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Dialogues with the Machine, or Ruins of Closure and Control in Interactive Digital Narratives

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The interrelations between literary studies and posthumanism deserve attention beyond the focus on the representation of posthuman identities on the story level. To explore these, this article looks at examples of interactive digital narratives (IDN): *Bandersnatch* (2018), a 'choose-your-own-adventure'-type instalment of Netflix's dystopian Sci Fi-anthology series *Black Mirror*, the short film *The Angry River* (2017), which employs gaze-detection technology to determine what viewers get to see, and the serious multi-platform videogame *The Climate Trail* (2019), specifically designed to move players 'into action'. Straddling the border between ludology and narrative to varying degrees, all offer the chance of 'do-overs' and the exploration of complex patterns and processes. They raise questions about the co-production of pre-scripted meanings, about authorial and reader agency, conceptions of control, closure, and narrative (un)reliability. Thus, this article argues, they challenge ideas about the potential of narratives in and beyond posthuman digital environments.

1. Introduction

Narratology and posthumanism have been slow to interact. Considering the ubiquity of studies dedicated to the depiction of posthuman identities in fictional narratives, this opening claim might sound contradictory. In the realm of literary and cultural studies, posthumanism is commonly and productively employed to trace the imaginative appeal of the frightening and fascinating reach of technology and human manipulations of nature across different media. While posthumanist theory mostly operates at the level of plot, it is also called upon to negotiate species boundaries and encounters with otherness, the eternal question of what constitutes 'the human' – and, most recently, the prospect of a future without the human. Transcending narrative content, things tend to look different. Posthumanism's inherent concern with technological advancement is less frequently related to developments on the level of narrative forms and affordances. Yet there is no doubt that the study of digital fiction has come of age in the last two decades. The literary narrative status of games, hypertext or other forms of digital fiction is no longer a matter of debate, neither is the question of whether 'established narrative theory can both contribute to and be transcended by' (Ensslin, 2012: 137) their analysis. Seminal studies such as Espen Aarseth's *Cybertext* (1997), Janet Murray's *Hamlet on the Holodeck* ([1997] 2016), Markku Eskelinen's *Cybertext Poetics* (2012) and Marie-Laure Ryan and Jan-Nöel Thon's *Storyworlds Across Media: Towards a Media-Conscious Narratology* (2014) have gone a long way in supplementing post-/classical literary and film narratology with theories of what is still commonly called 'new' media. While research into interactive digital narratives (IDN) has emerged into a thriving discipline in its own right (see Koenitz et al., 2017), literary theory, narratology, digital media, and game studies remain separate yet interconnected fields (see Eskelinen, 2012: 2) in which there is no shortage of scholarship. Albeit from different perspectives and with different agendas, this scholarship continues to reflect on contemporary media environments, transmedial storyworlds, and new modes of creation, participation and reception, as well as on the challenges these present to analytical parameters and terminology. All these issues premise continuously refined and increasingly symbiotic human-machine interactions. Yet, posthumanism does not seem to play a central role. This might be due to the discrepancy between what is perceived as a diverse, mostly abstract conglomerate of interdisciplinary theory, driven by underlying ethical concerns, and the analysis of the obvious and concrete, that is digital narrative.

This article sets out to explore what a perspective informed by critical posthumanism might have to offer to the study of digital fiction, taking a small step

towards bringing IDN, literary studies, and posthumanism together.[1] It contributes to the liberation of the study of narrative and posthumanism from the predominant focus on the representation of posthuman figures and identities and to consider instead processes of reading selected IDN, which straddle the border between ludology and narrative to varying degrees. According to Eskelinen, games provide a much stronger challenge to the cultural hegemony of narratives than other artistic forms and he postulates therefore that the 'dyad of art and ergodic (or "interactive") art is replaced with the triad including games' (Eskelinen, 2012: 10). Although the importance and potential of games has long been recognized especially in educational settings, a major dividing line remains between games and narratives (rather than between digital and non-digital literature; see Eskelinen, 2012: 207), and the attempts to expand literary narratology inevitably need to grapple with this line.

As a starting point I take Bell et al.'s definition of contemporary digital narrative as 'fiction that is written for and read on a computer screen, that pursues its verbal, discursive and/or conceptual complexity through the digital medium, and that would lose something of its aesthetic function if it were removed from that medium' (2010). In addition to the central criterion of human-machine interaction, it needs emphasising that digital fiction is experienced (rather than either read, watched, or played), that its analysis needs to pay attention to its ludic qualities, as the medial affordances are as important as the fictions they transmit; and, lastly, that readers are aware of the 'ontological status of the work and the world that it describes' (Bell et al., 2010). This consciousness of the mechanics and design of the storyworld and its content constitutes the posthuman dimension of the selected case studies: they are texts, which, as will be shown in the following, in different ways 'read us as we read them' (Atkins, 2003: 147). By definition, interactivity is a reciprocal process – the machine watches the reader and vice versa. Atkins explains this characteristic of 'game fiction':

> We do not simply 'look' or 'gaze' or 'watch' the unfolding text, but the text is watching us in a way that can only have the potential to disturb in our age of increasing technological surveillance. [...] We act. It reacts. We act again. It reacts again. It rewards our attention with attention of its own. This might be presented to us in

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[1] This article departs from an understanding of critical posthumanism that emphazises posthumanism's emancipatory critical potential to break and redefine categorical and other boundaries. While this also includes the idea of a 'posthumanism without technology' (Callus and Herbrechter, 2007) and historical lines of inquiry, it must be clearly differentiated from an uncritical embrace of technophiliac and progress-oriented outlook of transhumanism (see Bartosch and Hoydis, 2019: 10).

> 'real-time' but we are locked in a complex dialogue or dance with the machine that
> amounts to a sequence that goes both ways. (2003: 146–47)

This 'dialogue with the machine' lies at the heart of my reading of two examples of interactive film, *Bandersnatch* (2018), an instalment of Netflix's Sci Fi (SF)-anthology series *Black Mirror,* and the short film *The Angry River* (2017), directed by Armen Perian. The latter received critical acclaim as a 'landmark' film which employs gaze-detection technology to determine which of five different storylines a viewer gets to see. Meanwhile *Bandersnatch*, Netflix's first venture into interactive filmmaking for adults that drew a global audience, tells the story of a young programmer struggling to adapt a 'choose-your-own-adventure'-type fiction into a video game and continuously instructs the viewer to make decisions through mouse-clicks while streaming the film. Both examples raise questions about the co-production of (pre-scripted) meanings at different stages – about control and agency during the viewing process and present entanglements of human-machine interaction. They challenge ideas about storytelling beyond digital environments and the critical vocabulary employed to analyze them. At the same time, they arguably offer potential for viewer engagement, immersion, and attention than non-interactive narratives. This aspect is also particularly relevant to my third example, the freely available serious multi-platform videogame *The Climate Trail* (2019), designed by William D. Volk with the intention to shock readers into action. These types of multiform, multisequential narratives deserve attention not only in light of the enduring crisis of communication in the field of interdisciplinary climate change research, but due to the fact that they confront readers with alternative endings or 'paths' that offer the chance of 'do-overs' and the exploration of complex patterns and processes amid controversy.

It is one of the premises of this Special Collection that the study of narratives and posthumanism, across different media, needs to continue the expansion into increasingly sophisticated machine-human interactions (see also Elstermann, 2020) and their impact on the sense of reader and authorial control. With readers of IDN inevitably engaging both with their own posthuman subjectivities, as well as empathically with that of the characters, this article also explores the question what constitutes a sense of closure or narrative (un)reliability – the latter being a theoretical concept originally firmly based on notions of the 'implied author' (Booth) and reception contexts from literature and film (Nünning; Currie; Hansen). It argues that there is much to gain from seeking a stronger integration of posthumanism and narratology, including reflection on concepts such as unreliable narration, agency, and control.

In the following, 'reading' (reader) is used as generic term to refer to the process of personal interaction with the narrative environment. The first part of this article between will introduce and probe characteristics of IDN, followed by a discussion of the three examples. Further research in cognitive and empirical literary studies is certainly required when it comes to making any claims about the potential of IDN to create greater immersion and sense of agency (in comparison to non-ergodic literature and film) or their lasting impact. I will conclude with the suggestion that while the readers' sense of narrative closure, reliability, and control might be in ruins, therein lies both potential and threat, especially if the respective IDNs also engage with pressing ecocritical and posthumanist concerns such as climate change and human agency on the story and on a meta-level.

2. Choice, Agency, Immersion

As an interdisciplinary field, research into IDN has gained critical mass from the 1990s onwards. A central development, as mentioned above, is the ongoing conceptual redrawing of the boundaries between games and stories. In addition, 'IDN bestows cocreative power on its users through interaction and therefore reshapes the relation creator, work and audience' (Koenitz et al., 2017: 1–2). Generally, the reader takes on a more active role in the unfolding of a story, which results in greater levels of engagement (see McErlean, 2018: 11). Whereas a novel or a film traditionally tells a story by asking the reader to set aside the right to make choices and let the agency of the protagonists take over, a staple element in IDN is the *choice*, defined as 'the situation in which the user has to decide between a certain number of explicit options' (Estupinán et al., 2018: 150; Perlin, 2004: 14). Agency, meanwhile, is understood as 'the satisfying power to take *meaningful action* and see the results of our decisions and choices' (Murray, 2016: 126; my emphasis). Choices are often accompanied by elements such as on-screen stopwatches, showing the time running out, pre-choice warnings, or post-choice commentary. Another typical feature is the integration of morally challenging decisions, because it instils a strong sense of dramatic agency in the interactors, as Murray (2018: 8) explains. However, in reality there is little to no freedom or contingency, all choices and forking paths are carefully prescribed, regardless of whether they are later perceived as 'meaningful' or not. It is important to note that with regard to conceptions of agency especially in game studies, more often than not these appear to draw on persistent ideas of enlightenment subjectivity and an autonomous human subject.[2]

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[2] It is beyond the scope of my argument here to explore the wider and complex question of the position of the subject in contemporary materialism and what exactly constitutes posthuman *subjectivity* in contrast to it. However, in these

Yet rather than emphasize 'the illusion of freedom of choice' (Atkins, 2003: 45) in this context, it is productive to focus also on the dialectic of enablement and constraint, the former created by 'the thrill of exerting power over enticing and plastic materials' (Murray, 2016: 153) – this technological aspect, at least, is not impaired by the felt loss of agency with regard to narrative content. Meanwhile the ending of IDNs in particular often leaves readers unsure whether they have experienced everything there is to experience, and they actively have to determine closure, eventually, by 'clicking out' of the story. So, while there are two levels – description and narration – in traditional codex fictions, in IDN there is the added crucial third level of the reader choices, and these can be transparent or more unconscious.

As has been argued in foundational studies in the field of IDN, Murray's *Hamlet on the Holodeck* and Aarseth's *Cybertext*, it is to some extent inevitable and justified to use the tools of traditional literary criticism to criticize participatory literature: there are many structural parallels, and concepts such as character, plot, and story which, despite obvious differences, are not called into question. Still, the borrowing of terms from literary theory affects the study and perception of digital texts – and often not in productive ways, for example, if terms from posthuman theory (cyborg literature) or 'empty' computer rhetoric (virtual, hypertext, interactive) are imposed onto it (see Aarseth, 1997: 85; 59; 96). Both Aarseth and Murray are critical of this, and stress how these terms carry different meanings in different contexts. In particular the concepts of non-linearity and interaction, key factors in the process of establishing a sense of reader vs. authorial agency and control, call for further reflection.

The common reference to cybertext as 'nonlinear' literature has been criticised, due to the negative quality and incoherence it suggests. However, it is crucial to note that multisequential or multiform narratives, which have emerged as the preferable alternative terms, confront readers with a particular kind of cognitive challenge and inaccessibility of meaning, with aporias different from the ambiguities of a linear text, Aarseth argues (1997: 3). The reader can even be made to feel rejected by it when a certain forking path or ending is not available:

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examples of IDN, the reader is located as a posthuman *subject* in the sense that they experience a distinct relationality with a nonhuman entity (the machine) during the reading process. Drawing on Zaag's insightful review of Braidotti's study *The Posthuman*, one might, of course, argue that this kind of 'relationality is exactly where the transformative potential of the posthuman subject lies' (Zaag, 2016: 333). What I am generally concerned with are what can best be referred to as processes of *posthumanisation* of both narrative production and reception in the sense that they rein-scribe embodiment under new conditions (see Herbrechter, 2012: 330, 333). Challenging liberal humanist conceptions of author and reader, they continue explorations of narratology and forms of writing fictions '"outside" (before and after) the human' (340).

> In contrast to the aporias experienced in codex literature, where we are not able to make sense of a particular part even though we have access to the whole text, the *hypertext aporias* prevents us from making sense of the whole because we may not have access to a particular part. Aporia here becomes a trope, [...] rather than the usual transcendental resistance of the (absent) meaning of a difficult passage. (1997: 91; my emphasis)

The exact opposite experience, then, of aporia is hypertext *epiphany*, the sudden moment when the reader reaches understanding of the text's whole meta-structure and design as a single arc, the culmination of a process which might even be conceived of as an act of authorship (cf. McErlean, 2018: 138; Aarseth, 1997: 91). Once the reader has successfully identified patterns out of what is initially an overload of complex information, their pleasure is typically at its highest. This is followed by a decline towards the ending of the process: 'The readings end when the reader tires of repeating screen cycles' (McErlean, 2018: 131). The procession from confusion to engagement to tiredness is commonly determined by and referred to as interaction or participation. Unlike interactivity, the latter term less readily evokes ideas of freedom in front of the computer screen, and of human and machine as equal communicative *posthuman inter-actors*, each capable of awareness of the situation – which is still a fantasy, if an intriguing and persistent one. Thus, while, in theory IDN allows greater liberation and indetermination than codex literature, the experience of being controlled by a computer is anything but liberating. To draw on Aarseth yet again, the reader is essentially 'as much at the constructor's mercy [...] as in any [...] text, although in a different way' (1997: 89; see McErlean, 2018: 141). The interrelations between reader participation, agency and immersion are thus complex ones. The latter is seen as another characteristic of IDN, referring to the experience of being immersed, surrounded by another reality,[3] a state which fully consumes readers' attention. However, in many participatory narratives of the non-virtual reality kind, the reader has to continuously break 'the digital equivalent of the theatre's fourth wall' (Murray, 2016: 103), although there are different conventions for preserving it as much as possible (see., e.g. Bell, 2019). Similarly, all the while agency is something one routinely expects to feel sitting in front of a computer, yet:

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[3] It is necessary to distinguish between mechanical (device-user) and narrative (content-user) immersion, though they often, interact. The material realities in a VR setting are a radically different matter, of course. In the case of *Bandersnatch* especially, we are confronted with a case where the machine 'remains a physical presence, and a bulky one at that' (Atkins, 2003: 12; see also Murray, 2016: 125).

> Because of the vague and pervasive use of the term interactivity, the pleasure of agency in electronic environments is often confused with the mere ability to […] click on a mouse. But activity alone is not agency. […] The players' actions have effect, but the actions are not chosen and the effects are not related to the players' intentions. (Murray, 2016: 161)

This experience shapes especially examples of interactive filmmaking such as *Bandersnatch* and *Angry River*, to which the analysis now turns.

3. Dialogue with the Machine (1): *Black Mirror: Bandersnatch*

The Netflix series *Black Mirror* (2015–) is a striking example of contemporary fiction's engagement with a whole variety of scenarios and the impact of technologies on our already posthuman lives.[4] Full of speculative dread and dark humour, each episode tells a self-contained story set in the near future, featuring different dystopian aspects of the contradictory co-dependent relationship between humans, media, and advanced technology (see Wortham, 2015). Themes include the use of social media, YouTube, twitter, all sorts of transhumanist prosthetic enhancements, for example implanted microchips which allow for the manipulation of memories, or devices which facilitate the escape from reality and death via fantasies stored in a data cloud.[5] Yet, with the exception of *Bandersnatch*, first released in December 2018, all other episodes to date are produced as conventional film. Directed by David Slade and written by Charlie Brooker, *Bandersnatch* is the series' first interactive film, and a self-conscious and participatory meta-narrative on posthuman narrative processes. Brooker describes it as 'a film, but in the process of creation it shares many things with video games' (cited in Ivars-Nicolas and Martinez-Cano, 2019: 5).[6] Allowing multi-device access through smart phones and TVs, tablets, pcs or laptops, *Bandersnatch* counts as one of the most 'visible contemporary example[s] of interactive filmmaking [for adults]' (Damiani

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[4] Consequently, it has attracted praise and critical attention. *The New York Times* declared: '*Black Mirror* is hands down the most relevant program of our time' (Poniewozik, 2016); the first substantial collection of scholarly perspectives on the series is McSweeney and Joy's *Through the Black Mirror: Deconstructing the Side Effects of the Digital Age* (2019).

[5] This features in famous episodes, for example, 'Nose Dive' (3.1), 'San Junipero' (3.4) and 'The Entire History of You' (1.3).

[6] The designers of *Bandersnatch* struggle to situate their work between game and cinematic experience. McSweeney and Joy propose to categorize *Bandersnatch* as 'hyper-narrative interactive cinema', drawing on Nitzan Ben Shaul's definition in *Hyper-narrative Interactive Cinema* (2008). *Bandersnatch*, they argue, deserves analysis both with regard to its film narrative and interactive parts. It also brought interactive film, a somewhat neglected medium first popular in the 1980s back into the mainstream (see McSweeney and Joy, 2019a: 272–4). Crossovers between games and film are usually criticized from both ends for being too far from either loyal readership's medium of choice. But the genre has also been given popularity from game developers such as Quantic Reams (e.g. *Heavy Rain*, 2010; *Detroit: Becoming Human*, 2018).

2019), reaching a huge audience via Netflix, but it uses fairly simple technology.[7] As far as originality goes, story and design draw heavily on Edward Packard's 'Choose your Own Adventure' series for Bantam Books, which dates back to the 1970s.

Tellingly set in the year 1984, amid the early years of the video game industry, the narrative follows the struggle of young programmer Stefan Butler (Fionn Whitehead) to write a best-selling interactive computer game, based on the novel *Bandersnatch*, for the tech company Tuckersoft, workplace of famous game developer Colin Ritman (Will Poulter). In the different branching paths, Stefan encounters terrible deadlines, but regardless of whether he meets them nor not, he always fails in the end because his game will receive only average to bad ratings in a TV show. Choice points in the story are spaced out at three-to-five-minute intervals, offering the reader two options at the bottom of the screen. The first binary choices are fairly simple and inconsequential, they concern breakfast choices, accepting a job offer, keeping a deadline. As the reader becomes slowly used to the mechanics, choices become more drastic and ethically challenging: for example, whether Stefan or Colin, both high on acid at this point, should jump off a balcony. Thus, the reader is drawn into complicity and moral engagement with the story (see Streitfeld, 2018). After Stefan kills his dad with an ashtray, the reader faces perhaps the most gruesome choice: to chop up the body or bury it. Either way, Stefan is apprehended for the deed.

Bandersnatch is a foldback story, meaning that the plot branches out into different strands, but folds back to single inevitable events and a defining moment in the narrative that the reader eventually has to reach, such as the murder of Stefan's father.[8] If the reader chooses neither option and refuses to interact via mouse-click, the film will choose for them and let them passively experience a version which plays out in roughly ninety minutes. With non-mandatory interaction, Ivars-Nicolas and Martinez-Cano argue, there is no reward for the reader (as would be typical in games), and the only driving force is their curiosity 'to see all the possible connections [which] generate the consequent repeated consumption of the experience' (Ivars-Nicolas and Martinez-Cano, 2019: 8).

The footage of all branching storylines added together lasts well over five hours, whereas the shortest experience lasts forty minutes. Officially there are eight main

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[7] Andy Schuler, leading video engineer at Netflix, explains: 'Netflix may not be the first to experiment with this type of storytelling, but we are the first to do it at this scale' (Schuler, 2019: 27). Previous, far less successful experiments by the streaming service include *Puss and Boot: Trapped in an Epic Tale* (2017) and *Minecraft: Story Mode* (2018). *Bandersnatch* remains the first interactive title marketed to adults, and it also culminates a year's worth of iterative improvements building on the lessons of previous branching titles (see Schuler, 2019: 30).

[8] As such, it is technically neither a linear nor a branching story (see McSweeney and Joy, 2019a: 277).

endings, but with multiple variants, and one post-credit 'easter egg'. The reader has the option to keep 'playing' for another ending after they have reached one. According to Brooker, what matters is precisely that readers experience scenes more than once; however, they are often compressed or only slightly altered (see Strause, 2018). Typically for *Black Mirror*, there is a lot of self-referential irony and metacommentary in *Bandersnatch*, an interactive cross-over between film and game about the making-of an interactive video game. Memorable 'meta' moments include Stefan breaking the fourth wall and asking the reader to explain what the 21st-century streaming service Netflix is, as he feels uncannily controlled by an outside force (the reader). This encounter sends Stefan, struggling with his mental health as it is, to see a psychiatrist. Of the possible endings, the most obviously metafictional one invites the reader to unlock a secret Tuckersoft website after the film credits where they can play Colin's 'Nohzdyve' game, downloading the game leads to a Netflix job advertisement for engineers.

But there is never a happy ending for Stefan, who, the reader realizes, is stuck in a painful memory loop that harks back to a central traumatic childhood incident: the loss of his mother in a fatal accident, after she missed the train she originally intended to take because Stefan forgot his beloved toy rabbit in his father's safe. *Bandersnatch* dramatizes the desperate human wish to be able to return to the past and change one crucial moment and Stefan's struggle to eventually accept the impossibility of this. This is paralleled by the reader's posthuman recognition that they are also not able to undo past choices – unless restarting the whole film from the beginning. Meanwhile, in the film Colin delivers a conspiracy theory speech, ripe with metanarrative irony, that parallels the experience of reality with being in a videogame. The scene occurs if the viewer makes the choice for Stefan to skip seeing his therapist and go to Colin's apartment instead, where they take LSD together:

> People think there's one reality but there's loads of them, all snaking off, like roots. And what we do on one path affects what happens on the other paths. People think you can't go back and change things, but you can, that's what flashbacks are, they're invitations to go back and make different choices. When you make a decision, you think it's you doing it, but it's not. It's the spirit out there that's connected to our world that decides what we do and we just have to go along for the ride. (*Bandersnatch*, 2018)

McSweeney and Joy, editors of the first book-length study of the series, view *Bandersnatch* as a logical extension of the *Black Mirror* universe, which explores the impact of technology (in this instance, video games) onto human life, often linking it closely to trauma (McSweeney and Joy, 2019a: 281). With game design and control

the over-arching topics explored in parallel in and outside the storyworld, much of *Bandersnatch*'s success can indeed be attributed to its 'clever marriage of theme and mechanism' (Parkin, 2019). Even more crucially, in my opinion, it offers a meta-commentary on free will in a posthuman environment, as both characters and reader are trapped in a prescribed universe, where they realize how little individual choice and autonomy, treasured pillars of humanist selfhood, they are actually left with. As such, *Bandersnatch* undermines more than notions of interactivity and viewer volition (see Streitfeld, 2018; Sacher, 2019).[9] Stefan disobeys choices made by the reader or questions if they were the best ones; in the process he seemingly grows into awareness of his own fictionality. At one point, he addresses the reader directly again, asking for proof that they are real instead of him. If the reader initially relies on the idea that their choices matter, soon the awareness sets in that this control is an illusion. The protagonist undergoes the same disillusionment, which culminates in a scene where Stefan screams at his therapist: 'I'm not in control!' (*Bandersnatch*, 2018).

The fact that the *Black Mirror* producers choose the endings is continuously reflected on a meta-level. As Sacher says, 'the outcome(s) and the emotional arc of the story are still very much under the creator's control' (Sacher, 2019). If *Bandersnatch*'s unresolved ending leaves readers feeling dissatisfied, there is always the option to plunge back into the story and make different choices. The fact that the individual endings have no coherence with each other, however, can lead to an emotionally and cognitively disappointing narrative experience, and does not encourage absorption in the character's inner lives; alternatively, as I will show, this storytelling experiment allows for a different kind of readerly immersion.

One month after the first release of *Bandersnatch*, Netflix posted some statistics about the 'most popular' viewer choices on Twitter, which allows comparative studies for example regarding comparison of British and global audiences' empathy with Stefan (see Reilly, 2019), or readers' sense of agency. Although the film has eight endings and potentially one trillion individual story combinations, a small empirical user study conducted by Roth and Koenitz (2019) among 32 students showed that autonomy was generally rated rather low, especially with regard to the choice of killing Stefan's father. While readers' expectation plays an important role, that is whether they approach *Bandersnatch* as game or film (see Roth and Koenitz, 2019: 252–3), Roth and Koenitz emphasize the irony of an interactive narrative which is essentially about losing control to the machine. I agree with their view of *Bandersnatch* as a crucial step for the production of interactive digital narrative videos and their critical analysis, including the study of

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[9] To be precise, *Bandersnatch* offers mechanical, user-device interactivity, but no social interactivity (between two or more people); what is thoroughly questioned is content interactivity, between reader and the narrative/programme.

audience reaction. The film invites replays to revisit decisions, though sometimes there are no alternatives to choosing deadly violence; the perceived agency is limited, and notions of human autonomy are deconstructed. Instead of feeling empathy with Stefan, the reader is made to reflect on agency and responsibility in this posthuman narrative experiment: 'to what extent do we control the character, how much responsibility do we have and what level of control do we have ourselves?' (Roth and Koenitz, 2019: 250; see also Humann, 2019: 126). This is essentially what makes Bandersnatch a critically posthumanist narrative which is concerned with posthumanism on multiple levels, content as well as narrative form and design. Readers experience a different kind of posthuman storytelling and overt human-machine interaction, which impacts on perceived notions of control, co-authorship, and unreliability. Trust in the implied author is fully deconstructed through the mechanics and design of the branching narratives, all the while classic factors compromising narrative reliability (such as the character's/narrator's criminal activities, drug-use, mental health issues, trauma) accumulate on the story level.

4. Dialogue with the Machine (2): *The Angry River*

Another experiment with interactive film that 'transforms the way we think about telling stories' (O'Neill, 2008: 93) in posthuman environments is Armen Perian's *The Angry River,* which premiered in May 2017 and is permanently available online.[10] It presents a fusion of storytelling and gaze-detecting technology to create a narrative beyond click-based interactivity. It tracks the reader's eye-movement and then self-edits driven by the emotional and cognitive bias into one of five storylines, varying in duration between eight and twenty minutes. Meanwhile the viewing experience plays out like a traditional film, after the reader completes the technical set-up: watching *The Angry River* requires browser calibration and allowing access to one's computer web camera. The film fuses cinema, algorithmic profiling, and eye-tracking, the latter being technologies increasingly used in online ads we receive on social media streams. According to Perian, technology is employed here to serve a particular story that 'could not be told otherwise'. The director's interest lies in exploring unconscious interaction and 'the relationship between sight and perspective,' something Perian goes on to say, 'is intrinsic to cinema' (cit. in Damiani, 2019). This relates to one crucial difference to interactive films such as *Bandersnatch*. Technology is meant to disappear into the background and allows the reader to get immersed into the narrative without 'active' interaction. Another point of difference is that the reader is made into an unreliable

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[10] Available at: <https://www.theangryriver.com>.

narrator by the machine and has to distrust their own perception of the story, yet is unable to gain control and a sense of epiphany.

On the plot level, the film deals with a crime story of a family of human traffickers in Portland, Oregon. The reader unconsciously 'chooses' to follow one of the different characters (e.g. the father, the mother, Jasper, Lera) while watching, which leads them to one of five different versions, with different endings, different aesthetics and soundtrack. Like *Bandersnatch*, it is designed through interactive branches, with the algorithm allegedly selecting the character the viewer is most interested in. From personal experience, it is strange to see how knowing this prior to watching the film affects readers. In my case, I was very aware of a possible gender bias when following the different characters and tried to self-monitor my gaze; students in my class were more neutral and experimented with all possible versions (e.g. changing camera settings and the lighting in their rooms, leaving the screen, watching the film in pairs etc.).[11] However, closure is denied regardless; readers have to decide how to judge, trust, and to accept or question the version(s) they get to see, which confronts them with an experience of unreliable narration and aporia. The reader is made to reflect on choice and free will in a different way than in *Bandersnatch*, as the meta-commentary is less ironic and overt. The film always ends with a final screen that reveals to the reader which version they have seen and it reiterates how 'where you look becomes the story you see' (*The Angry River*, 2017).[12] *Angry River* results in a narrative experience that calls for reflection on our posthuman relationship with the environment and, both like and unlike *Bandersnatch*, it 'feels much less like a game and more like an exploration of narrative structure' (Damiani, 2019). In addition, in both examples the reader soon becomes less intrigued by the individual branches and forking paths in the plot than engaging with what Marie-Laure Ryan calls the 'pattern of their interconnections' (Ryan, 2001: 8) in IDN.

Both *The Angry River* and *Bandersnatch* lead to the experience of narrative and posthuman *readerly* unreliability. This performs a new kind of posthumanist decentring in the shifting relationship between human-machine. In IDN, even more so than in other prose fictions or film, it is impossible to apply only a rhetorical or a cognitivist approach to narrative unreliability. The first situates it exclusively in the text and

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[11] I taught all three examples discussed in this article in my cultural studies seminar 'Posthumanism Across Different Media' at the University of Graz, Austria, in the winter semester 2020/21. It was attended by twenty students in the Master Programme English and American Studies, and my analysis is indebted to their critical questions and our class discussions.

[12] Another example is Eko's VR film *Broken Night* (2017), where interaction is driven by viewer emotion and perspective varies depending on gaze direction (see McErlean, 2018: 161).

hinges on the notion of an implied (human) author whose norms deviate from those of the (typically first-person) narrator, who provides clues such as inconsistencies and falsities for the reader to decipher (Booth, 1967), whereas the second focusses more on the interplay between reader and text. Therefore, Nünning explains 'we can define unreliable narration neither as a structural nor as a semantic aspect of the textbase alone, but only by taking into account the conceptual framework that readers bring for the text' (Nünning, 1999: 60). What happens, then, in multilinear digital narratives which might offer a plurality of clues for the reader to decipher, but which defy closure far beyond the open-endedness of postmodern novels, for example? According to Ensslin (2012), who has explored types and degrees of readerly unreliability in hyperfiction, here the text 'generically evokes the notion of an (unintentional) unreliable reader, as s/he is inclined to continually question and revise previous readings based on new lexical information' (2012: 140). This might also apply to *Bandersnatch*, where the reader continues to collect knowledge about the different narrative branches and film mechanics – yet it is by no means clear where the lines between unintentional/intentional readerly unreliability might be drawn in this context. One might also apply Hansen's taxonomy of narrative unreliability (Hansen, 2009), and distinguish between *intra-narrational* and *inter-textual* clues in the narration (such as Stefan's drug-induced hallucinations, his character type), *inter-narrational* clues, produced here not by different narrators but by the different branches, and, finally and perhaps most obviously, the extra-textual level: the reader's awareness of this being an interactive film. In *The Angry River*, the reader is also unreliable without intent, and can revise their interpretation. Both examples employ what one might describe in Coe and Mitchell's terminology as a 'game narrator', to refer to the 'non-personified entity responsible for the visual, auditory and interactive (gameplay) modes of a game that take part in the act of narration' (Roe and Mitchell 2019, 3). Yet this ignores the posthuman element characteristic of these kinds of unreliability in IDN, the human-machine interaction, which renders intentionality or its lack thereof hard to pin down. It also disregards the intentionality of the human authors involved in producing these films which set out to explore the very concept of posthuman narrative (un)reliability.

5. Dialogue with the Machine (3): *The Climate Trail*

Similarly to *Bandersnatch* and *Angry River*, *The Climate Trail* is an experiment in interactive digital narration with fairly simplistic technology, which will fascinate and disappoint readers depending on their expectations and how they are framed. (In my experience, avid gamers are bound to be disappointed by this serious game, which employs flat characters, basic mechanics, and limited choices.) Designed as a free game for PC and mobiles to facilitate easy access in schools, *The Climate Trail* is inspired by

one of the most popular serious games of all times, *The Oregon Trail* (MECC, 1971–2011; see Sherry, 2016: 116). Developer William D. Volk describes it as follows: 'The game takes place in the future, when our inaction regarding the climate crisis has rendered much of the world uninhabitable. The player leads climate refugees as they flee from ever worsening conditions, combining adventure, survival and visual novel elements' (Volk, 2019: 141). The setting is a future Atlanta, after 'the Burn'. The reader enters the storyworld as a character, who joins a small group of surviving refugees and has to make a hazardous journey on foot to Canada to escape the unbearable heat in the American South. In line with the games' educational design, it features an intersectionally diverse cast of characters, including Katherine, a climate scientist, young Bonnie, who lost both parents to the 'permafrost plague,' and senior citizen Albert, who fought during the 'resource wars' over oil, food, and land.

After beginning the journey, the continual choices are repetitive but always existential: how much water and sorghum to carry, how fast to walk, when to seek shelter from a storm or heatwave, whether to go scavenging for food in a deserted city along the way, whether to risk drinking potentially poisonous water from a pond. The chances of group members dying of starvation or dehydration are high, the health status of each character is continuously monitored during the game, adding a constant sense of increasing risk. While there is always the option to begin the trail again, or to choose a different level of difficulty (of which there are three), the game cannot be won in the traditional sense. After arrival in Canada, it is revealed that long-term survival is impossible due to the devastating impact of the multiple repercussions of anthropogenic climate change. In this sense, the game also presents an instance of unreliable narration, here through the established device of a final twist at the end of the narrative and through continual frustration of the reader – who starts to question their trust in the game narrator and into the chances of winning this game which shares many traits with 'survival games', *The Last of Us* being another inspiration of Volk's. Funes explains: 'Winning the game isn't exactly easy. [...] Unfortunately, arriving in Canada doesn't exactly solve everything, but you'll have to play and win the game to find out' (Funes, 2019).

In *The Climate Trail*, which remains one of the surprisingly few games out there to date that address the issue of climate change,[13] Volk specifically sought to combine educational content, scientific information, and 'a call to action' (Volk, 2019: 141–142). Creating a backdrop of feared worst-case scenarios of extreme weather events

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[13] According to Wibeck and Neset's recent assessment, the number of games developed in the area of climate change has increased rapidly during the past few years, though, if one looks at surveys of the field (see, e.g. Wu and Lee 2015), climate change games 'vary greatly in format, technical sophistication, and scientific accuracy' (Wibeck and Neset 2020), with management games being the most dominant game format.

caused by ongoing carbon emissions (see Lieberman, 2020), Volk hopes to couple the dissemination of scientific information about how this scenario came about (for example about feedback loops, the consequences of three or four degrees rise in global temperature, sea level rise etc.) with strong affect, caused by the setting and choices which lead to the death of one's own or any of the other characters. With the game's agenda being to dramatize the severity of climate change and the human struggle to survive, unsurprisingly, it comes with a lot of information about climate science which readers need to engage with before it starts ('The Climate Book' in the game menu). Arguably, from the start *The Climate Trail* thus falls into the trap of 'info-dumping' or lecturing, one of the frequent drawbacks and central challenges of 'cli-fi' (see Goodbody and Johns-Putra, 2019: 9), regardless of the genre or media.[14] In striking contrast or rather as counterbalance, the bleak game narrative tries to shock readers and tap into their emotions while they make decisions which, Volk stresses, are always more emotionally-driven: 'You can throw facts at people all day long and it won't make a difference. People don't make decisions based on facts. They really don't' (cit. in Lieberman, 2020; see Taylor, 2019). The game tries to make the experience of climate change shockingly real but also shows the force of human agency and how each decision carries a consequence, some more immediate and some better or more fatal than others.

The issues of choice and agency leads me back to posthumanism. Drawing on Krzywinska and Brown, one can argue that digital games and playing them *per se* 'have become associated with the posthuman' (2015: 192). But neither does the simple use of game-based tools in human-machine interaction render 'us posthuman but instead prop up an imaginary status as posthuman – a fantasy of power and purchase that is born from our all-too-human condition' (Krzywinska and Brown, 2015: 193). With regard to posthumanism, *The Climate Trail* engages with the force of the non-human environment and the looming extinction of the human species on the story level but does not make use of posthuman characters or imagery. Nor does it break with, though it at least decentres, a deep structural, anthropocentric, and humanist feature of games. In most games, individualism frequently rules: the human player is

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[14] When asked whether he used models and predictions made by climate scientists, Volk names a whole list of studies on feedback loops in particular and explains: 'I want to create an emotional impact, weave in science information, and make a game that makes a difference. [...] Will it succeed? I don't know. But I figured it was better than just wallowing in despair over our inaction and ignorance on climate change.' See the author's blog: <https://www.theclimatetrail.com/development-blog/why-am-i-giving-this-game-away-or-can-a-game-make-you-cry>. This calls for debate around what type of narratives – not just IDN – might possibly foster 'climate change literacy', a topic that I'm currently exploring as PI in a research project funded by the Volkswagen Foundation (2021–2022), together with Roman Bartosch and Jens Martin Gurr.

a centre and master of their own destiny, reliant on their ability to detect patterns and 'win' (Krzywinska and Brown, 2015: 199). *The Climate Trail* requires affective concern for the consequence of choices, human-nonhuman entanglements, and a small community. Whether this design translates into a successful game narrative, requires further reader-reception studies in educational settings – and what one might call *interactional* studies which move beyond reception and raise the question how games might be used to facilitate action.[15]

6. Posthuman Narratology

Addressing the subject of posthuman spectatorship, William Lewis notes: 'The posthuman paradigm calls into question the ontological basis of subjectivity and position and, by questioning what it means to be a subject in our technologically mediated world, we must also question what it means to engage with(in) that world' (Lewis, 2017: 8). The latter concerns us here. Digital technologies cause different experiences of narrative in which immersion, participation, and play gain a significant role (13), they also contribute to changing notions of the 'reading self'. The traditional boundaries between and conceptions of reader and author become blurry, as do the lines between fixed and open endings, if stories can be experienced with a variety of conclusions, which might not all be accessible to every reader. At the same time, Atkins emphasizes an approach to game fictions that I take as a cue for locating a more materialist-oriented posthumanism and application to narratology: He argues that it is necessary to relate games and other forms of digital narratives to other kinds of fiction, but still look closely at the things themselves (Atkins, 2003: 19). IND, or narrative 'game-fiction', 'has not rejected its roots, but instead remains fixed in narrative traditions' (2003: 145). Still, readers enter into a different, posthumanist contract with the text, as the clear-cut humanist reading contract between human (reader) – text – human (author), lies in ruins. Posthumanism offers a way to grasp this shift, and the intersection of technology and narrative construction.

All three examples invite reflection on the architecture of narratives, on non-human scales and patterns of pathways, which shape what we can describe as posthuman narratives – which thus 'enable readers to see in another way, allowing other stories to emerge, other considerations to be made' (Tomasula, 2014: 18). Employing

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[15] While the importance and potential of games in general has long been recognized in educational settings, climate change communication is slowly but steadily catching up. One can observe a growing interest in video games as a tool of communication relating to aspects of climate science and sustainability. For a recent study, see Foltz et al (2019: 2); and Flood et al, who conclude in their review of climate adaptation games that these 'are an effective tool for engaging with diverse publics and enable social learning' (2018, 18).

different technologies and aesthetic and mechanic strategies, they explore another characteristic of IDN, namely the testing of options and imaginative alternatives. They thus deconstruct and leave in ruins the human-authored, 'fixed 'meaning' of a single imaginative possibility' (Atkins, 2003: 144). This clashes with one of the keystones of acts of reading, that even readers well-trained to tolerate and expect postmodern playfulness and indeterminacy, arguably retain: prediction and a sense of closure. As Douglas explains: 'Endings [...] either confirm or invalidate the predictions we have made about resolutions to conflicts and probable outcomes as we read stories, watch films, or speculate about the lives of others' (Douglas, 1994: 161). Readers of IDN must supply their own, posthuman sense of an ending, and do so either cumulatively, by deciding on one that is just plausible enough, or by exiting the narrative. This cannot be measured against postmodern readings of non-interactive literature and film. Drawing on the reactions of my students in class, what satisfies a reader's need for closure beyond the physical end of a story is realizing as many of its paths as possible and trying to understand how it is designed – in other words, engaging in a dialogue with the machine, rather than interpreting a storyline.

The implications of this also concern ethics and empathy. According to Mason, a decisive difference between games and literature lies in the former 'a sense of responsibility and guilt for the death of an ally', while 'literature provokes empathy rather than remorse' (Mason, 2013: 32). In my opinion, this resonates with interpretations of *Bandersnatch*, as a hybrid form in between fiction and game, as offering readers 'antidotes to regret' (see Parkin, 2019). Readers are left with a constant sense of missing out on a different, potentially better story. Parkin points out:

> every choice made is accompanied by a melancholic chaser, [...] the viewer is invited to seek out each pathway and build a four-dimensional picture of the plot's narrative possibilities. This design minimizes wastefulness, but it also allays our fear of missing out. We can explore various courses of action before settling on our preferred route. There are few such chances in life, where we live with our choices and their repercussions.

This quality of experiences offered by IDN such as *Bandersnatch* would be valuable to explore further especially in the context of climate change communication. If a novel causes empathy with a character's frustrations or death, in game fictions readers experience them more directly, having exercised agency and thus 'caused' the character to die, which fosters a sense of responsibility (Mason, 2013: 33). Even if all IDN are prescribed, and regardless of whether interaction is transparent (mouse-

clicks) or unconscious (eye-tracking), there is the sense of the possibility of 'do over' (Murray, 2018: 6), accompanied either with a positive sense of (finite) possibilities, or frustration. But it is always an experience of a process, of complex patterns, causalities, und uncertainties.

7. Conclusion: Experiencing Tragic Process

A dystopian aspect of the emerging field of 'Neurocinema' and interactive film which is hard to ignore is undoubtedly the collection of data. The monitoring of viewer emotions and cognitive responses (MRI machines, gaze tracking, mouse-clicks) allows filmmakers to track which scenes and sequences engage or lose viewer's interest (see Hasson et al., 2008: 2). Experiments like *Bandersnatch* and *Angry River* create new reception environments and kinds of immersion, but are also built towards total control of the reader's attention, with the obvious dangers of commercial exploitation this affords. While there is still a long way to go, as technology is not sufficiently advanced to fully assess the cognitive and emotional effectiveness of a film, these examples of participatory storytelling illustrate the kind of 'creep' inherent in viewing processes where the familiar and the unfamiliar exist side by side 'in the physical interactivity between an electronic device and a person' (McErlean, 2018: 163; see Hasson et al, 2008: 13).

Framed more positively, the potential of IDN lies in presenting 'us with multiform scenarios in which the same events can be understood in multiple contexts and the same starting points can be imagined as giving rise to multiple possible outcomes' (Murray, 2018: 3). *Bandersnatch*, *The Angry River,* and *The Climate Trail* explore issues of viewer volition, control and indeterminacy, and they offer chances for meta-reflection on how choices relate to actions, how certain paths are blocked, and where it is possible return to another choice. They also trigger a gaming desire to see all possible versions of a story. The impact on reader affect and closure is crucial, as discussed above. From a theoretical perspective, if one subscribes to the Aristotelian concept of tragedy, for example, if there is no closure, catharsis is impossible. Furthermore, the development of the tragic plot hinges on one single choice, on one fatal, irreversible moment. But, as Murray (2016: 222) suggests, and this needs stressing, multisequential narratives allow for the capturing not just of tragic choice but of tragic *process*, in other words, of much broader and more complex explorations of cause and effects. This is relevant for example with regard to communicating the complexity and urgency of the climate crisis and other threats of our increasingly posthuman existence: if we perceive our world (and its risks) as ever-more complex, we need new, posthuman story environments

that, to borrow Murray's words once more, allow 'us to make sense of them by enticing us into exploring a dense narrative world from every possible perspective' (2016: 223); because 'we look for the causes of everything from global climate change to specific instances of human suffering in multiple actions by collective and individual actors over time and distance' (2018: 14–15).

Herein lie the intersections of the study of IDN, narratology, and our posthuman existence in the Anthropocene. The posthuman postulates a move beyond established truth regimes and binary oppositions, it responds to and entails, as Callus, Herbrechter, and Rossini sum up, a 'relatively straightforward imperative to think beyond humanism, anthropomorphism and anthropocentrism' (Callus, Herbrechter, and Rossini, 2014: 112). It presents a discourse very much tied up with the future and with global survival and living together. If we are currently living in what Rushkoff evocatively calls 'a distracted present' (2011: 4), it is clear why crises such as the COVID-19 pandemic or climate change, which require a painful thinking ahead and engagement with complicated entanglements of past, present and future, are such a challenge. It is worth considering that linear stories, told uninterruptedly over time and building towards a single ending, might gradually fail to capture the attention of readers raised in participatory environments where '[n]arrativity is replaced by something more like putting together a puzzle by making connections and recognizing patterns' (2011: 34). Ultimately, the cross-over from story-telling into gaming, where narratives are not narrowed toward one destined ending but can branch out into new possibilities and give the reader a however temporary sense that they have agency to choose their own adventures and find their own answers (see 2011: 67; 62), might help foster the cognitive capacities needed to tackle our present posthuman challenges in the Anthropocene.

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References

Aarseth, E J 1997 *Cybertext. Perspectives on Ergodic Literature*. Baltimore, ML, and London: The Johns Hopkins University Press.

Atkins, B 2003 *More Than A Game. The Computer Game as Fictional Form*. Manchester: Manchester University Press.

Bell, A 2019 Digital Fictionality. Possible Worlds Theory, Ontology, and Hyperlinks. In: **Bell, A** and **Ryan, M L** (Eds.) *Possible Worlds Theory and Contemporary Narratology*. Lincoln: University of Nebraska Press, pp. 249–271.

Bell, A, **Ensslin, A, Ciccoricco, D, Laccetti, J, Pressman, J,** and **Rustad, H** 2010 A [S]creed for Digital Fiction. *Electronic Book Review*. http://electronicbookreview.com/essay/a-screed-for-digital-fiction/ [Last accessed 1 March 2021].

Black Mirror: Bandersnatch. Dir. D. Slade, Prod. R. McLean. 2018. USA: Netflix.

Booth, **WC** 1967 *The Rhetoric of Fiction*. Chicago: The University of Chicago Press.

Callus, I, and **Herbrechter, S** 2007 Critical Posthumanism, or, The Invention of a Posthumanism Without Technology. *Subject Matters* 3.2/4.1: 15–29.

Callus, I, Herbrechter, S and **Rossini, M** 2014 Introduction: Dis/Locating Posthumanism in European Literary and Critical Traditions. *European Journal of English Studies* 18.2: 103–120.

Currie, G 1995 Unreliability Refigured: Narrative in Literature and Film. *The Journal of Aesthetics and Art Criticism*, 53.1): 19–29.

Curie Roe, C and **Mitchell, A** 2019 'Is This Really Happening?': Game Mechanics as Unreliable Narrator. In: *Proceedings of the 2019 DiGRA International Conference: Game, Play and the Emerging Ludo-Mix*. pp. 1–16. http://www.digra.org/wp-content/uploads/digital-library/DiGRA_2019_paper_201-min.pdf [Last accessed 1 March 2021]

Damiani, J 2019 The Angry River as a Landmark Interactive Film. Now Armen Perian Is Pushing the Form Even Further. https://www.forbes.com/sites/jessedamiani/2019/02/18/the-angry-river-is-a-landmark-interactive-film-now-armen-perian-is-pushing-the-form-even-further/#649217356f17 [Last accessed 1 March 2021].

Douglas, J Y 1994 How Do I Stop This Thing? Closure and Indeterminacy in Interactive Narratives. In: *Hyper/Text/Theory*. **Landow, G P** (Ed.) Baltimore: Johns Hopkins University Press, pp. 159–188.

Elstermann, A 2020 Computer-Generated Text as a Posthuman Mode of Literature Production. *Open Library of Humanities* 6(2): 1–23. DOI: https://doi.org/10.16995/olh.627

Eskelinen, M 2012 Cybertext Poetics. The Critical Landscape of New Media Literary Theory. London: Continuum.

Ensslin, A 2012 'I want to say I may have seen my son die this morning': Unintentional Unreliable Narration in Digital Fiction Language and Literature: *International Journal of Stylistics* 21(2): 36–149. DOI: https://doi.org/10.1177/0963947011435859

Estupinán, S, **Maret, B, Kasper, A,** and **Szilas, N** 2018. A Multidimensional Classification of Choice Presentation in Interactive Narrative. In: **Rouse, R, Koenitz, H** and **Haahr, M** (Eds.) *Interactive Storytelling. 11ᵗʰ International Conference on Interactive Digital Storytelling.* Cham: Springer, pp. 149–153.

Flood, S, Cradock-Henry, N A, Blackett, P, and **Edwards, P**. 2018. Adaptive and interactive climate futures: Systematic review of 'serious games' for engagement and decision-making. *Environmental Research Letters* 13(6). https://iopscience.iop.org/article/10.1088/1748-9326/aac1c6/pdf [Last accessed 1 June 2021].

Foltz A, Williams C, Gerson S A, Reynolds D J, Pogoda S, Begum T, Walton S P 2019 Game Developers' Approaches to Communicating Climate Change. *Frontiers in Communication* (4): 1–28. DOI: https://doi.org/10.3389/fcomm.2019.00028

Funes, Y 2019 A New Video Game Tests Whether You Can Survive the Climate Apocalypse. https://earther.gizmodo.com/a-new-video-game-testswhether-you-can-survive-the-clim-1839336048 [Last accessed 1 March 2021].

Goodbody, A and **Johns-Putra, A** (Eds.) 2019 *Cli-Fi. A Companion*. New York: Peter Lang.

Hansen, P 2009 Unreliable Narration in Cinema. Facing the Cognitive Challenge Arising from Literary Studies. *Amsterdam International Electronic Journal for Cultural Narratology* (AJCN) 5. https://cf.hum.uva.nl/narratology/a09_hansen.htm [Last accessed 1 March 2021].

Hasson, U, **Landesmann, O, Knappmeyer, B, Vallines, I, Rubin, N,** and **Heeger, D J** 2008 Neurocinematics: The Neuroscience of Film. *Projections* 2(1): 1–26.

Herbrechter, S 2012 Posthumanism, subjectivity, autobiography. *Subjectivity* 5(3): 327–347. https://link.springer.com/content/pdf/10.1057/sub.2012.13.pdf [Last accessed 1 June 2021].

Hoydis, J, and **Bartosch, R.** 2019 Introduction: Teaching Otherwise? Towards a Posthuman(ist) Pedagogical Practice. In: **Bartosch, B,** and **Hoydis, J.** *Teaching the Posthuman*. Heidelberg: Winter, pp. 7–23.

Humann, H D. 2019 *Reality Simulation in Science Fiction Literature, Film and Television*. Jefferson, NC: McFarland.

Ivars-Nicolas, B and **Martinez-Cano, F J** 2019 *Interactivity in Fiction Series as Part of Its Transmedia Universe: The Case of Black Mirror*. DOI: https://doi.org/10.5772/intechopen.86881

Koenitz, H, Ferri, G, Haahr, M, Sezen, D, and **Sezen, T I** (Eds.) 2017 *Interactive Digital Narrative: History, Theory and Practice.* New York: Routledge.

Krzywinska, T and **Brown, D** 2015 Games, Gamers and Posthumanism. In: **Hauskeller, M, Philbeck, T D** and **Carbonell, C D** (Eds.) *The Palgrave Handbook of Posthumanism in Film and Television.* London: Palgrave Macmillan, pp. 192–201.

Lewis, W W 2017 Performing 'Posthuman' Spectatorship. Digital Proximity and Variable Agencies *Performance Research* 22(3): 7–14.

Lieberman, B 2020 *The Climate Trail': Survival game pits players against climate catastrophe.* https://yaleclimateconnections.org/2020/01/the-climate-trail-survival-game-pits-players-against-climate-catastrophe/ [Last accessed 1 March 2021].

Mason, S 2013 On Games and Links: Extending the Vocabulary of Agency and Immersion in Interactive Narrative. In: *Interactive Storytelling: 6th International Conference, ICIDS 2013, Istanbul, November 6–9, 2013, Proceedings.* Cham: Springer, pp. 25–34. DOI: https://doi.org/10.1007/978-3-319-02756-2_3

McErlean, K 2018 *Interactive Narratives and Transmedia Storytelling. Creating Immersive Stories Across New Media Platforms.* New York and London: Routledge.

McSweeney, T and **Joy, S** 2019a Change Your Past, Your Presence, Your Future? Interactive Narratives and Trauma in *Bandersnatch* (2018). In: **McSweeney, T** and **Joy, S** (Eds.) *Through the Black Mirror: Deconstructing the Side Effects of the Digital Age.* Cham: Palgrave Macmillan, pp. 271–284.

McSweeney, T and **Joy, S** (Eds.) 2019b Through the Black Mirror: Deconstructing the Side Effects of the Digital Age. Cham: Palgrave Macmillan.

Murray, J H 2016 Hamlet on the Holodeck. The Future of Narrative in Cyberspace. Updated ed. Cambridge, MA, and London: MIT Press.

Murray, J H 2018 Research into Interactive Digital Narrative: A Kaleidoscopic View. In: **Rouse, R, Koenitz, H** and **Haahr, M** (Eds.) *Interactive Storytelling. 11th International Conference on Interactive Digital Storytelling.* Cham: Springer, pp. 3–17.

Nünning, A 1999 Unreliable, Compared to What? Towards a Cognitive Theory of Unreliable Narration: Prolegomena and Hypotheses. In: **Grünzweig, W** and **Solbach, A** (Eds.) *Grenzüberschreitungen: Narratologie im Kontext/Transcending Boundaries: Narratology in Context.* Tübingen: Narr, pp. 53–73.

O'Neill, S 2008 *Interactive Media. The Semiotics of Embodied Interaction.* London: Springer.

Parkin, S 2019 The 'Bandersnatch' Episode of 'Black Mirror' and the Pitfalls of Interactive Fiction. https://www.newyorker.com/culture/on-television/bandersnatch-and-the-pitfalls-of-interactive-fiction [Last accessed 1 March 2021].

Perlin, K 2004 Can There Be a Form Between a Game and a Story? In: **Wardrip-Fruin, N** and **Harrington, P** (Eds.) Designed by **Crumpton, M** *First Person: New Media as Story, Performance and Game.* Cambridge, MA: MIT Press, pp.12–14.

Poniewozik, J 2016 'Black Mirror' Finds Terror, and Soul, in the Machine. *The New York Times* 20 October. https://www.nytimes.com/2016/10/21/arts/television/review-black-mirror-finds-terror-and-soul-in-the-machine.html [Last accessed 1 March 2021].

Reilly, N 2019 *The Most Popular Choices Have Been Revealed.* https://www.nme.com/news/the-most-popular-bandersnatch-choices-have-been-revealed-2436045 [Last accessed 1 March 2021].

Roth, C and **Koenitz, H** 2019 Bandersnatch, Yea or Nay? Reception and User Experience of an Interactive Digital Narrative Video. In: TVX '19: Proceedings of the 2019 ACM International Conference on Interactive Experiences for TV and Online Video, Salford, UK in June 2019, pp. 247–254. DOI: https://doi.org/10.1145/3317697.3325124

Rushkoff, D 2011 *Present Shock. When Everything Happens Now.* New York: Penguin.

Ryan, M-L 2001 Beyond Myth and Metaphor – The Case of Narrative in Digital Media *Game Studies* 1(1): 1–14.

Ryan, M-L, and **J-N Thon**, (Eds.) 2014 *Storyworlds Across Media: Towards a Media-Conscious Narratology.* Lincoln: University of Nebraska Press.

Sacher, D 2019 Bandersnatch – And the Promise of Interactive Storytelling. https://www.dansacher.com/news/2019/1/2/bandersnatch [Last accessed 1 March 2021].

Schuler, A 2019 Other Side of the Mirror. *Streaming Media Magazine,* Sept. 26–32. https://www.streamingmedia.com/Articles/ReadArticle.aspx?ArticleID=134349&pageNum=2 [Last accessed 1 March 2021].

Sherry, J L 2016 Debating How to Learn from Video Games. In: *The Video Game Debate: Unravelling the Physical, Social, and Psychological Effects.* New York: Routledge, pp. 116–130.

Strause, J 2018 Black Mirror: All the 'Bandersnatch' Endings and How to Reach Them. https://www.hollywoodreporter.com/live-feed/black-mirror-bandersnatch-how-reach-endings-1171988 [Last accessed 1 March 2021].

Streitfeld, D 2018 Black Mirror Gives Power to the People. https://www.nytimes.com/2018/12/28/arts/television/black-mirror-netflix-interactive.html [Last accessed 1 March 2021].

Taylor, H 2019 *The Climate Trail*: a bleak look at what awaits us if we fail to address climate change. https://www.gamesindustry.biz/articles/2019-10-30-the-climate-trail-a-bleak-look-at-what-awaits-us-if-we-fail-to-address-climate-change [Last accessed 1 March 2021].

The Angry River. Directed and Produced by **Perian, A.** Written by **Perian, A, Benenati, S,** and **Eggert,** N 2017 USA. https://www.theangryriver.com/ [Last accessed 1 March 2021].

The Climate Trail. Design and Development **Volk, W D** 2019. Deep State Games. https://www.theclimatetrail.com/ [Last accessed 1 March 2021].

Tomasula, S 2014 Visualization, Scale, and the Emergence of Posthuman Narrative. *Sillages Critiques* 17. (23pp.). DOI: https://doi.org/10.4000/sillagescritiques.3562

van der Zaag, A-C 2016 On Posthuman Subjectivity *Journal of Cultural Economy* 9(3): 330–336. DOI: https://doi.org/10.1080/17530350.2015.1040436

Volk, W D 2019 The Climate Trail: how to survive the climate apocalypse. (Interview) *Journal of Geek Studies*, 6(2): 141–144. https://jgeekstudies.files.wordpress.com/2019/11/interview_2019_climatetrail.pdf [Last accessed 1 March 2021].

Wibeck, V., and **T-S. Neset** 2020 Focus groups and serious gaming in climate change communication research—A methodological review. *WIREs Climate Change* 11(5): pp. 1–16. DOI: https://doi.org/10.1002/wcc.664

Wortham, J 2015 Black Mirror' and the Horrors and Delights of Technology *The New York Times* 30 January.

Wu, J.S., and **J.J. Lee** 2015 Climate Change Games as Tools for Education and Engagement. *Nature Climate Change* 5: 413–418. https://www.nature.com/articles/nclimate2566 [Last accessed 1 June 2021].