Partners: Human and Nonhuman Performers and Interactive Narrative in Postdigital Theater

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Abstract. Media performance scholarship has largely not engaged with innovative work in the incorporation of technology in mainstream theater, pursuing instead a nearly exclusive focus on non-narrative works of media performance such as electronic music, dance, and installation art. This article provides a corrective to this absence, and highlights creative work from the 19th century onward with technologies in service of interactive storytelling in theater. Cornerstone concepts in the media performance field are examined, as well as possible anxieties behind the relative exclusion of narrative theater from the field. The concept of partnership is put forth as a way of understanding human and non-human performer relationships in postdigital culture, and a call for collaboration across disciplines including interactive narrative, games, electronic literature, artificial intelligence, and architecture is discussed. The practice-theory divide is bridged with a closing discussion of the author's work in creative practice in the field.

Keywords: Theater, Postdigital, Interactive Narrative, Non-Human .

1. Performance in Postdigital Culture

1.1. Entering Real-Time

We have entered the era of "real-time" media. What will this mean for storytelling in media that have always been real-time, such as theater, for example? Canned media, which must progress in one predefined direction only and contain only one expression or outcome are children of the early 20th century, while real-time, responsive, or playable media have emerged as the dominant offspring of the early 21st century. At a recent professional development seminar held Epic Games to promote its Unreal 4 game engine, it was emphasized proudly, over and over, that rendering was no longer required in the game engine, everything was real-time. This rhetoric of speed and transparency neatly compliments the current cultural obsessions with reality media, such as virtual and augmented reality, and even reality tv.

In the culture of real-time media, we have often been described as postdigital [1, 2, 3, 4]. This term has had shifting meanings over time and across disciplines since at least the early 2000's including computer music, art and aesthetics, museum studies, games and cultural heritage. Performance studies scholar Matthew Causey has argued

for a definition of postdigital performance focused on resistance to the digital, claiming that postdigital performance works “can be understood as *thinking digitally*, embodying an activist strategy of critique within and against postdigital culture’s various ideological and economic strategies of control, alienation, and self-commodification” [5; pg 432]. This perspective feels too narrow to me (and perhaps too optimistic in terms of ‘resistance,’ a point I will return to later) given one hallmark of the postdigital as a time of breaking down traditional or modernist boundaries between human/other, official/amateur, producer/consumer, high culture/kitsch, etc.

The postdigital is not only destructive, but is also generative of new ways of seeing, speaking, listening, and acting —all of which we are still in the process of theorizing and understanding. What is clear is that our world has fundamentally changed; even Walter Benjamin’s auratic, unmediated mountaintop from 1935 no longer exists: “If, while resting on a summer afternoon, you follow with your eyes a mountain range on the horizon or a branch which casts its shadow over you, you experience the aura of those mountains, of that branch” [6]. That vista is long gone, not only because of environmental threats and overdevelopment, but also because of the collective cultural consciousness focused on capturing vistas for display on Instagram. Like the perceptual shifts described in Erwin Panofsky’s *Perspective as Symbolic Form* [7] and John Berger’s *Ways of Seeing* [8], we are becoming postdigital in how we see and interpret reality and images as well.

Theater scholar and artist Mark Sussman’s examination of the history of techno-magic on stage and how human-machine relations have been understood through time is helpful in grounding this discussion [9]. Sussman refers to the 1748 La Mettrie’s influential phrase *l’homme machine* as a core concept for the 18th century lens of understanding the human body as a machine, or body as automaton [10]. Sussman then describes the shift in understanding in the 19th century, towards anthropomorphized machines (as opposed to mechanized humans). A recent contribution from Ashley Ferro-Murray and Timothy Murray traces technological integration in performance across a series of phases, outlined as “the mechanical age, the televisual age, and the age of the Internet” [11]. This analysis is helpful in delineating large-scale shift related to technology in performance. Building on Ferro-Murray and Murray’s work, and Sussman’s analysis, we might describe the 20th century human-machine relationship as “extensions of man,” to cite Marshal McLuhan’s work [12], and then later in the 20th century, we might focus on a tighter coupling represented by the cyborg figure, written about so influentially by Donna Haraway [13]. Haraway again, presciently, provides a concept for understanding the human-machine relationship in our own early 21st century as a de-centered, hybrid, reciprocal partnership, in which she suggests our blended bio-mechanical-digital offspring might be regarded as “oddkin” [14]. It is this characterization of the subjectivities inhabiting the postdigital (human and non-human oddkin) that I find productive for rethinking human and non-human performer relationships on stage.

1.2. Liveness in Real-Time

One of the most influential 20th century scholarly conversations about the relationship between technology and performance is often referred to as ‘the liveness debate.’

Now that we have a much wider array of technologies in play in performance, beyond canned or linear media, how should we understand this line of thought, which has had major influence on the trajectory of the field? The liveness debate refers primarily to two works: Peggy Phelan's 1993 publication *Unmarked: The Politics of Performance* [15] and Philip Auslander's 1999 book *Liveness: Performance in a Mediatized Culture* [16], which was in part written as a response to Phelan's publication. While many scholars have weighed in during the intervening years, continually putting these two works in conversation with one another as a way of demarcating boundaries of the field, it is helpful to revisit the two works to note a commonality in their work that often goes unremarked upon: both sides of this debate conceptualize digital technology as an anti-theatrical force, and performance as a whole is conceptualized in both cases as somehow essentially mismatched with technology. Neither Phelan's nor Auslander's viewpoint serves to support innovative practice with digital technology in traditional theater, because of the oppositional way in which technology and theater are positioned. This is significant, because these two works have served as a cornerstone for digital performance technology in the intervening decades, and their influence continues to resonate powerfully. It is also worth noting that while other theorists have placed these two works in direct conversation with one another, Phelan and Auslander each write from very different perspectives and with different aims. This difference should be highlighted, in order to make clear the ways in which the two works talk past one another.

Auslander's writing centers on an economic model, which emphasizes the pervasive, unavoidable nature of late capitalism. His argument hinges on the belief that it is no longer possible to avoid entanglement with dominant culture, which he defines as mediatized, because capitalism controls all aspects of production and reception. He emphasizes this as a corrective to Phelan's work, which seeks to define the ontology of performance as one of resistance against dominant ideologies. It must be pointed out, that as astute as Auslander's critique may be of Phelan's work, he offers no alternative solutions. Again, this is because on a fundamental level, he is engaged in a different project.

Phelan writes from a cultural studies perspective, developing interpretations of many types of performances with the aim of carving out the possibility of an oppositional stance within dominant culture. Phelan is explicitly not interested in theater, however, which she characterizes as an oppressive part of dominant consumer culture which reifies the scopophilic, male gaze discussed so famously in Laura Mulvey's essay on Hollywood film [17]. None of Phelan's performance examples come from mainstream theater. Instead, Phelan analyzes performative works from Adrian Piper, Robert Mapplethorpe, Cindy Sherman, the Guerrilla Girls, a reproductive rights group, and others. While Auslander does discuss some examples of mainstream or commercial theater, only lackluster and disappointing examples are brought forward, to reinforce his thesis that media has "dominated" theater and degraded the stage as a space of creativity. Following up on Auslander's argument that media is poised to kill theater, roughly twenty years later today, we might expect to find all traces of theater stamped out in the wake of the highly advanced automated show control technologies available. And yet, the monster lives! Theater's Frankenstein-like capability to com-

bine and absorb components, conventions, and techniques from other cultural arenas allows it to rise from the (oft proclaimed) ashes, again and again.

Indeed, these highly advanced automated show control technologies are in use across many genres of performance today — not only the Broadway touring shows that Auslander so disparages, but also in what are referred to as avant-garde or experimental performances, such as Andrew Schneider's *After* [18]. These performances carry on a long tradition of precise actor-machine synchronicity, dating back at least to Josef Svoboda's *Laterna Magika* performance experiments at the Brussels'58 Expo [19]. These works are spectacles of system automation, incorporating human as cyborg or cog-in-the-machine, and can be beautiful and interesting in their own right. While the remainder of this paper will focus on performances incorporating real-time or responsive technologies, and not canned or linear media systems, this focus is not meant as a denigration of other types of work and approaches; there is room on the stage for everyone. In fact, as noted in Jay David Bolter's keynote address at ISEA'11, *The Digital Plenitude and the End of Art* [20], this type of non-hierarchical cultural plethora is one of the hallmarks of the postdigital.

It must be acknowledged, there is a long history of debating what theater is for, or what it should do. In broad terms, the most ancient roots of theater might be found in ritual, religious ceremony, and liturgical drama — all meant to solidify social power structures, guide cultural norms, and soothe anxieties about the hereafter [21, 22]. Court theater might be understood as functioning to reify the greatness of the monarch and justify claims to power, while enlightenment theater educated a new middle class how to think, behave, and maintain power structures in the new economic order. The contemporary genre of performance referred to by many names including media performance, digital theater, virtual theater, and digital dramaturgy is at least in part a reaction against the new postdigital cultural order (or disorder) and functions to maintain a power structure focused around mostly white, male academics and artists working to preserve a so-called avant-garde, which is privileged by the Art (capital A as in High Art) market. One of the ways in which this boundary maintenance takes place is the relative invisibility of folk or popular forms in the study of digital performance. This leads to the question: what are the real anxieties in postdigital performance? Semiotic slippages between the human, animal and machine? Or a sense of erosion between High Art, scholarship, and the (already) encroaching postdigital plethora?

In Defense of Story. An excellent recent contribution to the field, Bay-Cheng, Parker-Starbuck, and Saltz's coauthored "Performance and Media: Taxonomies for a Changing Field" [23] provides a brilliant overview of the scholarship in media and performance over the past several decades. The summary, besides being a valuable tool as a guide to the field, makes clear a glaring omission: the field has avoided text-based, mainstream theater. That is, the field has neither focused on examples of traditional, script-based narrative theater as objects of study, and has likewise (or perhaps due to this neglect) not identified narrative, story, or playwright as significant components in the multitude of frameworks, lenses, and taxonomies that have been developed. An early work in the field first published in German in 1999 and only later

translated to English in 2006, Hans-Thies Lehmann's *Postdramatic Theater* [24] concluded that computational media had unseated the primacy of text — meaning story and script — in theatre for the 20th century. It seems this assertion was met with near unanimous agreement in the scholarship that followed. David Barnett's work stands as a notable exception [25]. In addition to this neglect of mainstream theater by the bulk of media performance scholarship, work on puppetry and mask has been for the most part treated separately as well. As John Bell has noted "[...] puppets, masks, and objects have always had a strong connection to folk theatre, popular theatre, and religion, but (or perhaps consequently) they have rarely been subjects of sustained systematic academic attention in this century" [26, pg. 15]. What a missed opportunity, not having the scholarship on digital technologies (and mostly screen technologies) in conversation with this significant legacy of technology in performance; the history of performing objects.

The lack of scholarship on technology in mainstream plays impoverishes the larger field, and cuts off theater as an acknowledged site of potential and ongoing innovation. Instead, media performance scholarship has focused on a particular avant-garde, which we must acknowledge is not really new, stemming directly from early 20th century modernism such as Oskar Schlemmer's *Kunstfiguren*, and now must be considered a solidified tradition and not experimental work. While the contemporary work has taken an aggressively anti-narrative tone, it's interesting to note that predecessor Schlemmer had always intended to later re-incorporate narrative into his work. He had identified narrative as a particularly complex, difficult element, and due to his constructivist, medium-centrist approach, began his performance experiments working with the most basic elements: "We confess that up to now we have cautiously avoided experimenting with this element of language, not in order to de-emphasize it, but conscious of its significance, to master it slowly" [27, pg. 91]. Unfortunately, Schlemmer was never able to carry his work forward to the point of reintroducing narrative, as the second world war cut his career short.

The contemporary anti-narrative approach in this tradition comes at a high cost particularly in terms of accessibility, meaning the works produced often require highly specialized literacies to access, and are most often created by and for privileged white male audiences. Yet, this genre of work often claims for itself an attitude of resistance — against *what* is not always clear, yet is often assumed to be capitalism. This avant-garde and it's accompanying scholarship positions more accessible, popular work as 'commercial' — a distinction which is somewhat disingenuous given these avant-garde performances and venues also charge admission, and some are quite expensive to access such as international biennales, high tech venues such as ZKM, BAM, EMPAC, Banff, and international festivals such as the fringe festivals.

In addition, the media upon which the media performance field is built has complicity always already designed into the system - from the deplorable late capitalist material conditions of production of the technology, to the media archeology of these technologies as military training and simulation systems. The farther back one looks, the more dubious the claim of 'resistance' becomes. Langdon Winner has famously critiqued the view of technology as apolitical in his landmark essay *Do Artifacts Have Politics?* [28], debunking the myth that technologies can be separated from use, em-

phasizing their entanglement in non-neutral forces from the moment of conception. So while this avant-garde tradition of media performance work certainly should be studied, it should not be the *only* genre studied within the purview of media and performance scholarship, to the exclusion of others. As early as the 1920s, a group of scholars were calling for attention to be paid to popular forms. Semiotician and linguist Pyotr Bogatyev's 1923 study of the Czech puppetry tradition makes a powerful argument for "the study of folk theatre […] as it is not a fragment of the past or an artistic relic […] folk drama lives and evolves together with the people, reflecting their own most pressing needs and everyday poetics" [29, pg.101]. This argument can be extended to make a case for why we must include commercial, mainstream, or community theater today as objects worthy of study in postdigital performance.

These popular forms of theater are still highly narrative, resisting Lehmann's and others' claims that we are postdramatic as a culture. While some scholars may refer to these works as throwbacks, outmoded, or passé, the fact remains these works enjoy a sizable audience, and this is the type of theater most people in America encounter today, from elementary school plays to touring Broadway productions, to much of college-level theater education. The theater that starts with a play script and tells a story to an audience is far from dead, and our cultural interest in story at large continues unabated. There is great political power in story today, meaning today is not the moment to ignore story or take an anti-narrative stance. We live in what might be a golden age of story, when a good story, repeated again and again, is taken for fact. That, of course, is propaganda, which may be best refuted by offering alternative storylines. Luckily there are brilliant playwrights today, and from decades and centuries before us, who have penned plays (yes, stories) that continue to resist dominant power structures and oppression, and remain relevant today. For just one example among many, Max Wellman's *Sincerity Forever* [30] comes to mind. Published in 1990, at a contentious moment in the culture wars we once again find raging at a fever pitch, the play opens with this scene, which remains chillingly relevant:

> Scene One
> *A beautiful summer's night in the outskirts of Hillsbottom. Two girls sit in a parked car talking about things. Both are dressed in Ku Klux Klan garb.*
> JUDY: Molly, do you know why God created the world they way he did? So complicated, I mean?
> (Pause.)
> MOLLY: Nope.
> JUDY: Because I've been thinking about it, and I just get more and more puzzled.
> MOLLY: So do I.
> JUDY: Because if there is a divine plan it sure doesn't look it, very divine, that is. Or planlike. It looks kinda like a mess.

Wellman goes on to bring us into a (not so) strange world in which KKK members openly share their views, an African-American woman is Jesus, and mystic alien furballs have overrun the earth. Beyond the clear need for stories like these in our current fractured, frictional political state, it is a missed opportunity to find the discussion of

storytelling and narrative mostly absent from the scholarship on digital performance, as other fields continue to engage deeply with narrative (such as interactive fiction, games, and artificial intelligence). These fields could use shared expertise on what makes storytelling effective across different aims, and could in turn share new ideas about storytelling with postdigital playwrights.

2. The Postdigital Playwright

What does the postdigital offer the playwright? The playwright creates a script to facilitate action and response, hence the need for stage directions. Reflecting the plasticity of the stage, stage directions can range from pedestrian to fantastical, to the practically lyric [31]. The playwright writes for multiple readers, all of whom are active readers: the director, designers, crew, cast, and audience. Theater (yes, scripted plays) are *by nature* interactive. The play comes into being through enactment by the actors or players. The play script is, and has always been, an interactive text. And, for much of theater history, the audience was overtly interactive as well. The convention of a silent, apparently passive, internally interpretive audience as a necessary part of scripted theater is a more recent development. As Richard Butsch reminds us in his excellent study on the development of American audiences, spectators were active until "the Jacksonian era in the 1830s and 1840s, the upper classes grew to fear such working class sovereignty […] Elites labeled exercises in audience sovereignty as rowdyism, […] redefining it as poor manners rather than an exercise of audience rights" [32, pg. 5].

Pushing back against this relatively new form of passivity, the early 20th century avant-garde began a focus on reclaiming the inclusion of the audience member in the performance. This inclusion of the audience member as performer continued, reaching a high point with late midcentury environmental theatre, and creative works such as Allan Kaprow's happenings and Lee Breuer's *The Gospel at Colonus*. Given the current craze for interactivity, however, we must remember that just because something is participatory or interactive, it is not necessarily good. Today, sometimes this move to include the audience is done in an authoritarian manner, such as Ant Hampton's *The Extra People*, in which audience members are ordered around the performance space for an hour with no explanation, via individual instructions delivered through iPod headphones [33]. Sometimes audience participation is a shallow move that includes no dramaturgical impact, as in the audiences' navigation of the complex multiscreen but ultimately meaningless performance space in Peter Stamer, Jörg Laue, and Alain Franco's *26 Letters to Deleuze* [34]. Sometimes, however, audience participation is exciting, and lends meaningful intimacy to a story experience, as in the second act of Maria Irene Fornes' *Fefu and Her Friends*, when the audience enters the set of the main character's home, to take part in a set of three scenes in close quarters with the performers [35].

While focused on exploring the interaction between performer and audience member, the avant-garde may have overlooked another form of interactivity that is equally

fascinating and generative — the interaction between performers, human and non-human. Interactivity can be participated in, but it can also be a spectator sport. Sport, in fact, is partly defined by people watching others interact. Brecht himself wrote on the connections between sport and theater [36], concluding theater could gain from incorporating some of the real-time uncertainty of sport (perhaps now more possible given our real-time technologies). And of course today we have eSports, where spectators watch others play videogames, and theater is still with us in the traditional spectatorial form, with an audience seated watching others, who like gamers are also referred to as players.

2.1. Postdigital Performers: Human and Non-Human Partners

What does it mean for dramatic narrative text to introduce technological interactivity in partnership with human performers? Do narrative play structures need to change? Or, is it the case that plays are always interactive already, and the stage is an extremely plastic environment - even more plastic than the page, making traditional theater an ideal laboratory for experimentation in postdigital performance. Building on his earlier work on a taxonomy for digital theater, David Z. Saltz identifies in a more recent iteration of his work "five functions that media can play in relation to the live performer's actions: scene, prop, actor, costume, and mirror" [37, pg 97]. Media as actor is of particular interest given real-time technologies' capabilities for responsivity. The response is a defining characteristic of the modern actor, with most modern theories of actor training, from Stanislavsky to Grotowski and beyond focusing on developing responsiveness as a valued skill. Saltz defines media-as-actor as "[related to] by the performer as an autonomous agent, a subject in its own right, with sentience and volition. […] The relationship between the live performer and the virtual actor here is not instrumental, as it is with a virtual prop, but *responsive*" [37, pg 100]. Thus the media-as-actor is characterized by responsiveness, or at least, the illusion of responsiveness.

For the postdigital era it may be more interesting to focus on this interaction between human and non-human performers, instead of a modernist focus on the interaction between performers and audience. The media-as-actor might be conceived of today as a *partner,* as opposed to more limited conceptions of media as *alien* (a threatening force to be kept out of theater - such as Auslander and Phelan both describe), as *servant* (who does what the human master commands and remains invisible), or as *tool* (which is visible but inert, and understood as malleable or neutral). In many scenarios, we often ask, How did the technology perform? Given this new perspective on media-as-actor as postdigtial partner, we might begin to ask instead, How did the technology play? How playful was it? How expressive? Was it a generous partner? Performance scholar Matthew O'Hare has cited generosity as an important component in performance partnerships with technology, based on his research in actor training methods [38]. The possibility emerges that real-time media can afford us increasingly generous partnerships.

In understanding this responsive, potentially generous partnership between human and non-human performers on the postdigital stage, looking to research on puppetry and performing objects may be helpful. Steve Tillis' category of the 'media figure' is

defined as a "figure whose performance is made possible through technological mediation [39 pg 182]. Tillis includes CGI, stop motion animation, motion capture animation, animatronic figures, and figures in cel animation in this group. Tillis notes that similar to puppets, the media figure most often excels in a non-naturalistic role, meaning the media figure (at least at this point in time) poses no threat in terms of a replacement for human performers. Instead, we might think of these media figures as our partners, as messy human-machine collaborations, or as Haraway's oddkin. Stephen Kaplin's "Puppet Tree" taxonomy for organizing thinking around performing objects based on the physical distance from the human body is very useful [40], and by reframing this perspective slightly, shifting the focus away from the human body and to the space between the human and non-human bodies or entities, and to the qualitative nature of these collaborative relationships, this taxonomy becomes useful for understanding the postdigital stage. While focusing on the material distance between human body and performing object is important for understanding some of the core material constraints and affordances of particular object, this literal distance is just one important quality among many that describe the human-non-human performer relationship. By shifting the frame of reference away from the human, and decentering the human, we might instead focus on the qualitative and reciprocal nature of the relationship between non-human and human performers, focusing on qualities such as responsivity, generosity, playfulness, and creativity in terms of how we discuss and value these collaborations.

In addition, we could expand the range of Kaplin's taxonomy to also include things at much larger scale in which bodies and objects interact, such as the performance environment. In terms of environment, I refer not only to the set or backdrop for the performance, but also the larger structure such as a theatre building or performance venue. It is a common saying in theatre that 'the set directs the play;' a comment that recognizes the power of space in storytelling, but of course the theatre building also to some degree determines what is possible for the set. With the advent of robotic architecture, or the incorporation of responsive, live technologies into building practices as described by Weller and Do [41] we may have an opportunity in our postdigital era to revisit some of the tantalizing but unbuilt collaborations between architects and theatre directors, such as Walter Gropius and Erwin Piscator's *Total Theatre* from 1927 [42], and Cecil Price and Joan Littlewood's *Fun Palace* from 1968 [43]. Space should not be overlooked as a potential generative, creative non-human performing partner.

3. Postdigital Theater Histories and Contemporary Practices

The postdigital does not define a break from the past so much as continuations along multiple trajectories in a simultaneous, de-centered fashion. Focusing on narrative script-based theater and histories of human and non-human performance partnerships, including responsive spaces, we find many inspiring examples to draw from. Early works, of course, incorporate linear media, meaning the responsiveness of the media partner is a tightly rehearsed illusion. However, as mentioned above, this type of work continues today, and so cannot be conveniently ascribed to a set of technologies or

time period. While this particular trajectory at large has not been highlighted by media performance scholars, and much work remains to be done in the excavation of this history, I share here an initial, incomplete set of examples, listed in chronological order. In each case I share references to more detailed information about the production:

- 1840s - 1850s: John Banvard performs proto-documentary style narratives live in front of scrolling panoramic paintings of the Mississippi River. With paintings scrolling in real-time to represent the actual speed of a journey down the river, the performances lasted several hours [44]. These performances tour around the world, and influence advanced moving panorama attractions around the turn of the century [45].
- 1898: Lincoln J. Carter's play *Chattanooga* includes simulated interaction between on-stage performers and filmed train action, projected at the back of the stage [46].
- 1907: Horace Goldin's magic act opens with a film showing him riding up to the theatre in a taxi, then physically entering the stage, followed by a simulated interaction between himself on stage and the cab driver projected on film [47].
- 1914: Winsor McCay's vaudeville act *Gertie the Dinosaur* builds on his experience as a 'chalk talk' vaudeville performer and early animator. The performance includes tightly rehearsed simulated interaction between McCay on stage and the projected dinosaur, including the illusion of McCay becoming transferred to the animated world at the end of the act [48].
- 1927-1931: Erwin Piscator directs multiple productions with innovative uses of film on stage, including most notably *Hoopla, Wir Leben!* and *Rasputin* (1927). The production of *Hoopla*! includes a multi-story set on a turntable, mounted with multiple projection surfaces, and incorporates film imagery not only as scenery but with expressionist effects, and to display animated text translations of morse code communications between performers [49]. Rasputin is performed on a set that also has multiple projection surfaces, constrcuted in a globe or shell-like shape, all mounted on a rotating turntable, and covered with reflective projection material [50]. Piscator also develops accompanying theoretical work, parsing the multiple dramaturgical functions of film on stage as didactic, dramatic, and as commentary [51].
- 1948-2002: Scenographer Josef Svoboda's long and storied career includes a multitude of examples of inspired experiments with technology in theater, opera, and dance. Of particular relevance for the concept of performing in partnership with media are his works stemming from *Laterna Magika*, originally exhibited at Expo'58 in Brussels. Svoboda continues to innovate on the techniques for creating the illusion of responsivity between live performer and film, even in his final production, *Graffiti,* in 2001 [19, 52].
- 1967 - 1990: Filmmaker and theater director Radúz Činčera develops projects billed as interactive films, but which incorporate complex interweavings of filmic and theatrical storytelling with interactive technologies, audience participation, and theatrical performance. Key performances include *Kineautomat*, developed in partnership with Josef Svoboda and shown at the Czechoslovak Pavilion at Expo67 in Montreal in 1967, and *Cinelabyrinth*, developed for the Osaka World Expo in 1990 [53].

- 1970 - today: Scenographer William Dudley continues to explore a variety of technologies, mechanical and digital, in traditional theater today, including mechanized seating platforms, a fog screen projection display, and 360-degree projection surfaces. While his uses of technology are more limited to traditional scenic functions, they are interesting examples of environmental or immersive approaches in narrative theater. Notable productions include *The Big Picnic* (1994), *Hitchcock Blonde* (2003), *The Woman in White* (2004), and *Peter Pan in Kensington Gardens 360* (2009) [54].
- 1990s - today: Director and performance scholar David Z. Saltz's work is explicitly focused on integrating responsive technologies including pressure sensors, motion capture, and robotics in performance with strong dramaturgical justification. Notable productions include *Kaspar* (1999), *The Tempest* (2000), an ongoing *commedia dell'arte* project involving both robotic and human performers [55, 56].
- 2006: Playwright Elizabeth Meriwether's *Heddatron*, a scifi comedy in which a pregnant housewife is abducted by robots and forced to perform Hedda Gabler. The script calls for "functioning robots or at least something on wheels with recorded dialogue" [57].

I have also contributed productions to this trajectory, emphasizing the potentials of responsive media as partners. My production of Sophie Treadwell's *Machinal* (2004) cast a robot in the role of the priest, emphasizing the callous, mechanical nature of the society portrayed in the piece. My 2007 musical adaptation of Georg Büchner's *Woyzeck*, co-created with composer Brendan Padgett, choreographer Kyle Shepard, and media designer Michelle Moon Lee, used augmented reality to bring interactivity to a script in which the author had never prescribed an order for the scenes, to allow audiences to construct their own pathways through the narrative. A 2013 production of Haruki Marukami's *after the quake*, created in collaboration with director Melissa Foulger, used a gesture controlled projected waveform to bring the play's giant, earthquake-causing worm to life. More recently, I collaborated with media designer Marc Destefano on a production of Thornton Wilder's *Our Town* (2017), utilizing a 360-degreee projection screen and gesture-based system that displayed procedurally generated artworks, derived from hand-painted and hand-drawn works commissioned for the production from artist Clare Johnson. The screen responded to the Stage Manager character's movements, extending his dramaturgical power as a puppet-master to pull the audience into the world of the play. Also in 2017, my adaptation of Henrik Ibsen's *Peer Gynt*, created together with orchestra and choir director Nicholas DeMaison and sculptor Jefferson Kielwagen, combined physical and digital media to experiment with scale and playful shifts between modes of representation. Giant sculptural puppets, a full orchestra and chorus, live narrator, and miniature toy theatre augmented by live projection at massive scale, came together to emphasize the comic and surreal qualities of the narrative.

The aim of the timeline sketched above, along with the addition of my own work, is to begin to bring together a restorative history of mainstream theater's innovations with responsive technologies, both in the postdigital era today and the analogue pre-

history. I hope others will add citations to this initial collection, including their own works.

4. Conclusion

In conclusion, the category of media theater work that engages creatively with technologies as postdigital partners and continues to incorporate the rich tradition of dramatic storytelling stands as a relatively untapped area in media performance scholarship, also ripe for collaboration with adjacent fields including games, interactive narrative, artificial intelligence, electronic literature, architecture, puppetry, and performing object work that are likewise concerned with responsive technologies and narrative. Unlike the critique of interdisciplinary in Grotowski's description of the 'Rich Theatre,' which " depends on artistic kleptomania," the disciplinary crossings open to postdigital theatre have the potential to develop creative, generous human and non-human partnerships, surpassing the decorative dystopia envisioned by Grotowski [58]. The goals of this paper have been to highlight the work both historical and contemporary in this under-examined area, as well as seek to unravel some of the reasons behind its relative lack of inclusion in the scholarly literature. In addition, I have put forth the concept of partnership as particularly relevant for the postdigital theater maker, building on work from Haraway, Saltz, O'Hare and others to claim the responsive technological actor as a viable cast member for the postdigital narrative stage. I hope these theoretical moves will help to expand and extend the conversation, and further bridge intersecting disciplines.

In tandem with the scholarly conversation, I hope this paper will help inspire further work in practice in responsive technologies in narrative theater. My own work will also continue in this direction. Again in collaboration with media designer Marc Destefano, I will direct Sondheim and Wheeler's *Sweeney Todd* in early 2019, using facial projection mapping to create responsive masks for Sweeney's victims, who will transform under his murderous clutches, appearing to share the same face with the actor portraying the judge character, who is Sweeney's ultimate aim. Also planned for performance in 2019, I am co-authoring with Lissa Holloway-Attaway an original play that will feature multiple characters connected to the ecological threats facing the Baltic Sea, including invasive species, refuse, and a robot who will tell a procedurally generated speculative future folktale, using an AI story generator to navigate a corpus of Baltic story materials.

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