

University of Groningen

Digital Drapery and Body Schema-tics

Leberg, Dan

Published in:
PUBLIC Journal: Art Culture Ideas

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2020

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Leberg, D. (2020). Digital Drapery and Body Schema-tics: Collaborative Authorship in Motion Capture Performance. *PUBLIC Journal: Art Culture Ideas*, (60), 237-249.

Copyright

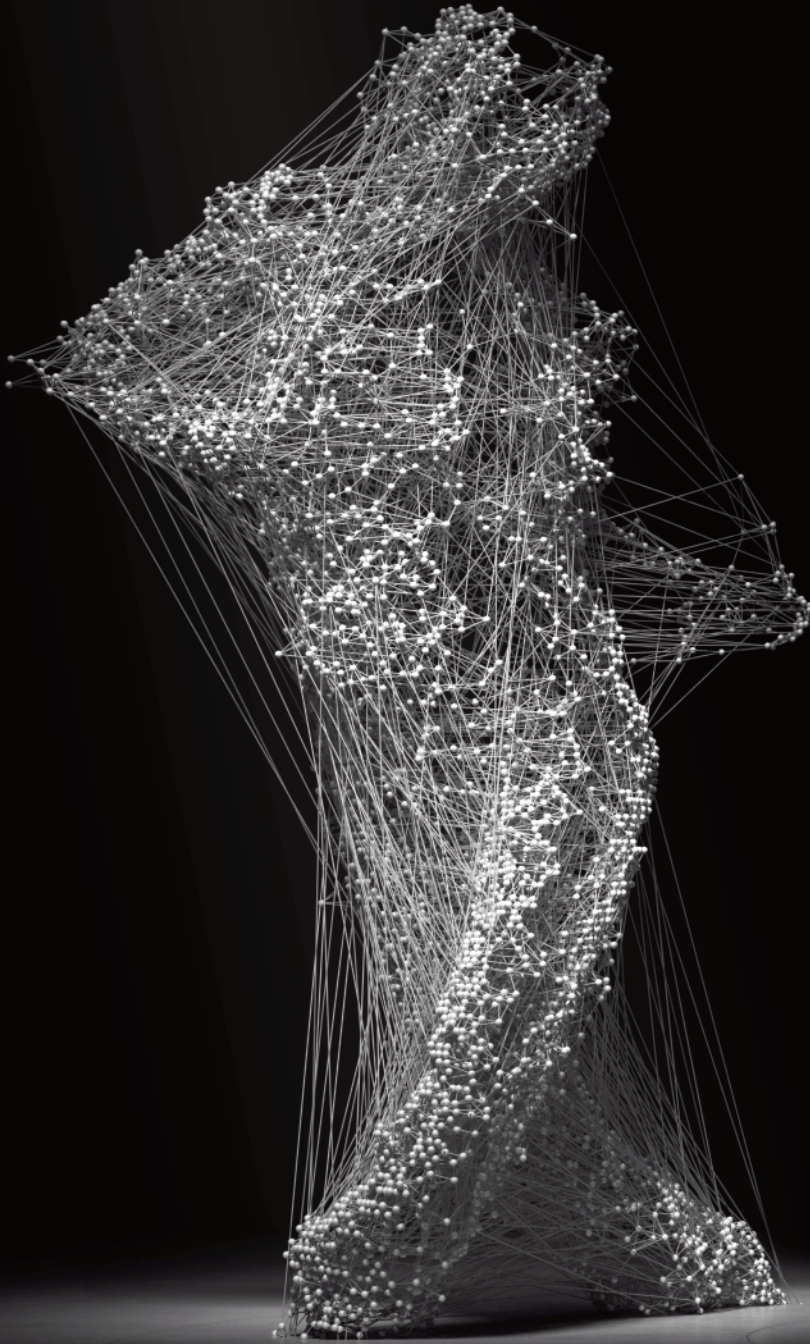
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.



Maria Takeuchi and Frederico Phillips, *as·phyx·i*

DAN LEBERG

DIGITAL DRAPERY AND BODY SCHEMATICS

Collaborative Authorship in Motion Capture Performance

It is somewhat paradoxical that Lev Kuleshov, the Soviet filmmaker and theorist whose best-known work has long stood as a *de facto* proof that film acting is inherently over-determined by the rest of film form, would also show some of the earliest significant interest in what filmed actors can actually communicate.¹ Kuleshov's Metric Web experiments sought to create a film acting regimen² that would maximize the actor's communicative potential. While envisioning a geometric grid emanating from the camera's lens, Kuleshov's actor harmonizes her lines, speed, intensities of motion, and proximity to the camera, with coordinates within that imaginary grid and thereby making all movements legible for the camera.³ Ronald Levaco argues that the acting practices within Kuleshov's Metric Web prioritized clarity of motion over any potential Stanislavskian psychological realism of the character: the goal was to capture geometrically-comprehensible motion on camera on the presumption that clear motions would signify clear narrative intentions and thereby maximize the actor's communicative potential.⁴ Unfortunately, any footage of Kuleshov's Metric Web experiments is lost to time—if they were ever filmed in the first place.⁵

The historical irony of Kuleshov's interest in capturing actorly movements on camera is further compounded by contemporary debates on motion capture ("mocap") performance and CGI animation. It goes without saying that the industrial conditions of early state-funded Soviet filmmaking are fundamentally different to those of the Hollywood blockbuster and its embrace of mocap technology. The underlying question, however, of how a filmed actor should move and perform so as to communicate an intended meaning with maximum clarity to the anticipated spectator, remains. Moreover, the question of what—if anything—is ultimately communicated by the mocap actor has fueled significant critical and industrial debate over mocap's aesthetics, production culture, labour politics, and more.

Despite the ubiquity of motion capture technology explicitly designed to render three-dimensional models of actorly movement in meticulous geometric detail—technology that seemingly enables everything about the actorly motion on screen that Kuleshov aspired to study—there remains little to no consensus among film critics and film practitioners about the nature, functions, and possibilities for acting on screen. Motion capture technology's digital mediation of the actor's performing body has invigorated debates over Hollywood's labour politics,⁶ the industrial challenges faced by (digital) animators,⁷ representational politics, and the ascription of creative agency,⁸ and the very visibility of the mocaptor⁹ within her performance.¹⁰ Motion capture technology further confounds critical issues within Film and Media Studies, such as the ascription of authorship, star

studies and celebrity commodification,¹¹ and the ethical dilemmas of digitally “resurrecting”¹² dead actors for future performances.¹³ Although many of these studies invoke the industrial enthusiasm of mocap’s most prolific practitioners, such as mocaptor Andy Serkis, what is missing in many of these studies is what mocap technology brings to screen acting as a creative production practice. After all, performances by synthespians—the digitally animated characters modelled from mocap performances by flesh-and-blood actors—are often approached with the same expectations of psychological realism as their traditionally human scene partners.

Just as Kuleshov’s *Metric Web* investigated what screen actors express when their actions, emotions, and intentions are recorded, in this article I analyze how the collaboration between mocaptor and CGI animator is mediated by the 3D recording technology’s meticulous mapping of the performing actor’s movements. The emphasis on actor-animator collaboration in mocap performance creation prompts us to rethink the ways in which motion capture suits transform actorly performances into the digital “dancing skeletons”¹⁴ onto which the animator attaches the synthespian’s digital flesh. I will not approach mocapting from the well-trodden spectatorial vantage point that positions synthespians as self-referential digital simulacra¹⁵ skirting the commercially treacherous borders of the uncanny valley.¹⁶ Instead, my intervention is to situate acting techniques and production practices within the critical conversation of motion capture acting. My argument, therefore, proposes alternative metaphors for synthespian’s digital costuming and the nature of the recorded mocap performance to underscore the importance of the actor and animator’s shared roles in designing and creating synthespians.¹⁷

ACTING AND EMBODIMENT

As a practice, motion capture acting relies on the same connections between physical action, emotion, and cognition as many other Western realist acting traditions. The use of motivated physical action to connect the actor to the character’s inner experiences, and thereby immerse the actor within her character’s situational world, has been a cornerstone of realist acting practices from Stanislavsky onwards. This trajectory of physical action as a catalyst for emotional and imaginary stimulation suggests a binary between the actor’s traditionally external resources, like gesture and costuming, and the actor’s traditionally internal resources, such as imagination and emotion. However, to compartmentalize motion to the traditionally external body, and imagination and emotion to the traditionally internal mind, misrepresents the deep connection between cognition and embodiment in the actor’s creative practices.

Contemporary cognitive and phenomenological research on realistic acting has long since abandoned the Cartesian binary of mind and body in favour of studying the actor’s unified bodymind,¹⁸ a deeply interwoven meshwork of perception, attention, and intention that does not distinguish neatly between internal and external stimuli. Daniel Johnston’s phenomenological analysis of Stanislavsky’s acting system insists that realist actors are simultaneously invested in connecting to their character’s lived experience and understanding the greater narrative world in which the character resides.¹⁹ Therefore, as a phenomenological experiment in becoming and being one’s character in that character’s fictional world, the actor must engage all of her bodymind resources to undertake this immersion. The actor’s imagination must be allowed to work through the entirety of her bodymind to provoke the creative immersions in the character’s lived world, wherever and however she finds

them. Physical action is therefore a useful point of creative departure for actors to establish connections with their characters, using whatever traditionally external and traditionally internal discoveries are useful in translating the scripted character into the actor's bodymind.²⁰ Since, as Evan Thompson argues, bodymind action is deeply related to the communication of intentionality,²¹ then the instrumentality of the actor's unified bodymind²² to her acting work can manifest equally through the actor's capacity to imagine with her body and to be emotionally "moved" over the course of a narrative arc. Actors express their character's intentionality through both verbal and non-verbal communication using whatever bodymind resources best realise the intended narrative result.²³

Therefore, in contemporary research and practice, realist acting is better understood as the actor's bodymind communication of the situational intentionality of the actor-as-character.²⁴ By treating traditionally internal and external resources like imagination and physical action as mutually informing bodymind processes, the actor reconfigures her quotidian bodymind to present it as the situational self of the character. The actor thereby reflects the character's intentional state through the way this newly reconfigured situational bodymind moves, acts, speaks, feels, listens, etc. The focus on the communication of intentionality avoids the internal/external binary by enabling the actor to let all of her actions, reactions, experiences, affective states, and imaginations inform each other as a dynamic system.²⁵ Moreover, the actor's immersive work is often strengthened when physical action coincides with—or better yet, is motivated by—an internal perturbation that is in keeping with the character's experience of the dramatic moment at hand.²⁶ In short, actors create by doing, and through this can produce and communicate tremendous amounts of information about their character's intentional state.²⁷

DIGITAL DRAPERY

Theatrical and cinematic costume designers use two primary strategies to fit costumes to their actors: drafting and drapery. When drafting a costume, the designer uses the actor's physical measurements to mathematically ensure that the clothing will fit the actor. Costume drapery, on the other hand, is where the designer wraps a piece of fabric around the actor's physical body and measures, pins, cuts, and generally tinkers with the fabric based on how it fits and moves on the actual performer. Drapery therefore factors the fabric's texture, weight, feel, and capacity for motion into each costume piece's final measurement based on how the actor-as-character will perform while wearing it. The term "Digital Drapery" crucially expands upon existing metaphors for motion capture technology as the actor's "mask,"²⁸ "make-up,"²⁹ or "puppet"³⁰ by accounting for the mocaptor's relationship to whatever humanoid or non-humanoid synthespian may ensue from her collaboration with the animator.

On one hand, it is tempting to position animators as "costume drafters" because of the importance of mathematical calculations in determining a character's appearance. On the other hand, the "drapery" metaphor better encompasses the animator's contribution to the performance collaboration because the dimensions of the real-life mocaptor are not necessarily those of the eventual character. Many of Serkis's synthespian characters, from the sickly Gollum in the Lord of the Rings series (Peter Jackson, 2001-2003) to the gargantuan King Kong (*Kong Kong*, Peter Jackson, 2005), have significantly different body structures, shapes, and sizes to the quotidian human Serkis. Moreover, Serkis's synthespians frequently perform physical actions that are beyond Serkis's human capacity to do safely on set, such as Gollum's face-first downward rock-climbing. Nevertheless, since Gollum's animated

body is still modelled on Serkis's digitized skeleton, the WETA animators had to wrap Gollum's digital flesh around Serkis' digital skeleton in a manner that was informed by Serkis's physical vocabulary *and* would fit the requirements of the scene at hand. By draping Gollum on to Serkis's digital skeleton, rather than mathematically trimming Gollum to fit Serkis's lived body, the WETA animators become post-production collaborators with the mocaptors in the creation of the synthespian's performance.

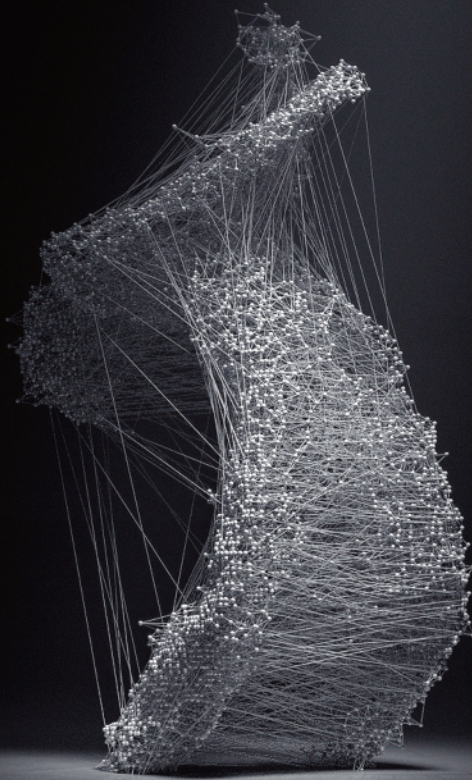
Digital drapery productively connects the actor- animator collaboration to the aspects of the actor's performing body that mocap technology actually records: the actor's capacity for movement when she imagines her body to be that of her often fantastical synthespian character. Digital drapery is therefore the negotiation of the actor's recorded digital skeleton with the character that is wrapped around it based on the possibilities for the synthespian's movements and performance, rather than a slavish adherence to the actor's performance or the animator's complete over-determination of the actor. Ultimately, this metaphor calls attention to the collaboration between actors and animators in order to better analyze motion capture acting and synthespian creation as a creative and technological practice.

As such, this line of investigation connects the actor's use of memory, imagination, and action with the modern neuroscientific distinction between body image and body schema. This distinction builds upon cognitive research on theatrical acting in a way that alleviates the problematic binary of the mocaptor's indexical or iconic presence within her synthespian character.

BODY IMAGES AND BODY SCHEMA-TICS

A great deal of scholarship on motion capture acting and synthespians is preoccupied with the degree of indexicality or iconicity of the actor's performance that is encoded by the motion capture technology. For example, Barry King argues that mocaptor performances leave, at best, a vague iconic relic of the mocaptor because of the "impersonality" of the recorded motions and the lack of definitive traces of the mocaptor's performance.³¹ Tanine Allison, on the other hand, suggests that motion capture's "digital indexicality"³² indicates that a mocaptor has performed, whether or not the final synthespian in any way resembles the shape of the mocaptor's body. Synthespians like Serkis's Kong are a form of "indexical animation" in which Serkis's acting work informs but does not solely determine Serkis-as-Kong's performance.³³ Sharon Carnicke's praxis experiments with mocap technology seems to second King's argument in that Carnicke's team was deeply surprised by the high level of personal recognition when watching their "dancing skeletons" after filming.³⁴ On the other hand, Carnicke's production-driven analysis suggests that the raw motion capture data also carries an indexical sign of the mocaptor, and the visibility of that indexical trace depends largely on how and what the animators drape upon that digital skeleton during post-production.

Insightful and articulate as these arguments are, the indexicality/iconicity debate in motion capture acting is predicated on the idea that the actor must be qualified as the primary—or even singular—author of the synthespian's performance. It is also important to note that this semiotic conception of solo authorship is configured within a spectatorial critical perspective. Synthespian performances, like those of flesh-and-blood actors, are often positioned as completed texts to be analyzed, as opposed to being studied as a collaborative process through which the mocaptor and animators—to say nothing of the director—produce the performance. As an alternative take on the visibility of the individual actor, I suggest an alternative framework that predisposes whatever of the



as · phyx · i · a

The project as · phyx · i · a is a collaborative effort and experimental film created by Maria Takeuchi with Frederico Phillips and performed by Shiho Tanaka. The project is an effort to explore new ways to use and/or combine technologies and different fields in an experiment without many of the common commercial limitations. The performance is centered in an eloquent choreography that stresses the desire to be expressive without bounds.

Motion data was captured using inexpensive sensors and that data paved the way through an extensive number of steps. Once all the scanned point cloud data was combined, that was then used as the base for the creative development on the piece. A series of iterative studies on styles followed and several techniques and dynamic simulations were then applied using a number 3D tools for various results.

An environment was also built to integrate the character and allow for a more visually photo-real representation of the scenes. Maria Takeuchi was responsible for co-directing the project and created an original sound track which guided the narrative. The track was created using various digital and analog techniques. Frederico Phillips created the visuals, from pre-visualization to final rendering. Samuel Blalark assisted the project in several areas with key feedback and on location support such as filming for behind the scenes.

Credits:

Visuals and Direction : Frederico Phillips

Music and Direction : Maria Takeuchi

Performance Artist : Shiho Tanaka

Camera Filming / Support : Samuel Blalark

Camera equipment : Jason Guerrero

actor is encoded to be the raw materials for collaboration with the animators while also grounding the analysis in the mocaptor's body. Rather than debating indexicality versus iconicity, I suggest that cognitive neuroscience's distinction between body image and body schema provides a more productive framework for assessing the visibility of the mocaptor within synthespian creation. Rephrasing the indexicality/iconicity debate in terms of body image and body schema emphasizes the collaborative thinking-together necessary to create synthespian performances by accounting for the intentionality within the performance, which is encoded for future collaborations.

Contemporary cognitive neuroscientists distinguish body image from body schema in terms of self-conceptions of appearance and motion. Rick Kemp's neuroscientific model of actorly character identification builds upon Shaun Gallagher and Andrew Meltzoff's distinction between body image—the mental self-representation of one's physical appearance and affective state—and body schema, which refers to the self-understanding of one's capacity for physical movement.³⁵ Frederique de Vignemont describes the body schema as an action-oriented “cluster of sensorimotor representations,”³⁶ which includes both intentionally-motivated actions and all accompanying incremental movements in support of intention-laden actions.³⁷ Body image therefore presents the mind with a relatively stable self-image as opposed to body schema's focus on the self-perception of its range of possible actions.

Kemp argues that actors create by doing, and as such the creative interaction between body image and body schema immerses the actor in the character's lived experience.³⁸ Once the actor absorbs the situational character's appearance and physicality into her bodymind through creative research and experimentation,³⁹ she reorganizes her quotidian self as the character's situational self.⁴⁰ The interdependence of body image and body schema for the performance of a situational self is the same for traditional screen acting as with mocapting. Mocaptors are often shown conceptual sketches and digital mock-ups of what their synthespian will look like. These sketches give the actor a sense of the character's body image and an opportunity to glean insights into the character's potential body schema. Serkis reports that, during motion capture sessions for the *Planet of the Apes* films (2011–2017) and videogame (2017), the mocaptors were able to watch rough digital mock-ups of their synthespians move in real time based on the mocaptor's actions.⁴¹ This iterative loop of mocaptor action and simplified synthespian results give mocaptors an immediate experience of how their digital body image responds to the mocaptor-as-character's situational body schema, thereby creating an iterative loop of on-set/post-production collaborations. Even if not yet fitted in full detail, the preliminary digital drapery of the simplified synthespian gives the mocaptor an imagination-inspiring glimpse towards the final animated result, which can productively inform the actor-as-character's body schema.

Moreover, the digital mock-up draped across the mocaptor's body on-set supports the longstanding actorly tradition of using key props and costume pieces in rehearsal. Laurence Olivier, for example, frequently experimented with using physical objects, from costume pieces to potential props, to see how they prompted external actions while connecting to his characters.⁴² Olivier wore back and shoulder padding for his acclaimed performance in *Richard III* (1955). More recently, and contemporaneous to Serkis's mocap work as Gollum, Viggo Mortensen wore a sword on his belt for months and learned to ride horses to refine his physical vocabulary for the *Lord of the Rings* films.⁴³ Therefore, regardless of how traditional, classical, or fantastical the role at hand, actors frequently

look to traditional acting practices to mutually inform their eventual character's body image and body schema. As such, I suggest that this experimentation of situational body images and body schemas is contained within Serkis's assertion that motion capture acting's engagement with the character's appearance and physicality is fundamentally similar to that of traditional screen acting.⁴⁴

The need to connect the character's inner life to her physical performance is particularly important for Serkis's roles because of the anthropomorphic impulse in his non-human performances towards realist psychological plausibility. Serkis insists that his most prolific motion capture performances—Gollum in *Lord of the Rings* and Caesar in *Planet of the Apes*—depended on Serkis's ability to express the “humanity”⁴⁵ of his non-human characters through mostly traditional screen acting practices. Serkis insists that motion capture acting is still, at its core, the enactment of the actor-as-character's intention-laden bodymind, and that mocaptors prepare for their performances in much the same way as do other screen actors. The mocaptor audition and rehearsal process for the *Planet of the Apes: Last Frontier* videogame (2017), for example, included a mandatory “ape camp” in which the mocaptors studied ape behaviour and learned to channel their characters' intentionality through the observed simian physical vocabulary.⁴⁶ During this training, the mocaptors wore physical prosthetics to support the ape's physical vocabulary, such as forearm extensions to better simulate running on four legs. The mocaptors had to immerse themselves within the apes' physical vocabulary, from posture and gait to facial minutia,⁴⁷ to not only realign their bodyminds as their characters but to do so in a way that the motion capture recordings would encode as “ape” for the animators. All of the observational studies, movement training, and prosthetics aimed to ground the actor-as-character's intentionality in the anticipated synthespian's body. This creative process does not so much prioritize a purely exterior performance as it does to allow the actor to draw physical cues into the actor-as-character's bodymind to better enworld the synthespian within the drama at hand.⁴⁸

The communicative potential of the actor's interconnected, intention-laden bodymind is on display throughout the *Lord of the Rings* films. Although Serkis was originally hired only for Gollum's voice, director Jackson soon discovered that Serkis was best able to produce that voice when he simultaneously moved as Gollum as well.⁴⁹ Some scholars have argued that motion capture acting represents an overwhelming challenge to realist acting because of its capacity to “fragment”⁵⁰ the actor's body and dissolve whatever remains of the screen actor's authorial claim of her performance. I suggest, however, that just because motion capture technology offers the ability to overdetermine an actor's contribution to a synthespian performance, one should not presume that mocaptors are devoid of all creative agency. Screen actors have long since learned to overcompensate for the often-less-than-ideal production circumstances dictated by on-set logistics and budget constraints, from long waits between takes to shooting a film out of narrative sequence.⁵¹ Mocap technology has not replaced the need for flesh-and-blood actors. Instead, as Cynthia Baron argues, it has prompted a new set of formal constraints and affordance within which to perform one's craft.⁵² Mocap literally encodes the physical manifestations of the mocaptor's bodymind intentionality for future use by animators, which begs the question of what aspects of the performing mocaptor become part of the digital dancing skeleton.

From an actorly and production standpoint, the mocaptor's prosthetics and on-set digital mock-up does not, as Stahl and others have suggested, inherently separate the performing actor from her performing body⁵³ at the detriment to the actor. Instead, as Allison rightly suggests, in production

and reception contexts alike the on-set digital mock-up and accompanying prosthetics “translate” the mocaptor’s performance for the CG animators, literally transforming the actor-as-character’s body schema into a bodily schematic blueprint for the synthespian’s eventual body. The mocaptor’s intensive physical training and use of on-set mock-up resources immerses the mocaptor in the eventual-synthespian’s body image and body schema, aided in no small part by the animators’ preliminary draping of digital fabric around the recorded performance. Although Carnicke’s term “dancing skeleton” is productively evocative of the raw digital recording of the mocaptor’s performance, I suggest that the rival term, “body schema-tic,” better accounts for the recorded capacity for motion while also highlighting its anticipated post-production usage as the blueprint for a synthespian performance. Body schema-tic allows the raw blueprint-like mocap data to retain a connection to the mocaptor’s capacity for motion while anticipating the data’s post-production collaboration with the animators.

In summary, the iconicity and indexicality of the mocaptor’s visibility are, as King, Allison, and others demonstrate, valuable frames of reference for spectatorial analyses of the cultural semiotics and labour politics of the synthespian’s performance. From a production standpoint, however, body image and body schema may prove to be productive terms when assessing the mocaptor’s contribution to the final performance. On one hand, synthespians like Serkis-as-Gollum or Serkis-as-Caesar are iconic of the animator’s digital drapery over the recorded actor’s body schema-tic; on the other hand, the synthespian is indexical of the collaboration between mocaptor and animator, as it is mediated through the motion capture technology. The emphasis here is on “contribution” rather than “result” since the CG animator is as much a creative agent in synthespian performance as the mocaptor.

COLLECTIVE AUTHORSHIP: ACTOR/ANIMATOR COLLABORATIONS

As the digital draper of the synthespian’s virtual flesh, the animator’s collaboration in the synthespian’s performance marks a significant challenge to traditional notions of artistic authorship. A great deal of the scholarship on motion capture acting is preoccupied with the idea that the actor is the primary author of her performance. The actor as a discreet creative agent, for example, is a core presumption of Matt Stahl’s astute historical analysis of “virtual labor,” the dissociation of actors from the performing body onscreen when actors can be conveniently and cost-effectively replaced by animated simulacra who are owned by their producers.⁵⁴ By “separating motion from the actor’s body,”⁵⁵ producers are capable of producing indefinite numbers of actorly performances while simultaneously displacing the actor as a creative and pay-worthy individual. Moreover, Burston’s influential study of the ever-increasing use of synthespians in Hollywood filmmaking argues, among other things, that motion capture technology devalues star and non-star performances alike: if established popular actors can be indefinitely recoded and resurrected to perform without ever appearing on set, and an animator’s algorithm can instantly generate vast groups of extras who do not need to be cast, hired, costumed, fed, or paid, synthespians potentially undermine the very notion of hiring an actor at all.⁵⁶

I do not wish to marginalize the cultural critique of economic structures in mainstream media industries, or to presume that a film producer’s capitalistic project will always prioritize creative experimentation and egalitarian labour relations. Stahl, for example, rightly asserts that the politics of intellectual property, copyrighting, and credit for creative contribution in film production is a result of internal legal struggles within the film industry that significantly disfavour a production’s “technical”

staff, a category into which mocap's many digital labourers could fall.⁵⁷ What I wish to draw attention to instead is the *de facto* presumption that actors—and, by extension, mocaptors—are inherently misrepresented, overdetermined, and wronged as creative agents because of the greater technological and industrial practices that mediate their performances. In traditional screen acting, the Kuleshov effect can produce a performance in the editing room that never took place on set, but this advance in montage theory has not prevented actors from becoming skilled and necessary creative agents in film production. The constraints and affordances of media-making technology do not inherently stop any actor from acting on screen. Studies of motion capture acting should not, therefore, presume that mocap is the herald of the screen actor's creative erasure. Instead, the collective effort required to produce a compelling synthespian performance suggests that research on mocap should abandon old notions of individual genius in favour of contemporary models of collective film authorship.

Rather than dismiss the notion of authorial agency altogether on the grounds that, as Michel Foucault argues, the multiplicity of voices within a text obscure the clear identification of a single author,⁵⁸ Colin McCabe argues that film production is an inherently collaborative process and must be analyzed as such.⁵⁹ The necessary plurality of personal contributions within film production positions a film's director, cast, and crew as integrated creative workers who rely on each other's professional skills to produce a media text that somehow corresponds to a collective conception of what that media text should be. By working towards an anticipated, unrealized, and shared production goal, unified by expectations for the as-yet-unseen final result, a film's collective authors double as the film's first audience⁶⁰ since they must watch an imagined final film to make their required contribution to the production. The flexibility of McCabe's broad conception of collective cinematic authorship allows for post-production animators to be rightly included among the skilled creative professionals who contribute to the synthespian's performance, guided and influenced by the mocaptor's body schema-tic.

In this regard, McCabe's ideas about collective authorship are consistent with John Caldwell's Production Studies' approach to modern audiovisual media. Production Studies focuses on the complicated interpersonal, legal, technological, and industrial relationships through which films are made, rather than a semiotic analysis of what the finished film represents. Caldwell argues persuasively that the sweeping industrial shift towards digital filmmaking breaks easy boundaries between film production and post-production job descriptions. The ensuing conflicts from this shift to primarily digital filmmaking often manifest as a conflict over individual authorial agency because of heightened levels of necessary interdepartmental collaboration.⁶¹ Whereas DPs⁶² once controlled the look of a shot on set, and CGI effects designers and other digital media specialists would embellish upon these recorded shots afterwards, the plethora of available digital adjustments to recorded material prompts all of these parties to collaborate—and not always harmoniously—from shooting days until the final mastered version is complete.⁶³

This diffusion of creative agency across many filmmaking specialists on the level of shot composition easily parallels the necessary collaboration between mocap actors and CGI animators when creating compelling synthespians. Whereas Caldwell frequently frames these collaborations as sites of likely conflict, which must be diffused before they derail film production altogether, the personal and professional politics of the actor-animator collaboration remain relatively uncharted from a Production Studies perspective. A key difference between the creative tensions between DPs

and digital effects producers, and those of mocap actors and animators, might be the presumption of autonomous authority.

Like cinematography and computer graphic design, screen acting and animation existed as distinct professional fields before the transition to predominately digital filmmaking. Whereas for Caldwell, DPs and digital effects producers vie for their former levels of control, mocap actors and animators have no choice but to rely on each other since mocap simply requires input from both sets of creative partners. Mocap without actors is just computer animation; mocap without animators is just acting. The hybrid nature of character creation in mocap inherently disposes its core practitioners to pool their creative expertise towards a common goal. The extensive actor-animator collaborations that went into producing Serkis-as-Gollum, from the meticulous digital rendering of Serkis's facial muscles⁶⁴ to the animators' reliance on the non-mocap daily footage of Serkis performing scenes alongside his co-stars,⁶⁵ speak to mocap's inherently co-creative nature.

It is important to remember, however, that the collaboration between mocaptors and animators does not necessarily require the mocaptor and animator to work side-by-side and simultaneously while creating the synthespian. Mocaptors are ostensibly finished with a role's performance once the last take has been recorded. The collaboration through which the animator drapes the synthespian's digital flesh over the mocaptor's body schema-tic is therefore mediated by mocap technology *and* enacted through a sufficiently common imaginary vision for how the synthespian should perform.

Studies of group cognition in team-based problem-solving (TBPS) are well-equipped to account for motion capture filmmaking's on-set/post-production collaborations and collective authorship because of how film production is organized around the realisation of an agreed-upon but unspecified end result. Woei Hung argues that complex TBPS requires an agreed-upon division of labour and common vision across specialized team members to produce meaningful results when the details of the collaboration's end goals are open-ended.⁶⁶ Many aspects of film production could easily qualify as complex problems with many possible solutions that will each require the coordinated efforts of specialized team members. For example, the production team of a film can decide which scene to film on a given day of the shoot, and agree upon the portion of the screenplay that will constitute that scene, but the exact details of how the scene will be staged, shot, performed, edited, etc., are likely the result of the collaborative efforts of everyone on set. Regardless of the team member's professional specialization and relative place in the film's decision-making hierarchy, the team's ability to think along with each other towards realizing their agreed-upon common goal is what makes the end result more than the aggregate of its parts.⁶⁷ To extend Hung's cognitive model of TBPS to mocaptor-animator collaborations, the synthespian is created through a common vision, shared by specialized professionals through the motion capture technology, and informed by all of their individual expertise. If, as Caldwell argues, media-making technologies enable their operators to "think together" during film production,⁶⁸ then mocap technology's facilitation of actor-animator collaboration is a means of co-creating the synthespian's eventual performance by collectively playing with the possibilities for the character's body image and body schema. The production of the intentionality-laden body schema-tic, and the body schema-tic's eventual drapery as the synthespian, require highly specialized media professionals to think together through their work, collectively authoring the synthespian performance.

CONCLUSION

In this article, I have aspired to generate interest in combining cognition, critical theory, and ethnographic case studies in the hopes that the study of mocap film production can escape the purely spectatorial frameworks that focus on actorly agency, the iconicity and indexicality of the mocaptor within the synthespian, and the individualistic conception of authorship. By reframing motion capture acting and animation from a Production Studies and cognitive perspective, mocaptors and synthespians can be analyzed as more than obedient commercial by-products of late capitalism. The concepts of digital drapery and body schema-tic help to move the critical conversation to include the forces of creative production behind the synthespian's creation. Although Hung's model of collective cognition in TBPS provides useful context to the mocaptor and animator's creative collaboration, an ethnographic application of this model is necessary to analyze the thinking-together required to produce a specific synthespian performance.

While rarely addressing mocap production explicitly, a great deal of contemporary Television Studies research on screen acting is embracing interview-based approaches to analyzing what and how actors do what they do within the constraints and affordances of the television production industry.⁶⁹ This new research trajectory shows great promise for creating and sustaining a conversation about actors in terms of the actor's explicit use of on-set production resources in her performance, her character embodiment, and her creative labour practices on the whole. There is no reason why this methodology could not also extend to mocaptors and CGI animators so that their experiences with mocap production can better inform its analysis. Production histories, press and promotional materials for motion capture films, and critical commentary can all provide valuable precedents and contexts for this kind of creative labour, which can be greatly enriched by studying contemporary creative practices as examples of situated expertise. Critical metaphors like "digital drapery" and "body schema-tics" could provide useful frameworks through which to discuss what mocaptors and animators have to say about their work because they accommodate the creative, technological, logistical, and indeed personal dimensions of synthespian production.

As a final thought, Cynthia Baron's analysis of acting in digital cinema rightly points out that Western realist acting has never been technologically neutral,⁷⁰ from the *korthurni* and masks in classical Greek tragic theatre to the microphones of early twentieth century radio plays. Mocap, like these other technological interventions, presents the study of acting with a new challenge: the screen actor's work must accommodate not only framing and editing but an explicit attempt to digitally re-costume the entire actor's body after filming is complete. As prolific mocaptors like Serkis are quick to point out, however, mocap does not obscure acting nearly as much as it provides new opportunities for creative professionals to develop and explore a highly physical screen-specific performance style. Although this style is currently associated most closely with blockbuster filmmaking and big-budget videogame production, only time will tell what independent and experimental filmmakers will do with mocap acting and animation as the technology becomes more commonplace and less financially prohibitive.

NOTES

- 1 The Kuleshov Effect demonstrates that spectators will draw meanings about a character's disposition and intentions across edits without any significant action from the performer. For example, shots of a man's face with a neutral expression come to suggest hunger when intercut with images of food, whereas the same shots of the same man will connote grief when intercut with a coffin or lust when intercut with an attractive woman. This principle has long demonstrated that it is the filmmaker and editor—and not the actor—who create cinematic performances.

- 2 Lev Kuleshov, "Art of the Cinema (1929)," in *Kuleshov on Film: Writings of Lev Kuleshov*, ed. Ronald Levaco (Los Angeles, USA: University of California Press, 1974), 41-123.
- 3 *Ibid.*, 110-115.
- 4 Ronald Levaco, "Introduction," in *Kuleshov on Film: Writings of Lev Kuleshov*, ed. Ronald Levaco (Los Angeles, USA: University of California Press, 1974), 9-11.
- 5 Lev Kuleshov, "Our First Experiences (1934)," in *Kuleshov on Film: Writings of Lev Kuleshov*, ed. Ronald Levaco (Los Angeles, USA: University of California Press, 1974), 166-168.
- 6 Matt Stahl, "The Synthespian's Animated Prehistory: The Monkees, The Archies, Don Kirshner, and the Politics of 'Virtual Labor,'" *Television and New Media* 12.1 (2011): 3-22.
- 7 Yacov Freedman, "Is It Real... or Is it Motion Capture? The Battle to Redefine Animation in the Age of Digital Performance," *The Velvet Light Trap* 69 (2012): 38-49.
- 8 Barry King, "Articulating Digital Stardom," *Celebrity Studies* 2.3 (2011): 247-262; Jonathan Burston, "Synthespians Among Us: Rethinking the Actor in Media Work and Media Theory," in *Media and Cultural Theory*, eds. James Curran and David Morley (London, UK: Routledge, 2006), 251-262.
- 9 "Mocaptor" refers to the flesh-and-blood actor who performs while wearing a motion capture suit as part of creating a synthespian performance.
- 10 King, 254; Nicholas Bestor, "The Technologically Determined Decade: Robert Zemeckis, Andy Serkis, and the Promotion of Performance Capture," *Animation* 11.2 (2016): 169-188.
- 11 King, 249.
- 12 Bestor, 170.
- 13 Jason Sperb, "I'll (Always) Be Back: Virtual Performance and Post-Human Labor in the Age of Digital Cinema," *Culture, Theory and Critique* 53.3 (2012): 383-397; Lisa Bode, "No Longer Themselves? Framing Digitally Enabled Posthumous 'Performance,'" *Cinema Journal* 49.4: (2010): 46-70.
- 14 Sharon Marie Carnicke, "Emotional Expressivity in Motion Picture Capture Technology," in *Acting and Performance in Moving Image Culture*, eds. Jörg Sternagel, Deborah Levitt, and Dieter Mersch (Bielefeld, Germany: transcript Verlag, 2012), 321-337.
- 15 Judith Roof, "The Actor Who Wasn't There: Economies of Absence in Virtual Ecologies," *University of Toronto Quarterly* 83.3 (2014): 625-644; Sperb, 385-386.
- 16 Bestor, 175-176.
- 17 Burston, 254.
- 18 Rhonda Blair, *The Actor, Image, and Action: Acting and Cognitive Neuroscience* (London and New York, 2008), xii.
- 19 Daniel Johnston, "Stanislavskian Acting as Phenomenology in Practice," *Journal of Dramatic Theory and Criticism* 26.1 (2011): 69.
- 20 Rick Kemp, *Embodied Acting: What Neuroscience Tells Us about Performance* (London and New York: Routledge, 2012), 21.
- 21 Evan Thompson, *Mind in Life: Phenomenology, and the Sciences of the Mind* (Cambridge, Harvard University Press, 2007), 24-26.
- 22 John Lutterbie, *Toward a General Theory of Acting: Cognitive Science and Performance* (New York: Palgrave Macmillan, 2011), 22.
- 23 Kemp, 21.
- 24 Dan Leberg, "The Moving Parts: Screen Acting and Empathy" (PhD diss, University of Amsterdam, 2018), 34.
- 25 Lutterbie, 25; Dynamic Systems Theory (DST) proposes that the boundary rules, which govern a system's operation, can change in response to events that occur within that system, thus enabling an iterative loop of actions and corresponding adaptations. Cognitive theatre scholar John Lutterbie invoked DST to demonstrate how an actor's creative experimentation with a character can produce unexpected yet valuable information about the character, and that this information can significantly alter the actor's pursuit of future understanding about her character.
- 27 Kemp, 112.
- 28 Kemp, 132.
- 29 King, 251.
- 30 Brian Hiatt, "How Andy Serkis Became the King of Post-Human Acting," *Rolling Stone*, July 14, 2014, <https://www.rollingstone.com/movies/movie-news/how-andy-serkis-became-the-king-of-post-human-acting-98190/>.
- 31 Sean Aita, "Dance of the Übermarionettes: Toward a Contemporary Screen Actor Training," in *Theorizing Film Acting*, ed. Aaron Taylor (New York: Routledge, 2012), 256-270.
- 32 King, 256-257.
- 33 Tanine Allison, "More than a Man in a Monkey Suit: Andy Serkis, Motion Capture, and Digital Realism," *Quarterly Review of Film and Video* 28.4 (2011): 328.

- 34 Allison, 328.
- 35 Carnicke, 330.
- 36 Kemp, 136.
- 37 Frederique de Vignemont, "Body Schema and Body Image—Pros and Cons," *Neuropsychologica* 48.3 (2010): 679.
- 38 If, for example, I desire to drink from the full-to-the-brim cup of steaming coffee on my desk, my intentional action of lifting the precarious cup to my face will be on my body schema's hand-eye coordination to ensure that I do not spill the coffee and burn myself. The involuntary accompanying physical actions, as I perhaps clench my upper body, hold my breath, and limit my shoulder movements, are coordinated with my intentional actions through my body schema.
- 39 Kemp, 136-138.
- 40 Kemp, 137.
- 41 John Gaudiosi, "Digital Actors Will Never Replace Humans, Says Andy Serkis (And He Would Know)," *Digital Trends*, September 7, 2017, <https://www.digitaltrends.com/movies/andy-serkis-performance-capture-interview/>.
- 42 Julie Levinson, "The Auteur Renaissance, 1968-1980," in *Acting*, eds. Claudia Springer and Julie Levinson (London and New York: I. B. Tauris, 2015), 97.
- 43 Paul Young, "The Other Side of Viggo Mortensen," *Variety Magazine*, October 2003, 46.
- 44 Gaudiosi, September 7, 2017
- 45 Ryan Lambie, "Andy Serkis Interview: War For The Planet Of The Apes" Den of Geek, 2017, <https://www.denofgeek.com/uk/movies/andy-serkis/50478/andy-serkis-interview-war-for-the-planet-of-the-apes>; Gaudiosi, September 7, 2017.
- 46 Gaudiosi, September 7, 2017.
- 47 Allison, 329.
- 48 Nina Bandelj, "How Method Actors Create Character Roles," *Sociological Forum* 18.3 (2003): 402.
- 49 Cynthia Baron, "The Modern Entertainment Complex," in *Acting*, eds. Claudia Springer and Julie Levinson (London and New York, I. B. Tauris, 2015), 159.
- 50 Bestor, 175.
- 51 Leberg, 121-126.
- 52 Baron, 144-145.
- 53 Stahl, "Synthespian's Animated Prehistory," 6.
- 54 Stahl, "Synthespian's Animated Prehistory," 4.
- 55 Stahl, "Synthespian's Animated Prehistory," 6; Bestor, 174.
- 56 Burston, 254-255.
- 57 Matt Stahl, "Privilege and Distinction in Production Worlds," in *Production Culture*, eds. Vicki Mayer, Miranda J. Banks, and John T. Caldwell (New York and London: Routledge, 2009), 54-67.
- 58 Michel Foucault, "What is an author? [Extract]," in *Theories of Authorship*, ed. John Caughie (London and New York: Routledge, 1981), 288.
- 59 Colin MacCabe, "The Revenge of the Author," in *Film and Authorship*, ed. Virginia Wright Wexman (New Brunswick, NJ: Rutgers University Press, 2003), 36.
- 60 MacCabe, 36.
- 61 John Thorton Caldwell, "Trade Machines and Manufactured Identities," in *Production Culture* (Durham and London: Duke University Press, 2008), 181.
- 62 "Directors of Photography," also known as cinematographers.
- 63 Caldwell, "Trade Machines," 180-182.
- 64 Andy Serkis, *Gollum: How We Made Movie Magic* (London: Harper Collins, 2003), 37.
- 65 Baron, 159.
- 66 Woei Hung, "Team-Based Complex Problem Solving: A Collective Cognition Perspective," *Educational Technology Research and Development* 61.3 (2013): 365-384.
- 67 Hung, 366.
- 68 Caldwell, "Trade Machines," 150-152.
- 69 For details, see: Lucy Fife Donaldson and James Walters, "Inter(Acting): Television, Performance and Synthesis," *Critical Studies in Television* 13.3 (2018): 352-369; Gary Cassidy and Simone Knox, "Phil Davis: The Process of Acting," *Critical Studies in Television* 13.3 (2018): 315-332; Tom Cantrell and Christopher Hogg, "Returning to an Old Question: What Do Television Actors Do When They Act?," *Critical Studies in Television* 11.3 (2016): 283-298; Richard Hewett, "The Changing Determinants of UK Television Acting," *Critical Studies in Television* 10.1 (2015): 73-90.
- 70 Baron, 143-144.