teamLab *Borderless*: The Role of Play in Immersive, Interactive Installations

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Abstract

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This thesis considers the work of teamLab, a Japanese art collective that creates immersive and interactive installations using projection-based new media technology. An examination of teamLab's exhibition *teamLab Borderless* (2018-2022), at the MORI Building Digital Art Museum in Odaiba, Tokyo, Japan, is the primary focus of this study. In this exhibition, teamLab claims to present a "borderless" world. The collective believes that the multisensory, co-creative experiences they present have the potential to foster connections between people. In order to better understand how teamLab's exhibition invites visitors to rethink the way they interact with art, the significance of other people, and their perception of the gallery space, this thesis considers the experiential aspects of teamLab's *Borderless* exhibition through the lens of ludic theory. This perspective explores how the shifting interpretation of play has influenced the way people partake in artistic experiences, particularly in the context of the culture industry's "experience economy". Through a formal analysis of key artworks highlighting the relationship between visitors and the design of teamLab's installations, this thesis examines how immersive experiences affect the visitor's sense of agency, both within the museum and in the digital domain of social media as well. By exploring the dynamics between visitors and the virtual environment in teamLab's exhibition, this thesis proposes that that the collective's work offers a renewed understanding of the importance of our connections to others and our environment.

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On a personal note, I am grateful to my mom for her unwavering support throughout my academic journey. I would also like to thank my grandma and grandpa, who fostered my interest in art history from an early age and always emphasized the importance of learning. I would also like to mention my dog, Daisy, for being a source of joy and comfort. I would also like to thank my friends for their presence and support. I deeply value the kindness and reassurance I received over the course of my graduate studies.

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Introduction

teamLab immerses the viewer in an all-encompassing artistic experience through their exhibition *teamLab Borderless* (2018-2022), at the MORI Building Digital Art Museum in Odaiba, Tokyo, Japan (Figure 1). The museum is the flagship site of teamLab, an art collective that creates interactive installations, presenting a whimsical world through projection-based new media technology. Within a year of opening, teamLab's permanent *Borderless* exhibition received over 2.3 million visitors, becoming the most visited single-artist museum in the world.[1] teamLab's immersive, interactive exhibition brings into focus the relationship between the visitor and the virtual environment, a dynamic that is tied to the discourse surrounding the history of illusory strategies and the potential of screen-based media. The mediation of one's relationship to their environment served as a source of inspiration for Toshiyuki Inoko (b. 1977), the founder of teamLab.[2] Inoko founded teamLab in 2001 after graduating from the University of Tokyo's Department of Mathematical Engineering and Information Physics (Figure 2).[3] The collective's interdisciplinary team consists of four directors including Daisuke Sakai, the head of teamLab's digital solutions, Yuzuru Yoshimura, Tetsuya Tamura, and Kenichi Watanabe, bringing together their expertise in the fields of engineering, product design and robotics.[4] Since its beginnings, teamLab has grown to include over 400 members, comprised of artists, programmers, engineers, computer graphics animators, mathematicians and architects.[5] Initially, the collective sought to explore the way in which people perceive space, creating three-dimensional computer models and projecting them onto two-dimensional surfaces.[6] teamLab's practice has evolved into large-scale screen-based installations, presenting a multisensory experience by incorporating rich visual imagery and music with the spatial design of the museum. Inside the museum, the visitor is admitted into the art collective's vision of a "borderless world" awash in a kaleidoscope of

[1] Naomi Rea, "teamLab's Tokyo Museum Has Become the World's Most Popular Single-Artist Destination, Surpassing the Van Gogh Museum," *Artnet*, August 7, 2019, https://news.artnet.com/exhibitions/teamlab-museum-attendance-1618834.
[2] Karin Oen, "Art in the Age of Digital Interactivity," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson (San Francisco: Asian Art Museum, 2020), 8.
[3] Ibid, 8. Inoko is the current CEO of teamLab and serves as the collective's main representative.
[4] Anqi Xu, "Innovations in Art Through the Lens of Business Model Analysis and the Dynamics of Creative Industries: A Case Study of teamLab" (master's thesis, Stanford University, 2020), 20, https://stacks.stanford.edu/file/druid:qv154xg5274/200604-Anqi-thesis-finalvers.pdf.
[5] "Biography," teamLab, accessed October 25, 2020, https://www.teamlab.art/about/.
[6] Yuki Morishima, "Ultrasubjective Space: Exploration of Premodern Japanese Spatial Construction," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson (San Francisco: Asian Art Museum, 2020), 50.

colours and imagery, comprised of artworks which seem to possess a life of their own as they transform and react to the visitor (Figure 3). The collective examines how visitors interact with the artwork as well as one another, stating "teamLab believes that the digital domain can expand the capacities of art, and that digital art can create new relationships between people."[7]

The interactive environment cultivated in teamLab's installations invokes the relationship between art and play, a dynamic addressed by the collective itself.[8] Adam Booth, an Art Director working in Computer Graphics for teamLab, describes how the collective sought to make their artwork engaging for all audiences, citing teamLab's *Athletics Forest* as a sort of playground intended to encourage younger visitors to run, jump, and move around the gallery (Figure 4).[9] teamLab addresses the perceived divide between typically stationary modes of learning, such as reading and writing, and kinesthetic learning by bringing attention to the haptic knowledge that can be gained through interacting with one's surroundings.[10] The collective mobilizes their interdisciplinary skillset with the aim of generating an immersive experience, "[c]reating art that could be experienced through the body rather than consumed visually and intellectually."[11] teamLab encourages haptic engagement with their artwork, with a co-creative impact on both one's own experience, as well as that of fellow visitors, forming a symbiotic relationship between the artwork and the viewer. While the collective emphasizes the importance of crafting engaging experiences, I intend to consider the experiential aspects of teamLab's *Borderless* exhibition through the lens of ludic theory, which refers to the study of playfulness as a characteristic of culture.[12] In my thesis, I use ludic theory to interpret the haptic, participatory

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[7] "Digital Art," teamLab, accessed October 25, 2020, https://www.teamlab.art/concept/digitalart/.

[8] Adam Booth, "Inside teamLab: Everybody Plays a Little Bit," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson (San Francisco: Asian Art Museum, 2020), 95.

[9] Ibid, 95.

[10] "teamLab Athletics Forest," teamLab, accessed March 31, 2022, https://www.teamlab.art/concept/athleticsforest/. *Athletics Forest* is comprised of several interactive digital installations that encourage active, haptic responses from visitors. *Athletics Forest* includes *Graffiti Nature – High Mountains and Deep Valleys, Red List* (2016), featuring sloping floors emulating natural terrain and depicting an ecosystem of endangered wildlife and plants. The project also presents; *Inverted Globe, Giant Connecting Block Town* (2018) (the visitor interacts with the artwork by placing blocks representing houses and stations), *Weightless Forest of Resonating Life* (2018) (a series of illuminated three dimensional objects which move and react to the visitor's touch), *Multi Jumping Universe* (2018) (a flexible floor surface allows the visitor's movements to affect the digital installation), *Aerial Climbing Through a Flock of Coloured Birds* (2018) and *Light Forest Three Dimensional Bouldering* (2018) (artworks with a climbing element). While these exhibits provide younger visitors with a co-creative and kinesthetic learning experience, the artworks are accessible to all ages and highlight the interactive components found in teamLab's installations.

[11] Oen, "Art in the Age of Digital Interactivity," 8.

[12] Valerie Frissen, Jos de Mul, and Joost Raessens, "Homo Ludens 2.0: Play, Media and Identity," in *Contemporary Culture: New Directions in Art and Humanities Research*, ed. Judith Thissen, Robert Zwijnenberg, and Kitty

artworks teamLab has designed in order to better understand how teamLab's exhibition invites visitors to rethink the way they interact with art, the significance of other people, and their perception of the gallery space.[13] By constructing the museum as a site of play, I propose that the ludic characteristics of teamLab's immersive, interactive installations create a prosocial artistic experience that subverts the expectation of the institution as a space of passive spectatorship and asks visitors to reconsider their connection to their environment, as well as one another.[14]

In my thesis, I consider the immersive aspect of play, in which the viewer temporarily suspends their awareness of the borders of the artwork within the time and space of the museum exhibit. I introduce the significance of ludic theory in immersion by referencing Dutch historian Johan Huizinga's definition of the "ludic" in order to establish the Western conception of play as an act set apart from everyday reality, while at the same time providing an absorbing experience.[15] It is important to note that the concept of play does not translate neatly from one culture to another, a topic addressed in Massimo Raveri's introduction to *Japan at Play: The Ludic and the Logic of Power*. Raveri traces the evolution of play in Japanese culture, explaining how the term came to be associated with leisure in the 1980's due to Japan's contemporary culture industry.[16] I also look to the perspectives provided by teamLab's members on the significance of immersive design and participatory elements in their work. I aim to build on this discussion by turning to the contemporary research of philosophy professors Valerie Frissen and

Zijlmans (Amsterdam University Press, 2015), 74. Playfulness is defined as playful behaviour that has often been associated with leisurely activities, such as games, media consumption, and recreation. However, from an anthropological perspective, playfulness is also a sociocultural characteristic that has increasingly been associated with work, education, the military, and politics.

[13] Oen, "Art in the Age of Digital Interactivity," 3.

[14] Laura M. Padilla-Walker and Gustavo Carlo, "The Study of Prosocial Behaviour: Past, Present, and Future," in *Prosocial Development: A Multidimensional Approach*, ed. Laura M. Padilla-Walker and Gustavo Carlo (New York: Oxford University Press, 2014), 3-6, 9, 13. Prosocial behaviour is typically defined as actions intended to benefit others. In *Prosocial Development: A Multidimensional Approach*, developmental psychologist Laura M. Padilla-Walker and professor Gustavo Carlo examine prosocial behaviour within the context of social and developmental psychology. They claim that although prosocial behaviour is often considered as voluntary behaviour meant to benefit another, it can arise from a variety of motivations, and can manifest as low-cost or high-cost behaviours. While low-cost behaviours might include responsiveness and a willingness to work with others, high-cost behaviours tend to involve personal investment, such as volunteering and civic engagement. Padilla-Walker and Carlo also note studies on the effect of new media on prosocial behaviour, a new avenue of study considering how the representation of prosocial actions in media or the encouragement of prosocial actions in games can potentially affect the behaviour of the viewer or participant. The co-creative experience offered by teamLab uses new media to encourage visitors to engage with the artworks and potentially one another, as they hope to realize the presence of other people within the museum as a positive presence.

[15] Frissen, Mul, and Raessens, "Homo Ludens 2.0: Play, Media and Identity," 77.

[16] Massimo Raveri, "Introduction," in *Japan at Play: The Ludic and the Logic of Power*, ed. Joy Hendry and Massimo Raveri (London/New York: Routledge, 2005), 13.

Jos de Mul, as well as author Joost Raessens, who revisit ludic theory in "Homo Ludens 2.0: Play, Media and Identity" to reveal the intersection of play and technology in culture.[17] I aspire to bring a unique perspective to the study of teamLab's work by exploring how this shifting interpretation of play has influenced the way people partake in artistic experiences.

   I seek to engage with the existing discourse concerning teamLab's immersive techniques and their use of new media, as well as the position of teamLab in the so-called "experience economy".[18] I hope to further this avenue of research by examining how teamLab operates within the culture industry, and by considering the sensory elements of teamLab's artwork. I hope to demonstrate how the structural, visual, and auditory components of their installations create an immersive atmosphere that facilitates an interconnected relationship between the viewers, the technological apparatus, and the production of the artwork itself. The immersive quality of teamLab's exhibit and the design of their installations takes on an ambient quality that I explore in the latter half of my thesis through the lens of Paul Roquet's book, *Ambient Media: Japanese Atmospheres of Self*. Just as Roquet investigates how ambient media can help people to navigate their internal emotional landscape and their response to the external environment, I keep his considerations in mind in my own assessment of teamLab's exploration of boundaries and the relationship between the individual, the artwork, and society.[19] I seek to address how the use of ambient media integrates the visitor within the artwork itself, consequently creating immersive, interactive installations vital to the "borderless" experience teamLab has designed. I aim to build upon Roquet's exploration of how people use ambient media to navigate their social realities by considering how the creation of an immersive atmosphere in teamLab's work has the potential to enhance the visitor's awareness of their environment and other people. I hope to expand on the potential of participatory, immersive experiences to promote a more interconnected relationship between art and visitors within the museum.

   My approach to teamLab's artwork is grounded in my own personal experience of the *Borderless* exhibition in the spring of 2019. The ability to influence the artwork through my

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[17] Frissen, Mul, and Raessens, "Homo Ludens 2.0: Play, Media and Identity," 76.

[18] Oen, "Art in the Age of Digital Interactivity," 10-11. The "experience economy" was defined by B. Joseph Pine II and James H. Gilmore in 1999, which they envisioned as an economic shift from merely providing goods and services to the creation of engaging and memorable experiences surrounding these transactions. teamLab offers art as experience, similar to the tradition of international expositions, art biennials, and world's fairs, which likewise provide opportunities for sensory engagement.

[19] "Borderless World," teamLab, accessed October 25, 2020, https://borderless.teamlab.art/concepts/borderlessworld/.

movement within the gallery made me feel as if I was part of the artwork itself, rather than a passive viewer. The encompassing nature of teamLab's work was further enhanced by the architectural scale and construction of the exhibit, as well as the accompanying score, showcasing how the collective's various creative talents intertwine to present a cohesive artistic experience. Due to the reciprocal relationship between the viewer and the artwork, it seemed to me that the visitors themselves were also a part of the aesthetic whole, as both parties are necessary in order to fully experience the exhibition. As a result, with the playful nature of teamLab's work in mind, I sought to examine their immersive, interactive new media installations through the lens of ludic theory in order to understand how the viewer becomes a part of the work of art.

In the first part of my thesis, I begin with an overview of how the viewing experience has developed in relation to immersive design, particularly in the context of screen-based media. I then move into an examination of the structure of teamLab, considering the creative process and composition of the collective, as well as their business model and multimedia presence in order to better understand their audience. Following this examination, I present teamLab's concept of "ultrasubjective space", the spatial understanding that underlies the collective's artwork and provides the basis for their approach to the immersive experience, as well as the art historical influences they draw upon. A formal analysis of key artworks highlighting the distinct interactive and immersive qualities of teamLab's works forms the body of my argument. In *Universe of Water Particles on a Rock Where People* Gather (2018), I introduce how teamLab fosters engagement between individuals and the artwork. Following this piece, I question the individual's relationship to the design and construction of the artwork itself in their light sculpture series, *Flutter of Butterflies Beyond Borders, Intersections Create Life – 1 Butterfly Where 64 Light Rays Cross* (2018). Lastly, I address a variation on this theme in *Flutter of Butterflies Beyond Borders, Transcending Space - Floating Nest* (2018), which I examine through the lens of Roquet's work on ambient media, focusing on the incorporation of viewers into the artwork itself. I then delve into an analysis of ambient subjectivation, the process by which the individual is acted upon and responds to ambient media, and I contextualize the collective's work by examining the development of Japan's post-war culture industry. I consider how participatory experiences functioning within the culture industry affect the visitor's sense of agency, both within the museum and in the digital domain of social media as well. In this way, I

explore the implications of the immersive and interactive components of teamLab's work, and invite readers to contemplate how these factors shape the visitor's museum experience.

I have contextualized my study of teamLab's immersive installations by looking at the background of the collective, the creative channels through which they represent their artwork, and the audience to whom the work is presented. My introduction of teamLab's work is based on a theoretical examination of the history of illusory, screen-based media in order to present an overview of immersive strategies in art and iterations of these practices in new media installations. I also look to teamLab's own investigation of spatial recognition in Japanese art and traditional architecture, which they describe as "ultrasubjective space", and its influence upon the viewer's sensory experience of teamLab's artwork. Due to my own language limitations, I am unable to consider scholarly sources only available in Japanese. I consulted academic publications and art journalism available in English, including articles, exhibition catalogues, dissertations, and business publications, as well as translations of existing written and filmed interviews. I also reference the translation of Inoko's TED Talk "Meadow of Concepts", delivered in Fukuoka in 2013, and take into account the collective's documentation of their artwork through their website and online platforms. Finally, my research is also informed by the catalog for *teamLab: Continuity*, edited by curator and art historian Karin Oen and design scholar Clare Jacobson, teamLab's first major exhibition in North America at the Asian Art Museum of San Francisco.[20] The catalogue contains academic articles introducing central themes pertaining to teamLab's work, examining the relationship between art and technology as well as artistic precedents informing the collective's creative process. Additionally, the catalog features translated interviews with key figures from teamLab. The existing research presented in Oen and Jacobson's catalog provides insight into the collective's development, as well as theoretical considerations regarding teamLab's use of digital mediums to create immersive exhibitions, and how these artworks function within the "experience economy". Oen and Jacobson suggest that the interconnected components of teamLab's artistic practice demonstrate how various different realms—culture, art, technology, the environment—can be understood as hybrid, rather than separate, systems.[21] While I draw on Oen and Jacobson's text in my research, I plan to shift my

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[20] Jay Xu, "Foreword," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson (San Francisco: Asian Art Museum, 2020), ix.

[21] Oen, "Art in the Age of Digital Interactivity," 17.

focus towards exploring how the immersive and participatory aspects of teamLab's exhibition affect the visitor's engagement with the artwork. Although the experiential and immersive qualities of teamLab's work have been explored in Oen and Jacobson's catalog, I intend to differentiate my study by exploring the dynamic between ludic theory and the culture industry along with the sociohistorical implications of immersive media.

Trajectory of Immersive Experiences

teamLab views their use of new media as a "means to an end", enabling the collective to offer an immersive experience that seems premised on technical innovation.[22] However, these illusory strategies and their phenomenological approach to aesthetic experience are part of a long art historical trajectory that affects our contemporary understanding of their immersive digital installations. Art historian and media theorist Oliver Grau explores this evolution in his book, *Virtual Art: From Illusion to Immersion*. Grau states that there is "only old and new media, old and new attempts to create illusions…."[23] He contextualizes his argument within the development of Renaissance perspective, referencing Leon Battista Alberti's likening of painting to the creation of a window into an illusory space.[24] This terminology has been taken up in the work of media scholars such as Lev Manovich, who defines the "classical screen" as a frame dividing the space of the viewer from the space of the artwork.[25] Contemporary art historian Kate Mondloch considers how the historical predisposition to view the screen as a "window" has affected the way we define the role of the spectator in relation to screen-based media.[26] The Renaissance model implies an "immobile, disembodied, and idealist viewer", yet the individual's temporal and spatial relationship with the materiality of the screen as an apparatus complicates this understanding.[27] Manovich's theories of screen spectatorship draw attention to this dynamic, and present a tripartite approach to the viewing experience, considering the "temporality, scale and levels of 'interactivity'" of screen-based media.[28] Grau also emphasizes the importance of

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[22] Oen, "Art in the Age of Digital Interactivity," 6.
[23] Oliver Grau, *Virtual Art: From Illusion to Immersion* (Cambridge, Mass: The MIT Press, 2003), 346.
[24] Ibid, 340, 349.
[25] Lev Manovich, "The Screen and the User," in *Language of New Media*, (Cambridge: MIT Press, 2001), 95.
[26] Kate Mondloch, "Be Here (and There) Now: The Spatial Dynamics of Screen-Reliant Installation Art," *Art Journal* 66:3 (2007): 21, https://doi.org/10.1080/00043249.2007.10791263.
[27] Ibid, 23.
[28] Ibid, 24.

the viewer's awareness of the medium, the screen, describing immersion as an unconscious illusion predicated on the obfuscation of the boundaries and technological apparatus of the artwork.[29] Mondloch reveals that these questions of virtual and actual space were central ideas explored by artists addressing the spatial and temporal parameters of the gallery in the 1960s and 1970s, setting the stage for the transition from the "white cube" to the "black box".[30] Manovich further addresses this shift, examining how the development of screen technology that takes over the viewer's field of vision, such as virtual reality (VR), enables the "disappearance of the screen", changing or even erasing the spatial boundaries between the individual and the image.[31] Grau states that the merging of artwork and medium leads to a moment of "totalization", a moment in which the viewer no longer perceives these distinctions, when "the artwork is extinguished as an autonomously perceived aesthetic object for a limited period of time."[32] teamLab's use of 360-degree projections and additional structural elements such as mirrors transform the museum into the "black box", fully immersing the viewer in the artwork. Grau notes that immersive digital experiences increasingly rely on a combination of media, and in this way the sum of these parts is in essence no longer just an image. teamLab's work is complemented by original soundtracks composed by Hideaki Takahashi, creating a multisensory experience that surrounds the visitor both visually and aurally. Furthermore, in Grau's view, the ability of an artwork to compute in real time, like teamLab's work which responds to the movements of the viewer, constitutes the new mode of interface between the viewer and the image. Grau summarizes the impact of immersive new media, stating "The new parameters of virtual art play a decisive role in this: Interactivity challenges both the distinction between creator and observer as well as the status of an artwork and the function of exhibitions."[33] Notably, teamLab prefers the term "visitor" to "viewer" in order to further emphasize the interaction between the individual and the artwork, as art journalist Sophie Haigney writes, "both affecting its contours and experiencing its effect."[34] In *Borderless*, immersion and interactivity are integral to teamLab's concept, as the screen, the imagery, and the viewer are entangled.

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[29] Grau, *Virtual Art: From Illusion to Immersion*, 340, 349.
[30] Mondloch, "Be Here (and There) Now: The Spatial Dynamics of Screen-Reliant Installation Art," 21, 22.
[31] Manovich, "The Screen and the User," 97.
[32] Grau, *Virtual Art: From Illusion to Immersion*, 339, 340.
[33] Ibid, 343.
[34] Sophie Haigney, "The Blockbuster Avant-Garde," *Art in America* (January/February 2021): 30, https://www.artnews.com/art-in-america/features/teamlab-art-world-1234580691/.

teamLab: *Borderless*

teamLab describes itself as a group of "ultratechnologists", adopting an interdisciplinary approach to art, science, technology, and design to produce commercial and artistic experiences that encourage visitors to explore their relationship to the natural world.[35] The interdisciplinary expertise required to produce teamLab's artwork has shaped the collective's development as a team, and Inoko describes how the members of the group address both creative and technological considerations in a holistic manner as part of their collaborative process.[36] Oen considers the office environment of teamLab, noting how the convergence of diverse skillsets and artistic influences "reflects teamLab's commitment to play, exploration, and collaboration."[37] In an interview with Oen, interactive systems engineer Hiroaki Oishi compares the collective's multi-faceted creative process to the organization of the Japanese Rinpa School, in which artisans emulated a similar style, describing teamLab as a digital example: "people gather and create things aiming toward a certain style, a certain expression."[38] Booth also elaborates on how the structure of the working environment allows the exchange of ideas and insight into different areas of production, claiming "everybody plays a little bit" in the process of collaboration (Figure 5).[39]

Collaboration plays a role in teamLab's business model as well, financing their artistic endeavors with a combination of ticket sales and private commercial ventures. London-based Serpentine Galleries identifies teamLab as an "art stack" in their Future Art Ecosystems report, described as "artist-led collectives that produce every aspect of the art experience in-house, from code to venues, and draw revenue from ticketed experiences."[40] In the article "The Blockbuster Avant-Garde", Haigney examines the significance of teamLab funding their work through ticket sales, diverging from the more typical economic model of collectors and patrons by appealing to a broader audience.[41] In this way, teamLab's business model functions within the "experience economy", at the intersection between art venue and theme park, selling tickets to generate

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[35] Karin Oen, "About teamLab," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson (San Francisco: Asian Art Museum, 2020), v.

[36] Naoko Aono, "The Vision of Toshiyuki Inoko, a Founder of teamLab," *Pen Magazine International*, August 29, 2018, https://pen-online.com/arts/the-vision-of-toshiyuki-inoko-a-founder-of-teamlab/?scrolled=4.

[37] Oen, "Art in the Age of Digital Interactivity," 9.

[38] Hiroaki Oishi, "The Human is the Center of the Work," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson, trans. Kazumasa Nonaka (San Francisco: Asian Art Museum, 2020), 71.

[39] Booth, "Inside teamLab: Everybody Plays a Little Bit," 95.

[40] Haigney, "The Blockbuster Avant-Garde," 32.

[41] Haigney, "The Blockbuster Avant-Garde," 33.

revenue and venturing into commercial projects based on exhibition contents.[42] The collective's commercial projects are directed by their "solutions" team, developing applications, websites and databases to support their artistic production.[43]

teamLab's immersive, interactive installations have gained an international audience both physically and virtually. teamLab gained recognition within Japan and abroad when Japanese artist Takashi Murakami invited the collective to hold their first solo exhibition, *LIVE!* (2011), at the Kaikai Kiki Gallery in Taipei, Taiwan.[44] teamLab went on to participate in the Singapore Biennale *If the World Changed* (2013-2014) at the Singapore Art Museum, emerging as part of the Asian contemporary art market.[45] In 2014, the collective furthered their international scope by partnering with the Pace Gallery, with locations in New York City, Palo Alto (California), and London (England).[46] The president of the Pace Gallery, Marc Glimcher, likens teamLab's work to other artists who engage with light as a medium, but notes that the figurative quality of teamLab's installations distinguishes their work from their contemporaries, and their pieces provide a vaster interactive experience.[47] The collective has exhibited domestically in Japan, and internationally throughout Asia, Australia, North America, and Europe, culminating in the opening of the *MORI Building DIGITAL ART MUSEUM: teamLab Borderless* in 2018. The collective reaches beyond the art world to appeal to wide audiences not only with its dazzling installations, but through its multiplatform social media presence as well, including Facebook, Instagram, Twitter, YouTube, Weibo, and Youku (Figure 6). By allowing visitors to document their experience and share this content online, the viewers themselves generate online communities surrounding teamLab's artwork. teamLab features visual content, such as Instagram posts, on their website and also utilizes their own social media to share images of notable people who have visited their exhibitions, drawing further interest from new audiences. These platforms not only document the collective's artwork, but have become a space for the collective to host its

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[42] Chinchen Liu, "teamLab Research" (master's thesis, Sotheby's Institute of Art, 2019), 10, https://digitalcommons.sia.edu/stu_theses/29.

[43] Y-Jean Mun-Delsalle, "Japanese Digital Art Collective teamLab Imagines a World Without Any Boundaries, Part 2," Forbes, August 19, 2018, https://www.forbes.com/sites/yjeanmundelsalle/2018/08/19/japanese-digital-art-collective-teamlab-imagines-a-world-without-any-boundaries-part-2/#4d8f83c22e67.

[44] "About the exhibit works 'LIFE SURVIVES BY THE POWER OF LIFE' at the exhibition of Venice Biennale. Toshiyuki Inoko (TeamLab) Interview," Media, teamLab, last modified July, 2012, https://www.teamlab.art/press/sv1107/.

[45] teamLab, "Biography."

[46] "About," Pace Gallery, accessed March 31, 2022, https://www.pacegallery.com/about-1/.

[47] Haigney, "The Blockbuster Avant-Garde," 32.

artwork virtually, as seen in the YouTube livestream of their artwork *Flowers Bombing Home* (2020-present), and their recent collaboration with Tik Tok, *Every Life Survives in Fluctuating Space* (2021) which uses augmented reality to connect with viewers in their own home through the application (Figure 7). teamLab's online presence has allowed the collective to connect with their audience across borders, through various modes of engagement, however it is also important to consider the accessibility of their practice, and the demographic to which they cater. Oen notes that not everyone has equal access to information and communications technology, citing the "digital divide" and drawing awareness to the fact that audiences who are predisposed to partake in new media technologies tend to be those that have the disposable income to participate in the experience economy.[48] In the context of teamLab's work, Oen adds that while the collective makes use of technology, the actual interface of the artwork is fairly intuitive, often reacting to simple movements, enabling visitors to interact with the artworks without necessarily being tech-literate.[49] As the collective seeks to explore the viewer's relationship to space and the boundaries delineating artistic experiences—and people—it is also important to recognize the different levels of engagement possible in teamLab's artwork, and how people are able to navigate the digital world they present.

"Ultrasubjective Space"

In reconsidering the relationship between the individual and the piece of art, teamLab plays with the frame of the screen and the importance of Renaissance perspective by proposing the concept of "ultrasubjective space" (*chōshukan kūkan*, 超主観空間) (Figure 8).[50] This alternate perspective draws on the visual language of *yamato-e* paintings, meaning "Japanese paintings" depicting Japanese themes, from the Heian period (794-1185).[51] teamLab's work also bears resemblance to decorative art produced by the Rinpa School during the Edo period (1615-1868), which revived the style of *yamato-e* paintings.[52] teamLab presents a visual example of the contrast between Renaissance perspective and "ultrasubjective space" by placing Leonardo Da

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[48] Oen, "Art in the Age of Digital Interactivity," 15.

[49] Ibid, 15.

[50] Morishima, "Ultrasubjective Space: Exploration of Premodern Japanese Spatial Construction," 43.

[51] Anna Willmann, "*Yamato-e* Painting," in *Heilbrunn Timeline of Art History* (New York: The Metropolitan Museum of Art, 2003, last modified April 2013), https://www.metmuseum.org/toah/hd/yama/hd_yama.htm.

[52] Department of Asian Art, "Rinpa Painting Style," in *Heilbrunn Timeline of Art History* (New York: The Metropolitan Museum of Art, 2003), https://www.metmuseum.org/toah/hd/rinp/hd_rinp.htm.

Vinci's iconic portrait, the *Mona Lisa* (1503-1519), alongside a horizontal picture scroll (*emakimono*) (Figure 9).[53] The collective proposes that the Renaissance perspective employed in portraits and landscapes creates a fixed vantage point, whereas horizontal scrolls do not depict a dominant perspective, presenting shifting viewpoints.[54] Curators Yuki Morishima and Miwako Tezuka reveal how "ultrasubjective space" relies on the compositional techniques used in Japanese paintings between the sixteenth and eighteenth centuries to express depth vertically, in which the objects closest to the viewer are placed at the bottom of the artwork, and those farthest from the viewer are located near the top of the artwork. Morishima explains that rather than using linear perspective to create the illusion of three-dimensional space, Japanese artists employed stylistic techniques based on "subjective expression rather than objective documentation of space."[55] Compositions often employed a bird's-eye view, a technique that allowed both the overall scene and the details to be depicted simultaneously.[56] Morishima states that with this technique: "It is as if one is located within the painting (as one of the figures) viewing the landscape, at the same time one is located outside of the painting, seeing the overview of the landscape from a distance."[57] Another aspect of this style included bands of golden clouds (*kin'un*) framing the artwork, used to frame the composition and to impart a temporal quality, creating "multiple times in space" (iji dōzu) by dividing successive events or various seasons depicted within the same artwork.[58] The absence of rooftops, referred to as "blown roof" (*fukinuki yatai*), also revealed building interiors, allowing the individual to view both public and private perspectives within an artwork as well.[59] These techniques of spatial construction can be seen in teamLab's digitally illustrated story, *Flower and Corpse Glitch* (2012), which employs subjective expressions of space and time to cycle through seasons narrating the rise and fall of a city in relation to nature (Figure 10).[60]

In his 2013 TED talk "Meadow of Concepts" in Fukuoka, Inoko speaks from his perspective as a digital creator to address the subjective nature of the viewing experience and

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[53] "Ultrasubjective Space," teamLab, accessed March 31, 2022, https://www.teamlab.art/concept/ultrasubjective-space/.

[54] Ibid.

[55] Morishima, "Ultrasubjective Space: Exploration of Premodern Japanese Spatial Construction," 43.

[56] Ibid, 45.

[57] Ibid, 45.

[58] Ibid, 47.

[59] Ibid, 47.

[60] "Flower and Corpse Glitch," teamLab, accessed March 31, 2022, https://www.teamlab.art/w/fcglitch/.

question how the individual recognizes the world around them.[61] Inoko looks back to the work of premodern Japanese painters to examine how they depicted space and depth, prior to the introduction of Western perspective, claiming "just as Western paintings use perspective, Japanese paintings have their own structure to logically recognize space, differently from perspective paintings."[62] "Ultrasubjective space" is based on the movement of the viewer's eyes across the visual field, synthesizing a mental image of their surroundings rather than taking in a single, complete overview of the scene as portrayed by perspective. In this alternative mode of representation, the screen is no longer a "window" observed from a particular vantage point, but rather allows multiple views through the layering of space.[63] Although the viewing experience can often be considered personal or subjective, "ultrasubjective space" allows visitors to share their visual field with others by presenting a scene with no fixed vantage point.[64]

      Inoko believes that the notion of shifting perspectives and the subjective expression of space also influenced spatial design, an idea further examined by curator Miwako Tezuka. Tezuka draws parallels between the collective's use of traditional Japanese imagery in *Crows are Chased and the Chasing Crows are Destined to be Chased as well, Division in Perspective—Light in Dark* (2014) (Figure 11) and motifs found in Japanese folding screens, such as *Crows and Herons* (after 1605) by Hasegawa Tōhaku (Figure 12).[65] Where Grau turns to the role of perspective in illusion, Tezuka provides an alternate method of immersion by explaining the architectural significance of folding screens. Tezuka describes how folding screens served as moveable partitions, and could be expanded into an almost panoramic experience, as *Crows and Herons* reached twenty-three feet long and five feet high.[66] Tezuka presents similarities between teamLab's concept of "ultrasubjective space" and Japanese architecture, believing that both teamLab's work and these folding screens "suggest a potential fluidity of our spatial perception, one freed from the logic of perspective."[67] Tezuka elaborates on the role of sliding doors and folding screens in reconfiguring the spatial arrangement of a room, adjusting between private and

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[61] Toshiyuki Inoko, "Meadow of Concepts," filmed in 2013 at TEDxFukuoka, Japan, video, 2:47, https://tedxfukuoka.com/en/ls/spk_inoko/.
[62] Ibid, 3:30-4:10.
[63] Ibid, 6:30.
[64] Ibid, 2:00.
[65] Miwako Tezuka, "A Vast Ocean, a Boundless Sky: The Digital Liberation of teamLab," in *teamLab: Continuity*, ed. Karin Oen and Clare Jacobson (San Francisco: Asian Art Museum, 2020), 102.
[66] Ibid, 102.
[67] Ibid, 104.

public space. I believe Tezuka's research sets the groundwork for understanding how the materiality of the screen can mediate spaces both physically and ideologically. Visual arts and media scholar Guiliana Bruno touches on the private-public dynamic of screens, examining how the screen engages the viewer's senses through its architectural qualities, and in doing so has the capacity to transform their social experience by influencing their perception of different spaces.[68] Bruno also considers the screen's ornamental nature as a piece of material culture, revealing how "[i]ts material substance could activate, animate, and mediate the dimension of the imagination."[69] Bruno describes how the screen "had a real plastic visibility, and yet it was an imaginary structure" allowing light to pass through and create projections which intermingled with the screen decoration, connecting tangible and intangible art forms through its material.[70] Tezuka demonstrates the modality of the screen while Bruno addresses its material capabilities, together revealing the imaginative, illusory potential of the screen.

Tezuka furthers this discussion by revealing how moveable screens also allowed for the layering of imagery, enhancing the immersive experience. Like teamLab's interactive imagery which intermingles within the space of the gallery, screens could be assembled, overlapped and "because the world depicted in it [the screen] does not rely on a singular vanishing point, the viewer's relationship to the image would simply shift, rather than dislocate, when the panels moved."[71] teamLab further explores this notion in *Ephemeral Life Born from People, Layered Ultrasubjective Space* (2018), which depicts butterflies seemingly floating across free-standing semi-transparent screens, warranting the viewer's movement amongst the screens, rather than the screen serving as a barrier between the visitor and the artwork (Figure 13). This demonstrates how "ultrasubjective space" supports the immersion of the viewer in the artwork. Rather than employing the illusion of perspective, it instead enables the individual to view the artwork similar to a folding screen, able to observe part of the piece from wherever they are located in the gallery. The movement of other visitors and the intersection of artworks, like the layered imagery and the play of light and shadow across the screen, becomes part of the scene, further integrating the viewer themselves into the aesthetic whole. Inoko encapsulates this idea: "In short, spatial

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[68] Giuliana Bruno, "The Screen as Object: Art and the Atmospheres of Projection," in *Dreamlands: Immersive Cinema and Art, 1905-2016*, ed. C. Iles (New York: Whitney Museum of American Art, 2016), 158, 159.
[69] Giuliana Bruno, "Surface Tension, Screen Space," in *Screen Space Reconfigured*, ed. Susanne Sæther and Synne Bull (Amsterdam University Press, 2020), 41.
[70] Ibid, 41.
[71] Tezuka, "A Vast Ocean, a Boundless Sky: The Digital Liberation of teamLab," 105.

design dictated people's motion, and it differentiated people's worldview."[72] Just as single-point perspective reinforces a sense of illusion as if one were standing before a window looking out onto a fixed scene, "ultrasubjective space" encourages haptic engagement with the artwork by allowing the viewer to move freely while still remaining immersed in the composition.

***Universe of Water Particles*: Submersed in the Screen**

The ever-shifting viewpoints created through "ultrasubjective space" encourage the visitor to explore teamLab's exhibit, and perhaps because of this, there no set map for the museum. Within this model, *Universe of Water Particles on a Rock Where People Gather* (2018) becomes a site of convergence for both artwork and people as the viewer wanders through the gallery (Figure 14). Occupying a central area within the exhibit, a virtual waterfall cascades over the top of the screen in a shower of lines simulating the flow of water, breaking over the raised floor of the exhibit and forming rivulets around the rock-like surface. The piece overlays *Forest of Flowers and People: Lost, Immersed and Reborn* (2018) which renders flowers in real time according to the change of seasons and displays how teamLab's works work in tandem with one another as the flowers disintegrate and scatter when the flow of water increases, or the crows from *Crows are Chased and the Chasing Crows are Destined to be Chased as well* fly through the space (Figure 15).[73] The connection between *Universe of Water Particles on a Rock Where People Gather* and the other artworks is also inherent to the structure of the gallery itself, as it serves as a reservoir for the kinaesthetic *Athletics Forest* (2018) located on the second story just above the work, constructed in the shape of mountains and valleys from which the water "flows".[74] The water particles alter their course based on the path of the viewer through the space, flowing around the viewer's body as if the visitor is treading through a real stream. This causes a ripple effect as the water particles continue on their path, encountering other visitors within the space so that each person's interactions with the piece affects other viewers' haptic experience of the artwork. In this sense, *Universe of Water Particles on a Rock Where People Gather* has a communal aspect, as the design of the artwork itself asks the visitor to consider their relationship

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[72] Inoko, "Meadow of Concepts," 8:19.
[73] "Flower Forest: Lost, Immersed and Reborn," teamLab, accessed October 25, 2020, https://borderless.teamlab.art/ew/flowerforest/.
[74] "Graffiti Nature – High Mountains and Deep Valleys, Red List," teamLab, accessed March 31, 2022, https://borderless.teamlab.art/ew/mountains-valleys/.

to others within the space of the art gallery. Here, Grau's analysis of interactive, immersive new media is brought back into focus, as he explains: "If artificial creatures, agents, are present in the virtual image space, which behave like subjects and react to the observers, the feeling of *being inside the image space* is enhanced further."[75] The water particles are agents in the sense that they act in relation to their physical environment. teamLab's artwork is not a preset sequence, and a dynamic algorithm governs the manner in which the water particles react to the physical presence of the visitors in real-time.[76] The water particles react to the visitor's presence, even when the individual is standing still, but they can also be acted upon through the visitor's movements. The water particles are further subject to other artworks within the overarching arrangement of the exhibit. The piece forms part of a self-contained world wherein water flows from *Athletics Forest*, and this in turn affects the behaviour of other artworks. The interaction between the individual's body and the water particles projected on the screens appears to bridge the divide between the virtual image space and the physical space of the visitor. This crossover effect creates the sense that the individual is no longer merely viewing the artwork, but inhabiting the virtual environment.

Grau grapples with the effect of immersive artworks on the viewer's experience in his critique of theories of distance. Grau presents the case for critical detachment, considering how the blurring of boundaries between the space of the artwork and the space of the viewer might become an obstacle to "the observer's act of distancing that is a prerequisite for any critical reflection."[77] Grau traces the development of this idea to modern art theory, referencing German theorist Theodor Adorno, who conversely believed that aesthetic distance actually allowed the viewer to become closer to the content of the artwork.[78] He also examines philosophers including Michel Serres, Hans Jonas, and Hartmut Boehme, who presented arguments that aesthetic distance is essential to the viewer's process of making meaning.[79] Grau examines this claim in the context of contemporary artist Char Davies work *Osmose* (1995). Davies' artwork employs virtual reality technology and a motion-tracking vest to create a full-body immersive experience, and Grau places emphasis on the manner in which the artwork requires that "the observer

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[75] Grau, *Virtual Art: From Illusion to Immersion*, 344.
[76] Oen, "Art in the Age of Digital Interactivity," 3.
[77] Grau, *Virtual Art: From Illusion to Immersion*, 202.
[78] Ibid, 202.
[79] Ibid, 202, 203.

relinquish [the] distant and reserved experience of art and, instead, embrace eccentric, mind-expanding—or mind-assailing—experience of images."[80] *Osmose* brings to the fore the tension between immersive artwork and the concept of aesthetic distance, and instigates Grau's question to proponents of virtual reality: "Why the immense technological effort in order to return, after a gigantic detour, to the real?"[81] In asking this question, I believe Grau opens the door not only to the critique of immersive artwork through aesthetic distance, but also to another avenue of research; the exploration of ludic theory and the role of the playground in relation to the real.

Aesthetic distance assumes a frame, and implies a border between the artwork and the viewer. teamLab's *Borderless* exhibit seeks to do away with the frame of the artwork within the context of the gallery, embracing the spatial techniques of "ultrasubjective space" to present immersive, haptic installations that engage with visitors. Yet, even in this pursuit, the manner in which teamLab positions the visitor in relation to the artwork remains confined by the technical and physical parameters of the installations. I propose that the lack of aesthetic distance created through teamLab's use of "ultrasubjective space" facilitates engagement with their artwork, particularly when explored through the lens of ludic theory. In Huizinga's famous treatise on play, *Homo Ludens: A Study of the Play-Element in Culture*, he questions the absorbing quality of play in his work, and Dutch sociologist Jan van Bremen explains that he was "driven to explore the realms and boundaries of seriousness and play in human cultures and societies."[82] In Massimo Raveri's introduction to *Japan at Play: The Ludic and the Logic of Power*, he claims that Huizinga's insights revealed the value of play in domains that had previously been considered within the realm of aesthetics, metaphysics, ethics and the economy.[83] Raveri questions the dynamic between social and ludic patterns, delving into Huizinga's model in which "the ludic would be the actualization of an abstract model of social dynamics," writing that this approach implied an idealized concept of culture being mirrored in the logic of its games.[84] In his text, Huizinga describes the parameters of the playground, listing the screen as "consecrated" space "marked off beforehand either materially or ideally… within which special rules obtain.

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[80] Ibid, 200.

[81] Ibid, 201.

[82] Jan van Bremen, "Japan in the World of Johan Huizinga," in *Japan at Play: The Ludic and the Logic of Power*, ed. Joy Hendry and Massimo Raveri (London/New York: Routledge, 2005), 215. Huizinga's work has been circulated to a global readership, with two editions being published in Japan: the first in 1963, based on a German translation, and the second in 1973, which referred to American, Italian, French, and Dutch translations.

[83] Raveri, "Introduction," 2.

[84] Ibid, 3.

All are temporary worlds within the ordinary world, dedicated to the performance of an act apart."[85] Frissen, Mul, and Raessens revisit Huizinga's definition of play and suggest that in order to distinguish between "sheer serious modes of being" and "sheer fantasy", the player must be situated in both the ordinary world and the play world simultaneously, and be aware of this double experience, which they liken to the aesthetic experience.[86] This double experience is reflexive in nature, and so rather than the play world and its special rules being completely separate from the ordinary world, it instead functions as "a layer of meaning that *during* play is superimposed on everyday reality."[87] Frissen, Mul and Raessens note how this understanding almost resembles augmented reality, drawing a link to the technological implications of this theory.[88] Through this ludic model, it is possible to view the gallery as a liminal space that facilitates the blurring of borders between the art and the visitor. I propose this interpretation reflects Inoko's own interest in finding a way to dissolve the boundaries between the visitor's body and the artwork, seeking to recreate the experience of being immersed in one's environment.[89]

Immersive installations such as *Universe of Water Particles on a Rock Where People Gather* serve as a type of playground, marked off physically by the boundaries of the exhibit but also ideally through teamLab's immersive strategies. Raveri examines Huizinga's presentation of play as a liminal situation, reproducing aspects of reality as "a performance delimited in time and space, the ludic would be the actualization of an abstract model of social dynamics."[90] The visitor's engagement with the water particles allows them to re-enact the experience of stepping into water or under the waterfall without the fear of being drenched. The artwork also re-creates the social and haptic experience of navigating space, as the water particles steer the stream around the visitor, and in turn the individual situates the place of their own body in the flow of the virtual water in relation to fellow visitors. This emphasis on the role of the visitor in shaping an ever-evolving encounter with the artwork reflects teamLab's belief that the presence of other people can be considered as a positive experience.[91] By presenting play as a site for exploring

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[85] Johan Huizinga, *Homo Ludens: A Study of the Play-Element in Culture* (Boston: Beacon Press, 1955), 10.
[86] Frissen, Mul, and Raessens, "Homo Ludens 2.0: Play, Media and Identity," 81.
[87] Ibid, 81.
[88] Ibid, 81.
[89] Oen, "Art in the Age of Digital Interactivity," 7-8.
[90] Raveri, "Introduction," 3.
[91] Oen, "Art in the Age of Digital Interactivity," 3.

the possibilities of social and cultural dynamics, Raveri states that "[e]very example of play would be a powerful commentary on life. In the 'hypothetical' way of re-enacting the world that pertains to the nature of play, man invents, undoes and remakes 'reality' without fear of becoming imprisoned within it."[92] In the context of teamLab's piece, there is a sense of relationality present in both the interactions of the digital water particles producing the lines of flowing water, as well as the position of visitors within the gallery space. The interrelated movements of the artwork and the visitors makes apparent the very real experience of the flow of traffic within the museum, and recalls the ways in which people's paths cross and diverge in the dense urban environment. The way in which the streams flow between visitors provides a visual link between the effect of one person's actions on another person's experience, and while it might be challenging to take into account the movements of other people or obstacles in an urban space, within the artwork the presence of others is transformed into an opportunity for play. However, Raveri also raises a caveat to this perception, noting that games do not always mirror the cultural and social context from which they arise.[93] He supplies a connection between Huizinga's concept of play and the Japanese understanding of play as leisure. Play can allow an individual to disassociate from the imperfections of reality by presenting an idealized experience or serving as a means to evade unpleasant feelings and alleviate distress.[94] Play as a form of leisure also serves the role of suspending reality, focusing more on the division between the cultural experience of the gallery as a form of relaxation apart from the individual's everyday experience.[95]

In my own experience of the museum in 2019, I watched as visitors went up to stand atop the "rocks" under the main "waterfall", something that might not be possible if the artwork were actual water, however as the water particles flowed around their silhouettes the illusion was maintained, their actions serving to shape the artwork itself (Figure 16). Other visitors rested on the rocks as if they too were part of the structure, or reached out to touch the water as it passed by, engrossed in the responsive nature of the artwork, and therefore playing into the structure of the ludic experience (Figure 17). Takahashi's soundtrack also plays a role in suspending the concept of play, although the artworks are continuously generated within the closed-off space of

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[92] Raveri, "Introduction," 4.
[93] Ibid, 4.
[94] Ibid, 4.
[95] Ibid, 4, 13.

the gallery, the music indicates the passage of time. As the soundtrack changes and fades in and out, it takes on a temporal quality that both signifies shifts in the artwork and the duration of the viewing experience. The design of the artwork which responds to the viewer in real time lends a sense of order by which the viewer's interactions abide, suspending their disbelief to engage with the particles of light and playing with the artwork as if it truly were running water. Beyond the visual fantasy of the artwork, my understanding of the piece was also shaped by the presence of other visitors in the museum. I observed how the manner in which one person accesses the piece can transform the flow of water, sometimes allowing the particles to continue their trajectory and interact with other visitors, while at other times blocking or changing the direction of the water, either intentionally or unintentionally. Some visitors interrupted the flow of water to experiment with the artwork in a playful way, while other visitors taking photos or observing the piece temporarily became islands to navigate around. The reactive nature of the artwork made me more conscious of my position in relation to others, and made me gauge the way I moved through the gallery space. While in an urban space, crossing paths with other people might be an everyday occurrence, however the visual elements of teamLab's installation invite the visitor to become more aware of the tangential ways one person's actions can intersect with another, presenting a more communal understanding of how people share space that applies both within and outside the museum.

It is important to consider how immersive works such as *Universe of Water Particles* allow visitors to either engage with or withdraw from the illusion, as well as who is able to partake in the experience. teamLab's *Borderless* exhibit offers different levels of engagement. Oen explains that while the teamLab's installations may be primarily oriented towards "upper-middle class and able-bodied consumers", the collective has attempted to make their work more accessible by hosting large public exhibitions and crafting a user-friendly interface.[96] I believe it is important to note that due to the increased focus on multisensory, haptic engagement with teamLab's artwork, for people with differing sensory and physical abilities some aspects of the collective's installations may not be as accessible. Although it is still possible to navigate the main spaces of the museum, some of teamLab's more haptic installations, such as spaces with undulating floors or climbing elements, could prove inaccessible. These considerations reveal that the "borderless" experience presented by teamLab is not necessarily universal, as

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[96] Oen, "Art in the Age of Digital Interactivity," 15.

inaccessible areas of the exhibit serve to reinforce certain barriers to some visitors, and not others. At the same time, teamLab's conception of "ultrasubjective space" as a means of allowing the visitor to feel immersed in the artwork, wherever their position in the gallery, provides a more fluid vantage point for audiences. The artworks do not require the visitor to be standing at eye level, or occupy a particular position. teamLab's installations span the space of the gallery, and the imagery interacts with the visitor both when they are still and when they are in motion. Because the water particles react to the individual's position in the space, even the choice to withdraw from engaging with the artwork enables a particular immersive experience. Consequently, the technical capabilities of teamLab's work also possess the potential to make the experience of the museum more accessible to some visitors, depending on individual circumstance. There are additional limitations that shape the immersive and interactive qualities of teamLab's artwork, dictated by the affordances of the technological apparatus. The screens, sensors, projections, and algorithm make the experience possible, but also function within their own set rules defined by their technical capabilities. It is essential to examine the interaction between the visitor and the apparatus in order to understand how these elements of teamLab's artwork help to construct a sense of play in their immersive installations.

Light Sculptures: The Space of the Image

The technological possibilities and limits of teamLab's immersive installations are clearly presented through their light sculpture works, in which the visitor, the apparatus, and the medium meet to shape the artistic experience. teamlab's participatory light sculpture, *Flutter of Butterflies Beyond Borders, Intersections Create Life – 1 Butterfly Where 64 Light Rays Cross* (2018), is an extension of the collective's art ecosystem (Figure 18). As the butterflies generated from the work *Flutter of Butterflies Beyond Borders* (2015) migrate into the light sculpture space, they transition from the screen to three-dimensional space, depicted through the convergence of rays of light.[97] teamLab's light sculpture space brings the material apparatus to the forefront, with row upon row of moving lights mounted on the walls and ceiling, along with mirrored floors. The beams of light seem to surround the visitor as they are reflected, and intersect as the rays of light sweep over the room to create teamLab's light sculptures (Figure 19). The apparatus of the

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[97] "Flutter of Butterflies Beyond Borders, Intersections Create Life – 1 Butterfly Where 64 Light Rays Cross," teamLab, accessed March 31, 2022, https://www.teamlab.art/w/butterflies_light_rays_cross/.

artwork also seems to take on a life of its own as the rays of light react to the visitor's "touch" (Figure 20). When the visitor "touches" a butterfly comprised by the intersection of multiple light rays, the beams scatter and the light is dispersed, at once making light as a medium appear tangible and at the same time emphasizing its ephemeral qualities. The visitor can participate by actively engaging with the apparatus through the beams of light or take the opportunity to observe other people's interactions with the artwork, and both courses of action serve to shape the experience.

Participation forms a central component of teamLab's immersive installations. The collective offers a variety of artworks in which the visitor interacts through their presence or touch with the apparatus, or the material by which the artwork is being presented. However, teamLab's light sculptures stand apart from these experiences, as well as teamLab's screen based projections, due to the manner in which the apparatus is presented. In screen-based works such as *Universe of Water Particles*, the intuitive reaction of the projection to the position of the viewer, influencing the flow of the water, seamlessly integrates the individual with the artwork on the screen. The convincing appearance of the visitor and artwork inhabiting the same space subverts the screen as frame and reinforces teamLab's concept of a borderless experience. Furthermore, through the illusion of a space beyond the screen and the overwhelming scale of the installation, the material quality of the screen itself does not draw the visitor's attention. Looking back to Grau's observations regarding the viewer's awareness of the medium and the method by which it is conveyed, he comments that in order to minimize the presence of the mechanism in virtual installations, the "designers use all means at their disposal to banish this from the consciousness of the recipients."[98] In Grau's view, this dissolution of the interface threatens the viewer's "psychological detachment" from the work, and consequently their ability to objectively assess the media presented to them.[99] teamLab's light sculptures complicate this view and add a new dimension to their immersive strategy, as the lights, the means by which the artwork is created, are readily apparent in their placement and are brought to attention through the mechanics of the work itself. *Flutter of Butterflies Beyond Borders, Intersections Create Life – 1 Butterfly Where 64 Light Rays Cross* poses a situation in which the viewer's attention to the apparatus is a core element of the immersive installation. While immersed in the lights, the

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[98] Grau, *Virtual Art: From Illusion to Immersion*, 202.
[99] Ibid, 202.

medium by which the experience is created, the visitor's awareness is drawn to the positioning of the apparatus and they must be conscious of the lights' movement in order to react accordingly. Rather than being obscured, the apparatus is a vital aspect of the artwork. Other artworks, such as *Forest of Resonating Lamps* (2016), also employ lights as the apparatus and main focal point of the artwork, yet it takes on a different effect as the design of the light emitting diode (LED) lamps has been carefully considered (Figure 21).[100] These lamps differ from the undisguised apparatus of teamLab's light sculptures, and this distinction in design is significant as it changes how visitors perceive the borders between themselves and technology in the context of these immersive installations.

The bounds between the visitor and technology have often been explored in the context of virtual reality. The apparatus of teamLab's screen-based installations and virtual reality technologies such as CAVE (cave automatic virtual environment) both employ a surround-screen and surround-sound system.[101] While the CAVE system projects three-dimensional graphics within a cube of display screens to impart the impression of the user inhabiting the space of the image, the "black box" model of teamLab's gallery enhances the scale of the virtual experience to encompass the visitors in a communal space enveloped by the screen or the apparatus.[102] Likewise, just as the individual can explore their virtual environment by moving around inside the CAVE, visitors are free to wander and interact with the various facets of teamLab's installations. It should be noted teamLab's light sculptures diverge from CAVE, as the installation itself is physically present rather than simulated, with the visitors being able to inhabit the space of the image in which the rays of light converge. In her doctoral dissertation, Anja Bock examines spatial experience in the context of immersive new media and considers how virtual reality presents an opportunity to reconcile the "naturalness" or immersion of the user interface with the ability to interact with the apparatus.[103] Bock brings ludic theory into her explanation of the perceived incompatibility between two different types of readings that occur in virtual reality. According to Bock: "immersion requires that we consider the text as a 'world',

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[100] "Forest of Resonating Lamps – One Stroke," teamLab, accessed July 1, 2022, https://www.teamlab.art/w/forest_of_resonating_lamps/. The lamps, crafted with Murano glass, transition through a spectrum of colours and glow brightly when the visitor approaches, the light radiates to the other lamps and sweeps through the installation, which is endlessly reflected through the mirrored walls and floor.
[101] Anja Bock, "The Crossover of New Media Immersion and Site-Specificity: Contemporary Art and Spatial Experience" (PhD diss., Concordia University, 2009), 40.
[102] Ibid, 40.
[103] Ibid, 42-43.

whereas interactivity requires that we consider the text as a 'game'."[104] Bock explains how the way an artwork is presented, the illusionary aspects of immersive environments, conflicts with the ability to understand and manipulate the interactive elements of an artwork, the apparatus. As Bock states: "in immersion signs are said to disappear, while in interactivity signs are made visible."[105] To a certain extent, this mirrors Grau's research on the concealment of the mechanism in immersive installations. Virtual reality is the setting in which this contrast is explored, although this tension between immersion and interactivity also plays a role in teamLab's work. teamLab's light sculptures ask visitors to both immerse themselves in the artwork, and therefore read the environment as "world", while also inviting them to experience the piece as a "game" through their interaction with the apparatus itself. In this sense, the "world" and "game" coalesce, in a manner not dissimilar to Huizinga's conception of the "play-world". The moving lights that react to the visitor's touch establish the "game" and create the order which suspends the illusion of the artwork as a "world" of light sculptures the individual inhabits. Rather than the unconcealed apparatus hindering or deconstructing the immersive quality of teamLab's light sculptures, it serves to demonstrate how the technological capabilities of the artwork support the suspension of disbelief.

One concern with the presentation of immersive environments through virtual reality is a kind of disembodiment that can occur by presenting an illusory world visually, without consideration for the presence of the viewer's body. Bock describes this divide as an apperceptive experience—virtual reality allowing the user to self-reflect on the link between their kinaesthetic and virtual presence—quoted within the text as "'an experience of physical and imaginative relocation.'"[106] Although located in physical space, teamLab's reactive light sculptures also motivate reflection on the visitor's kinaesthetic experience, and based on the individual's interactions with the work, serve to shape the environment as well. The use of light as a medium approaches virtual reality as the rays of light appear to be present and intersect to create forms within the space, yet these projections do not actually physically occupy any of the space at all. Paradoxically, even though the light beams do not have an actual material presence, by moving away from the visitor's touch the artwork creates the illusion of physical interaction,

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[104] Ibid, 43.
[105] Ibid, 43-44.
[106] Anja Bock, "The Crossover of New Media Immersion and Site-Specificity: Contemporary Art and Spatial Experience," 41.

as if pushed away. The visitor inhabits both the real space within the gallery as well as the imaginary space of the image.

The question of how the body is located and defined within virtual environments is further expanded on by Nancy Katherine Hayles in "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments". Hayles addresses the complexities of the individual's embodied experience in relation to technology as part of her exploration of the "posthuman".[107] The potential dissolution of the body in virtual reality is taken up in Hayles' examination of *Traces* (1999), an art project conceived by Simon Penny (Figure 22).[108] This artwork provides a valuable comparison to teamLab's work, as *Traces* confronts the role of the apparatus in a virtual environment. Penny chose to bare the technological basis of the artwork rather than employ illusionistic textures or models that would disguise the virtual nature of the environment.[109] Similarly, the apparatus itself has been incorporated as part of teamLab's light sculptures, and the collective also explores the idea of revealing the digital framework of their art in *Flower and Corpse Glitch*, rendering the piece in "ultrasubjective space". The animated illustration alternates between illusionistic textures representing detailed imagery and the grid construction beneath.[110] teamLab envisions the artwork as peeling away the surface, "allowing a glimpse into the creative process."[111] Interestingly, by drawing attention to the apparatus rather than obscuring its presence, both teamLab and Penny seek to bring the audience more fully into the immersive experience.

Traces and *Flutter of Butterflies Beyond Borders, Intersections Create Life – 1 Butterfly Where 64 Light Rays Cross* are alike in that they both invite the viewer to shape the virtual sculpture and environment, albeit constructing the work in Penny's vision and diffusing the light in teamLab's iteration. Hayles describes how *Traces* evolved in response to participant's interactions, from reacting to the individual's motions and creating forms in the space based on the body's movement, to eventually incorporating elements of artificial intelligence to develop

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[107] N. Katherine Hayles, "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," *Configurations* 10, no. 2 (2002): 297, doi:10.1353/con.2003.0015.

[108] Ibid, 305-306. *Traces* tackles how humans and technology converge as the work translates the participant's body into volumetric cubes and models their movement within the digital environment, transporting the individual physically and mentally into the virtual space.

[109] "Traces," Artworks, Simon Penny, last modified 2020, https://simonpenny.net/works/traces.html.

[110] teamLab, "Flower and Corpse Glitch."

[111] Ibid.

structures or "traces" that are autonomous from the individual.[112] Hayles reveals that the evolution of the artificial intelligence in *Traces* "enacts a borderland where the boundaries of the self diffuse into the immediate environment and then differentiate into independent agents."[113] Here *Traces* suggests a blurring of the boundaries between the viewer and the technology used to create the artwork itself. teamLab's light sculptures function in an analogous fashion through their response to the visitor. While the light sculptures are reactive, the lights also follow their own autonomous pattern unless interrupted, and in this sense when an interaction does occur between the visitor and the lights, the individual's actions alter the shared gallery space and experience of the artwork. The self affects the apparatus, as well as the experience and actions of other visitors. Hayles concedes the manner in which technology has become integrated in people's quotidian embodied experience, but it is important to note that she examines the narrative surrounding the dissolution of the barriers between humanity and technology with caution.[114] For Hayles, this trajectory of thought espouses technology as a means of transcending the physical experience, instead she considers the way in which humans have coevolved with technological advancements.[115] In regard to Penny's work, Hayles views the unadorned representation of the user's body in virtual space as a way of using technology to solve a potential issue: "What was a tracking problem is thus transformed into the possibility of creative play between user and avatar."[116] Here, the interactive elements of *Traces* are framed as play, and the notion of the ludic is put forth to navigate the boundaries of the individual and their virtual environment.

In drawing a link between the concept of boundaries and play in her evaluation of *Traces*, Hayles opens a dialogue regarding the various ways in which the borders between the individual's body and the world are broken down. Hayles turns to artists writing about the borders between the individual's body and the world, questioning this divide: "'We project our bodies into the world—we speak, we breathe, we write… the notion of the skin as the boundary to the body falls apart.'"[117] In the context of teamLab's light sculptures, the interactive relationship between the visitor and the apparatus constitutes a site to playfully explore the

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[112] Hayles, "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," 307.
[113] Ibid, 308.
[114] Ibid, 299.
[115] Ibid, 299.
[116] Ibid, 309.
[117] Ibid, 311.

interconnected way in which one person's movement projects their presence onto the artwork, which then projects itself onto other visitors. The notion of the individual as a separate entity from the artwork and other visitors is ultimately called into question.

Flutter of Butterflies Beyond Borders: Art as Experience

Flutter of Butterflies Beyond Borders, Transcending Space – Floating Nest (2019) positions the visitor as part of the work itself, revealing the meticulous care teamLab has taken to erase the border between viewer and artwork (Figure 23). The *Floating Nest* incorporates the embodied experience of the visitor within the virtual lifecycle of the butterflies that roam teamLab's *Borderless* exhibit. In *Flutter of Butterflies Beyond Borders, Transcending Space – Floating Nest* the visitor is admitted into the "nest", a circular netted structure suspended within a room of 360-degree screens. Visitors are encouraged to lie near the edge of the net as *Flutter of Butterflies Beyond Borders* cycles through the space, taking in the butterflies that seem to rise from below and cascade down from above, surrounding the viewer totally in the virtual migration of the artwork (Figure 24). teamLab thus states their intention: "before long, the body will become immersed in the art, dissolving the boundary between people and the work."[118] As the experience comes to an end, the butterflies recede and rejoin the main spaces of the gallery, leaving the screens dark until the next artwork enters. The individual is located alongside other visitors within the "nest", transforming the structure of the installation into a means by which a shared perspective is created. This aligns with theories surrounding immersion in virtual environments, wherein "projection becomes a modality by which two individuals can connect while being exposed to different views of a shared space."[119] Recalling Morishima's description of "ultrasubjective space", the visitors are situated in the midst of the butterflies, while the spatial design of the "nest" also allows for multiple vantage points of the surrounding screens. The installation presents a meeting of the boundaries between visitors, as well as the physical framework and virtual imagery of the artwork.

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[118] "Flutter of Butterflies Beyond Borders, Transcending Space - Floating Nest," teamLab, accessed March 31, 2022, https://borderless.teamlab.art/ew/butterflies_nest/.

[119] Christine Ross, "The Projective Shift between Installation Art and New Media Art: From Distantiation to Connectivity," in *Screen/Space: The Projected Image in Contemporary Art*, ed. Tamara Trodd (Manchester; New York: Manchester University Press, 2011), 15.

Floating Nest, like *Universe of Water Particles* and *Flutter of Butterflies Beyond Borders, Intersections Create Life*, connects to the larger system of artworks through the butterfly motif that flows throughout the gallery. The butterflies themselves begin with *Flutter of Butterflies, Born from Hands* (2019), encountered at the entrance of teamLab's exhibit (Figure 25). Butterflies are generated as the visitor approaches the screen, announcing the entrance of new people to the gallery and responding to the individual's presence and touch in real time. teamLab explains: "These butterflies release art from the concept of the frame, removing boundaries from the artwork space."[120] Like the autonomous forms taking on a life of their own in *Traces*, these butterflies wander the exhibits, just as the visitors themselves do. In a way, the butterflies are a virtual representation of the self in the artwork (Figure 26). Returning to Hayles' exploration of the manner in which the participant's body intermingles with the virtual artwork, she claims that *Traces* reveals:

> …the playful and creative possibilities of a body with fuzzy boundaries, experiences of embodiment that transform and evolve through time, [and] connections to intelligent machines that enact the human-machine boundary as mutual emergence... .[121]

Hayles proposes that boundaries, or the lack thereof, between the body and the virtual serve as a site of emergence or creation. Emergence, a concept recently defined by artist and designer Jennifer Seevinck in the context of interactive art, occurs "when a new form or concept appears that was not directly implied by the context from which it arose; and where this emergent whole is more than a simple sum of the parts."[122] The boundaries of the visitor's body in *Flutter of Butterflies Beyond Borders, Transcending Space – Floating Nest* are blurred by the traces of the individual's interaction with *Flutter of Butterflies, Born from Hands*, creating the butterflies that eventually make their way to the *Floating Nest*. The artwork is not a pre-recorded image, and the butterflies emerge from the visitor's interactions with the artwork, rendered in real-time and unable to be replicated.[123] The immersive quality of *Floating Nest* is emergent in that the experience is not produced solely through the parts of the installation. The butterflies represent the interactive impact of the visitor, creating a layered experience in which the visitor is immersed both physically and virtually in the artwork.

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[120] teamLab, "Flutter of Butterflies Beyond Borders, Transcending Space - Floating Nest."
[121] Hayles, "Flesh and Metal: Reconfiguring the Mindbody in Virtual Environments," 309.
[122] Jennifer Seevinck, *Emergence in Interactive Art* (Brisbane: Springer, 2017), 13.
[123] teamLab, "Flutter of Butterflies Beyond Borders, Transcending Space - Floating Nest."

Art historian Kate Mondloch considers a sort of double-spatial dynamic in artwork where the space of the screen and the actual exhibition space overlap. Mondloch believes that the tension between virtual and actual space "proposes that viewers be both 'here' (embodied subjects in the material exhibition space) and 'there' (observers looking onto screen spaces) now."[124] This model of the visitor being both "here" and "there" at the same time is meant to demonstrate that viewing the screen and the material experience of the exhibition space are not mutually exclusive.[125] teamLab's *Floating Nest* asks the visitor to inhabit both virtual and actual space simultaneously, with the aim of creating a borderless experience. One should note, teamLab does not position the visitor as looking onto the screen space, but rather integrates visitor's body with the projected imagery by using motion-sensor systems, as Tezuka explains: "[i]n this way audience members are agents of compositional changes."[126] This is illustrated in the final iteration of the butterfly motif, *The Void* (2016) (Figure 27). Depicted across four dark, empty screens, *The Void* contrasts with the rich, colourful imagery throughout teamLab's exhibition. Should the visitor reach out to touch the butterflies generated by *Flutter of Butterflies, Born from Hands*, they will fall and fade away, leaving an empty screen once again. *The Void* can also result from the butterflies leaving the screens to enter the exhibit, and finally represent what is left in the absence of interaction with the artwork. This piece demonstrates the importance of the visitor's presence, as the butterflies are constantly in a state of flux reflecting the visitor's movements, revealing a symbiotic relationship. *The Void* rethinks the relationship between the visitor and the artwork, as the way the virtual imagery is depicted is dependent on the haptic immersion of the viewer. The visitor plays a role in constructing the projections on the screen, imparting their bodily experience on the virtual environment. The butterflies, like the visitor, mingle with other artworks in the exhibit, becoming a stand-in for the individual within the digital space. This reciprocal relationship between the visitor and the artwork suffuses *Flutter of Butterflies Beyond Borders, Transcending Space – Floating Nest*. In essence, the artwork conveys a visual metaphor that our own experience is made meaningful through our interactions with others. The merging of the visitor and the artwork is realized through the visitor's

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[124] Mondloch, "Be Here (and There) Now: The Spatial Dynamics of Screen-Reliant Installation Art," 23, 24.
[125] Ibid, 32.
[126] Tezuka, "A Vast Ocean, a Boundless Sky: The Digital Liberation of teamLab," 106.

interaction with the virtual space of the screen and the physically immersive experience within *Floating Nest*.

Media scholar Paul Roquet considers immersive haptic experiences in his study of ambient media—the means by which lights, sounds and other media affect the way an individual perceives their surrounding environment.[127] Opening with a description of the DVD *Jellyfish: Healing Kurage* (2006), Roquet reflects on the calming ambience created by jellyfish drifting across the screen.[128] Roquet describes the blue light cast by the screen and the accompanying music, the video allowing the viewer to enjoy selective aspects of the jellyfish with "no damp, no river stink, no risk of being stung."[129] *Flutter of Butterflies Beyond Borders, Transcending Space – Floating Nest* also captures the colours and wonder of a butterfly migration in an ambient experience, accompanied by a soothing soundtrack. The curated mood produced by ambient media presents a subjective environment, as the atmosphere mediates the way in which a person responds to their surroundings.[130] *Floating Nest* is both an audiovisual and physical subjective experience, as the visitor's body is suspended in the space of the image as if they too are a butterfly in the midst of the migration. The air of the gallery itself, when filled with light and sounds, becomes a conduit for the affective experience.[131] Roquet turns to the design of ambient atmosphere, realizing that "there is no escape from environmental subjectivation", instead advising the importance of understanding how it works and can be utilized instead. Within teamLab's *Borderless* exhibition, certain moods or atmospheres are generated based on the movement of the artworks throughout the gallery. As the music swells and the artwork changes, new experiences are created, eliciting different haptic responses from the viewer, reflecting Roquet's position in the sense that the visitor is continuously subject to the virtual environment in teamLab's installations. It is valuable to consider how mediated public spaces can act upon the individual outside the realm of the museum as well, raising questions regarding the context of who has the ability to design the ambient experience and their aim. In the context of teamLab, the collective seeks to encourage movement and interaction within the gallery, as seen in *Universe of Water Particles on a Rock Where People Gather*, which draws people towards the

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[127] Paul Roquet, *Ambient Media: Japanese Atmospheres of Self* (Minneapolis: University of Minnesota Press, 2015), 3-4.
[128] Ibid, 1.
[129] Ibid, 1.
[130] Ibid, 4.
[131] Ibid, 3.

virtual water particles by adding the sound of quietly running water to the soundtrack, recalling the ambience of a bubbling stream rather than a rushing river to create a soothing effect. In *Forest of Flowers and People: Lost, Immersed and Reborn*, stillness is rewarded as the flowers bloom around the visitor, but if the viewer touches the flower it disintegrates into a whirl of petals.[132] teamLab emphasizes the role of the visitor in shaping the exhibit. However, this is a reciprocal relationship in which design of teamLab's artwork also influences the movement of the viewer. In participating in the exhibit, the viewer becomes subject to teamLab's immersive strategies, and the ambient atmosphere dictates both people's motion and their outlook in a way that is not dissimilar to the concept of spatial design put forth by Inoko.

Ambient Subjectivation and the Participatory Experience

Ambient media occupies the liminal space of the gallery, between the physical boundaries of the visitor and the screen. Although the reciprocal interaction between the installation and the visitor blurs these boundaries, ambient media provides another entity to consider, the atmosphere itself. Roquet cites the influence of philosopher Tetsurō Watsuji's interpretation of the atmosphere on cultural policy in postwar Japan.[133] Watsuji suggested that the climate or atmosphere was "the medium through which humans come to understand themselves vis-à-vis the surrounding world."[134] Watsuji proposed a shared atmosphere as the basis of a national, unified identity, assigning the climate socio-political significance.[135] Roquet reveals how this idea was part of "a larger cultural emphasis on 'reading the air' (*kūki o yomu*) to determine correct behaviour."[136] Roquet explains that "correct behaviour" referred to conforming to the status quo established by existing power structures in order to maintain social harmony, effectively shifting the onus of governing behaviour from figures of authority to the air itself, which in contrast was "anonymous".[137] Roquet points out that not all members of a population have equal ability to influence the atmosphere, and certain groups often determine which behaviours are desired, revealing the "unevenness of social interaction."[138] This shift demonstrates the importance of

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[132] teamLab, "Flower Forest: Lost, Immersed and Reborn."
[133] Roquet, *Ambient Media: Japanese Atmospheres of Self*, 7.
[134] Ibid, 7.
[135] Ibid, 7.
[136] Ibid, 7.
[137] Ibid, 8.
[138] Ibid, 9.

understanding how ambient subjectivation can shape behaviour in the pursuit of sociopolitical policies, complicating our understanding of how ambient media is used in virtual environments. The atmosphere is presented as a medium through which ideas can be conveyed, and a means by which the visitor undergoes subjectivation. The process by which the atmosphere positions the individual as a subject is important to consider within teamLab's concept of "ultrasubjective space". Tezuka considers how "ultrasubjective space" challenges the separation between art as object and the visitor as viewer, instead presenting the notion of spatial fluidity.[139] In "ultrasubjective space", the aim is to make the visitor feel as if they have been placed within the artwork, rather than looking through a lens or frame.[140] Similar to "reading the air", Tezuka proposes that the visitor's experience of teamLab's installations is shaped by their interactions with the virtual environment, however she also expresses the prosocial aim of this process. As the immersive exhibit influences the visitor's interactions, they in turn affect the installation as well as the experience of other museum-goers, creating a system in which the presence of others enhances the artistic experience. While this type of prosocial behaviour is relatively low-cost in the sense that it has a responsive element and is motivated by people's desire to engage with the artwork, it demonstrates how interactive new media can be used to encourage people to think about how they relate to their environment and others. Tezuka claims: "Seeing every element that constitutes our surroundings as 'a living entity' allows for an empathic perception and comprehension of the world."[141] The visitors learn to read the cues of the artwork, which in turn shapes their interactions, and the atmosphere encourages the blurring of the boundary between the individual and the artwork as part of teamLab's borderless concept. Consequently, as Roquet suggests, the context of ambient subjectivation provides insight as to how it can be mobilized in a cultural setting.

Roquet's analysis of "reading the air" lays the groundwork to understand how ambient media came to be associated with play in the 1980's as a means of mood regulation.[142] Roquet describes the social shift away from a collective mindset towards a more autonomous "liberal ideal" during this period.[143] As social attitudes changed, ambient subjectivation was presented

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[139] Tezuka, "A Vast Ocean, a Boundless Sky: The Digital Liberation of teamLab," 102.
[140] teamLab, "Ultrasubjective Space."
[141] Tezuka, "A Vast Ocean, a Boundless Sky: The Digital Liberation of teamLab," 102.
[142] Roquet, *Ambient Media: Japanese Atmospheres of Self*, 13.
[143] Ibid, 9.

through more personalized forms of media and packaged as a form of somatic self-regulation.[144] Roquet's work borrows from Michel Foucault, who viewed this turn as a sort of environmental intervention "to tune people indirectly, via the atmosphere, rather than more directly demanding the adoption of social norms."[145] Consequently, the consumption of ambient media was framed as a form of self-care or leisure. In anthropologist Rupert Cox's overview of the Japanese cultural perception of play, he notes that in a modern context, leisure time and play are "almost synonymous".[146] Significantly, as the growing middle class sought to engage in leisure, commercial and governmental institutions invested heavily in media and the arts.[147] Despite the increasing institutionalization of the arts, ambient media continued to be framed as form of personal freedom and play, exchanging reality for the fantastical.[148] Roquet argues that this "notion of free play, however, misses the way neoliberal biopolitics pairs personal 'freedoms' with intensifying demands for self-discipline and self-restraint."[149] In this way, the turn to culture and media as a form of play was not necessarily for the sake of play itself, but rather a technique to manage the consumer's emotional state. Roquet elaborates that these practices often aligned with "larger social demands for healthy, active, emotionally in-control citizens."[150] Rupert Cox describes how the development of mass cultural institutions impacted the organization of the arts in Japan's postwar period, particularly during the economic growth and subsequent "leisure boom" of the 1970s and 1980s.[151] Media corporations and department stores mediated urban cultural experiences, creating a "paradigm shift from the personal to the organizational."[152] The outcome of this shift is twofold. Cox reveals that culture was mobilized by political, intellectual and popular circles to advance their interests: "[t]hese systems of state support and commercial patronage aimed to preserve and promote a sense of national identity through defining and organizing all forms of play as 'cultural' pursuits."[153] At the same time, the growth of the middle class led to an increased demand for cultural programmes and investment in the arts, which

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[144] Ibid, 13.
[145] Ibid, 10.
[146] Rupert Cox, "Is there a Japanese way of playing?" in *Japan at Play: The Ludic and the Logic of Power*, ed. Joy Hendry and Massimo Raveri (London/New York: Routledge, 2005), 169.
[147] Ibid, 180.
[148] Roquet, *Ambient Media: Japanese Atmospheres of Self*, 13.
[149] Ibid, 13.
[150] Ibid, 13.
[151] Cox, "Is there a Japanese way of playing?" 179.
[152] Ibid, 179.
[153] Ibid, 179.

received funding from both government and private sectors.[154] These activities were understood as a form of 'leisure', which Cox equates to the term *rejā*.[155] It is important to note that *rejā*, a loanword originally derived from leisure, has undergone semantic changes that distinguish its use in a Japanese context, and therefore is not identical to the Western understanding of leisure.[156] Cox acknowledges this shift in meaning, cautioning that although leisure is commonly associated with rest, in the 1960s *rejā* came to take on aspects of "luxury" and "active use" in a Japanese context.[157] This interpretation complicates Roquet's association of ambient media with leisure, both revealing the institutional interests at work in the production of culture while also presenting the individual's enjoyment of the arts as an engaged, rather than passive, act. Still, it remains important to consider how this reception was shaped by commercial and political interests. teamLab's use of ambient lighting and soundscapes in their interactive installations ties into the larger history of how these immersive strategies have been mobilized in a socioeconomic context to affect the manner in which media is consumed. Furthermore, teamLab maintains its artistic practice with both commercial funds and ticket sales, in a sense subjecting their artwork to the consideration of art as leisure. Reflecting on Grau's work, he reveals how the parameters of an institution also affect the artistic experience, as the design of immersive, interactive exhibits assigns a role to the spectator in terms of how they must engage with the artwork or one another, opening the discussion of ethics in ambient media and participatory art.[158] teamLab's use of ambient media shapes how visitors experience the collective's artwork, and consequently the collective sets a particular tone and establishes a set of behaviours that enable the visitor to interact with the installations, within the parameters of the museum. However, teamLab's focus on the active role of the visitor seemingly reflects Cox's description of play as leisure, suggesting that despite the effect of ambient subjectivation, there is a personal component to their work in which the individual is invited to engage with the artwork rather than reacting passively to a set

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[154] Ibid, 180.
[155] Ibid, 180.
[156] Eiji Ito, "The Effects of Culture on Conceptualizations of Leisure, Control, and Positive Affect Between Japanese and Canadian Undergraduate Students" (PhD diss., University of Alberta, 2014), 49, 66-69. This study examines how leisure and *rejā* can be used to describe comparable emotional states, however the perceived freedom and the type of control over one's experience varies in the understanding of these two terms, revealing translation issues related to cultural conceptions of leisure.
[157] Cox, "Is there a Japanese way of playing?" 180.
[158] Grau, *Virtual Art: From Illusion to Immersion*, 347.

of organizational expectations. To this end, it is important to consider how artworks that invite participation have been mobilized within both socioeconomic and artistic contexts.

Art historian Claire Bishop envisions participation as "a politicised working process", and suggests this social turn is aimed at rethinking the relationship between artist, artwork, and audience.[159] Like Roquet, Bishop also addresses the role of neoliberalism in participatory art. In an example that recalls the alignment of ambient media with social demands, Bishop describes how government spending on the arts by the United Kingdom's New Labour party was directed towards the ideal of social inclusion.[160] However, this notion of inclusion failed to incorporate members of the social periphery, as the "included majority" implicitly meant to "conform to full employment, have a disposable income, and be self-sufficient."[161] In Bishop's conclusion, she remarks that despite the intentions of participatory artists, "the values they impute to their work are understood formally (in terms of opposing individualism and the commodity object), without recognising that so many other aspects of this art practice dovetail… with neoliberalism's recent forms."[162] teamLab's exhibit is a part of the culture industry, and their concept of a collective, borderless "ultrasubjective space" resembles the aims of the artists Bishop describes. The ambient atmosphere of teamLab's interactive installations provides an unintentional parallel to the social role of ambient media as a technique of regulating the self. The "borderless" experience is dependent on the mediation of the visitor's emotional and haptic experience through the multisensory techniques of teamLab's installations. The exhibit presents a calming atmosphere which the visitor themselves may seek to experience, while at the same time adhering to the intended effect of the artwork. Roquet attempts to reconcile the freedom afforded by ambient media with its social implications. He believes it is important to not disavow "atmospheric determinations of self", but rather examine how ambient subjectivation occurs.[163] Roquet suggests that the individual positioned as the subject needs to "read the air" and recognize the ways in which they are responding to the atmosphere.[164]

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[159] Claire Bishop, *Artificial Hells: Participatory Art and the Politics of Spectatorship* (London; New York: Verso Books, 2012), 2.
[160] Ibid, 14.
[161] Ibid, 13, 14.
[162] Ibid, 277.
[163] Roquet, *Ambient Media: Japanese Atmospheres of Self*, 15.
[164] Ibid, 15.

The design of participatory experiences is taken up by curator Nina Simon in *The Participatory Museum*. Simon studies how we find meaning in participatory experiences, believing a sense of structure is necessary for people to engage comfortably with interactive elements of the museum.[165] Simon's exploration of the structural element of participatory experiences recalls Roquet's emphasis on understanding how ambient subjectivation is achieved, in both situations the interactive experience has been carefully orchestrated. Simon recognizes the playful aspect of interactive artwork, referencing the work of games researcher Jane McGonigal to establish qualities of rewarding participatory experiences.[166] McGonigal identifies satisfactory work, a feeling of accomplishment, interpersonal relationships, and being part of a larger cause as key components of happiness, which Simon believes can attained through participation.[167] These qualities are reminiscent of the neoliberal ideals presented in Roquet and Bishop's work, however the importance placed on constructing an experience that respects the visitor's investment of time and energy takes a different approach to the emotional engagement of museum visitors. Simon's understanding of participatory experiences moves away from the concept of the passive viewer to a more reciprocal model that aims to create valuable interactions with both the artwork and fellow visitors. This can be seen in Simon's explanation of the various stages of interaction. The experience begins on an individual level as the visitor consumes the content, their own individual interactions are eventually considered within the larger community of museum-goers, and ultimately, they have the opportunity to connect with others around a shared experience.[168] In my own experience of teamLab's light sculpture installations, I observed how the artwork responded to other people's presence as more visitors entered the space, inadvertently modelling how to engage with the artwork. In realizing how the light sculptures reacted to my actions along with those of others, it was possible to experiment with different movements in an attempt to influence the installation. Visitors were able to learn from one another, reflecting how the design of participatory experiences can encourage haptic engagement with the space and mingling with others in the space of the museum.

The agency of the visitor in participatory experiences is another important facet to consider, particularly in relation to immersive, interactive artwork. The ambient nature of

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[165] Nina Simon, *The Participatory Museum* (Santa Cruz, California: Museum 2.0, 2010), 13.
[166] Ibid, 17.
[167] Ibid, 17.
[168] Ibid, 26.

teamLab's installations means that while the visitor can actively influence the artwork, the artwork itself also engages passive viewers. The design of the participatory experience ensures the individual is always immersed in the virtual environment. Jenny Kidd, a media scholar, recognizes the museum as a mediated experience, and looks at the process by which "technologies become inscribed with authority."[169] teamLab's exhibit transforms the traditional relationship of the museum and its visitors from one in which information flows from the institution to the individual, to one in which the individual assumes a co-creative role in shaping the immersive experience. However, there also remains an aspect of authority in the way ambient media exerts itself upon the visitor. The virtual world *teamLab Borderless* presents in its exhibits is one from which the visitor cannot necessarily withdraw. Even when viewing the artwork passively, the visitor is still surrounded by imagery and positioned within the larger ecosystem of artworks. The ambient light of the projections is reflected onto the visitor's body, and they are aurally immersed in the art through the accompanying soundtrack. Furthermore, because there is no singular point of perspective in "ultrasubjective space" the individual is always situated as a viewer in the artwork. In this manner, both active and passive modes of viewership are incorporated in the structure of the experience. In *Artificial Hells*, Bishop views the binary presentation of passive and active spectatorship as reductive, stating "the binary of active/passive always ends up in deadlock…."[170] In this dichotomy, active and passive spectatorship are interchangeably criticized and opined. On one hand, the passive spectator merely views the art, while the art itself acts upon them, on the other, the haptically engaged visitor is contrasted with the contemplative, critically distanced viewer.[171] As a result, Bishop raises the question of how we define passive and active spectatorship. Although teamLab refers to the individual as visitor rather than viewer, implying their engagement with the artwork, the installation itself responds to observer and active participant alike. It confounds the description of the visitor as active or passive, as in some artworks even the act of walking, such as in *Universe of Water Particles*, is a form of engagement. Likewise, within teamLab's light sculptures the observer might fall under a beam of light, and therefore be haptically immersed in the space of the image, and subsequently affect the pattern of the artwork itself. As demonstrated in the cycle of *Flutter of Butterflies*

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[169] Jenny Kidd, *Museums in the New Mediascape: Transmedia, Participation, Ethics* (London; New York: Routledge, 2016), 1, 3.
[170] Bishop, *Artificial Hells: Participatory Art and the Politics of Spectatorship*, 38.
[171] Ibid, 38.

Beyond Borders, teamLab envisions the visitor as a part of the artwork, playing with the boundaries of the visitor in relation to their virtual environment. The reciprocal interaction between the installation, atmosphere, and visitors enmeshes them together, and in this sense, the viewer is neither active or passive, but rather simply part of the experience.

Kidd broadens her examination of participatory interactions between the individual and the museum by considering the role of social networks as an extension of the institution.[172] Kidd views the museum itself as a form of media, and refers to the presence of museum content across multiple platforms including social networks and digital media as "transmedia".[173] For Kidd, this content also falls under the "participation paradigm", as it grants the audience different ways to access the artwork, potentially expanding this access as well.[174] This access permits a wider range of perspectives to be presented, an idea put forward in the work of media theorist and critic Douglas Kellner and media scholar Gooyong Kim. Kellner and Kim discuss how the internet provides a space for "decentralized and interactive communication, a participatory model of pedagogy, and an expanded flow of information."[175] teamLab has embraced online platforms to reach both a local and international audience. The extension of their content through their website and platforms such as YouTube has also provided access to their work beyond the physical limitations of the gallery space. In the online space, Kellner and Kim reveal how the connective power of media has the potential to challenge conventional relationships between producers and consumers of knowledge.[176] Many of the visitors to teamLab can document and share their own experiences of the artwork online. In this way, teamLab is no longer the sole producer of knowledge regarding their artwork, and the visitors are not just consumers. In Kidd's view, this model opens up opportunities for play, a creative aspect also elaborated on by Kellner and Kim, who claim the internet has presented a space for individuals to "become a writer" and take on an authorial role.[177]

A recent artwork of teamLab that specifically touches on the co-creative role of the individual, as well as on Roquet's critique of ambient media as a form of self-care, is *Flowers*

[172] Kidd, *Museums in the New Mediascape: Transmedia, Participation, Ethics*, 44.
[173] Ibid, 24.
[174] Ibid, 26.
[175] Douglas Kellner and Gooyong Kim, "YouTube, Critical Pedagogy, and Media Activism," *The Review of Education, Pedagogy, and Cultural Studies* 32:1 (2010): 14, https://doi.org/10.1080/10714410903482658.
[176] Ibid, 21.
[177] Ibid, 21.

Bombing Home (2020) (Figure 28). Created in response to social distancing in the wake of the novel COVID-19 coronavirus and accessible through the collective's website and streaming live on YouTube, the artwork consists of a medley of flowers submitted by viewers from all over the world in an attempt to recreate the connections between people that would normally be possible in teamLab's exhibitions. Anyone with access to the internet and a screen to display the artwork is able to participate by downloading the flower template from their website, colouring it digitally or manually, and uploading their flower onto the website (Figures 29, 30, 31). The flower will almost instantaneously begin to bloom on the livestream, enabling the viewer to experience the co-creative elements of their artwork from the space of their own home (Figure 32). As each new flower enters the artwork, the creator's location is displayed on the screen, allowing the viewer to get a sense of the various times and spaces inhabited by other participants. teamLab intends for the piece to serve as a means of connection and entertainment in response to the social isolation and difficulty people may feel due to the pandemic.[178] *Flowers Bombing Home* exemplifies Kellner and Kim's conclusion that new media has created an "unprecedented space for individuals to exercise a performative/critical media pedagogy for self-realization and social transformation."[179] The creation and subsequent presentation of one's flower in the artwork allows the individual to project part of their own experience, and realize their efforts as part of the overall piece. The calming music and mesmerizing sway of the flowers as they appear on the screen recall Roquet's description of ambient media, with the theme of connection being proposed as a form of healing. The work is still tactile, as it requires the participant to colour the flower, and retains the multisensory visual and auditory qualities of teamLab's other artworks. Roquet acknowledges both the potential merits of ambient media as well as the more prescribed aspects of these experiences. The ability to comment on the video has been restricted, directing attention to the artwork itself as a means of communication between viewers. In this way, there are certain parameters that *Flowers Bombing Home* must work within. Most notably, it is important to consider whether the sense of connection provided by the artwork was able to alleviate the loneliness of participants missing family, friends, or even more informal social interactions.

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[178] teamLab, "Flowers Bombing Home," YouTube Video, live stream, 2020, https://www.youtube.com/watch?v=EDTjjib_s_k.
[179] Kellner and Kim, "YouTube, Critical Pedagogy, and Media Activism," 29.

In a conversation about *Flowers Bombing Home* between Japanese author Tsunehiro Uno and teamLab's Inoko, Uno describes the experience of seeing the flowers he drew as they appeared on the screen:

> My little actions catch the eye of people all over the world…When I first play[ed] this piece, I think most people just paint the flowers with the color they like. However, from the second time onward… I was conscious of the color scheme of the entire screen… In short, from the first play to the second play, human beings naturally pursue the joy of co-creation with other human beings.[180]

The process of creating a flower, choosing the colours, and adding one's own personality to the template personalizes the experience, and each flower provides a glimpse of the time another individual spent to interact with artwork. Similar to teamLab's work *Flutter of Butterflies, Born From Hands*, the individual contributes to the piece through their interactions. Again, there is a playful element to the artwork as a result of these interactions, turning the viewer's attention outward towards the relationship between their own flower and those surrounding it, each signifying another person and reminding the viewer of their connections to other people through the medium of teamLab's artwork. The work does not preclude anxiety about the coronavirus, and teamLab acknowledges that this was part of the impetus for the artwork. However, "Flowers Bombing Home", produced from the collective's own interplay of skills and ideas, invites the viewer to take part in the collaborative process as well, cultivating a sense of connection through the creation of the artwork.

Conclusion

teamLab's immersive, interactive installations place an emphasis on connection, inviting visitors to engage with the artwork, creating a ludic metaphor for the interactions between people and their environment in their everyday experience as well. In my exploration of teamLab's exhibition, I aimed to reveal the significance of play in immersion and reveal the effects of the design and construction of the artwork apparatus on the visitor's experience. I sought to demonstrate how the visitor's interaction with the apparatus is also a form of play, lending itself

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[180] Masayuki Koike, "I want to eliminate the boundary between the body and the work in 'ultrasubjective space'," *Slow Internet*, December 17, 2020, https://slowinternet-jp.translate.goog/article/borderless03/?_x_tr_sl=ja&_x_tr_tl=en&_x_tr_hl=en&_x_tr_pto=sc.

to the exploration of the boundaries between the audience and technology. *Flutter of Butterflies Beyond Borders, Transcending Space – Floating Nest* ultimately considers the sublimation of the viewer within the artwork, an idea built upon by *Flowers Bombing Home* in which the individual becomes co-creator. Raveri contextualizes this understanding of play in light of Japan's "leisure boom" in the 1980s, claiming, "the arts became more and more the product of a pervading industry of entertainment."[181] Oen examines teamLab's place in the experience economy, comparing their exhibitions with international expositions, art biennials, and world's fairs, and considers how these events provided the opportunity to gain knowledge through sensory engagement, revealing how interactive experiences can create a "complicated web of engagements, relationships, and memories."[182] The reciprocal interaction between the visitor and the artwork is not without the consideration of power dynamics in participatory experiences, as well as the question of how meaningful experiences can be constructed. Despite the association of art and leisure, to preclude interactive, immersive media from serious consideration undercuts the complex dynamic between art and play. Raveri observes that the concept of play itself is mutable, referencing the distinction between play (*asobi*), associated with "traditional" concepts including nature, ritual, imagination, and children engaging in free play, and leisure (*rejā*) which takes place indoors and typically involves technology.[183] teamLab's exhibition seems to incorporate both associations, presenting a virtual interpretation of the natural world and encouraging haptic interaction through the use of technology, reflecting Raveri's belief in the contradictory nature of play itself in relation to "other symbolic languages of society."[184] Cox states that within the Japanese notion of play, both the participant's creative experience and the structural logic of an activity are important components.[185] The rich visual imagery of teamLab's artwork is not merely ornamental, the lights, butterflies, and flowers respond to and act upon the viewer, creating an immersive atmosphere alongside the ever-present soundtrack. "Ultrasubjective space" draws on historical techniques of spatial construction to present a collective and interactive experience. The idea of emergence is brought back, as the creative play in teamLab's interactive environments arises from the visitor's experience and the elements of

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[181] Raveri, "Introduction," 13.
[182] Oen, "Art in the Age of Digital Interactivity," 11.
[183] Raveri, "Introduction," 18-19.
[184] Ibid, 18-19.
[185] Cox, "Is there a Japanese way of playing?" 182.

the installation, creating an immersive world that is more than the sum of its parts, built upon the feedback that occurs between visitors, the artwork, and one another.[186] Moreover, the way in which teamLab's work reacts to visitor's actions in real time and does not revert to previous states creates the possibility of longer-term engagement, as the traces from one visitor's actions influence later interactions.[187] Seevinck believes an influencing type of interaction "is something that resonates with memory and our experience of the natural world: *what you said to me yesterday is still with me today*."[188] The visitor imparts themselves on the artwork, and the artwork imparts its response on others. A flower drawn by one individual and displayed in *Flowers Bombing Home* is seen by someone else viewing the artwork in a different location, months later. The butterflies generated by visitors in *Flutter of Butterflies, Born from Hands* migrate to other visitors in the *Floating Nest*. teamLab creates connections between the visitor and the artwork, the body and technology, and the self and others. In this way, teamLab challenges the notion of borders, offering visitors a renewed understanding of the importance of our connections to others and our environment.

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[186] Seevinck, *Emergence in Interactive Art*, 13.
[187] Ibid, 32.
[188] Ibid, 167.

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Illustrations

Figure 1. Entrance to *teamLab Borderless* exhibition. (Photograph by Tan Sing, "Review for: teamLab Borderless Entrance Pass," *KLOOK*, September 11, 2020, https://www.klook.com/en-CA/activity/20707-teamlab-borderless-admission-ticket-tokyo/.)

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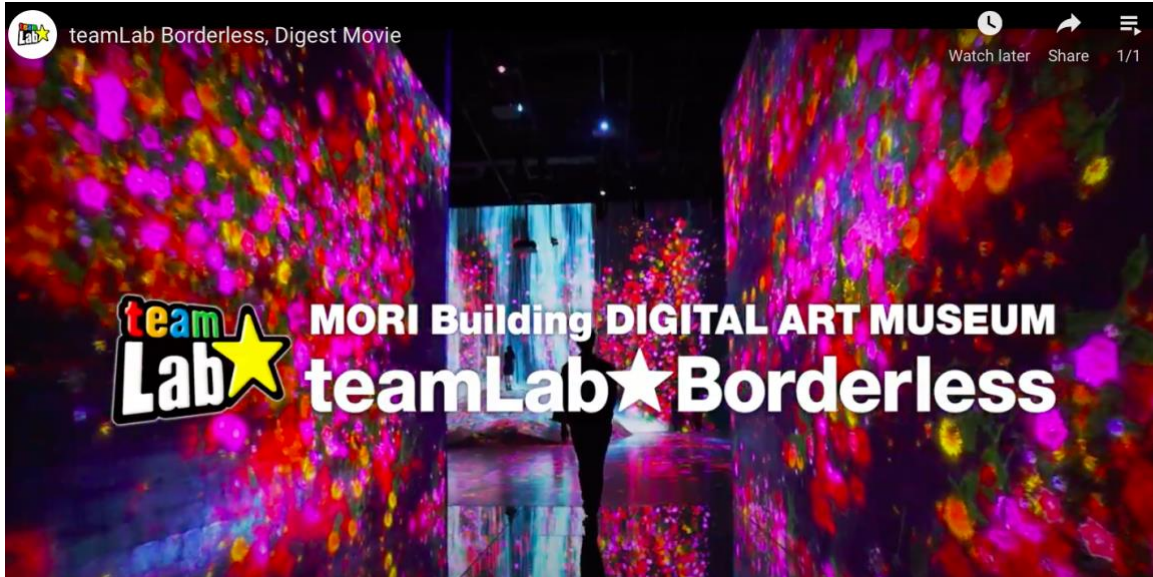
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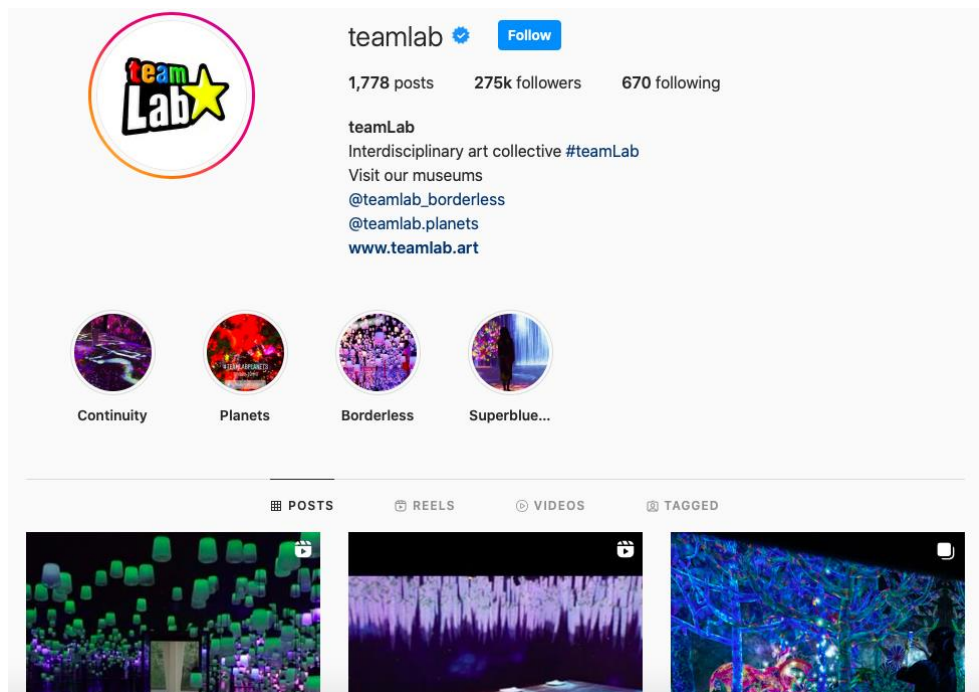
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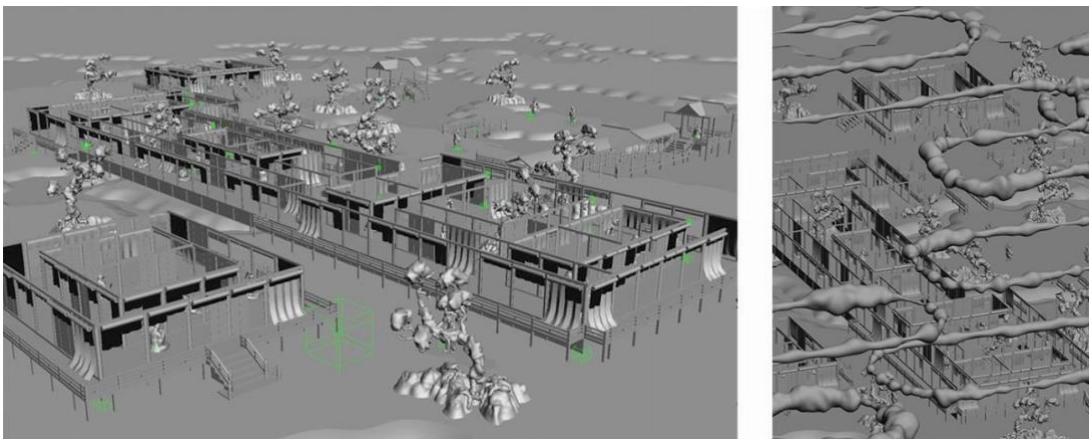
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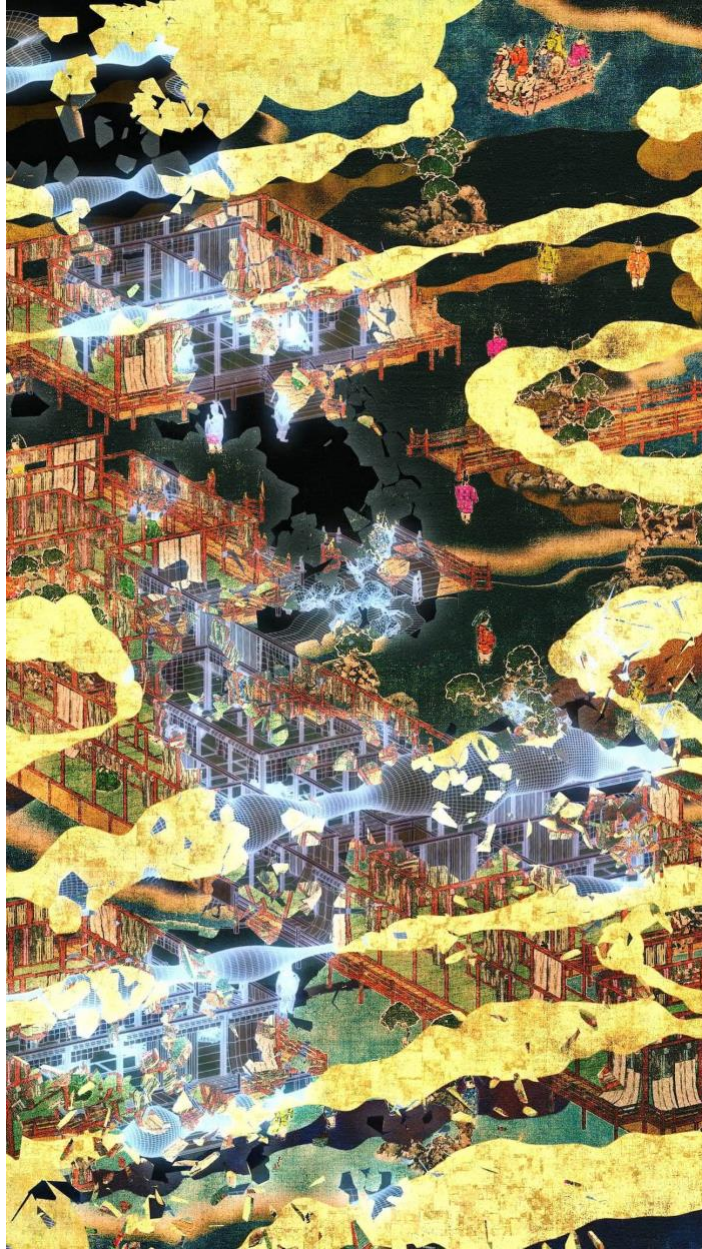
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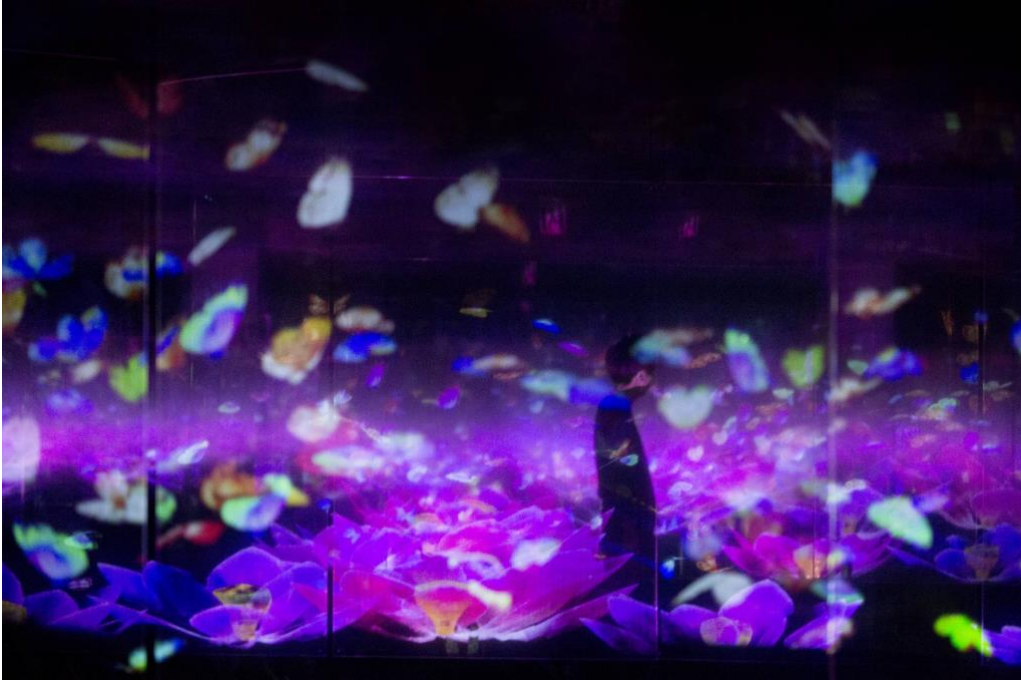
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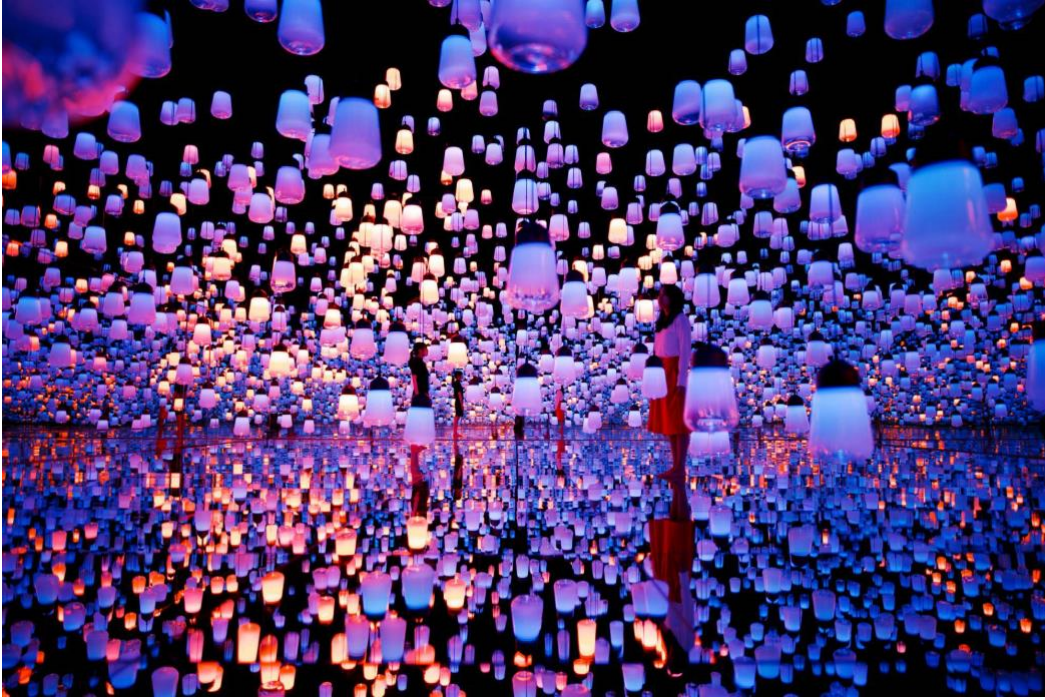

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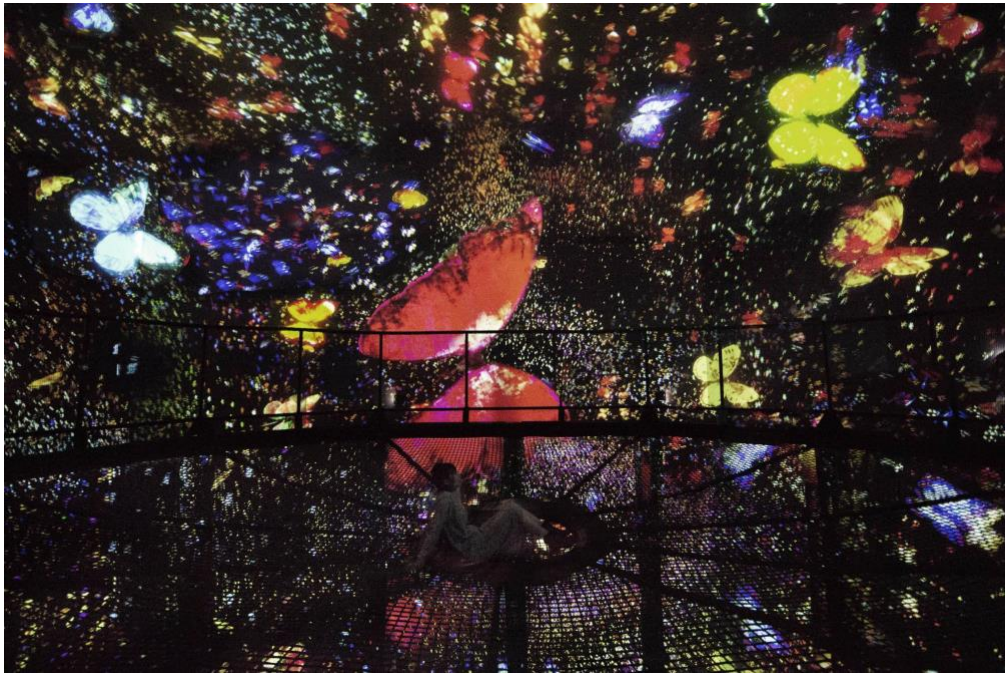Figure 22. Penny, Simon. "Traces – 3d Machine Vision, rear view of body model." 1999, immersive interactive artwork, displayed via CAVE. https://simonpenny.net/works/traces.html.

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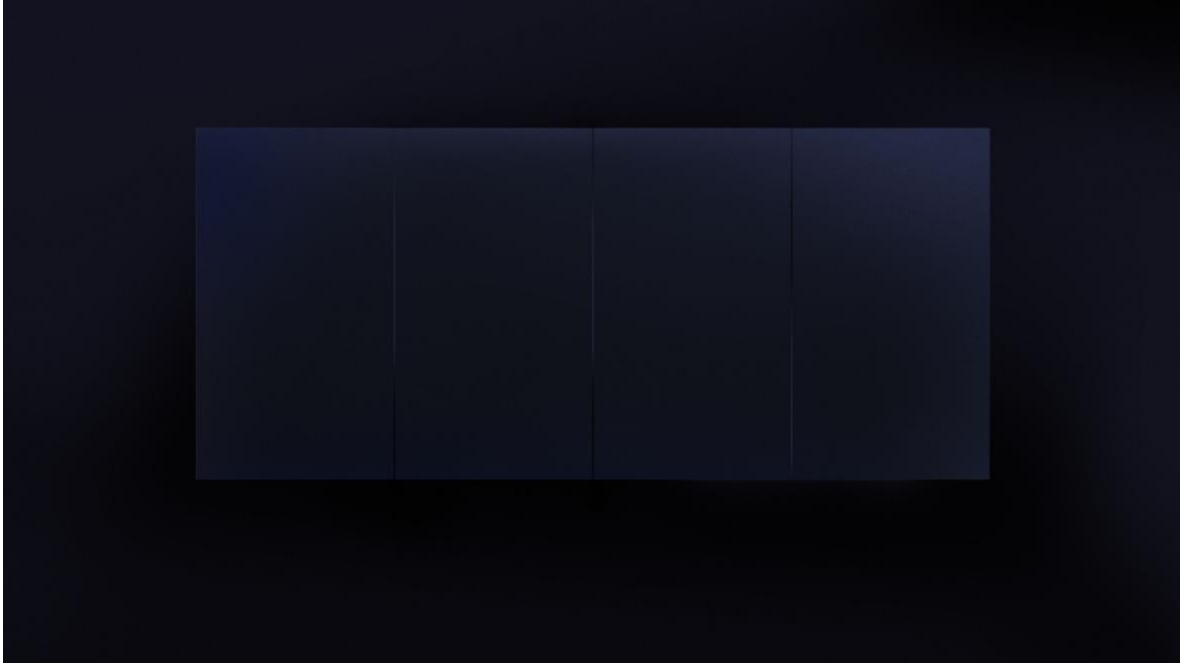
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Figure 29. Child colouring flower with crayons. (teamLab. "Flowers Bombing Home." 2020, interactive digital installation, sound: Hideaki Takahashi. https://www.teamlab.art/w/flowers_bombing_home/.)
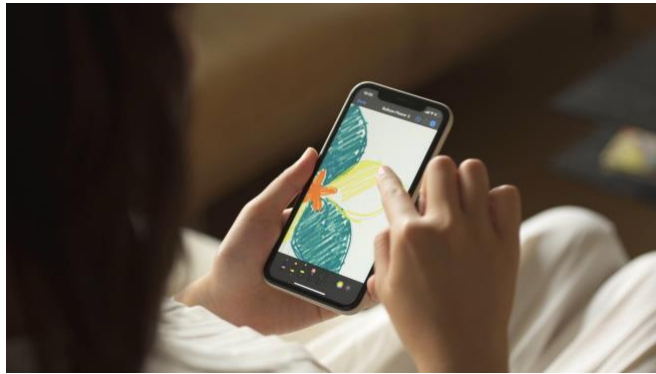

Figure 30. Person colouring flower digitally. (teamLab. "Flowers Bombing Home." 2020, interactive digital installation, sound: Hideaki Takahashi. https://www.teamlab.art/w/flowers_bombing_home/.)
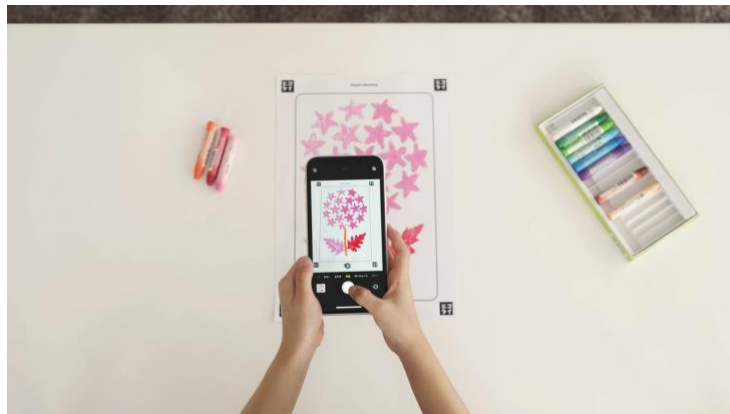

Figure 31. Photographing and uploading drawing. (teamLab. "Flowers Bombing Home." 2020, interactive digital installation, sound: Hideaki Takahashi. https://www.teamlab.art/w/flowers_bombing_home/.)

Figure 32. Screenshot of livestream. (teamLab. "Flowers Bombing Home." Screenshot by author. Accessed October 2020. https://www.teamlab.art/w/flowers_bombing_home/.)