

Rehearsing Upload*

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I enter the rehearsal studio of the new opera Upload by Michel van der Aa at the Dutch National Opera in February 2021. Lights are low. Projectors hum. The set consists of seven giant screens. Two singers stand on the stage: the baritone Roderick Williams gazes into a motion tracking camera while the soprano Julia Bullock watches his oversized avatar, brightly projected on the screens. Van der Aa faces a multiple-screen setup, focusing on how to transform Williams's body into a virtual gestalt. The stage projections show the avatar's face repeatedly disintegrating into thousands of particles, every time with different granular structures and contrasts. After some discussion, van der Aa walks back to his desk and announces that he would like to run through the scene again. The stage manager queues the projections, the stage lights, and the click track. Bullock starts singing, addressing the screens.¹

In this ethnographic vignette, all eyes are on the avatar. Humans and non-human matter center around the virtual protagonist as *Upload* stages a posthuman. The narrative tells a typical science-fiction tale, dealing with uploading the human mind to a server, developing into an avatar, and losing the physical body in the process. In the opera's plot, the figure of the avatar is founded on the withdrawal of a foundation in the form of a con-

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1 Excerpt of my fieldnote journal formulated after a day at the rehearsal studio.

genital body.² A “father” (Williams) uploads himself at a futurist laboratory and continues to exist as a virtual being: he thinks without having access to the tactility of a lived experience. Surprising his “daughter” (Bullock) with this transformation, a paternal dispute begins which questions life without a congenital body. In multiple ways, *Upload* is reminiscent of the fiction presented in Hans Moravec’s *Mind Children* (1988) as well as Tod Machover’s and Robert Pinsky’s robot opera *Death and the Powers* (2010) developed at the MIT Media Lab.³ *Upload*, too, explores state-of-the-art technology on stage.⁴ Composer, librettist, and director van der Aa conceptualized this posthuman opera for two voices, a chamber ensemble of eleven players, an electronic soundtrack, film, and motion capture. The story is driven by films projected on gigantic screens, stage action, and the singing avatar of the father, rendered in real time. To portray him as a virtual body, the opera recalibrates canonical operatic practices.

This article examines the process of rehearsing a posthuman opera from the perspective of a self-reflective ethnography. Proposing a rehearsal-oriented ontology of opera, I avoid discussions of the performance and even

2 See Bernhard Siegert, *Passage des Digitalen: Zeichenpraktiken der neuzeitlichen Wissenschaften 1500–1900* (Berlin: Brinkmann & Bose, 2003), 17.

3 In Machover’s opera, a man uploads his mind to gain eternal life and is confronted by the women of the family who question a life without a body. The divide between the “female-body versus male-brain” remains similar in *Upload*. Promoting problematic gender dynamics, the daughter argues: “I believe in my body more than in my soul,” while the father claims: “The world isn’t reduced to the surface of my skin ... I can still think my own thoughts.” The rational of the Vitruvian man is contrasted with the impulsive, subordinated woman. Beyond the father-daughter hierarchy, binary gendered dynamics pervade the entire story line. One example off the main story being that *Upload* tells side plots of other men who are uploaded to save their scientific knowledge while the respective women turn into avatars to spend more time with their children. For more on the gender divide in Machover’s opera, see David Trippett, “Digital Voices: Posthumanism and the Generation of Empathy,” in *The Cambridge Companion to Music in Digital Culture*, ed. Nicholas Cook, Monique M. Ingalls, and David Trippett (Cambridge: Cambridge University Press, 2019), 244–48. For parallels in futuristic narratives about mind uploading, see Hans Moravec, *Mind Children: The Future of Robot and Human Intelligence* (Cambridge, MA: Harvard University Press, 1988).

4 The robotic opera *Death and the Powers* was developed at the MIT as a research project within the *Opera of the Future* Media Lab Group. As such, it circumvented canonical production practices. For more see Peter Torpey, “Media Scores: A Framework for Composing the Modern-Day Gesamtkunstwerk” (PhD diss., Massachusetts Institute of Technology, 2013), <https://dspace.mit.edu/handle/1721.1/91887>, and Benjamin Bloomberg, “Making Musical Magic Live: Inventing Modern Production Technology for Human-Centric Music Performance” (PhD diss., Massachusetts Institute of Technology, 2020), <https://dspace.mit.edu/handle/1721.1/129893>.

the music itself. Whereas ethnographic investigations of the performing arts have greatly added to other disciplines such as performance, theater studies, and anthropology in the last decades, I strive to make the case for including the rehearsal more substantially in discussions that bridge contemporary opera and media studies.⁵ Tying into transdisciplinary dis-

5 For more literature on rehearsal processes from anthropologists, sociologists, and theater scholars, see amongst others Susan Letzler Cole, *Directors in Rehearsal: A Hidden World* (New York: Routledge, 1992); Paul Atkinson, "Performance and Rehearsal: The Ethnographer at the Opera," in *Qualitative Research Practice*, ed. Clive Seale et al. (London: Sage, 2004), 94–106; Atkinson, *Everyday Arias: An Operatic Ethnography* (Lanham: AltaMira Press, 2006); Josette Féral, "Introduction: Towards a Genetic Study of Performance—Take 2," *Theatre Research International* 33, no. 3 (2008): 223–33; Jens Roselt, *Phänomenologie des Theaters* (Paderborn: Wilhelm Fink Verlag, 2008); Jen Harvie and Andy Lavender, *Making Contemporary Theatre: International Rehearsal Processes* (Manchester: Manchester University Press, 2010); Jens Roselt and Melanie Hinz, eds., *Chaos + Konzept: Proben und Probieren im Theater* (Berlin: Alexander Verlag, 2011); Matthias Rebstock and David Roesner, eds., *Composed Theatre: Aesthetics, Practices, Processes* (Bristol: Intellect, 2012); Gay McAuley, *Not Magic but Work: An Ethnographic Account of a Rehearsal Process* (Manchester: Manchester University Press, 2015); Vlado Kotnik, *Opera as Anthropology: Anthropologists in Lyrical Settings* (Newcastle: Cambridge Scholars Publishing, 2016); Tamara Yasmin Quick, "Methodologische Diskurse der aktuellen Probenforschung," *Forum Modernes Theater* 31, no. 1/2 (2020): 39–63.

For an examination of historical rehearsal processes in opera, see amongst others Heinrich Porges, *Wagner Rehearsing the "Ring": An Eye-Witness Account of the Stage Rehearsals of the First Bayreuth Festival*, trans. Robert L. Jacobs (Cambridge: Cambridge University Press, 1983); James Deaville, ed., with Evan Baker, *Wagner in Rehearsal 1875–1876: The Diaries of Richard Fricke*, trans. George R. Fricke (Stuyvesant: Pendragon Press, 1998); Mark Everist, "Rehearsal Practices," in *The Oxford Handbook of Opera*, ed. Helen M. Greenwald (Oxford: Oxford University Press, 2014), 419–41.

For rehearsal ethnographies of western new music rehearsals, see Amanda Bayley and Michael Clarke, "Analytical Representations of Creative Processes in Michael Finnis's Second String Quartet," *Journal of Interdisciplinary Music Studies* 3, no. 1/2 (2009): 139–57; Bayley, "Ethnographic Research into Contemporary String Quartet Rehearsal," *Ethnomusicology Forum* 20, no. 3 (2011): 385–411; Bayley and Nicole Lizée, "Creative Layers and Continuities: A Case Study of Nicole Lizée and the Kronos Quartet," *Musicae Scientiae* 20, no. 3 (2016): 392–412; Bayley, "Cross-Cultural Collaborations with the Kronos Quartet," in *Distributed Creativity: Collaboration and Improvisation in Contemporary Music*, ed. Eric Clarke and Mark Doffman (New York: Oxford University Press, 2017), 93–113; Nicolas Donin, "Domesticating Gesture: The Collaborative Creative Process of Florence Baschet's *StreicherKreis* for 'Augmented' String Quartet (2006–08)," in Clarke and Doffman, *Distributed Creativity*, 70–87.

For ethnographies from practitioners and opera scholars, see Daniel Helfgot and William O. Beeman, *The Third Line: The Opera Performer as Interpreter* (New York: Schirmer Books, 1993); Denis Laborde, "L'Opéra et son régisseur. Notes sur la création d'une œuvre de Steve Reich," *Ethnologie française* 38, no. 1 (2008): 119–28; Megan Steigerwald Ille, "Bringing Down the House: Situating and Mediating Opera in the Twenty-First Century" (PhD diss.,

courses within opera, media, and critical posthuman studies, rehearsal ethnography showcases moments in the process and elements of productions mediated by technologies that remain difficult to trace in retrospect.⁶ In the midst of opera's production process—after the composition phase and before the premiere—I situate myself in the rehearsal studio and observe the development of an opera over the course of two months.⁷ Within this case, I enter the field as a writer for the Dutch National Opera and a participant-observer with a background as mezzo-soprano, dramaturg, and director of new opera.⁸ By looking *into* the rehearsal instead of *at* the performance, I shift my focus from the written score to verbal interactions and nonhuman sounds in the rehearsal studio. I comprehend opera's contemporary practices as a continuation of a genre that has historically driven scientific experimentation and technological innovation.⁹ Operatic technol-

University of Rochester, 2018); Steigerwald Ille, "Live in the Limo: Remediating Voice and Performing Spectatorship in Twenty-First-Century Opera," *The Opera Quarterly* 36, no. 1/2 (2020): 1–26; Michal Grover-Friedlander, *Staging Voice* (London: Routledge, 2021); Lea Luka Sikau, "I see Marina, but feel Maria': Marina Abramović's Mediation of Callas' Voice," in *Singing Out: The Musical Voice in Audiovisual Media*, ed. Catherine Haworth and Beth Carroll (Edinburgh: Edinburgh University Press, forthcoming); Sikau, "Rehearsing Callas," *The Opera Quarterly* (forthcoming).

6 From the relations of cinema with opera to emerging technologies in new music theater, operatic performance and its mediation in the digital era take center stage in the current discourse, highlighted amongst others by the recent foundation of this journal. See also Marcia Citron, *Opera on Screen* (New Haven: Yale University Press, 2000); Melina Esse, ed., "Mediating Opera," special issue, *The Opera Quarterly* 26, no. 1 (2010); James Steichen, "HD Opera: A Love/Hate Story," *The Opera Quarterly* 27, no. 4 (2011): 443–59; Jelena Novak, *Postopera: Reinventing the Voice-Body* (Farnham: Ashgate, 2015); Karen Henson, ed., *Technology and the Diva: Sopranos, Opera, and Media from Romanticism to the Digital Age* (Cambridge: Cambridge University Press, 2016); Milla Tiainen, "Sonic Technoecology: Voice and Non-anthropocentric Survival in *The Algae Opera*," *Australian Feminist Studies* 32, no. 94 (2017): 359–76; Gundula Kreuzer, "Operatic Configurations in the Digital Age," *The Opera Quarterly*, 35, no. 1/2 (2019): 130–34; Tereza Havelková, *Opera as Hypermedium: Meaning-Making, Immediacy, and the Politics of Perception* (Oxford: Oxford University Press, 2021).

7 *Upload* was produced during a national lockdown in spring 2021 at the Dutch National Opera. The restrictions caused by the Covid pandemic made it impossible to premiere the work in March 2021, as originally planned. However, the last rehearsal days on the main stage were used to shoot a film version of the production that was streamed via medici.tv even before its world premiere in July at the Bregenz Festspiele.

8 Lea Luka Sikau, "Upload en de stem zonder lichaam," in "OFF 2021," special edition, *Odeon Magazine* 30, no. 121 (2021): 56–57.

9 David Trippett and Benjamin Walton, "Introduction: The Laboratory and the Stage," in *Nineteenth-Century Opera and the Scientific Imagination*, ed. David Trippett and Benjamin Walton (Cambridge: Cambridge University Press, 2019), 2.

ogies both constitute the art form and interact with its agents. Intertwining sounds, stages, and screens, the rehearsal detangles how opera can be understood as an interface which interacts vibrantly through nonhuman technologies and human bodies.¹⁰

Rehearsal ethnography offers the opportunity to examine the agential relations of material and bodies that sustain opera at large. Rather than merely singling out one technology of wonder, such as the motion capture system, the rehearsal also highlights its embeddedness with material and bodies that have belonged to the operatic vocabulary for centuries.¹¹ The interface highlights opera's technogenesis, the dynamic co-evolution of humans with "old" and "new" technologies.¹² Beyond acknowledging the co-evolution within the rehearsal, I also draw on Ursula K. Le Guin's "The Carrier Bag Theory of Fiction" to conceptualize the rehearsal itself not only as an environment facilitating technogenesis, but as an immersive, co-evolving technology itself. Le Guin theorizes the first technologies in the Paleolithic age as containers which carry their interiors, explicitly opposing the narrative of sharp tools sticking out and producing hero stories.¹³ The rehearsal carries the ensemble of technogenesis over the course of several months.¹⁴ Its space contains physical connections between its agents, and its time carries electromagnetic signals and sound waves.¹⁵ With the

10 Hereby, I draw on Daniel Chua and Alexander Rehding, who elaborate on the interface of music at large as something that "interacts dynamically with a network of discourses and objects." Daniel K. L. Chua and Alexander Rehding, *Alien Listening: Voyager's Golden Record and Music from Earth* (New York: Zone Books, 2021), 200.

11 Walton points towards the materials of operatic productions that remain invisible because of their long-lasting history within the genre. He proposes to include the multiplicity of material rather than merely zooming on the technologies of spectacle. See Walton, "Technological Phantoms of the Opéra," in *Nineteenth-Century Opera and the Scientific Imagination*, 226.

12 Katherine Hayles, *How We Think: Digital Media and Contemporary Technogenesis* (Chicago: University of Chicago Press, 2012), 10.

13 Le Guin lists some exemplary devices for containing goods: "A leaf a gourd a shell a net a bag a sling a sack a bottle a pot a box a container." Ursula K. Le Guin, "The Carrier Bag Theory of Fiction," in *Women of Vision: Essays by Women Writing Science Fiction*, ed. Denise Du Pont (New York: St. Martin's Press, 1988), 3.

14 "Contemporary technogenesis is about adaptation, the fit between organisms and their environments, recognizing that both sides of the engagement (humans and technologies) are undergoing coordinated transformations." Hayles, *How We Think*, 81.

15 Music and computation scholar Shintaro Miyazaki expands on wireless spaces with regards to the notion of containing and carrying: "A space is not a network, but a channel and container for an infinite number of physical connections and the carrier of an infinite

recognition of the rehearsal as immersive technology, I highlight its genesis in co-evolution with the matter and bodies inside, preventing to isolate singular operatic technologies in the discussion. Transforming along with its production processes, an ethnography of the immersive technology not only sketches out *Upload's* production processes, but simultaneously reflects back on how the *carrier bag of opera* interfaces within the genre's environment.

In the process of this posthuman opera in particular, I interrogate how the immersive technology co-evolves in its production dynamics by transforming into a laboratory-like space. I dissect the composite of the avatar as an assemblage of (non)human agents that recalibrates processes of repetition and connection. Ultimately, this leads me to trace how van der Aa himself co-evolves into the posthuman form of an opera production.

Rehearsing Laboratory

The virtual body recalibrates the architecture of opera's immersive technology and imposes a prioritization of the digital scenography over the live mise-en-scène. As the opera is dependent on rehearsing with an avatar, the technologically ambitious project results in a significant transformation of the space. For *Upload*, the immersive technology evolves into a laboratory-like space. A technical crew sets up an interior architecture saturated with new technologies two days in advance of rehearsal. From the start, the rehearsals are embedded in a technological corset instead of a system of substitutes being simultaneously created around the performers.¹⁶ Whereas most opera productions nowadays work with set and prop substitutes while the final set is manufactured in operas' workshops, *Upload* exclusively employs parts of the original stage technology. From the first day of rehearsals, the score is set in stone as the sets and the elec-

number of signals." Miyazaki, "Algorhythmics: Understanding Micro-Temporality in Computational Cultures," *Computational Culture*, no. 2 (2012), <http://computationalculture.net/algorhythmics-understanding-micro-temporality-in-computational-cultures>.

¹⁶ This is different from previous ethnographic fieldwork I have conducted within other new operas, for example within Marina Abramović's opera production *7 Deaths of Maria Callas* (2020) or Sivan Eldar's *Like Flesh* (2022). In these cases, the set on the rehearsal stage is constantly adapting, for example when new props are being added. Contrastingly, *Upload* does not employ props, other than a blanket and a pillow in the last scene.

troacoustic soundtrack are preprogrammed.¹⁷ When looking at other opera productions that are comparable in terms of their screen usage, they differ in that they only install the original projectors, full-size screens, and spotlights in the auditorium, not in the rehearsal studio already.¹⁸ To incubate the virtual in an environment not originally designed for testing technology, *Upload* becomes dependent on the material's yet unknown affordances.

The technological infrastructure erects a laboratory-like structure which is best described through the notion of the “experimental system” as theorized by the Science and Technology Studies scholar Hans-Jörg Rheinberger. This system is made up of two entities: technical objects and epistemic things.¹⁹ Technical objects repeat processes, transmitting knowledge that is common sense in the field, such as the opera's schedule and technologies that have been part of the operatic vocabulary for centuries. These objects appear in the rehearsal as always already repeated. Through repetition, they enable epistemic things—chimeras which embody what the field does not know yet—to occur and co-evolve.²⁰ Generating difference within repetition, the epistemic thing is reworked with and against the repeated. This “thing” in flux magnifies the difference within repetitive structures and raises new questions, receiving the effort of knowledge.²¹ In *Upload*'s rehearsal, the chimera is literally the avatar which cannot be delineated by screen projections. Its agency expands as a compound of relations: it spans from Williams' appearance, his amplified voice and the avatar designer's code over van der Aa's vision, to the recalibration of the studio into a laboratory. The avatar introduces difference to the production practices of

17 Whereas in world premiere productions it is usual to change parts of the score quite flexibly or even to finish writing the music during the rehearsal phase, van der Aa merely changed one note in the daughter's part. The composer elaborated on this during a panel discussion at the symposium *Musiktheater der Zeitgenossenschaft: Michel van der Aas Schaffen an den Schnittstellen der Künste* (Ruhr University Bochum, 16 September 2022).

18 Two examples for productions that work with elaborate live-cued screens, and from which I can recount the rehearsal processes, are the aforementioned *Like Flesh* and the 2012 collaboration between Barrie Kosky and the theater collective 1927 on Mozart's *Die Zauberflöte* (1791).

19 Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube* (Stanford: Stanford University Press, 1997), 28.

20 Rheinberger, *Toward a History of Epistemic Things*, chap. 5 “Reproduction and Difference.”

21 Rheinberger, 29.

opera by experimenting with more responsive ways of interaction between performer and digital technologies.

By being explored in the rehearsal studio, the motion capture system contributes to reproduce *Upload* out of canonical practices, while it simultaneously reproduces itself out of the scientific context. According to avatar designer Darien Brito, the rehearsal forms an uncontrolled environment with significantly more unknown variables to navigate:

We [the *Upload* production team] are using tools that are not originally designed to behave in a way that is useful for opera productions. For these devices, the things that we are doing are a bit weird. They are not meant to be used in this setup. Normally, you would have a studio with proper lighting and the actors would not move much.²²

Brito describes the technological challenges in this production by taking on the perspective of the devices themselves. Even if the rehearsal studio recalibrated itself to accommodate the epistemic thing, the opera affords new capacities, culminating in a performance that has to render the protagonist in real time without recalibration and delay (but with costumes and changing lighting) for ninety minutes consecutively. Whereas performers can act as if a prop would be the original one—creating a culture of substitutes—the avatar only works with the original stage technology in place. The immersive technology of rehearsal modifies to co-evolve with the motion capture system at the same time as the computational system learns to adapt to the uncontrolled environment.

What drives the rehearsal to produce an avatar (and repeat itself) out of canonical practices? Van der Aa seeks for an avatar look which is dynamic and at the same time abstract enough, and which does not resemble the imagery of a live projection. I extract the artistic research question of how the avatar can embody the congenital body of the father in the virtual space, displaying credibility towards both its existence as a virtual being and its human “nature.” During the coding sessions, the team intends to create an avatar that retains the attention of the audience, even in moments when it competes with Williams’ physical body on the side stage. The avatar seeks to draw the audience’s gaze towards his virtual projection to make his congenital body appear as a substitute, proving liveness and serving the trend

22 Darien Brito, in interview with the author, February 25, 2021.

in contemporary music theater to reveal its own technical materiality.²³ For this effect to work, the avatar has to be projected in real time with minimal latency. Robert Wechsler argues that highly accurate motion capture systems mostly remain unused in realtime performances.²⁴ Against the grain of industry practices, *Upload* experiments with a real time motion capture system. As the look of the avatar changes in every scene, the rendering process is quite complex. The team tries to decrease the delay of the projected image so that the lip movement of the avatar is in sync with Williams's singing voice. Van der Aa is in close contact with Brito about changing the look. A few times, the avatar designer replies that the composer's requests are not feasible to translate into this virtual environment. Van der Aa counters half-jokingly: "I don't like to hear no." This back and forth between Brito, van der Aa, and the material capacities is characteristic for the research on the avatar's properties. In these moments, the avatar receives the effort of knowledge as hypotheses are falsified. The immersive technology of rehearsal carries a laboratory for the process of technogenesis to evolve through testing and falsification. The director tests his theories while the technology fails to meet his expectations. But instead of compromising his aesthetic ideas to technological feasibility within the framework of opera's schedule, he prioritizes the avatar imagery over rehearsal time with the cast.

Rehearsing Connection

Beyond testing the technical affordances, the virtual body reverses how other bodies in the studio comprehend interaction. Van der Aa, Brito, and the performers all interact distinctively with the avatar. The composer and the coder approximate the avatar while the performers are disconnected from their

23 Ulrike Hartung, *Postdramatisches Musiktheater* (Würzburg: Königshausen & Neumann, 2019), 75.

24 As exceptions to contemporary theatrical production processes, Wechsler points out two projects conducted in collaboration with universities: *motion*^e by Trisha Brown, Bill T. Jones et al. (Arizona State University, 2005) as well as Luc Vanier's *Bob's Palace* created at the Krannert Center for the Performing Arts (University of Illinois Urbana-Champaign, 2003). See Robert Wechsler, "Artistic Considerations in the Use of Motion Tracking with Live Performers: A Practical Guide," in *Performance and Technology: Practices of Virtual Embodiment and Interactivity*, ed. Susan Broadhurst and Josephine Machon (Basingstoke: Palgrave Macmillan, 2006), 60–77.

virtual interlocutor. Despite its virtual character, the composer and the avatar designer see it evolving from an imaginary vision into a more tangible image. While van der Aa steers the avatar artistically, Brito is the expert who understands how to accommodate for the avatar's affordances. In *TouchDesigner* (a software to simulate virtual objects) Brito creates a virtual environment that embeds the uploaded father and translates him into a cloud of particles in real time. The data tracked by the motion capture system is modified with different sets of filters that lend the avatar a different look in every sequence. The avatar designer is the only person interviewed who notices the avatar as "real and tangible," as he can "touch, move, and transform [it] in a literal sense."²⁵ For the other team members, the avatar seems to be an untouchable body. They perceive the avatar projections more as a cinematic screening merging with the films and less as an interactive body within the *mise-en-scène*. This notion is intensified as the conversations at the avatar designer's desk are so quiet that they remain incomprehensible for most of the production team. The knowledge generated about the epistemic thing in the studio is inaccessible and creates a distance between the virtual being and the team. The process relating to the avatar creation becomes opaque.

The performers, usually the most connected with fellow performers, are removed from tangible connection as their interactions are always mediated via screens and loudspeakers. Even for the baritone Williams, who lends the virtual chimera his bodily appearance, the avatar is out of his reach of control. Except when stepping out of the motion capture space and, thus, erasing the virtual body, Williams is not involved in how his bodily input is processed. To learn his part, he is dependent on technical instructions by Brito and conceptual guidance by Van der Aa. Restricted to a tiny square captured by the motion tracking system, he carries out his gestures, displaced in a ninety degrees angle from his performing counterpart. In conversations, he mentions that he does not know how his facial expressions are mediated—eliciting estrangement and disconnect—but that he fully trusts van der Aa in directing him.²⁶ The avatar projections require a counterintuitive acting style from Williams and a real-time modification from Brito that multiplies the performer, disseminates him all over the stage, and fragments his agency.

In the meantime, Bullock plays a daughter who is deprived of physical touch with her father, but still feels an emotional connection with him.

²⁵ Brito, interview.

²⁶ Roderick Williams in interview with the author, January 12, 2021.

In the rehearsal weeks, the soprano seeks to create this connection by acknowledging the virtual body as a sovereign stage persona:

I need to connect emotionally and start establishing a relationship with [his] avatar. It is such a bizarre thought, but I have to build a connective tissue with the avatar separated from [Williams] and [his] stage presence.²⁷

By splitting Williams in two, she defines the projections as her counterpart, as if the avatar itself was an autonomous body. She intends to match Brito's viewpoint—i.e., seeing the avatar as an entity she can affect and which, in turn, can also affect her actions. However, the avatar's constant fragmentation, the surround sound of its voice, and the several different filters make it difficult to locate and address her interlocutor. In the rehearsal process, the virtual body becomes a compound protagonist. Visually and sonically fragmented, Bullock seeks to find virtual touch points to connect with. Dramaturg Madelon Kooijman facilitates this process by tying each scene to an emotional expression of the daughter's character. Bullock projects her emotions onto the screens even if she does not receive a human performer's immediate response.

Zooming out from the individual interactions, the recalibration of connection culminates in the substitution of singers. Whereas most opera productions work with fake sets and props in the rehearsals, which replace the original performance objects, *Upload* uses the official sets from the first rehearsal day onwards. More specifically, it not only uses the same sets, but it replaces the performers to incubate the virtual, too. This process reverses canonical production logistics in modern opera houses. Williams is replaced by an intern who stands in front of the motion capture camera to experiment with the technology. While one human turns into a substitute for another human, matter is explored in its vast affordances. In conversation, the intern said that she “started to do extensive yoga and stretching sessions every morning before the rehearsals as the hours of standing and little movement in front of the camera were physically quite exhausting.”²⁸ In addition to the intern who facilitates the repetitive testing process, the performing covers for Bullock and Williams are frequently present in the studio. Compared to other new opera productions, in which covers attend the last rehearsals only and practice the *mise-en-scène* separately (for in-

27 Julia Bullock, in interview with the author, March 10, 2021.

28 Anne van Brunschot, in interview with the author, February 17, 2021.

stance, with the stage director's assistant), this production includes them to a significant extent during the rehearsal period.²⁹ On one rehearsal day, van der Aa starts staging the ninth scene of the opera, the daughter's solo aria, even though Bullock is not present. Her cover, Verity Wingate, has to jump in so that van der Aa can begin to stage the scene. In *Upload's* rehearsals, humans function as substitutes. By demanding qualities from humans that one might attribute to matter, and exploring the vibrant capacities of material, *Upload's* rehearsal practices propose a reversed understanding of non-human and human bodies in interaction, subverting canonical production practices.

Rehearsing van der Aa

Who exactly is this virtual body that recalibrates connections by erecting a laboratory? Up until this point, I focused on the avatar projection as a compound existence of Williams' appearance, his amplified voice, Brito's code, projectors, screens, and van der Aa's vision. The multiple agents are confounded by Williams' appearance, pretending to display his agency in the virtual realm. When he upsets himself, the particles of his face suddenly bluster around, seemingly elicited by his emotional reaction. However, Williams has nothing to do with the fragmentation and does not even know how exactly his look changes, as it is engineered from the avatar designer's desk. When seeing the avatar coming into being, his compound existence comes to the fore, made of the fusion of different data sets. Does the inquiry about virtual bodies in rehearsal culminate in the avatar, or does it rather lead to a broader examination of how humans, through opera rehearsals, store data in (non)human forms as data carriers?

Brito argues that "the idea of the avatar itself is in a way quite romanticized in the human form."³⁰ Staging a "romanticized" form, the avatar significantly impacts the immersive technology, the temporalities, and the interaction between (non)human bodies in the studio. However, when looking beyond the avatar projections, *Upload's* rehearsals function as the generation of data storage in less romanticized forms and with a broad-

29 As both covers Verity Wingate and Michael Wilmering are members of the Opera Studio of the Dutch National Opera, they are asked to join *Upload's* rehearsals whenever they do not have rehearsals for other productions running at the same time.

30 Brito, interview.

er scope. The avatar is always already in the studio, even before Williams' virtual body gets rendered smoothly. The baritone, for instance, recounts feeling like being a bodily extension of the composer, seeing himself as "an avatar for his artistic vision."³¹ For van der Aa, the rehearsal at large becomes his posthuman form. He stores his vision in the bodies and matter in the studio. He uploads his thoughts and corrections onto the rehearsal space, timing it precisely so that there is no overload. Williams reports to get as much information the performer needs at a time.³² In the following, I examine the ways in which van der Aa sets up his data storage system, uploads his vision, and updates it during the evolving technogenesis. His Wagnerian strive to create *Upload* according to his artistic vision not only enables him to decide which bodies and matter are in the studio, but also how they, as well as the rehearsal space and time at large, co-evolve into the composer's posthuman form.³³

In informal conversation during *Upload*'s rehearsals, several production members mention the uniqueness of van der Aa's position. Seldom does an opera house commission one person for the libretto, the film script, the film staging, the mise-en-scène, and the cast; as well as for deciding over large parts of the creative team and the technological crew. In opera productions of the twentieth and twenty-first centuries, multiple authorship is the default mode.³⁴ Van der Aa constitutes an exception, as he launched an organ-

31 Williams, interview.

32 Williams, interview.

33 The director of the Dutch National Opera, Sophie de Lint, introduces the composer as today's Wagner within the interviews for the documentary on *Upload*. Curiously, the first significant account of verbal interactions in operatic rehearsals at large focuses on Wagner's *Ring* (1875–76). The choreographer Richard Fricke was asked by Wagner to document everything he said during the rehearsals of the Bayreuth world premiere. Whereas this account could be considered as one of the first rehearsal ethnographies, it is almost entirely centered on the composer. In the diaries, it becomes apparent that Wagner was an unpredictable director, who drastically changed his ideas on the mise-en-scène from one to another: "In this condition, it is a necessity for him to block everything one way today, and then change it tomorrow." See Deaville and Baker, *Wagner in Rehearsal*, 80. While *Upload* may be considered a *Gesamtkunstwerk* in scope, van der Aa's direction is quite distinct from Wagner's rehearsal practices. Whereas Wagner constantly changed his mind during the final stages of production, van der Aa arrives at the rehearsals with precise, uncompromising ideas. Relating thereto, he might be considered to be more of a Verdian type, who rehearsed to approximate his ultimate vision of the opera. For Giuseppe Verdi's rehearsal practices, see Clemens Risi, "Encore! Oper wiederholen," in *Chaos + Konzept*, 97–109.

34 Nicholas Till argues that "the multiple authorship of opera has remained common throughout the twentieth century." "The Operatic Work: Texts, Performances, Receptions

izational structure for independently producing his works, called doubleA Foundation. He co-produces the opera with the Dutch National Opera as one commissioning partner out of six, enabling him to expand his agency and “own [his] own works.”³⁵

Before *Upload*, van der Aa has been successful in setting up this system, particularly in conceptualizing highly ambitious technological projects that augment realities, such as the 3D film operas *Sunken Garden* (2013) and *Blank Out* (2016), and the virtual reality installation *Eight* (2019). His foundation focuses on technological experimentation and the possibility of showcasing early stages of creation for interested theaters and festivals.³⁶ For artistic directors of opera houses and performing arts institutions, this offer is especially promising as it minimizes risks inherent to technologically ambitious productions. By establishing partnerships that finance specific stages of development more so than commissioning an overall opera, the doubleA Foundation can make use of an independent budget to introduce technological experimentation early in the process. The emphasis on the technological and artistic development, realized by multiple, week-long sprints for testing the technology, points to an alternative approach to operatic creation that rethinks opera by modifying its process.³⁷ By combining self-producing and commissioning, van der Aa’s strategy is reminiscent of the operatic entrepreneurship demonstrated, amongst others, in the realm of Philip Glass and Robert Wilson’s *Einstein on the Beach* (1976) or Beryl Korot and Steve Reich’s *The Cave* (1993). Seen as a precondition to experiment within opera in the late twentieth-century

and Repertories,” in *The Cambridge Companion to Opera Studies*, ed. Nicholas Till (Cambridge: Cambridge University Press, 2012), 245.

³⁵ The opera *Upload* was financed by the following commissioning partners: Dutch National Opera, Opera Cologne, Bregenzer Festspiele, Ensemble MusikFabrik, Park Avenue Armory, and the doubleA Foundation itself. During a panel discussion at the symposium *Musiktheater der Zeitgenossenschaft* (see note 17), the composer claimed that he seeks to own his works.

³⁶ See “doubleA Lab,” doubleA Foundation website, accessed January 8, 2023, <https://doublea.net/doublea-lab/>.

³⁷ This is not to say that opera theaters are not themselves already working on rethinking production processes. Operas such as Eldar’s *Like Flesh* demonstrate that there are alternative forms of collaboration with institutions such as the IRCAM within the framework of more traditional operatic production to enable research, experimentation, and testing phases. Such development is further reinforced by European initiatives such as FEDORA (European Circle of Philanthropists of Opera and Ballet, www.fedora-platform.com) and ENOA (European Network of Opera Academies, www.enoa-community.com), which establish partnerships between opera houses and other cultural institutions.

United States, Korot and Reich decided to self-produce *The Cave* with multiple commissioning partners and, thus, were able to steer all aspects of the artistic process.³⁸ In a similar fashion, van der Aa intends not to produce his operas under the umbrella of a single theater that chooses the production team. The doubleA Foundation enables him to surpass the role of the composer and oversee the entire chain of creation. Within *Upload*, he functions in multiple roles. Moreover, he chooses the set designer, the singers, external dramaturgs, and the technological experts. This leads to a collective dominion of men in the rehearsal studio. Beyond the gender-biased narrative told in the opera's plot, the role division, too, reflects a gender divide with regards to responsibility. The leading roles in the production besides van der Aa, such as the set designer, the conductor, and cinematographer, are occupied by men, whereas the assistants and the dramaturg, who are responsible for organizational tasks and the "emotional journey" of the daughter, are women. The biases are carried over to the bodies and matter that store data in the rehearsal—the printed libretto, the video servers preserving the film, and the people co-evolving with such data.

Similarly, the music is carried not only by the score, but also the spatial allocation of roles, van der Aa's tempi dictated by a click track, amplification mechanisms, and the singer's position. The spatial organization of the studio gives indications of how van der Aa turns the space into his avatar. In the rehearsal studios of most contemporary opera productions, there is a fixed spatial relationship: the musical side of the production situates itself on the right side and the singers on stage. Both of these subspaces are expected to sound and have the main agency over the audible space of a rehearsal studio. The spatial relationship between the *mise-en-scène* and the music is clearly separated. The music comes from the right and the front while stage direction comments are uttered from the left. Within *Upload*, this idea of rehearsal soundscape is modified: the separation of sound and space is deconstructed, as *Upload's* sound spatialities are more enmeshed. As the stage director is also the composer, the lines between the *mise-en-scène* and the music are blurred. Sound no longer comes from the right and the front, but from everywhere as the sources are separated from their origin and distributed via surround speakers. This detachment of singers from

38 See Ryan Ebright, "My Answer to What Music Theatre Can Be: Iconoclasm and Entrepreneurship in Steve Reich and Beryl Korot's *The Cave*," *American Music* 35, no. 1 (2017): 30.

their vocal output ties into larger debates on the ineffability of the voice in opera and sound cinema. Carolyn Abbate argues that such simultaneity of disembodiment and omnipresence “sets up a situation of mastery and submissiveness.”³⁹ In this case, the “mastery” over the sounds is animated by van der Aa, as there is no piano and no accompanist.⁴⁰ The accompanist is swapped for van der Aa’s electroacoustic tracks that are disseminated through surround speakers together with the singers’ amplified voices. The double-digit number of speakers is distributed along the walls of the studio and emits acousmatic sounds—an utterance that one hears without seeing the cause behind the sound.⁴¹ The elaborated MIDI files mimic the orchestral sounds, making an accompanist redundant. While offering more diversification in sound than a piano accompaniment, they also disseminate the composed electronic track.

In addition to restructuring the audible space, van der Aa controls the musical time by storing his desired tempi in external matter. He works with click tracks—cues that give the exact beat to facilitate synchronization with the films projected. The performers learned their parts with the click track prior to arriving at the Dutch National Opera. Having memorized the meter, they now experience more freedom in the studio as they sing on top of an electroacoustic track which does not feature any click. By following the conductor’s lead, they can increasingly focus on their musical interpretation without having to listen to every beat. In rehearsal, the metronome function is transferred to the conductor. The conductor’s desk is equipped with visual and audible signals. The beats dictate van der Aa’s time. The conductor follows the pulse van der Aa imagined for the music at a time when he composed the piece. Via the click track, the composer inscribes a musical meter from the past and conducts invisibly. Attached to the conductor’s desk I find a small click track box with a red and a green light. For the first beat in a bar, it shows the red light and for the other ones the green. Additionally, there lies an mp3 player with earphones that sends cues, which are exclusively audible for the conductor. The assistant conductor Fergus McAlpine comments on the shift in the conductor’s agency as manifested by the click tracks:

39 Carolyn Abbate, *In Search of Opera* (Princeton: Princeton University Press, 2001), 148.

40 The piano is replaced by a keyboard which is only used to give single notes to the singers.

41 To expand on the notion of acousmatic sounds, see Pierre Schaeffer, *Treatise on Musical Objects: An Essay across Disciplines*, trans. Christine North and John Dack (Oakland: University of California Press, 2017), 64–69 (“Acousmatics”).

The audio click isn't simply like conducting to a metronome, it sends a pulse through your system that cannot not be followed; but it's so rigid that it can take away from the music. The light, on the other hand, when on its own acts more like a guideline of the beat. This is nice, as my ears can completely open up to what's going on around me—I can feel more musical. The downside is that if I'm not careful, it's easy to lose the pulse. Additionally, the beat in the music comes at the start of the light, and not when it's at its brightest. So, one has to conduct even more ahead of the beat.⁴²

The rigidity of the click tracks and the MIDI files as well as the presence of the composer modify operatic sound spatialities—and thus also the conductor's role. In addition, their agency is decreased because of van der Aa's time management to hand the score and the MIDI files to the singers in time to rehearse properly.⁴³ For the majority of blocking rehearsals, the conductor Otto Tausk is substituted by his assistant. In conversations, McAlpine compares his work for *Upload* to conducting film music concerts, or ballets in which the choreographer's steps are set in stone.⁴⁴ Whereas typically the stage director and the conductor dominate the sound spatialities of opera rehearsals, here the relationship is shifted. While conforming to a sound source that nobody else in the studio can hear, the conductor translates the click tracks and musical dynamics into gesture. Within *Upload*'s rehearsals, the film cues, musical tempi, and dynamics are extremely precise, almost set in stone. The composer becomes a choreographer of time, while the conductor co-evolves into a translator rather than a musical interpreter—the composer diminishes the conductor's area of responsibility. As the conductor's agency gets significantly reduced to following instead of directing the music, van der Aa's agency, in return, expands. Van der Aa decenters the conductor, decreases the singers' flexibility, and transfers agency to the acousmatic sounds and their dissemination technology.

Apart from the click track, the composer steers the vocal quality and the loudness of the singers in the rehearsal studio. He asks the singers for little vibrato while controlling their amplification via a mixing console. The

42 Fergus McAlpine, in interview with the author, March 8, 2021.

43 From my previous experience in new opera productions, it is quite rare for opera creations to have such a fixed score this early in the process. During the musical rehearsals for *Upload* with the Ensemble Musikfabrik, the conductor Otto Tausk stated that he only found two errors in the entire score, something he claimed to be extremely impressive.

44 McAlpine, interview.

singers are equipped with microphones in most rehearsals. Whereas usually they would be able to quietly check in with their fellow singer, they suddenly cannot steer their voices like they are used. The control over the sound spatialities, musical dynamics, and adjusting to an acoustic situation—techniques perfected by the operatic performer—are lost once the amplification is outsourced beyond the performer's body.⁴⁵ The composer seeks for an amplification, a “cinema-sizing” of voices.⁴⁶ This “cinema-sizing” changes the rehearsal at large: In the studio, the singers practice their parts with the amplification mechanism in place; They adjust their physical technique to the technological device; The amplification capacity of the operatic voice itself is no longer needed to the same degree and yields to another vocal quality.⁴⁷ Associated with a more natural singing style, van der Aa prefers a non-vibrato voice with clear text comprehensibility over the operatic voice.⁴⁸ Maintaining the acoustic environment of the original stage in the rehearsal studio allows the singers to minimize insecurity factors and find the right technique early in the process. Rehearsing at the opera house for a period of eight weeks, they take on another acoustic body, a body which is constantly “cinema-sized,” even in the production studio.

This is an unusual practice for opera rehearsals. From my experience with various canonical and new operas, productions usually work with some form of acoustic balance in the rehearsal studio before introducing amplification in the auditorium. When singers are exclusively amplified in the final rehearsals and performances, the sound engineers turn their microphones on when they are on stage and off when side stage. However, for the setting of *Upload's* rehearsals, the microphones remain turned on throughout. Sonically, the singers are in “performance mode” even when waiting side stage for the avatar projections to be tested. Amplification makes each conversation audible in the studio, just like Williams's close-

45 Having worked with van der Aa before, Williams states that he learned to trust both van der Aa's idea of the voice as well as the expertise of the sound engineers. During the interview, he elaborates further on Van der Aa disliking the canonical operatic voice and aiming for a non-vibrato one with crisp and clear diction. For Williams, this vocal technique is quite effortless and gentle to produce. Moreover, these features are reminiscent of vocal styles associated with other music theater works from the late twentieth and the early twenty-first century by Steve Reich, Beryl Korot, Philip Glass, and Louis Andriessen.

46 Jonathan Burston, “Theatre Space as Virtual Place: Audio Technology, the Reconfigured Singing Body, and the Megamusical,” *Popular Music* 17, no. 2 (1998): 207.

47 See Paul Sanden, *Liveness in Modern Music: Musicians, Technology, and the Perception of Performance* (New York: Routledge, 2013), 22.

48 Williams, interview.

up projections are visible for everyone. Detached from the privacy of personal interaction, and with their voices streamed with a surround sound setup, the singers reduce their utterances to whispering when they don't sing. Through amplification technology, the singers' spoken voices ultimately get silenced. Considering how much time the singers spend merely waiting for the avatar to be optimized, there are significantly few casual exchanges. The private speech yields to van der Aa's idea of singing. In the score for *Upload*, vocal lines are written without any instruction for speech. Thus, conversations disseminated over speakers seem alienating. Within a rehearsal that is sonically set up to be a performance, the private speaking voice seems to dissociate from the singers' bodies. Even if the whispers are produced by the singer's larynx, they mark estranged sounds. The amplification produces a different order in the sonic spatialities of the studio. The occasional whisper—albeit elicited by the singer's body—is an utterance that distorts van der Aa's desired sound quality. The microphone hosts the voice, and the composer hosts the sonic space. Following the wires of the microphone, I am again directed to the composer who feeds the connection between the amplification system, the singers' bodies, their voices, and the laboratory space.

The entire development process of van der Aa's opera can be read as a technogenesis of uploading that renders all involved (non)humans along with the immersive technology of rehearsal into van der Aa's data outlets. The "epistemic thing" is essentially the avatar behind the avatar—i.e., van der Aa in his fragmentation of the rehearsals' spaces and times. Through the commissioning structure and the doubleA Foundation, he builds the *carrier bag of opera* according to his preferences of people and matter as well as his reimaginations of sonic and spatial setups. He outsources himself in bits of data that get continuously updated until the rehearsal phase ends. The opera is not premiered in a physical space at first but, instead, shot as a film and uploaded online on the medici.tv platform.⁴⁹ The posthuman technogenesis of van der Aa's rehearsal is ultimately compressed into one medium, reducing the space to one single screen, and condensing the years of development into ninety minutes.

49 <https://www.medici.tv/en/operas/upload-michel-van-der-aa-julia-bullock-roderick-williams-dno>, accessed January 8, 2023.

Works Cited

- Abbate, Carolyn. *In Search of Opera*. Princeton: Princeton University Press, 2001.
- Atkinson, Paul. *Everyday Arias: An Operatic Ethnography*. Lanham: AltaMira Press, 2006.
- . “Performance and Rehearsal: The Ethnographer at the Opera.” In *Qualitative Research Practice*, edited by Clive Seale, Giampietro Gobo, Jaber F. Gubrium, and David Silverman, 94–106. London: Sage, 2004.
- Bayley, Amanda. “Cross-Cultural Collaborations with the Kronos Quartet.” In *Distributed Creativity: Collaboration and Improvisation in Contemporary Music*, edited by Eric Clarke and Mark Doffman, 93–113. New York: Oxford University Press, 2017.
- . “Ethnographic Research into Contemporary String Quartet Rehearsal.” *Ethnomusicology Forum* 20, no. 3 (2011): 385–411.
- Bayley, Amanda, and Michael Clarke. “Analytical Representations of Creative Processes in Michael Finnis’s Second String Quartet.” *Journal of Interdisciplinary Music Studies* 3, no. 1/2 (2009): 139–57.
- Bayley, Amanda, and Nicole Lizée. “Creative Layers and Continuities: A Case Study of Nicole Lizée and the Kronos Quartet.” *Musicae Scientiae* 20, no. 3 (2016): 392–412.
- Bloomberg, Benjamin. “Making Musical Magic Live: Inventing Modern Production Technology for Human-Centric Music Performance.” PhD diss., Massachusetts Institute of Technology, 2020. <https://dspace.mit.edu/handle/1721.1/129893>.
- Burston, Jonathan. “Theatre Space as Virtual Place: Audio Technology, the Reconfigured Singing Body, and the Megamusical.” *Popular Music* 17, no. 2 (1998): 205–218.
- Chua, Daniel K. L., and Alexander Rehding. *Alien Listening: Voyager’s Golden Record and Music from Earth*. New York: Zone Books, 2021.
- Citron, Marcia. *Opera on Screen*. New Haven: Yale University Press, 2000.
- Clarke, Eric, and Mark Doffman, eds. *Distributed Creativity: Collaboration and Improvisation in Contemporary Music*. New York: Oxford University Press, 2017.
- Deaville, James, ed., with Evan Baker. *Wagner in Rehearsal 1875–1876: The Diaries of Richard Fricke*. Translated by George R. Fricke. Stuyvesant: Pendragon Press, 1998.
- Donin, Nicolas. “Domesticating Gesture: The Collaborative Creative Process of Florence Baschet’s *StreicherKreis* for ‘Augmented’ String Quartet (2006–08).” In Clarke and Doffman, *Distributed Creativity*, 70–88.
- Ebright, Ryan. “‘My Answer to What Music Theatre Can Be’: Iconoclasm and Entrepreneurship in Steve Reich and Beryl Korot’s *The Cave*.” *American Music* 35, no. 1 (2017): 29–50.
- Esse, Melina, ed. “Mediating Opera.” Special issue, *The Opera Quarterly* 26, no. 1 (2010).
- Everist, Mark. “Rehearsal Practices.” In *The Oxford Handbook of Opera*, edited by Helen M. Greenwald, 419–41. Oxford: Oxford University Press, 2014.
- Féral, Josette. “Introduction: Towards a Genetic Study of Performance—Take 2.” *Theatre Research International* 33, no. 3 (2008): 223–33.
- Grover-Friedlander, Michal. *Staging Voice*. London: Routledge, 2021.
- Harvie, Jen, and Andy Lavender. *Making Contemporary Theatre: International Rehearsal Processes*. Manchester: Manchester University Press, 2010.
- Hartung, Ulrike. *Postdramatisches Musiktheater*. Würzburg: Königshausen & Neumann, 2019.

- Havelková, Tereza. *Opera as Hypermedium: Meaning-Making, Immediacy, and the Politics of Perception*. Oxford: Oxford University Press, 2021.
- Henson, Karen ed. *Technology and the Diva: Sopranos, Opera, and Media from Romanticism to the Digital Age*. Cambridge: Cambridge University Press, 2016.
- Helfgot, Daniel, and William O. Beeman. *The Third Line: The Opera Performer as Interpreter*. New York: Schirmer Books, 1993.
- Kotnik, Vlado. *Opera as Anthropology: Anthropologists in Lyrical Settings*. Newcastle: Cambridge Scholars Publishing, 2016.
- Kreuzer, Gundula. "Operatic Configurations in the Digital Age." *The Opera Quarterly*, 35, no. 1/2 (2019): 130–34.
- Laborde, Denis. "L'Opéra et son régisseur. Notes sur la création d'une œuvre de Steve Reich." *Ethnologie française* 38, no. 1 (2008): 119–28.
- Letzler Cole, Susan. *Directors in Rehearsal: A Hidden World*. New York: Routledge, 1992.
- Le Guin, Ursula K. "The Carrier Bag Theory of Fiction." In *Women of Vision: Essays by Women Writing Science Fiction*, edited by Denise Du Pont, 1–12. New York: St. Martin's Press, 1988.
- McAuley, Gay. *Not Magic but Work: An Ethnographic Account of a Rehearsal Process*. Manchester: Manchester University Press, 2015.
- Miyazaki, Shintaro. "Algorhythmics: Understanding Micro-Temporality in Computational Cultures." *Computational Culture*, no. 2 (2012). <http://computationalculture.net/algorhythmics-understanding-micro-temporality-in-computational-cultures>.
- Moravec, Hans. *Mind Children: The Future of Robot and Human Intelligence*. Cambridge, MA: Harvard University Press, 1988.
- Novak, Jelena. *Postopera: Reinventing the Voice-Body*. Farnham: Ashgate, 2015.
- Porges, Heinrich. *Wagner Rehearsing the "Ring": An Eye-Witness Account of the Stage Rehearsals of the First Bayreuth Festival*. Translated by Robert L. Jacobs. Cambridge: Cambridge University Press, 1983.
- Quick, Tamara Yasmin. "Methodologische Diskurse der aktuellen Probenforschung." *Forum Modernes Theater* 31, no. 1/2 (2020): 39–63.
- Rebstock, Matthias, and David Roesner, eds. *Composed Theatre: Aesthetics, Practices, Processes*. Bristol: Intellect, 2012.
- Rheinberger, Hans-Jörg. *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube*. Stanford: Stanford University Press, 1997.
- Roselt, Jens. *Phänomenologie des Theaters*. Paderborn: Wilhelm Fink Verlag, 2008.
- Roselt, Jens, and Melanie Hinz, eds. *Chaos + Konzept: Proben und Probieren im Theater*. Berlin: Alexander Verlag, 2011.
- Sanden, Paul. *Liveness in Modern Music: Musicians, Technology, and the Perception of Performance*. New York: Routledge, 2013.
- Schaeffer, Pierre. *Treatise on Musical Objects: An Essay across Disciplines*, translated by Christine North and John Dack. Oakland: University of California Press, 2017.
- Siegert, Bernhard. *Passage des Digitalen: Zeichenpraktiken der neuzeitlichen Wissenschaften 1500–1900*. Berlin: Brinkmann & Bose, 2003.
- Sikau, Lea Luka. "I see Marina, but feel Maria': Marina Abramović's Mediation of Callas' Voice." In *Singing Out: The Musical Voice in Audiovisual Media*, edited by Catherine Haworth and Beth Carroll. Edinburgh: Edinburgh University Press, forthcoming.

- . “Rehearsing Callas.” *The Opera Quarterly* (forthcoming).
- . “Upload en de stem zonder lichaam.” In “OFF 2021,” special edition, *Odeon Magazine* 30, no. 121 (2021): 56–57.
- Steichen, James. “HD Opera: A Love/Hate Story.” *The Opera Quarterly* 27, no. 4 (2011): 443–59.
- Steigerwald Ille, Megan. “Bringing Down the House: Situating and Mediating Opera in the Twenty-First Century.” PhD diss., University of Rochester, 2018. ProQuest (10829833).
- . “Live in the Limo: Remediating Voice and Performing Spectatorship in Twenty-First-Century Opera.” *The Opera Quarterly* 36, no. 1/2 (2020): 1–26.
- Tiainen, Milla. “Sonic Technoecology: Voice and Non-anthropocentric Survival in *The Algae Opera*.” *Australian Feminist Studies* 32, no. 94 (2017): 359–76.
- Till, Nicholas. “The Operatic Work: Texts, Performances, Receptions and Repertoires.” In *The Cambridge Companion to Opera Studies*, edited by Nicholas Till, 225–53. Cambridge: Cambridge University Press, 2012.
- Torpey, Peter. “Media Scores: A Framework for Composing the Modern-Day Gesamtkunstwerk.” PhD diss., Massachusetts Institute of Technology, 2013. <https://dspace.mit.edu/handle/1721.1/91887>.
- Trippett, David. “Digital Voices: Posthumanism and the Generation of Empathy.” in *The Cambridge Companion to Music in Digital Culture*, edited by Nicholas Cook, Monique M. Ingalls, and David Trippett, 227–48. Cambridge: Cambridge University Press, 2019.
- Trippett, David, and Benjamin Walton, eds. *Nineteenth-Century Opera and the Scientific Imagination*. Cambridge: Cambridge University Press, 2019.
- Walton, Benjamin. “Technological Phantoms of the Opéra.” In Trippett and Walton, *Nineteenth-Century Opera*, 199–226. Cambridge: Cambridge University Press, 2019.
- Wechsler, Robert. “Artistic Considerations in the Use of Motion Tracking with Live Performers: A Practical Guide.” In *Performance and Technology: Practices of Virtual Embodiment and Interactivity*, edited by Susan Broadhurst and Josephine Machon, 60–77. Basingstoke: Palgrave Macmillan, 2006.

Abstract

This article examines the process of developing a posthuman opera, Michel van der Aa’s *Upload* (2021), from the perspective of a rehearsal ethnography. Proposing a rehearsal-oriented ontology of opera, this article avoids discussions of the performance and even the music itself to focus on stages of rehearsing with a virtual body. As a participant-observer, I examine how the rehearsal space of *Upload* evolves into a laboratory that negotiates receptacles of digital data with congenial bodies. Dissecting the avatar as a compound of (non)human agents, I interrogate how rehearsing a virtual body reconfigures operatic production dynamics. The operatic rehearsal processes repetition and connection, and co-evolves together with the technologies of production. With the example of various agents’ interactions during the rehearsal, I illustrate how the figure of the avatar reproduces *Upload* out of canonical rehearsal practices by recalibrating the connections between opera’s agents. These elaborations lead to an understanding of van der Aa as a composer who recalibrates himself into the posthuman form of an opera production.

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