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# Exploring volumetric video and narrative through Samuel Beckett s Play

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**ABSTRACT**

This paper draws upon the primary research of an interdepartmental collaborative practice-as-research project that took place at Trinity College during 2017, in which a Samuel Beckett play, entitled Play, was reinterpreted for virtual reality. It included contributions from the Departments of Computer Science, Drama and Electrical and Electronic Engineering. The goal of this article is to offer some expanded philosophical and aesthetic reflections on the practice, now that the major production processes are completed. The primary themes that are dealt with in this paper are the reorganised rules concerning: (1) making work in the VR medium and (2) the impact of the research on viewership and content engagement in digital culture. In doing so we draw on the technological philosophy of Bernard Stiegler, who extends the legacy of Gilles Deleuze and Gilbert Simondon, to reflect on the psychic, sociopolitical and economic impacts of VR technology on cognition, subjectivity and identity in the contemporary digitalised world.

## Introduction

Free-viewpoint video (FVV) is a cutting-edge volumetric video (VV) capture technique that promises to re-empower artists in the expanding economy of Virtual Reality (VR) and Augmented Reality (AR). It is a video-recording technique where an array of video cameras arranged in an arc – covering the surface area from all possible angles – simultaneously capture an actor or object (see Figure 1). The footage is stitched together using innovative computer-vision software algorithms, thereby facilitating the construction of a volumetric mesh with photorealistic texturing that can be displayed in 3D software and game engines (see Figure 2(a–c)).[1] The result of FVV capture is the creation of a 3D VV object that offers similar functionality to animated graphical objects created natively in 3D drawing software; that is, when viewed in a virtual scene, the user is afforded free navigation and can choose their own point-of-view and proximity to the object (Smolic et al. 2006).

Aljosa Smolic, director of V-SENSE, makes provisions for collaborative, creative research experiments in his administration of funding from Science Foundation Ireland (SFI), as he holds that these open new research questions by generating problems that are not otherwise encountered in controlled laboratory experiments. Early in 2017, Néill O'Dwyer,

Figure 1. FVV capture setup with actor and director on the green screen set.

previously of the Dept. of Drama, joined V-SENSE in the capacity of creative director. O'Dwyer's function was to conceive creative experiments that would showcase the technology under development and drive scientific research beyond the exclusively quantitative domain. The goals of Virtual Play were to: conceive an interactive, immersive story that would demonstrate the innovative FVV pipeline and computer vision techniques being developed at V-SENSE; help reinvent storytelling by eliciting the new specificities of interactive digital media; and reactivate the work of a celebrated modern author for the evolved conditions of mediatised spectating in the twenty-first century.

## Project background

Preceding Virtual Play, O'Dwyer was engaged in a practice-as-research (PaR) collaboration with the director and Beckett scholar Nicholas Johnson on a project entitled Intermedial Play, which involved a live webcast of Samuel Beckett's Play, using a pan-tilt-zoom (PTZ) camera. Beckett's original script is conceived for the proscenium arch paradigm of theatrical spectatorship. Three actors encased in 'three identical grey urns ... about 1 yard high' (Beckett 2006, 307) are positioned downstage, and they face 'undeviatingly front throughout the play' (ibid.). The action of the play is the interrogation of the characters by the spotlight, and under duress the actors give interrelated but individual accounts of a love triangle.[2] Each actor has a monologue that they must recite; however, these monologues are interwoven as a quasi-dialogue, and they may only speak when the light is on them.[3] As such, Beckett's original theatrical text consists in the audience bearing witness to a sort



Figure 2. Reconstructed character of W1: a) mesh, b) voxels and c) photorealistic texture.

of Pavlovian trial. However, audience members only witness; they sit in the relative comfort and safety of the auditorium and passively observe the proceedings.

In Intermedial Play, we replaced the spotlight with the PTZ camera. The main goals of the project were three-fold:

(1) To reactivate Beckett's text by reinterpreting it for the redefined conditions of contemporary spectatorship, over intermedial, reticulated, digital networks.
(2) To employ the new technologies of digital media, and to harness video surveillance devices such as zoom, framing and the first-person gaze, to align the spectator with the interrogation process and bring them closer to the dialogue/action.
(3) To harness the newly democratised technologies of live broadcasting to preserve and extend the reach and accessibility of the theatre spectacle. Although we used video technologies and the event was automatically recorded, the emphasis of the project was on maintaining the energy, pressure and dynamism of the live.[4]

We immediately recognised the aptness of Play to V-SENSEs remit of creative experiments and the exciting opportunities afforded by translating it to VR. Beckett's original script consists in an interactive game between the light operator and the actors, which exposes the mechanisms behind their functioning and foregrounds the theatre itself. It deeply engages notions of dialogue and interactivity, and is self-reflexive on the ontology of staging drama. The immanent interactive and ludic qualities at the heart of Play make it an ideal text to migrate to VR, because the medium's inherent playful qualities – proven by its success in the gaming sector – afford new possibilities for investigating how Play might work with an actively engaged audience .[5] Therefore, it was mutually agreed that the PaR collaboration revolving around the Play text would continue, and version 2.0 was conceived (Virtual Play). Play was thus selected as the axis for application of the VV technology – a vehicle for exploring new possibilities for narrative in interactive immersive environments. The decision to progress to this second stage affirms our PaR methodology by continuing the primary research goals of version 1.0, but applying them in the context of VR technologies.

As VR head-mounted displays (HMDs) become more pervasive and art-going publics increasingly consume content via digital media networks, new and pressing questions emerge: how will modern classical stories and narratives continue to be consumed and appreciated in the new digitalised world? How will the works of celebrated authors be passed on to new generations of art consumers, expectant of engaging with content via electronic paradigms? Indeed, how will such stories survive in the future? Such questions animate the newly established Trinity Centre for Beckett Studies as much as they concern technologists.

The reinterpretation of Beckett's text for VR serves three main strands of research: (1) to employ and showcase cutting-edge video capture research techniques, (2) to explore the potential for their deployment in interactive narratives; and (3) to test the viability of translating the works of celebrated authors for the VR medium, so that they continue to be celebrated by new generations of content consumers. The rest of this article is dedicated to reflecting upon these three research strands underpinning Virtual Play. The next two sections address the first and second research strands by briefly describing the technical architecture of the work, then explaining how the narrative rules were modified to

investigate new potentialities for audiences in interactive digital media. The subsequent sections reflect on how such praxis reactivates celebrated work and generates new experiences, modelling the problematics of how cultural knowledge is transmitted from one generation to the next. We conclude that VV's innovative methods of inscription, capture and dissemination show how knowledge, as both technical skill and epistemological wisdom, is transmitted by evolving methods that occasion new affordances and limitations.

## Rationale: technical and aesthetic decisions

Beckett's overarching rule of the performance is that actors speak when the light is on them and stop when the light is off them. The order of who speaks and when is determined by Beckett in his script. However, Beckett actually opens the sequence of articulation to variation himself.[6] Most directors choose to stick to Beckett's predefined order for the second iteration and only repeat the play once, thus moving to the outro and blackout directions after the second iteration. To continue for an indeterminate number of loops would exhaust the actors and incite ennui on the part of the audience. However, this option is available and readily achievable within the VR framework, because the actor is now a machinic recording that can loop infinitely, and the conventions of VR demand that the audience can enter and leave the fictional world as they choose. We chose to pursue this narrative paradigm because it makes an audience engagement scenario available in which the 'interrogation' is not witnessed passively but rather enacted, and in which the temporality of this operation is theoretically boundless – two affordances that Beckett could not avail of in the theatre. The challenge was to design a user experience that would complement the narrative strategy.

Provisions were made at the planning stage to capture the material in different ways, to provide options at the building stage.[7] We experimented with several user interaction and user experience designs. Our preferred version was selected based on our prerogative to elicit the interactive, exploratory and playful characteristics of digital media, by giving control of the spotlight to the end-user and empowering them to provoke the character into speech by controlling the light. Further user-driven experiments revealed that the most satisfactory, effective and user-friendly method of spotlight operation is to align the light with the user's gaze; whatever the user looks at is illuminated by the beam of the virtual spotlight (see Figure 3). 'End users are thus empowered to discover the interdependent monologues by themselves, merely by looking at the actors and focusing their attention on them' (O'Dwyer et al. 2017); this interactive framework has the added benefit of allowing the audience to decide who speaks, when they speak and for how long. Therefore, the project embraces the characteristics of digital media that are widely celebrated as positive and beneficial to end-users: active engagement, dialogue, exploration and so on. In previous versions made for theatre and film, the audience are passive and dislocated from the interactive game by the rectangular proscenium or screen that demarcates the bounds of the fictional world. In our VR version, the audience is central, causal and responsive to the dialogue, and by donning the VR HMD they are more completely immersed in the fictional world.[8] This sensation of total immersion, peculiar to VR, also has its shortcomings, but discussion of these is more appropriate to areas such as media psychology and is beyond the scope of this paper.

Figure 3. User s point-of-view as they shine the light on W1 by gazing at her.

Based on the exhibitions of the work so far, we have found this interactive format of narrative disclosure highly engaging and have received positive critical feedback from Beckett scholars, computer scientists and lay users on every occasion.[9] While our exhibitions and audience feedback sessions support the view that an interactive, audience-centric approach is empowering for the user, there is also qualified cognitive science research to support the notion that this ludic, hypertextual format can offer a beneficial contribution to the evolving field of intermedial pedagogical practices. This addresses the second major goal of the project: to explore the potential of interactive narratives in immersive environments.

## Hyper-attention positively engaged

The exhibitions of the work so far have revealed that the audience-centric strategy opens a completely new way of experiencing the text. Beckett's stage directions for theatre describe the delivery of text as 'rapid' and 'toneless', thus creating a deluge of words (Beckett 2006, 307).[10] The cues are numerous and 'immediate' (ibid.); there is no space for reflection in the switches between characters speaking. Combined with the roving spotlight, these conditions induce a state approaching hypnosis, making character perspectives and plot details difficult for the audience to decipher, particularly on a first viewing. While incomprehension, disorientation and groundlessness are aesthetic strategies deployed at times by Beckett, he also tacitly acknowledges the interpretive difficulties, hence the 'Repeat play' stage direction (Beckett 2006, 317).[11] The fundamental question around which the narrative framework of Virtual Play revolves is that of attention. It is through the operation of gazing at a character that the narrative is disclosed. Attention is a crucial phenomenon in digital culture, because when a user is afforded the ability to attend to whatever they like, for as long as they like, this raises a new set of user engagement criteria not just for storytelling, but also for content provision, e-commerce and education. In her article 'Hyper and Deep Attention: The Generational Divide in Cognitive

Modes', N. Katherine Hayles posits that 'we are in the midst of a generational shift in cognitive styles that poses challenges to education at all levels' (Hayles 2007, 187). Hayles defines hyper attention as a cognitive style 'characterized by switching focus rapidly among different tasks, preferring multiple information streams, seeking a high level of stimulation, and having a low tolerance for boredom' (ibid.), whereas deep attention is the more conventional cognitive mode conducive to reading books, 'characterised by concentrating on a single object for long periods … , ignoring outside stimuli while so engaged, preferring a single information stream, and having a high tolerance for long focus times' (ibid.). Hayles' position is not to promote or admonish either mode, simply to point out that hyper attention is on the rise, and there is sufficient research supporting the view that it is intensified by digital media. She maintains that educational and cultural policy need to respond to the new situation, and our PaR supports this view.

In our production users are allowed to engage Beckett's text on their own terms. Users can hyper-attend to the story, thereby getting a more personalised and active experience, versus audiences who engage with it in the passive, linear format.[12] For Hayles, developments in the technological realm conduce a reorganisation of the cognitive realm. However, straightforwardly jumping to the conclusion that the diminishment of the average capacity for deep attention and the rise of hyper attention is an impoverishment is erroneous; it is also a new opportunity to re-think, re-organise and re-structure pedagogical practices. Virtual Play 'demonstrates how intensifiers of hyper-attention can be positively engaged and used to elicit a rich and rewarding "reader" experience' (O'Dwyer et al. 2018). In terms of the PaR, it can be stated that Virtual Play elicits the specificities of digital VR technologies to assist in the re-activation and pedagogical transmission of a cultural artefact, via the cognitive mode of hyper attention.

According to Bernard Stiegler, the question of attention is central to the contemporary capitalist model; attention is the new 'fuel' of 'the hyperindustrial economy' (Stiegler and Rossouw 2011, 53). Thus, there is an opportunity for the creative/performing arts not only to show the way for positive pedagogies via digital media, but also to occupy a central role in important policy decisions being played out in the culture industries: the economy of capturing and retaining attention. When a person is engaged in dialogue or an act of observation, they are captivated by a flow of moments; the listener is mutable, in flux, disappearing and evolving. Every person listens, interprets and responds in a unique way based on their singular life experiences. To engage this subject, it is useful to address the theories of Edmund Husserl, and Stiegler thereafter.

## Husserl and Stiegler: from attention to temporal objects

Working during the advent of recording technologies, Husserl theorised musical melodies, cinematic films, and radio broadcasts as 'temporal objects'. These are objects constituted by a succession of instances that flow into one another, creating a whole greater than the sum of the parts, e.g. the melody of a musical composition.[13] These objects flow past the eyes and ears of the audience, only becoming perceivable in the moment of their disappearance, mirroring the temporality of consciousness itself. A temporal object has the same structure as an interlocutor in the sense that when one attends to it, one does so in the same manner as if listening to a real person; it can modify the temporality of a listener's consciousness (Stiegler 2014, 17–18).

Considering the phenomenological processes of paying attention, Husserl conducts a deconstruction of its etymological relative: retention. He holds that retention is a phenomenon that is divisible into two types: primary and secondary.[14] Primary retention is related to perception: it is the ability, for example, to decipher and interpret the syntax of a sentence, and make meaning from what would otherwise be a flow of words. Secondary retention is, conversely, related to memory: it is used when recalling dialogue, text, or poetry. Stiegler takes Husserl's phenomenological theory a step further by integrating the verbatim retentional capabilities of mechanical recording technologies, which he calls tertiary retention.[15] Tertiary retentions are possible because technologies of audiovisual inscription and mnemotechniques facilitate the exact recording of articulations and gesticulations. Stiegler calls these 'industrial temporal objects' (Stiegler 2008, 10) because, as mechanical inscriptions, they constitute the new economy that is founded on an industrialisation of memory.[16] He points out that tertiary retentions are 'a prosthesis of memory exteriorised' (Stiegler 2014, 34), and they permit the same live event to be repeated, revisited and relived ad infinitum (we might recall here Krapp's Last Tape). An important characteristic of tertiary retentions is that they have the power to reorganise the first two genera, thus providing a better understanding of retentional processes. Stiegler writes: 'Repetition produces di*ff*erence' (Stiegler 2014, 34), meaning that every time the same temporal object is played back it modifies temporal phenomena; that is, 'primary retentions vary from one phenomenon to the next' (Ibid.). The retentions from the first time of listening – now assimilated to secondary retentions – bring focus to the primary retentions of the second playback, meaning that the interlocutor can focus on finer details with each repetition. Recalling Hayles' argument, it is clear how Virtual Play shows the potential for a positive relation to hyper attention. The fact that users can spend as long as they like in the VR environment opens up opportunities for deep interpretations through hyper-attentive linking within the dialogue, which was impossible via the original conditions of the theatre paradigm.

The gameplay of Virtual Play is as follows: the characters repeat their monologues infinitely, but they are paused by default. When one looks at a character they speak; when one looks away they stop; upon looking back, the character continues their monologue from precisely the point where the previous cut-o*ff* occurred.[17] We decided to stop the narrative from descending into complete arbitrariness, by preventing the user from randomly jumping around the dialogue – an overused device in computer art, as well as being further from Beckett's stated preferences. In keeping with the original play, control over activating the characters' speech is limited to switching between characters. The user is therefore bound to listen to the individual characters' monologues as Beckett originally envisioned, while still maintaining a feeling of control and involvement. By editing with the gaze, users can: (1) revisit certain sections of the play and bring renewed focus to these sections of dialogue upon each return, (2) explore sections of dialogue and plot details that they may have missed on previous passes, and (3) discover and invent new combinations of interchange between characters through reorganised aural juxtaposition.

Considering the impact of tertiary retentions on cognition, we can reflect on Virtual Play thus: Stiegler's understanding of di*ff*erence, when he says that repetition produces it, is drawn from the thinking of Gilbert Simondon and Gilles Deleuze. He uses the term in the sense that, as knowledge is transferred from one being to another (or from a group

to an individual etc.), each transaction is interpreted and embodied in an individual way – depending on the already acquired experiences of the receiver – and so undergoes differentiation in its re-usage. For example, an apprentice learns skills from a master, yet brings their own idiosyncrasies to a craft through their uptake and reactivation of those skills. This process is defined as individuation, and it is techno-historically determined, in the sense that the techniques as well as the (technological) means of knowledge transfer, which modulate the transactions, are constantly evolving.

## Individuation: theoretical background

The principle of individuation refers to how discrete entities, particularly things of the same taxonomy, can be identified as differentiated from one another, that is, how a thing is identified as an individual entity and not something else. This principle is most obvious when applied to organic species, especially humans. Simondon makes an influential contribution to the theoretical debate in his book L'individuation Psychique et Collective (1989). He takes a historical-materialist view by conceiving of what he describes as a 'pre-individual milieu'. This is a body of human knowledge – consisting of heritage, tradition, skills, experience, etc. – that is accumulated by any given socio-ethnic collective over time. Survival of the pre-individual milieu depends on its continual reactivation by being handed down to ensuing generations, and being singularly interpreted and adopted by new individuals, who in turn individuate themselves as independent, cognisant beings, separate from their peer group. Importantly, he synthesises this concept within an ontological framework to argue against straightforward anthropocentric (Cartesian) philosophical views, and to theorise how human subjects are every bit as much an effect of the material world as they are a cause. The pre-individual milieu is transhistorical and therefore connects, and is shared by, generations. Each generation adopts certain elements and discards others, depending on what is useful, valued and necessary. This adoption takes place through processes of dialogue between individuals and their interacting milieus. In this respect, individuation is a constantly developing process; it is always in flux, never in a static, fixed state. Thus, the view of individuals as discrete atoms is subordinated in favour of an ecological–ontological view that privileges processes, change and reconfigurations over the subjectivities that bring them about.

Stiegler builds upon the work of Simondon by providing useful antitheses and syntheses. He agrees with Simondon that individuation is a fluid process through which the individual and the group co-constitute each other's identities. Stiegler writes: 'the individuation of the I being always inscribed in that of the we, while, inversely, the individuation of the we only takes place through the conflicting individuations of the Is that compose it' (Stiegler 2014, 51). That is, the individual and group are not straightforward binary opposites; they both exist inherently within each other, determining each other through and by processes of consensus and dissensus, which are themselves fluid and subject to economies of scale (we recall Beckett's Not I). Furthermore, Stiegler agrees with Simondon on the transhistorical nature of the process: individuation takes place across an accumulated repertoire of exteriorised artefacts and symbols, which acts as a sort of bank that holds, safeguards and transmits knowledge from one generation to the next. Stiegler writes: 'The I and the we are bound in individuation by the preindividual milieu, with its positive conditions of effectiveness coming from what I have called

retentional apparatuses' (ibid.). The transactions and processes that constitute individuation are mediated through and by the material domain of exteriorised traces that comprise the preindividual milieu, whether they be the fruits of labour or the tools that facilitate their coming into being. Retentional apparatuses are reified, tangible objects – such as text, artefacts or audiovisual documents – that are a manifestation of skills, tradition, culture, invention and so on, storing and transferring knowledge from one generation to the next. Per Simondon, these concretised artefacts are only possible because of the precondition of the existence of the technical milieu. It is at this point that Stiegler's philosophy departs from Simondon's.

For Stiegler, the technical milieu not only facilitates or mediates the encounter between the psychic individual and the collective, but it also asserts its own organisational logic, which is an individuation of the technical system. Just as the technical system supports the fundamental possibility of retentional apparatuses, so too do those retentional apparatuses 'condition the organization of the individuation of the I with the individuation of the we in a single process of psychic, collective and technical individuation' (ibid.); that is, the technical system can and does individuate. Furthermore, through its individuations, the technical system also modifies the technical processes and the technological knowledge of how those processes are executed.

## A general organology: the emergence of the VV artificial organ

It is precisely on the topic of technical individuation that Stiegler critiques Simondon. Simondon consistently says that only living beings can individuate, whereas Stiegler argues that technologies – as 'inorganic organized beings' (Stiegler 1998, 17) – not only influence human individuation, but so too do they individuate.[18] Stiegler synthesises Simondon's work with cybernetic theory[19] to arrive at a new proposition that gives credit to the notion that individuation is a fluid, three-way, interdependent process involving the psychosomatic (individual), the social (organisation) and technical (organs). He proposes that this be called a general organology, which is an analytical methodology for understanding all human activity in the context of this 'triple individuation' (Stiegler et al. 2012, 166). He writes: 'the conditions of individuation are organological: they pass through the organs of perception, but they endlessly recombine the assemblages [agencements] of these organs through technical mediations' (Stiegler 2011, 14). By this he means to conflate technology with the body rather than differentiate them, thereby admitting 'technological organs to the project of evolution, just as biological organs already are' (O'Dwyer 2015, 55). Under this conception, technologies are neither straightforward means for conducting tasks nor prostheses of the body; rather, they are 'artificial organs' (Stiegler 2011, 14) that are relationally linked to both the biological organs and collective organisations. However, the evolution of artificial organs is not at all a progressive lineage like biological organs, or to put it in the words of Felix Guattari: 'The reproducibility of the technical machine differs from that of living beings, in that it is not based on sequential codes perfectly circumscribed in a territorialised genome' (Guattari 1995, 42).

The technical system is an apparatus that has a central role to play in ongoing processes of human individuation, to which everyone and everything is subjected. The preindividual milieu is a historically determined territory consisting of all material knowledge, in the form of either technological artefacts (from alphanumeric characters to sculptures hewn

from a block of marble), or technological organs (tools, techniques and working processes). To speak of technical evolution, or the phylogenesis[20] of artificial organs, provokes the instinct to reach for the organic paradigm as the yardstick. However, they do not operate in the same way. In biological evolution organisms can only acquire a new genetic trait either by 'inheriting it from a previous generation, or by evolving it in the present one' (Vaccari and Barnet 2009, 4); whereas, 'in technical evolution, machines are not entirely dependent on the previous generation. They can borrow innovations from generations in the past (retroactivation) or they can borrow from entirely different branches of the evolutionary tree (horizontal transmission)' (ibid.). Dynamic shifts in aspects of socioculture and economics affect relations between individuals and groups, which in turn effect changes in the preindividual milieu that are unpredictable. As technological organs evolve they can metastasise and give way to entirely new types of artificial organs that are employed in different social contexts for previously unforeseen ends, which in turn occasions new types of knowledge, information, fabrications and methods. In the case of Virtual Play, this tendency can be seen in our decision to adopt interactive narrative principles and user experience design protocols from the field of gaming. However, these are only applicable because the emergence of the FVV technique and VR hardware affords new possibilities for captured video footage that were not possible using the conventional film capture and display paradigm.

What this evinces is that the material world is far more volatile and unstable than is generally assumed. The evolution of technical organs – FVV, VV and VR – or the entry of new artificial organs into the technical apparatus, is entirely dependent on a variety of human sociopolitical, economic and cultural subjectivities; machines do not have an internal genome with a capacity for auto-production or self-design. The concept of entry also raises the possibility of its diametric other: exit. Exit from the technical apparatus also implies the more perplexing possibility of exit from the pre-individual milieu. This is always determined by a failure of intergenerational transmission and/or individual adoption of knowledge, which implies a loss of knowledge: a dis-individuation. It is primarily for this reason that Stiegler appeals for a 'politics of memory',[21] a call that he continually repeats throughout his broader philosophical programme. By selecting what knowledge is retained and what is discarded, we are contributing to the intergenerational body of knowledge that frames how future generations will perceive human history, and shapes the possibilities of their existence. This point is epistemologically pertinent to our decision to remake Samuel Beckett's Play for VR.

It is unlikely, due to Beckett's fame, that any of his scripts will be lost from the intergenerational knowledge fund (at least for some time). However, there is a real risk that his performances will become increasingly inaccessible to large demographics of future art-publics, if the texts are not prepared for the dominant artificial organs of perception, which are, in the current epoch, converging with the various HMD and VR technologies. Our project henceforth champions Stiegler's call for a politics of memory by advocating a continuing celebration of Beckett's work to new generations of content consumers. However, this means representing it in a way that was not envisioned by the author. The modifications and rewriting of the rules, necessary to make this work work, bring this article to a key concept that constitutes this reflection on practice: transindividuation.

## Transindividuation: reactivating Beckett in the twenty-first century

Transindividuation is a special type of individuation proposed by Stiegler, which finds its ideal expression in art and is an important facet of his aesthetics. He holds that the work of art is a special and powerful type of technical object that has an enduring quality because, due to its protracted lifespan, it can communicate across many generations and geospatial divides; it is transhistorical and trans-spatial. In this sense, art provides a language and medium that allows individuals and groups to individuate with each other across non-contiguous time and space. Furthermore, the processes of interpretation and identification summoned by the artwork can inspire and motivate audiences into action, that is, into thinking actively; art can equip art-going publics with creative impetus. Stiegler writes: 'To see a work by showing what it makes us do … this is what initiates a circuit of transindividuation (of the formation of an epoch)' (Stiegler 2010, 17). The mysterious aura of art that compels its preservation is the primary means by which humans can speak to each other across and down through non-contiguous generations; it is a long circuit of individuation. This positions art as a major pillar supporting the pre-individual knowledge fund.

Thus conceived, Beckett's script is the work of art, and our project is a reactivation of it. However, a simple restaging of a play does not qualify as a transindividuation in Stiegler's aesthetics; on the contrary, it must bring something new and contemporaneous to the table, by reactivating the question at the heart of the original, and by levelling an intensive questioning at sociopolitical, economic and cultural subjectivities. This informs our choices to modify Beckett's stage directions to accommodate an interactive dramaturgy; indeed, there are certain scenographic elements that had to be changed for it to work at all in the immersive VR environment. For example, we placed the characters in a triangular format, surrounding the user, because the environment affords six degrees of freedom (6DoF) of movement. This new set design facilitates a natural, measured sensation of moving around the characters during the interrogation (see Figure 4).



Figure 4. Triangular configuration of characters, particular to the VR recreation.

Taking Stiegler's principle of a general organology and applying it to this PaR facilitates an understanding that the VV capture technique employed here is an artificial organ, newly evolved out of the precondition of the existence of the computers, software techniques, and so on. However, organ taxonomies are themselves sub-categorisable; while we can think of the HMD as a prosthetic organ of perception, we can think of VV as a somato-psychic prosthesis. That is, the HMD is a physical prosthesis of the audio-visual senses (like spectacles or hearing aids), while VV is a meta-prosthesis of the expression of the mind (like language, alphabets or drawing techniques). The newness of the technology demands the involvement of computer scientists, artists, actors, sound engineers etc. As such, the collision of Beckett's timeless narrative with the innovative technology activates a transindividuation in which the interconnected minds and bodies of the art–science collective are re-organised towards a common goal, which is the re-activation, concretisation, and re-communication of Samuel Beckett's art idea. Hence, the technical–artistic individuals constituting the creative collective occupy a 'technosomatic' evolutionary trajectory that is propelled, not by phylogenetic processes involving the biological flesh, but by epi-phylogenetic[22] processes involving the artificial organs of the technical body: the cyborg. We reject the dualistic: 'The evolution of this technology is the evolution of the human; any attempt to oppose the two in a false binary is to misunderstand that each is the essence of the other' (Johnson and O'Dwyer 2018). Since human evolutionary processes transferred from the biological to the technical milieu, they have been increasing in terms of speed and sophistication, and continue to do so. These technosomatic evolutionary surges are characterised by the pretext that they challenge forth a renegotiation of the rules of thinking, (inter)acting, making and doing.

While it is true that we employed technology to alter the work of art, it is more apt to the theory of individuation to reflect on how technology is altering the way we make and engage with work. The VR author–audience paradigm marks a fundamental shift from film, because the user controls where the camera looks. Viewers inhabit a world where they edit with their gaze by directing their attention to a given region of interest (ROI). There is no possibility of cutting to a different take to hide imperfections and, despite the numerous postproduction processes involved in VV, 'editing is not used to create situational continuity from a sequence of different shots, nor is it used to generate discontinuity, for example through montage' (ibid.). The result of these new conditions is that, at the capture stage, the actor has to articulate the entire text flawlessly from start to finish, which is surprisingly akin to the pressure of performing for a live theatre audience.[23] VV reorganises the rules of performing for capture technologies so that they resonate more with the live conditions of theatre than with conventional film. Film tends to act as a document of an encounter that already happened; live (proscenium-based) theatre establishes an encounter happening now, but often marginalises the audience; VR simulates an encounter, giving the impression is that it is happening now to me. In the second half of Virtual Play this impression is intensified by the immediacy of the text, which is comprised of statements addressed directly to the interrogator: 'Listening to these direct addresses is more akin to engaging in a conversation than listening to a story. Therefore, it challenges the dominant paradigm of telling stories in the past tense' (Johnson and O'Dwyer 2018). Therefore, VV provides new opportunities for storytelling and narrative, because engagement with temporal objects in VR has the effect of immediatising their presence, even though captured audiovisuals bear an inherent relation with the past.

VR is also a beneficiary of the other positive aspect of transindividuation: an ability to be widely disseminated. The benefits of global digital networks for the distribution of film and for the promotion of visual/performing arts are widely celebrated. However, virtual theatre employs both use-cases to its empowerment. On the one hand, a perfect duplicate of the document (an executable application) can be downloaded and played on any computer terminal prepared and capable of running VR applications; on the other hand, the interactive nature and verisimilitude of the encounter offer some experiential qualities of the live, even on repeat performances.

In keeping with Stiegler's position that technology itself individuates, it is important to note not only how the medium changes art, but also how art changes the medium. The complexity of developing computer animations, procedural graphics and working with game engines has historically meant that VR has been largely closed off to creative practitioners. The emergence of VV technology, and the fact that a lot can be achieved in a game engine like Unity without any demand for programming literacy, now means that building an interactive VR application using video-capture technologies is accessible to independent artists. The development of VV technology represents a burgeoning of a new creative territory in which the history of theatre, performance and filmmaking techniques collide with computational animation, gaming and interactive narrative. What knowledge and skills are kept, and which are decommissioned, are subject to indeterminate contingencies that only hindsight can confirm. What is certain is that the modified rules will exert an influence on the development of new cultural processes, artefacts, styles and devices.

## Conclusion

This paper has employed Stiegler's technological philosophy (and several related authors in the field) to provide a philosophical reflection on a practice-based experiment involving a Beckett text, which interrogates drama through ludic interactivity. All evolutionary leaps in the technological domain impact on existing culture in ways that can be read as both positive and negative – specifically with Beckett's work, there is the inevitable debate on fidelity to the author's original vision.[24] However, with rapidly evolving technologies of inscription, dissemination and reticulation, and the analogously modified conditions of access, spectatorship and intersubjectivity, there is an urgent need for works to be migrated to new media, both for preservation and making them accessible to art publics with evolved expectations. The VV techniques and the VR hardware can be understood as the technical organs in the tripartite relational (organological) dynamic that they share with the original author (Beckett), and the social organisations (our art–science collective and the evolved audiences we attempt to reach). The technological developments affect and pressurise a migration of Beckett's text from the familiar domain of theatre to a territory that is uncharted. It is only fitting that Beckett's text should be the vector for a foray in the technological avant-garde. Some of the original characteristics are lost in the translation, but new ones are gained. The transmission of the cultural artefact to the evolved milieu should not be straightforwardly interpreted as a cultural impoverishment; on the contrary, there is an intensification actuated by new expressive processes, psychosomatic prostheses and the global reach of a networked world. These in turn occasion augmented transnational, trans-epochal cultural connections. This rewiring of

the cultural artefact for digitally reticulated territories also reciprocates a revitalisation of the original at the local level.

We believe that Virtual Play demonstrates how experimental, interdisciplinary collaborations between artists and scientists can help pave the way for revitalised and intensified cultural experiences by innovatively reconfiguring the relations between cultural artefacts and scientific innovation. Such collaborative experiments are not only important in relation to the technical; they are also of epistemological significance. They establish new pathways in which Beckett's works, creative technologies, and the communities of practice where both intersect, can go on.

## Notes

1. The technical construction process is described in detail in: O'Dwyer et al. 2017, 262–267. This research is driven by V-SENSE <https://v-sense.scss.tcd.ie>, a computer science research group in Trinity College, led by Prof. Aljosa Smolic.
2. The final stage direction is 'Repeat play', which means that, when interpreted in its most logical sense, the play loops infinitely. Considering this, in conjunction with the funerary urns, suggests that it is a post-life purgatorial encounter, wherein the characters are doomed to repeat and relive their sins, ad infinitum.
3. Apart from the intro, outro, and middle 'chorus' section, where they are all simultaneously illuminated and speak together in a hushed tone.
4. The PaR project was partly inspired by Anthony Minghella's gesture, in his version of Play for the Beckett on Film (2001) collection, of using the camera as interrogator (rather than a light). In our production we sought to maintain risk for the performers within a screened context by using real-time broadcast.
5. Play was reinterpreted once before for a nascent form of VR called 'i-Glasses' by Lance Gharavi (1996), although we were not aware of this pre-exiting version when we undertook our own PaR endeavour. While Gharavi did use digital scenographies to extend the visual experience of the audience, the experiment did not extend to user empowerment in the context of interactive technologies.
6. Beckett opens this possibility first in his stage directions; in a note entitled 'Repeat', he writes, 'the repeat may be an exact replica of first statement or it may present an element of variation' (2006, 320). In his own intermedial adaptation of Play for radio, however, he went further, holding that actors could speak in a random order, provided that their monologue remained in sequence. See Esslin (1983, 125–154).
7. For example, the actors were captured articulating the text from start to finish without interruption, and with strategic pauses after certain sentences, statements and paragraphs.
8. The edges of the screen in the HMD are more difficult to discern, because they are aligned with the natural periphery of human vision.
9. The completed work has been exhibited on five occasions: (1) the 2017 Samuel Beckett Summer School, (2) the 2017 Intermedial Beckett Symposium, (3) European Research Night (TCD), (4) the New European Media (NEM) Conference, in Madrid, where it won first prize in the NEM Art Awards, and (5) Beyond Festival, Centre for Media Art, Karlsruhe.
10. Beckett's stage directions, though protected in stage production contracts, are often open to a certain degree of actor/director interpretation, and should be set in context in relation to his performance culture of the 1960s. 'Toneless' delivery carries many possible solutions, which the actors were freed to individually explore; 'rapid' pace is, of course, equally relative.
11. The new affordance for viewers to curate their experience through re-ordering, revisiting, and reactivating the characters might be differentiated from the experience of sitting in the theatre in important ways, but some of the phenomenological reactions reported, by people both familiar and unfamiliar with Beckett's original, are the same: confusion, bafflement, panic, and occasionally disgust.

12. Despite their initial confusion and incomprehension, users who spent protracted periods of time engaging with Virtual Play (e.g. the project programmers and users providing technical feedback) reported that they came to deeply understand the nuances of the text and the intricacies of the plot, even though they did not set out to do so, and did not have any English or dramatic scholarly background. It apparently became embedded through repetition and difference, while in a ludic state of mind.

13. Husserl uses music to explain the concepts, by comparing contiguous individual notes to an overall tune.

14. Husserl examines questions of retention and time in On the Phenomenology of the Consciousness of Internal Time and in Logical Investigations 1 & 2.

15. Husserl does consider 'inscribed memory', which he calls 'the consciousness of image', but declines to integrate it into his phenomenological thinking, because as a pre-existing, non-lived past it is external to consciousness and lived experience.

16. Industrial temporal objects and tertiary retentions are essentially the same thing: audio-visual recordings. Whereas the term 'temporal object' is used to think about the physical recording, the 'tertiary retention' is used to think about its significance in the context of recollection – a hypomnesic memory support.

17. We considered other formats, such as: random entry points; having the character begin again; or, continue speaking at a low, almost inaudible, level, when not being watched.

18. Stiegler is amazed that Simondon refused to give credit to the notion of technology individuating, saying: 'one little thing in Simondon that seemed very striking to me was that in all he published, psychic individuation had nothing to do with technical individuation. […] I think that for him it's diabolical to talk of technical individuation, for the reason he lays out in his critique of Wiener, which is that technical individuation requires cybernetics: the cybernetic object is capable of individuating itself. For Simondon, that is impossible. He says consistently that only the living being can individuate itself in that way'. (Stiegler et al. 2012, 166)

19. For example, theories by Norbert Weiner, William Ross Ashby and Alan Turing.

20. Phylogenesis is the evolutionary development and diversification of a species or group of organisms, or of a particular feature of an organism.

21. Stiegler has been espousing a politics of memory since the inaugural volume of his thesis, Technics and Time 1. The theoretical axiom constitutes a conceptual fulcrum around which much of his critical theory revolves.

22. In anthropological analysis of the human phenomenon of tool use, André Leroi-Gourhan conceives of an extracorporeal, non-genetic influence on human gene expression, which he describes as the epigenetic layer. Stiegler advances this supposition by proposing that the occasioning of the epigenetic layer is not a singular, prehistoric event; conversely, it is vectorised by an evolving, primordial memory and is sedimented, conserved and passed down through technical exteriorisations. He calls this epiphylogenesis and defines it as 'that store of memory that is particular to a unique life form – the human … It is a matter of memory retained in things' (Stiegler 2014, 33).

23. However, it must be stressed that once the perfect capture is achieved it is safely inscribed in computer memory. Therefore, as in film, the anxiety of whether the actor will forget lines or collapse, is removed from the live actor–audience dynamic.

24. For a detailed discussion of this debate, see Johnson and Heron's Experimental Beckett (2019).

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No potential conflict of interest was reported by the authors.

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