *77*(12), 4847–4861. https://doi.org/10.1111/jan.14996

Di Gessa, G., Bordone, V., & Arpino, B. (2023). Changes in Grandparental Childcare During the Pandemic and Mental Health. Evidence From England. *The Journals of Gerontology: Series B*, *78*(2), 319–329. https://doi.org/10.1093/geronb/gbac104

Dong, J., Guo, Y., & Xie, J. (2023). Research on Smart Community Aging-In-Place Service Model. In M. F. b. S. M. Dom et al. (Eds.), *Proceedings of the 2nd International Conference on Culture, Design and Social Development* (pp. 501–505). Atlantis Press SARL. https://www.atlantis-press.com/proceedings/cdsd-22/125984867

Dorsten, A., Sifford, K.S., Bharucha, A., Mecca, L.P., & Wactlar, H. (2009). Ethical Perspectives on Emerging Assistive Technologies. Insights from Foucus Groups With Stakeholders in Long-Term Care Facilities. *Journal of Empirical Research on Human Research Ethics*, *4*(1), 25–36. https://doi.org/10.1525/jer.2009.4.1.25

Egerer, M., Lin, B., Kingsley, J., Marsh, P., Diekmann, L., & Ossola, A. (2022). Gardening Can Relieve Human Stress and Boost Nature Connection During The COVID-19 Pandemic. *Urban Forestry & Urban Greening*, *68*, 127483. https://doi.org/10.1016/j.ufug.2022.127483

Engemann, K., Pedersen, C. B., Arge, L., Tsirogiannis, C., Mortensen, P. B., & Svenning, J.-C. (2019). Residential Green Space in Childhood is Associated With Lower Risk of Psychiatric Disorders From Adolescence Into Adulthood. *Proceedings of the National Academy of Sciences*, *116*(11), 5188–5193. https://doi.org/10.1073/pnas.1807504116

Ertaş, S.B., Polat, A.I., & Özturan, O. (2022). Evaluation of the Elderly Balcony Usage in Terms of Socialization During the COVID-19 Outbreak. *Journal of Aging and Environment, 37*(4), 478–491. https://doi.org/10.1080/26892618.2022.2109793

Fischer, S.H., David, D., Crotty, B.H., Dierks, M., & Safran, C. (2014). Acceptance and Use of Health Information Technology by Community-Dwelling Elders. *International Journal of Medical Informatics*, *83*(9), 624–635. http://dx.doi.org/10.1016/j.ijmedinf.2014.06.005

Forsyth, A., & Molinsky, J. (2021). What is Aging in Place? Confusions and Contradictions. *Housing Policy Debate*, *31*(2), 181–196. https://doi.org/10.1080/10511482.2020.1793795

Hanson, J. (2002). The Inclusive City. What Active Ageing Might Mean For Urban Design. In T. Maltby et al. (Eds.), *Active Ageing: myth or reality. Proceedings of the British Society of Gerontology 31st Annual Conference* (pp. 143–145). https://discovery.ucl.ac.uk/id/eprint/3319

Gyasi, E. (2022). *How to Design Healthy Sustainable Interior Spaces*. [Unpublished doctoral dissertation]. Atlantic International University.

Hosseini, R. S. R., Nik, E. A., Uson, G. E., & Armesto, A. A. (2015). Flexible Housing. The role of Spatial Organization in Achieving Functional Efficiency. *International Journal of Architectural Research: Archnet-IJAR*, *9*(2), 65–76. https://www.archnet.org/publications/10272

Johnson, J., Rodriguez, M. A., & Al Snih, S. (2020). Life-Space Mobility in the Elderly: Current Perspectives. *Clinical Interventions in Aging*, *15*, 1665-1674. https://doi.org/10.2147/cia.s196944

Kaplan, S. (1995). The Restorative Benefits of Nature. Toward an Integrative Framework. *Journal of Environmental Psychology*, *15*(3), 169–182. https://doi.org/10.1016/0272-4944(95)90001-2

Karimi, R., Avazpour, B., & M.E. Sepasgozar, S. (2020). Effective Factors on Desirability of Private Open Spaces. A Case Study of Kuye Nasr Residential Buildings, Tehran. In S. Shirowzhan, & K. Zhang (Eds.), *Smart Cities and Construction Technologies*. IntechOpen. https://doi.org/10.5772/intechopen.89335

Katarzyna, D., Fronk, M., Krysińska, M., Marczak, H., Partyka, O., Kwiatkowska, K., & Pajewska, M. (2018). *Living Environments of Polish Seniors. Needs and Challenges*. Aleksandra Czerw.

Kesik, T., Liam, O., & Terri, P. (2019). *Enhancing the Livability and Resilience of Multi-Unit Residential Buildings*. MURB Design Guide.

Kumar, V., & Chawda, R. K. (2020). A Research Paper on Smart Home. *International Journal of Engineering Applied Sciences and Technology*, *5*(3), 530–532. https://doi.org/10.33564/ijeast.2020.v05i03.088

Labib, S. M., Lindley, S., & Huck, J. J. (2020). Spatial Dimensions of the Influence of Urban Green-Blue Spaces on Human Health. A Systematic Review. *Environmental Research*, *180*, 108869. https://doi.org/10.1016/j.envres.2019.108869

Maas, J., Verheij, R. A., de Vries, S., Spreeuwenberg, P., Schellevis, F. G., & Groenewegen, P. P. (2009). Morbidity is Related to a Green Living Environment. *Journal of Epidemiology and Community Health*, *63*(12), 967–973. https://doi.org/10.1136/jech.2008.079038

Mahmood, A., Patille, R., Lam, E., Mora, D. J., Gurung, S., Bookmyer, G., Weldrick, R., Chaudhury, H., & Canham, S. L. (2022). Aging in the Right Place For Older Adults Experiencing Housing Insecurity. An Environmental Assessment of Temporary Housing Program. *International Journal of Environmental Research and Public Health*, *19*(22), 14857. https://doi.org/10.3390/ijerph192214857

Makhno, S. (2020). Life After Coronavirus. How Will The Pandemic Affect Our Homes? *Dezeen*. https://www.dezeen.com/2020/03/25/life-after-coronavirus-impact-homes-design-architecture/

Mammarella, N., Di Domenico, A., Palumbo, R., & Fairfield, B. (2016). When Green is Positive and Red is Negative. Aging and the Influence of Color on Emotional Memories. *Psychology and Aging*, *31*(8), 914–926. https://doi.org/10.1037/pag0000122

Mierzejewska, L., Sikorska-Podyma, K., Szejnfeld, M., Wdowicka, M., Modrzewski, B., & Lechowska, E. (2023). The Role of Greenery in Stress Reduction among City Residents during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, *20*(10), 5832. https://doi.org/10.3390/ijerph20105832

Nielsen, D. (2020). 17 Architects and Designers on How the Pandemic Will Change Our Homes Forever. *Dwell*. https://www.dwell.com/article/architects-say-coronavirus-COVID-19-pandemic-will-change-home-design-ee29c873

Orlofsky, S., & Wozniak, K. (2022). Older Adults' Experiences Using Alexa. *Geriatric Nursing*, *48*, 247–257. https://doi.org/10.1016/j.gerinurse.2022.09.017

Pedersen, I., Reid, S., & Aspevig, K. (2018). Developing Social Robots for Aging Populations. A Literature Review of Recent Academic Sources. *Sociology Compass*, *12*(6), e12585. https://doi.org/10.1111/soc4.12585

Pouso, S., Borja, Á., Fleming, L. E., Gómez-Baggethun, E., White, M. P., & Uyarra, M. C. (2021). Contact With Blue-Green Spaces During the COVID-19 Pandemic Lockdown Beneficial for Mental Health. *The Science of the Total Environment*, *756*, 143984. https://doi.org/10.1016/j.scitotenv.2020.143984

Rantanen, T., Eronen, J., Kauppinen, M., Kokko, K., Sanaslahti, S., Kajan, N., & Portegijs, E. (2021). Life-Space Mobility and Active Aging as Factors Underlying Quality of Life Among Older People Before and During COVID-19 Lockdown in Finland—A Longitudinal Study. *The Journals of Gerontology. Series A*, *76*(3), e60–e67. https://doi.org/10.1093/gerona/glaa274

Reeder, B., Meyer, E., Lazar, A., Chaudhuri, S., Thompson, H. J., & Demiris, G. (2013). Framing the Evidence for Health Smart Homes and Home-Based Consumer Health Technologies as a Public Health Intervention for Independent Aging. A Systematic Review. *International Journal of Medical Informatics*, *82*(7), 565–579. https://doi.org/10.1016/j.ijmedinf.2013.03.007

Ribeiro, C., Ramos, N. M. M., & Flores-Colen, I. (2020). A Review of Balcony Impacts on the Indoor Environmental Quality of Dwellings. *Sustainability*, *12*(16), 6453. https://doi.org/10.3390/su12166453

Sugiharto, A. (2017). Design of Residential Building is Based on the Accessibility of the Elderly Residents to the Environment and Building. *ARTEKS Jurnal Teknik Arsitektur*, *1*(2), 99–116. https://doi.org/10.30822/arteks.v1i2.31

Vakalis, D., Touchie, M., Tzekova, E., MacLean, H. L., & Siegel, J. A. (2019). Indoor Environmental Quality Perceptions of Social Housing Residents. *Building and Environment*, *150*, 135–143. https://doi.org/10.1016/j.buildenv.2018.12.062

Valdez, P., & Mehrabian, A. (1994). Effects of Color on Emotions. *Journal of Experimental Psychology*, *123*(4), 394–409. https://doi.org/10.1037/0096-3445.123.4.394

Wilson, C., Hargreaves, T., & Hauxwell-Baldwin, R. (2017). Benefits and Risks of Smart Home Technologies. *Energy Policy*, *103*, 72–83. https://doi.org/10.1016/j.enpol.2016.12.047

World Health Organization (2007). *Global Age-friendly Cities. A Guide*. WHO Press. https://www.who.int/publications/i/item/9789241547307

World Health Organization (2015). *World Report on Ageing and Health*. WHO Press. https://www.who.int/publications/i/item/9789241565042

World Health Organization (2017). *Age-Friendly Environments in Europe. A Handbook of Domains for Policy Action*. WHO Regional Office for Europe. https://www.who.int/publications/i/item/9789289052887

Xiao, X., Wei, Y., & Li, M. (2018). The method of measurement and applications of Visible Green Index in Japan. *International Urban Planning*, *33*(2), 98–103. https://doi.org/10.22217/upi.2015.547

Xue, P., Mak, C. M., Cheung, H. D., & Chao, J. (2016). Post-Occupancy Evaluation of Sunshades and Balconies' Effects on Luminous Comfort Through a Questionnaire Survey. *Building Services Engineering Research & Technology*, *37*(1), 51–65. https://doi.org/10.1177/0143624415596472

Yan, Y., Bayham, J., Richter, A., & Fenichel, E. P. (2021). Risk Compensation and Face Mask Mandates During the COVID-19 Pandemic. *Scientific Reports*, *11*, 3174. https://doi.org/10.1038/s41598-021-82574-w

Zivkovic, M., Stamenkovic, M., & Petrovic, V. (2021). Towards Flexible Housing. Basic Design Principles. *Facta Universitatis. Series Architecture and Civil Engineering*, *19*(2), 183–192. https://doi.org/10.2298/fuace211129014z

Redefining Paradigms

How Technology Shapes Interior Spaces in the Age of Drones and Flying Cars

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Abstract
Mobility technologies, since the discovery of the uniaxial wheel, have strongly shaped the forms and times of cities and buildings and their interiors. The paper explores how newly developed flying transports, such as drones, may in the future reshape and alter the interiors of the buildings we inhabit.
Utopias about cities with flying cars are a literature full of examples and theories, such as Andrea Branz/Archizoom's *No Stop City* and *Instant City* and others, but also even more extensive cinematography such as Christopher Nolan's movie *Inception* and Stanley Kubrick's *2001: A Space Odyssey*.
In fact, the flying vehicles, by which people as well as goods will soon move, introduce a fourth dimension (time) and will allow access to buildings from the roof and facades. They will recover the distributional logic of an iconic and historical typology of Milanese architecture, that of the *edificio a ballatoio*, in which the distribution of spaces followed a private/public logic that would lend itself perfectly to the buildings of the drone city.
The article will explore the transformations in plans, materials, facades, ways of living, and relationships that, this coming revolution, will introduce into the interior spaces of buildings and our existences.

1. Elevation. How Drones Will Change Cities

In 2018, design magazine Dezeen, produced a documentary directed by Marcus Fairs and Oliver Manzi, entitled *Elevation. How drone will change cities*, that began questioning architects, designers, planners, and curators about the impact of drones on the city, built space, interiors, and ways of living. It was a documentary assessing both the negative and positive implications of drones arriving on our windowsills, balconies and terraces delivering goods and people at all times of the day and night.
The documentary includes interviews with Norman Foster of Foster+Partners, Anab Jain of Superflux, and transport designer Paul Priestman, who demonstrate enthusiasm in highlighting the potential of these new vehicles of transport and delivery (Hafiz & Zohdy, 2022).

There are also more critical voices who see the possibility of losing privacy and security, if not becoming instruments of risk to our safety (Baraona Pohl, Verzier, & Shoshan, 2018). There are futuristic evaluations in which drones will help us relieve congestion on the streets, enable us to control construction sites, carry out construction or decoration, as in the case of the façade painted by drones in an experiment carried out by the Carlo Ratti e Associati Studio, and help us increase our awareness of the context with a constant change of perspective.

The purpose of this article is to show how this already available technology will profoundly reshape even the most intimate parts of a building, such as the interior spaces.

2. Nomadic Infrastructures

The use of drones undermines the transport system that has shaped the city so far, based on linear and fixed infrastructures. Roads, streets, squares, developed linearly at ground level defined plots of land on which architecture and buildings were constructed.

The horizontal, radial, linear or gridded city has created architecture, especially residential architecture, developed by layers/layers of intimacy and privacy with a progression: public, semi- public, semi-private, private, intimate.

The foundation of cities has been shaped by streets and pathways, squares, pavements, and entrances to buildings mainly at ground level, but the visionary temptation to imagine different modes of access and movement accompanies the history of architecture and interiors.

One of the most famous reflections on the impact that flying transportations could have on living goes back to F. L. Wright's *Broadacre City*, in which flying machines were used for short-range proximity connections. That visionary project anticipated an advanced and technological system of last-mile logistics, served by flying vehicles better suited to the city environment, capable of relieving traffic congestion of the streets and allowing a reforestation of the city as advocated by Carlos Moreno's recent theories on the *15 minutes city*.

We are not new to this scenario that has fed literature and movie. In Ridley Scott's *Blade Runner,* flying vehicles land on the various floors of the city, creating new connections at different heights, without necessarily entering from the ground floor.

The exploration of the potential about the relationship between accessibility and the verticality of buildings has been

going on since the dawn of modern architecture, when the automobile became a popular private vehicle, but also when the first air transport began to invent prototype aircraft.
The technological fervor also found expression in the movement of Futurism, which, through projects and works of art, had guessed that mobility would become a shaping force in architecture, the city, and the lives of all.
Futurism played a key role in inspiring the iconic film *Metropolis*, directed by Fritz Lang in 1927, in which spaces intertwine at all heights, linking accesses with flying bridges that crossed vertical spaces that mix public and private, inside, and outside in a continuum.
The idea of nomadic/flying infrastructures, experimented theoretically by the radical movements in the architecture of the 1960s and 1970s, with projects such as Archigram's *Instant City*, were certainly the birth of the multidimensional mobility paradigm. Also the introduction of imagery as in Archigram/Branzi's *No Stop City*, where the building was fully accessible, flexible and therefore penetrable from all points and not hierarchically from the ground floor, led to experimental projects such as Steven Holl's *Linked Hybrid* building complex in Beijing, which while maintaining the paradigm of gravity and access from the ground explored the potential that access to the building from other levels could develop.
The latest generation of buildings seems to consider access to all heights a possibility and no longer a projection. *The Line* project in Saudi Arabia, which has a popular genealogy in Mario Fiorentino's *Corviale* and which introduces the concept of an elevated development of a city that is, however, a single building, 170 km long and 500 meters high, and *The Circle* pro-

ject in Dubai, which consists of a 550-metre-high ring that is in fact a horizontal high-rise skyscraper, go in this direction. Evidently, these visions derive from a technology such as drones that is becoming increasingly democratized.
Imagining a world where buildings are accessed through all sides, rather than just horizontally at ground level, has the potential to transform urban life in profound ways. This paradigm shift redefines development, composition, and a different perspective, in which horizontal and vertical spaces intermingle, raising the baseline for the emergence of the city. For Paul Priestman, the potential impact of drones is equal to the advent of the first railway, which initiated the linear expansion of cities. So, what could happen, and in part is already happening, is that drones will redesign the various scales of design from the city to the building and from this to the interior.

3. Flipped Building

The arrival of drones, which will allow access from all sides of the building but before that from every other side, will allow entry from the roof. Again, this is not a morphological novelty, in fact some buildings, which may be in areas backed by mountains or cliffs, may have an entrance from the top of the building and provide a top- down development. As in the provocative project recently proposed by Oxo Architects is in fact *inverted high-rise*, a building that envisages the reuse of abandoned motorway bridges on the Salerno-Reggio Calabria motorway, accessed from above by leaving the car and descending downwards. The project envisages a pedestrian street and a road dedicated to vehicular traffic at the top, and a self-sufficient vertical village with rainwater collection

systems, purifiers, solar energy plants and mechanization of organic waste. A geothermal and geo-hydro plant would provide hot water and electricity to the inhabitants of the futuristic condominium, who would have to descend 45 meters in a lift to reach the houses embedded in the pylons.
The role of the roof, which Le Corbusier had already identified as strategic in the *Unité d'Habitation* in Marseilles, becomes even more significant because it becomes a place of access and service not only to the community but also to the city. As soon as transport moves from the ways of earth to the ways of heaven, the entire city will expand with a vertical logic and new typological forms will emerge that will serve to land, park, recharge drones (Hafiz & Zohdy, 2022).
But what the drones will be able to introduce is a real flip of the section of the buildings by reconfiguring the composition, functions, and hierarchies of all the interior spaces and especially by raising the base line and abandoning or redesigning the ground floor. The overturned building will distribute spaces according to other logics and flows, the role of roofs will be completely redesigned at the expense of exclusivity and in favor of the community.

4. The Street-Balcony

To understand the possible scenarios of the impact of drones on buildings, the most interesting way seems to be the one already explored in the past by all those experiments related to the typology of the balcony building or the street at height. The access, in fact, to the building from each façade entails a review not only of the roof, but also of the balconies, terraces, and service ramps of the building.

Indeed, to think that drones will dissolve the boundaries between indoors and outdoors is unthinkable now, while it is plausible to think that access will be mediated by architectural infrastructures capable of transferring certain qualities of the street to the heights while guaranteeing privacy and security. In the past, examples of the development of typologies capable of taking streets to heights, such as Ludwig Hilberseimer's attempts to develop the *Vertical City* have proved to be interesting proposals.

If the street is a room for the community, then is crucial that movements on the street are imbued with sensitivity and sense in order not to violate the home, but at the same time to offer opportunities for encounters and to adhere to a kind of pact that the street makes with the buildings facing it (Kahn, 1971). Herman Hertzberger stated that the streets of a city need slowness, concentration to ensure social exchanges and lively relations between people who do not have intimate knowledge of each other and who do not intend to have it (Hertzberger, 1996). In Hertzberger's projects, in fact, the street-living room is the one in the vicinity of residences "in which the semi-public/semi-private space outside the dwellings becomes a common living room, a shared space between those who live there" (Bernardini, 2018).

It is precisely this idea of the street-inhabitant that seems to point a sensible way forward in architecture's response to the entry of drones to safeguard its interiors. For this concept assumes that inhabitants share something and have expectations of reciprocity from one another (Kahn, 1971). The street-balcony is a form of social gallery whose function is not simply the dislocation, but that of community pact.

The absence of vehicles has allowed important experiments with it in the history of architecture, as in many of the works of the Team X Architects, the Smithson, Giancarlo De Carlo, Bakema and Van der Broek, Candilis Josic and Woods. In their projects, this design infrastructure reinterpreted the system of relationships, both physical and social, of the traditional city, but took it to new heights, entering the buildings and giving shape to a private urban space (Bernardini, 2018). Another model that may point to interesting answers is the stem model proposed by the Candilis Josic and Woods group of architects, which envisages elevated pedestrian paths that accommodate both services and residences (Hertzberger, 2009). The stem tapers off as it proceeds towards residences in increasingly smaller paths, ensuring a mediated relationship between housing and services and urban space.

In Smithson's *street-in-the-air* and Bakema's and Van der Broek's aerial walkways, whose sections accommodate activities and socializing, but above all to guarantee another fundamental requirement, that of privacy of the living quarters, without which even the sociability of the balcony would be undermined (Smithson, 1971).

For this reason, the KCAP group, in the *Stadstuinen* project in Rotterdam, decides to move the balcony away from the façade by a few meters, then to set it apart for having the entrance area to the dwellings has a semi-private mediating the transition between the individual and collective dimensions of the residence, thus solving the problem of privacy between inside and outside. The balcony, although detached from the building, is of such a size as to invite moments of rest and not just transit (Bernardini, 2018).

The separation between public and private made by the street-balcony must be a *soft edge* that can filter passages to and from the interior in a gradual and pleasant way, avoiding defensive closures to the exterior (Gehl, 1977).

The street-balcony is a semi-private or semi-public space that has a strong relationship to both the interior space and the public space on the ground. Jane Jacobs about the value of this infrastructure in relation to a building in Brooklyn argues that the walkways were cleverly designed not just for transit, but for other uses as well, to solicit self-surveillance from the residents (Jacobs, 2009).

The walkway provides the necessary distance to allow frequent but not demanding contact, guarantee privacy and keep the public space vital (Smithson, 1971).

The street-balcony responds to road congestion caused by cars, making the ground zero of cities unlivable. This model has taken hold in those very high-density metropolises, where flows are separated to make mobility efficient and optimize space, and where interiors have a very substantial urban dimension. This is what has started to happen in cities like Hong Kong, which already experience this four- dimensionality. The ground floor is cancelled in favor of a connectivity that produces an urban-scaled interior (Frampton, Solomon, & Wong, 2018).

In this sense, the *West Village Basis Yard* project in Chengdu is of great interest to us. A walkway winding through the courtyard connects each floor of the building, from the basement to the roof; it is designed for pedestrians and cyclists for leisure and sports activities. This constant change of altitude activates a dynamic flow of energy within this architectural design and gives joggers and cyclists an unusual experience.

The project aims to integrate a variety of social resources into a local collective living space that simultaneously accommodates sports and leisure activities, cultural and artistic events, fashion, and creative industries.

5. Post-Domestic Interiors

The Smithsons understood early on that a new housing model needed a new type of street, and for this reason a Post-Domestic model with drones in the urban landscape must also precede a new type of elevated street or balcony-road. In this idea of the street-balcony or ramp-balcony there is a safety dimension that allows even the most fragile categories to have autonomy. The street-balcony is a threshold between residence and sky (Bernardini, 2018).

The issue of privacy is in fact central to the management of the relationship with the interior, and this theme is often resolved by the arrangement of spaces, as envisaged by Herman Hertzberger in the *Student House* on the Weesperstraat, in which the bedrooms, facing the balcony, have a raised floor and ribbon windows that allow a view of the landscape without allowing outside glances to infringe privacy.

Regarding the threshold relationship between drone and architecture, we have arrived at the likely scenario that drones will approach buildings through the mediation of an infrastructure such as the street-balcony, but we will have to understand what will happen to the composition of spaces and the qualities of these ones. Domestic spaces will undergo the most metamorphosis, entering that Post-Domestic configuration also initiated by the digital revolution.

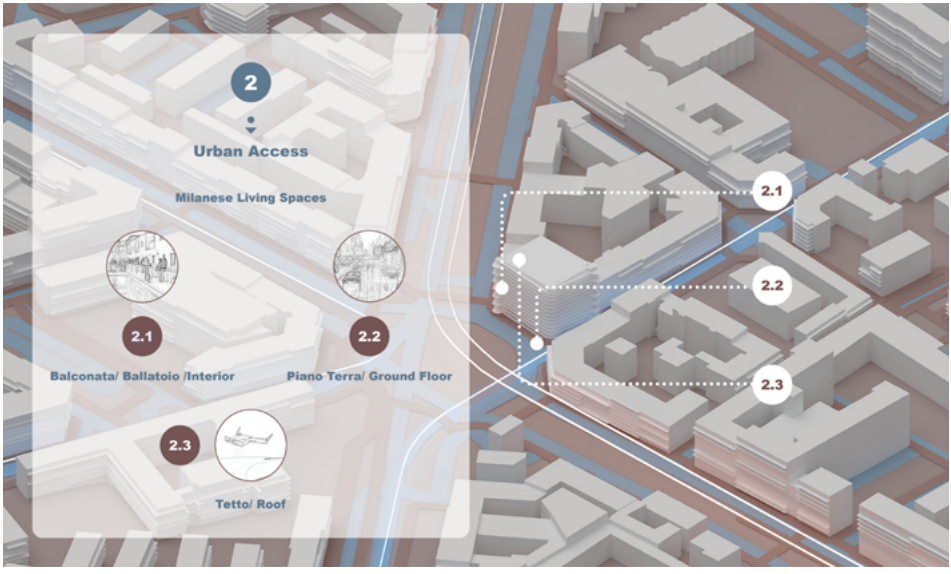


Figure 1. Baharlouei, E., Site of the building, Thesis Incubator Studio, Politecnico di Milano, 2023. (designed by Elena Baharlouei).

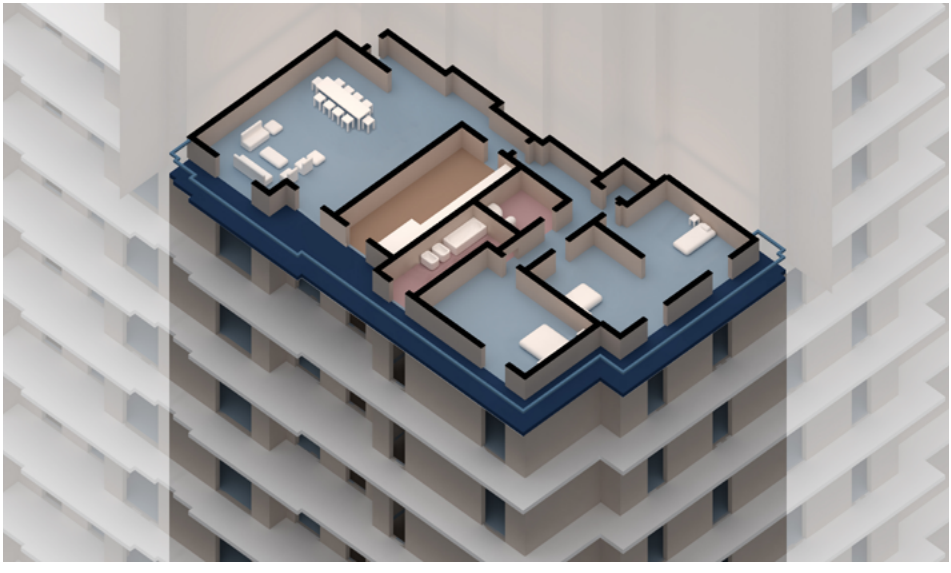


Figure 2. Baharlouei, E., The existing Apartment, Thesis Incubator Studio, Politecnico di Milano, 2023. (designed by Elena Baharlouei).

The availability of technology such as drones raises political, social, and cultural issues that are perhaps the main obstacle to their indiscriminate entry onto the market today. Within residential spaces, drones will have a profound impact on the security that will require openings to the outside world, windows and balconies, to protect against intrusions by strangers; on the privacy that will have to be somehow guaranteed especially in the most intimate areas of the home; on the relationships that will have, even in the real world and not only in the digital one, continuity without any filter between public and private (Rao, Gopi, & Maione, 2016)
Drones will have an impact on the composition of the interior spaces of residences, and interior research will have to move on several fronts:

- The redesign of interior layouts with a potential move of the most private spaces away from the permeable parts of the building.
- The exploration of new smart materials in architecture and interiors capable of filtering according to situations and moments from the view, listening, etc. of spaces to the interior and vice versa.
- The creation of buffer zones capable of interposing themselves between the airspace of the drones and the building, such as ramps capable of interrupting the continuity between outside and inside.

From research carried out within the Design Department of the Politecnico di Milano, and with a thesis developed within the Thesis Incubator Studio, we have been able to ascertain

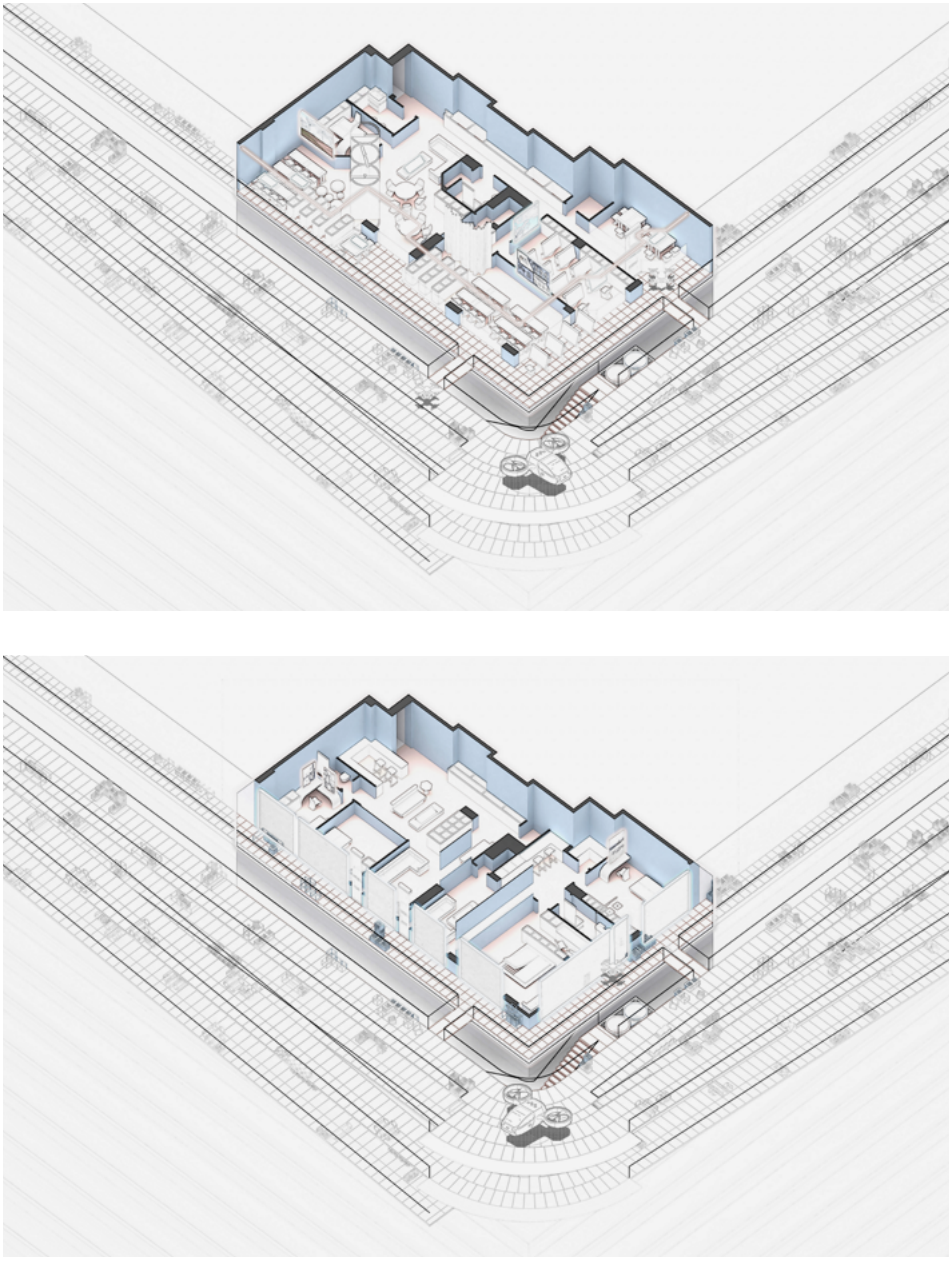
that the walkway typology, as mentioned in the previous paragraphs, is the one that best responds to the needs for privacy, security but also sociality in a world of flying transport (Baharoulei, 2023).
What in the tradition of early 20th-century Milanese architecture is called the *balcony typology* thus becomes one of the Post-Domestic typologies for this potential transformation (Figg. 1-7).

The research experimented with how an existing residential building could be redesigned should drones become the main (not only) transport system for people and goods soon. It emerged that the interior would undergo the following transformations:

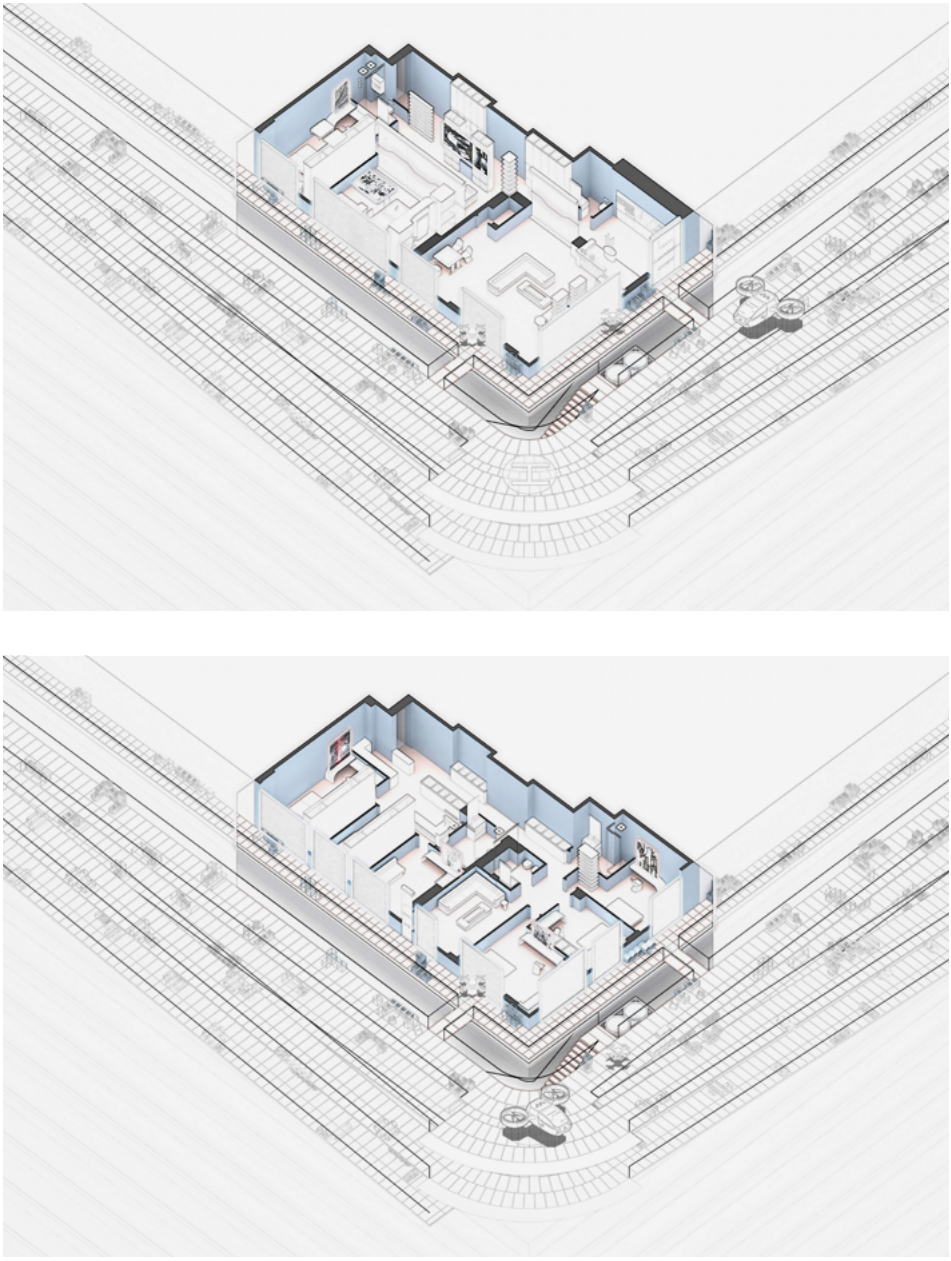
- **Layout**. Floor plans are defined according to the entrance, predominantly from the street- balcony and the windows that guarantee the entry of light but must not guarantee violation of privacy. Established services, such as bathrooms and kitchens, remain fixed points, while the other rooms are distributed towards the street-balcony those of living, while the bedrooms are pushed inwards or behind screens. On average, the bedrooms increase their surface area by becoming true studios, while the service areas reduce their size. Entertainment areas, on the other hand, take on a strategic role and increase in size.
- **Partitions**. Walls tend to take the form of movable partitions with different characteristics in terms of geometry and shading. Curtain systems with different degrees of transparency and opacity make spaces and their functions more flexible.

- **Windows and shading**. Windows become membranes with different levels of shading. Size and positioning are also related to the need for privacy, but also ventilation and lighting.
- **Accesses**. Two entrances can be envisaged, one from the inside confirming the existing one and another from the outside adapting existing balconies, loggias, and galleries to allow for disembarking.
- **Balconies**. They change their role and configuration in which these spaces can open or close to provide semi-private or semi-public spaces.
- **Bedrooms**. Each room then becomes its own place, tending to be self-sufficient with all comforts. Privacy must be guaranteed, not necessarily at night, but in intimate moments.

Although drones are now on our windowsills, research is still very fragmented and unsystematic, failing to offer relevant insights into a design, social, political, and therefore regulatory framework.
It will therefore be important for the disciplines of interior design to help research, explore and package possible scenarios in the immediate future for designers, builders, regulators, and ordinary inhabitants.



Figures 3 & 4. Baharlouei, E., Art School and Apartment for 2 families, Thesis Incubator Studio, Politecnico di Milano, 2023. (designed by Elena Baharlouei).



Figures 5 & 6. Baharlouei, E., Apartment for working and Apartment for students, Thesis Incubator Studio, Politecnico di Milano, 2023. (designed by Elena Baharlouei).

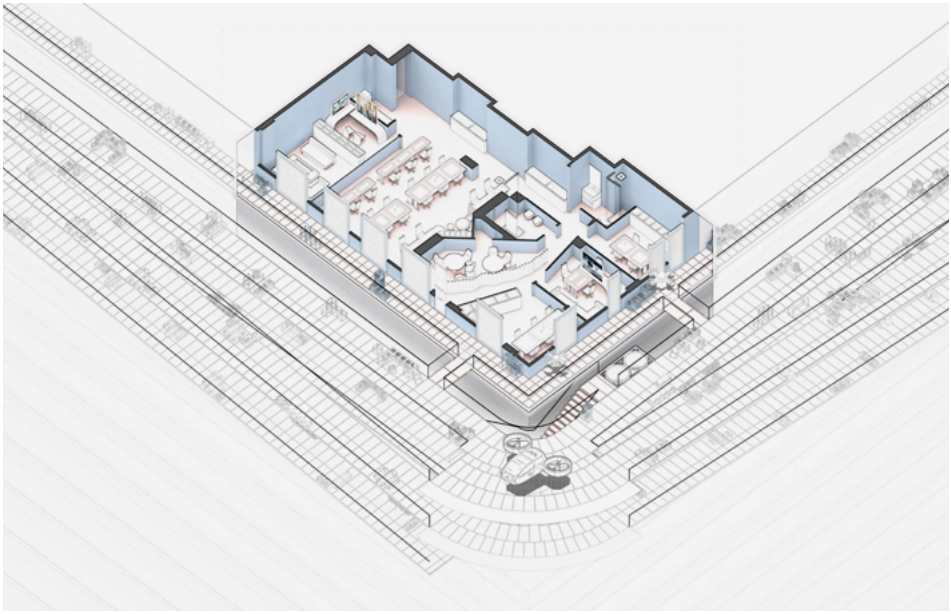


Figure 7. Baharlouei, E., Offices, Thesis Incubator Studio, Politecnico di Milano, 2023. (designed by Elena Baharlouei).

References

Baharoulei, E. (2023). *To flip the Paradigms. A Design Speculation in Corvetto.* [Unpublished thesis dissertation]. Politecnico di Milano.

Baraona Pohl, E. B., Verzier, M. O., & Shoshan, M. (Eds.). (2018). *Drone. Unmanned. Architecture and Security Series* (Vol. 1). Dpr-Barcelona.

Bernardini, C. (2018). *Lo spazio della strada. Integrazione e accessibilità come superamento delle soluzioni tecniche standard*. [Unpublished doctoral dissertation]. Università di Roma la Sapienza.

Bharat R., Gopi, A. G., & Maione, R. (2016). The Societal Impact of Commercial Drones. *Technology in Society*, *45*, 83–90. https://doi.org/10.1016/j.techsoc.2016.02.009

Fairs, M., & Manzi, O. (2018, May 21). Elevation. How Drones Will Change Cities. *Dezeen*. https://www.dezeen.com/2018/05/21/dezeen-drones-documentary-elevation-release/

Farina, M. (2012). *Spazi e figure dell'abitare. Il progetto della residenza contemporanea in Olanda*. Quodlibet.

Frampton, A., Solomon, J.D, & Wong, C. (2018). *Cities Without Ground. A Hong Kong Guidebook*. Oro Editions.

Frampton, K. (1982). La strada ordinaria come manufatto continuo. In A. Standford (Ed.), *Strade* (pp. 335–364). Edizioni Dedalo.

Gehl, J. (1977). *The Interface Between Public and Private Territories in Residential Areas*. The Department of Architecture and Building, Melbourne University.

Hafiz, D., & Zohdy, I. (2022). Smart Cities in the Autonomous Era. How Autonomous Technologies Can Change the City Design and Infrastructure. In F. Rosso, D. Morea, & D. O. Pribadi (Eds.), *Innovations in Green Urbanization and Alternative Renewable Energy. Advances in Science, Technology & Innovation* (pp. 37–45). Springer. https://doi.org/10.1007/978-3-031-07381-6_4

Hertzberger, H. (1996). *Lezioni di architettura*. Laterza.

Hertzberger, H. (2009). Come incrementare la coesione sociale nell'housing e nel progetto urbano. In L. Gelsomino, & O. Marinoni, *I territori europei dell'abitare* (p. 25). Editrice Compositori.

Jacobs, J. (2009). *Vita e morte delle grandi città. Saggio sulle metropoli americane*. Einaudi.

Kahn, L. (1971). The Room, the Street, the Human Agreement. *AIA Journal*, *56*, 33–34.

Porta, S. (2002). *Dancing street. Scena pubblica urbana e vita sociale*. Edizioni Unicopli.

Sapolsky, R. M. (2017). *Behave. The Biology of Humans at Our Best and Worst*. Penguin Books.

Smithson, A., & Smithson, P. (1971). *Struttura urbana. Studi di Alison e Peter Smithson*. Calderini. (Original work published 1967).

III

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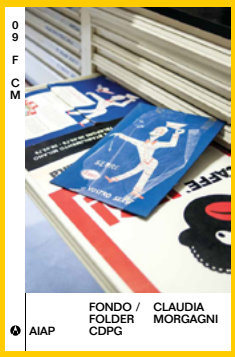

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