INTRO-DUCTION

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This publication should be read as a workbook. It is conceived as a catalog without linear order, as a conglomeration of diverse texts and images that relate and react to one another in multivarious ways. Sometimes they contradict one another, but taken together, they are intended to trigger discussion about the multitude of experiences with actors, avatars, digital assistants, and other artificial beings bestowed upon us by new technologies. The images and texts seek to spur new approaches to scientific, artistic, and aesthetic engagement with such artificial beings, which includes animate technological artefacts with humanlike faces and gestures, androids and robots that, while perceptibly dissimilar to humans, are supposed to interact with us. We meet them with acceptance or reject and fear them. The contributions bring them into communication with people, and theatrical actors in particular, in order to study the social *relationships* between humans, machines, and their "descendants." The catalog draws on a longstanding collaboration between three very different research groups: the Institute for Theory and the Institute for Performing Arts and Film at the Zurich University of the Arts, which work with the aesthetics, forms, dramaturgy, and production of artificial scenarios, as well as the Swiss Epilepsy Clinic, which conducts neuroscientific research. In the run of the collaboration, all three partners pursued their own methodological strategies, from philosophy to approaches from artistic research and visualization techniques to EEG tests and fMRI scans. But all three were united in the goal of seeking to understand how humans react to artificial beings, and in particular the differences between encounters with human faces and encounters with artificially generated faces, such as those of avatars, animated actors, and the like. The catalog brings together the findings of this collaborative research. It also contains contributions from other partners, important reference texts, and further supplementary materials.

The research focused on how people perceive and cognitively process perceptions of real people and artificial artefacts and objects that represent people, whether it be in image form or by means of other visualizations, on the stage, in photorealistic paintings, and in film. The inquiry sought to uncover systematic, practical, and empirical evidence—or a lack thereof—about whether we perceive such representations differently than we do living people, especially when both only appear to us in images or recordings. In order to ensure that the different research projects were comparable with one another, they were limited to perceptions of faces. The key variables were actors who mimed certain facial expressions *perceived as signifying emotions,* and artificial beings like avatars that, by means of real-time motion capture, imitate the same expression. Facial recognition programs were used to scan the actors' faces and transform them into avatars. The programs included that of the Zurich start-up *Faceshift,* which was acquired by Apple during the course of the research, and *FaceRig* from Romania's Holotech Studios SRL.[1] The initial hypothesis was that human reactions to human faces, on the one hand, and to avatars, on the other, represent *distinct forms of relating* that do not just concern perception, but extend deep into the world of human emotions. In short, the assumption was that people register these impressions of faciality in disparate, incommensurable ways. If the hypothesis is correct, it would problematize, if not outright undermine the substitution theory of simulation, which holds that, given the necessary technological development, simulated beings can be perfected to such a degree that they appear indistinguishable to real persons and can actually be mistaken for such.[2]

One source of this foundational hypothesis was the widespread observation that we seem generally willing to accept or are mostly undisturbed by barbarity among artificial beings or animated characters in a way that does not hold when they occur between real people. Comics and cartoons depict all kinds of violence without shocking us. Indeed, we are often amused (as a defensive reaction) by them, even though these same acts would be unbearable if we witnessed them being committed by humans. Moreover, it seems that animation technology cannot completely or sufficiently model the eyes of artificial faces. The gaze, the windows of the "soul" are lacking, or at least are not convincing, because the eyes of the avatar are "looking at nothing," while the gravity of real humans' eyes consists in the fact they are always looking at "something" definite.[3] Similarly, the eye and

1 The research group ended up working with FaceRig. We would like to thank Holotech Studios for kindly giving us permission to use the program for research purposes.

2 On the simulation theory, the implausibility of which is discussed in further detail below, see Bostrom (2003).

3 On the phenomenological theory of the gaze see Sartre (1992), p. 340–400; Lacan (1978), p. 67–122; Waldenfels (1999), p. 124–147.

mouth cavities of avatars have no depth. They appear as just another surface receptive to all kinds of modifications and projections, such as pseudo-gazes or fake asymmetries between the eyes that come from nowhere and, as a result, remain expressionless. Thus, avatars are missing authentic facial features. Instead, they confront us with cyberfaces that are at once interfaces, which neither see nor conceal anything, but merely achieve visibility by being projected onto a screen.

Other similar intuitive points might help further underscore the plausibility of this difference. But they can only serve as guides to help researchers more precisely formulate their goals, questions, and empirical experiments. In this catalog, they provide starting points for philosophical, aesthetic, practical, and neuroscientific inquiries into why other humans affect us differently than avatars, robots, and the like ever could. We cannot avoid identifying with living beings, which might be one reason why their emotional expressions seem to evoke a different (emotional and affective) reaction in us than even the most accurate simulated expressions of artificially generated beings. This observation is all the more pressing in an era where the "media sphere" and technologized world cause us to interact more and more with quasi-autonomous characters, robots, automatons, and other artificial objects. This holds for theater, film, and computer games as well as for things like automated chatbots on the internet. The purpose of the interdisciplinary research presented in this catalog consists in employing diverse methods and, at the same time, analyzing the social, artistic, and cognitive consequences that such interactions have today and might have in the future.

FIG. 1
PROTOTYPE OF AN AVATAR.
HTTPS://FREE3D.COM/DE/3D-MODEL/HUMAN-MAN-SCAN-134MBODY-AVATAR-MARVELOUSDESIGNER-7701.HTML

To this end, the researchers intentionally brought concepts and methods normally considered incongruent into dialogue with one another. This involved combining approaches from phenomenology, cultural anthropology, and media philosophy with the production of images, practical settings, and performative experimental constellations at the Zurich University of the Arts' Immersive Arts Space, and, finally, the empirical experiments conducted with fMRI and EEG monitoring at the Swiss Epilepsy Clinic on subjects with and without epilepsy. In order to make the research of all three subprojects manageable and compatible, we decided to limit our work to the paradigm of "faciality," the emotional expressions of faces, and how they affect people. We chose as our primary object of study avatars as virtual-visual representations of people and, more specifically, avatars' "faces" and their algorithmic production. Thus, the research presented here analyzed all kinds of *images of faces* and humans' affective and emotional reactions to them. They include sequences of images of human faces expressing particular emotions as well as analogous sequences of avatars' faces that, like mirrors, were generated out of the human facial expressions. To sharpen our comparative perspective, each series was played through once by professional actors, by acting students, and by people with no training in acting.

However, this choice alone gave rise to complications with terminology. Is it possible to talk of "faces" in both cases? Do avatars have "faces" in an authentic sense or just the appearance of a face? With the aim of getting around this difficulty, the different research projects as well as the catalog distinguish between "face" (for the human face) and "visage" for the "faciality" of non-human artefacts. The etymological roots of the old German word for face, "Antlitz"—"*ante litze*"—signify that which looks at us, underscoring the significance of the gaze and the moment of an unfathomable alterity central to Emmanuel Levinas's philosophy. This alterity is, at the same time, connected to the aura of the human face, to its numinosity. In contrast, the duality of "visage" relevant for the singular oscillation between faciality and projection surface has more affinity with the Latin "*facies*" and is reminiscent of masks, grimaces, and "making faces." The terminological distinction thus has the advantage of avoiding confusion on the discursive level. This is all the more important because the research projects seek to study the potential for confusion in perception, particularly when it comes to images.

AN INTERDISCIPLINARY RESEARCH PROJECT

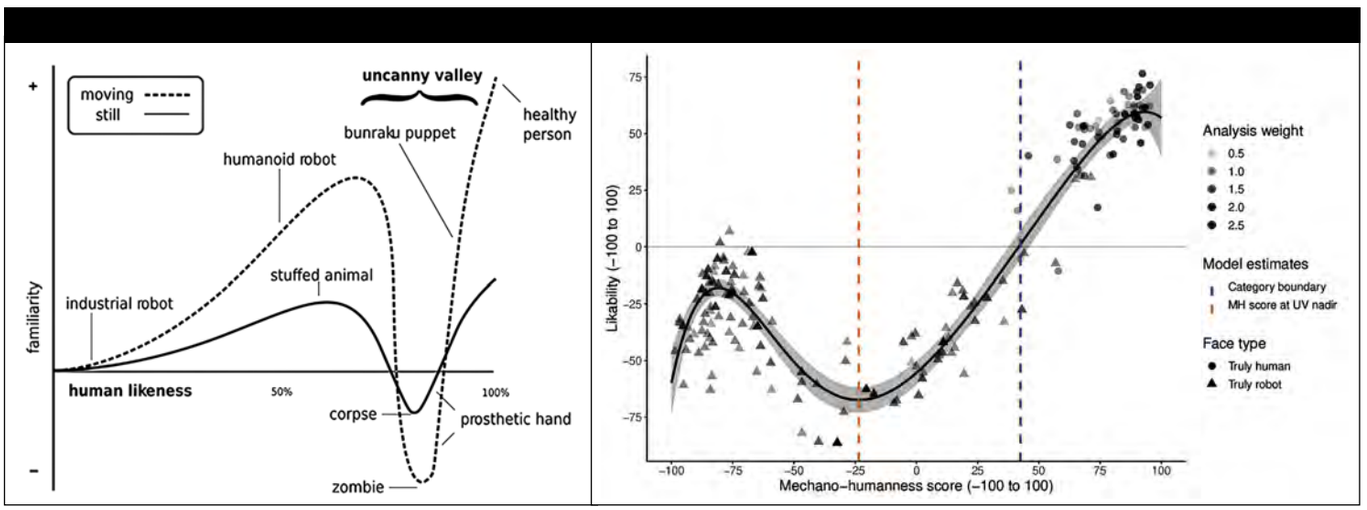
In this tightknit collaboration, three different disciplines shared their expertise with one another in order explore, in both theoretical reflection and empirical experiment, the hypothesis about the difference between how humans perceive other humans and how they perceive animate artificial artefacts. The *philosophical analyses* (Dieter Mersch, Jörg Sternagel) do not take Bruno Latour's actor-network theory as their starting point, even though this might have seemed like the obvious choice, since it focuses on networks of interlaced or overlapping relations. Rather, they work with phenomenological approaches that primarily address questions of *relating* and, in particular, the *relation between the face and the visages of avatars.* Special attention was paid to the role of the human gaze and the difference between embodiment and corporeality. Networks are based on the notion of symmetrical or egalitarian relations. However, one of the research group's primary hypotheses was the manifest *asymmetry of relations* between humans and other humans, on the one hand, and humans and artificial beings, on the other, an asymmetry exemplified by the difference between intentional looks and artificially animated eyes. Key literature here included the philosophy of Emmanuel Lévinas, who holds that the experience of the human face maintains an exceptional place in the experience of the other; Jean-Paul Sartre's account of "the look" in *Being and Nothingness;* Jacques Lacan's psychoanalysis of the gaze; and, on embodiment and corporeality, the work of Maurice Merleau-Ponty, Bernhard Waldenfels, Käte Meyer-Drawe, and Vivian Sobchack.

Some of the research group's core questions were: How do we perceive others? How do we recognize their "face"? What does it mean to be confronted with a "face" in distinction to the "modelled *facies"* or "visage" of an avatar? And what does it mean to express *oneself,* to make an expression, in contrast to imitating or simulating an expression? What are the critical aspects of this difference? Are avatar faces an analog of masks? In turn, how are masks different from simulacra? How do we develop a relation to either one? Do avatars just have *eyes without sight,* while the human gaze, as Lacan writes, has to be separated from the eye, because it represents an insistence in the imaginary that affects us, stalks us, and challenges us, an insistence that we cannot escape? What does the particular gravity of the human gaze consist in? From what does its force derive, and can it be artificially constructed? Further, are human bodily gestures "expression-laden," while avatars merely produce animated movements? Do they have a body with all of its expressiveness or just the formal contours of a corporeal entity? Can embodiment and its fullness be simulated—or do avatars and the like simply have similarities, representing a kind of "as-if" body? Does Helmut Plessner's distinction between "being body" and "having corporeality" play a role here? Is the innerness of "being body" constitutive for living persons, while artificial beings, dolls, avatars, and robots have, at best, a (grafted) exterior body? Finally, what does it really mean to maintain a relationship with something or someone different from ourselves? Does entering into a relationship always already mean entering into a social relation? Are not relationships—in contrast to relations—necessarily situated in a social context, so that we can only ever reconstruct them with *social and ethical categories?*

One of the group's primary hypotheses is that relationships of alterity constitute a special type of relation that is substantially distinct from relations to artificial beings, things, and other objects. Relationships of alterity are rooted in intersubjective acts of relating that are defined by concepts like alterity and foreignness, responsivity and passibility, witness, trust, and recognition. Something similar can be said of the processes of cooperation and communication essential for sociality. These processes do not just consist of abstract "inter-actions," an indifferent exchange of data, information flows, and other intentional structures; rather, they are always already founded upon an originary "respon-

siveness." Can these forms of relation be transferred to artificial beings without remainder, as some theories of post-humanism and media studies claim? Over the course of the research projects, it became clear that this problem has serious implications for paradigms significant to cultural and media studies, including actor-network theory (Bruno Latour), new materialism (Graham Harman, Tim Ingold, Timothy Morton, and others), and technological transhumanism, because the research question concerns nothing less than our relation to technology, which is constructed by our creativity, but which, as many have noted, has a tendency to overpower us and outstrip our ability to maintain control over it.

A particularly fruitful theoretical model for our inquiry was the "Uncanny Valley" (Mori 1970), a fictitious schema developed in 1970 by Japanese roboticist Masahiro Mori. According to the graph, artificial beings, animated dolls, robots, and other simulations and autonomous actors become more uncanny to us the more "humanlike" or realistic they appear. For Mori, uncanniness becomes more pronounced the more the humanoid objects are capable of moving on their own or articulating statements.



FIGS. 2 AND 3

SCHEMA FROM MASAHIRO MORI, "THE UNCANNY VALLEY," AND REPRESENTATION OF EMPIRICAL FINDINGS ON INDIVIDUAL PARAMETERS

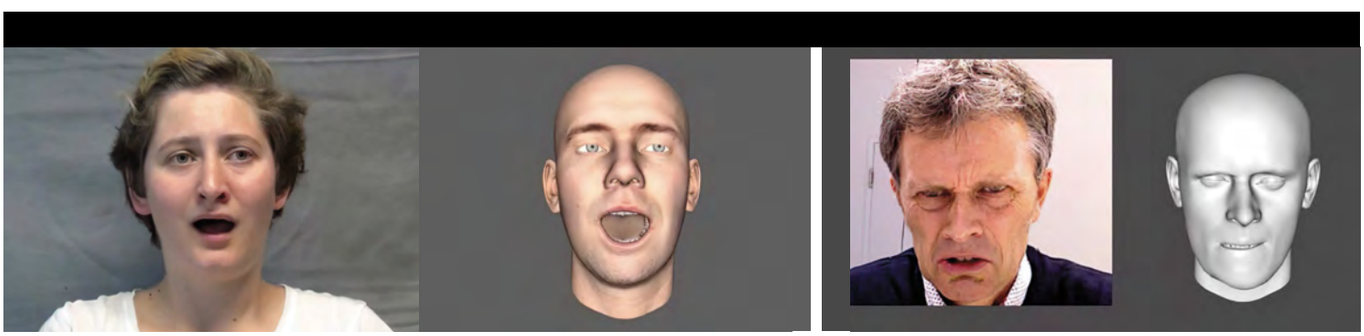
FROM MAYA B. MATHUR, FRANCESCA LUNARDI, BALAZS ACZEL, ET AL., "UNCANNY BUT NOT CONFUSING: MULTISITE STUDY OF PERCEPTUAL CATEGORY CONFUSION IN THE UNCANNY VALLEY," DOI:10.31219/OSF.IO/89SF4.

Of course, the model's utility requires distinguishing between visual media and "real life," but in general, it suggests that there is a fundamental incommensurability between people, on the one hand, and artificial beings, on the other—an incommensurability that cannot simply be ignored or circumvented. This necessitates that all-too realistic representations as well as fictional encounters with artificial beings in "real life" not transgress certain limits. Indeed, according to Mori, it is an ethical imperative of their design that they evidence a certain degree of dissimilarity with people. This notion seems especially applicable to artistic projects in which animated dolls or robots make explicit their "dollness" or "robotness" and thus inscribe a moment of distance or reflexivity into the relations that recipients might establish with them.

Nevertheless, it should not be forgotten that Mori's ruminations on the "Uncanny Valley" were heuristic in nature and were not based on empirical study. Since the publication of his article, numerous studies in cognitive psychology and the psychology of perception have both supported his claims and called them into question. In short, the "Uncanny Valley" is just a model, not a proof. Still, the schema is valuable precisely as a heuristic, which, as an unproven assertion, evokes a whole range of questions. The research projects

detailed in this catalog sought to contribute novel philosophical, artistic, and neuroscientific perspectives on this issue. Because if the project's key philosophical hypothesis that there is a hard distinction between humans' perception of human faces and avatar visages holds, it is to be expected that its effects can be observed in the regions of the brain responsible for facial perception. Moreover, multiple articles in this catalog engage with Mori's model in order to confirm, criticize, or further develop it and use it as a guide for fleshing out the difference between relating to human and avatar faces and analyzing its empirical and aesthetic effects.

The *aesthetic-artistic experiments* conducted in the mode of *artistic research* at the Institute for the Performing Arts and Film at the Zurich University of the Arts (Anton Rey, Gunter Lösel, Miriam Loertscher, Michel Weber) explored this and other issues through performative, dialogical studies of facial expressions made by actors and those made by avatars either modelled on the actors or directly manipulated by them. Thus, they implemented in practice what had remained hypothetical in theory. Alongside Faceshift, they worked with a number of programs like MSQRD, FaceApp, and Clip2Comic. Particularly interesting was their work with FaceRig, which enabled actors to play with avatars of themselves as if they were acting in front of a mirror and, at the same time, helped them establish a practical, reflexive experimental setting that provided optimized images for the neuroscientific researchers. The visualizations consisted of parallel images of actors making intense facial expressions for particular emotions like fear or joy alongside the avatar "visages" generated from them. These comparable images were then studied as part of the neuroscientific experiments. Physiological methods like pulse measurements and eye tracking were used to prepare the images. Their size, proportions, etc. were also standardized and digitally refined. Multiple model images were produced and selected for each set in order to obtain the best pictures for the subsequent neuroscientific experiments, which sought to identify variations in brain activity in reaction to the images.



FIGS. 4 AND 5

OWN IMAGES PRODUCED AS PART OF THE PROJECT

FROM INSTITUTE FOR THE PERFORMING ARTS AND FILM, ZURICH UNIVERSITY OF THE ARTS

The production of image sets was one part of the goal of creating reflexive self-encounters. Another was the performative, aesthetic, artistic constellation: actors mimed an emotion, saw themselves in real-time as an avatar, and at once controlled their own facial expressions and that of the avatar. For each round, they employed clearly distinguishable forms of expression. In a second series of images, they then selected the most neutral facial expressions possible. This should not be confused with "expressionlessness," since neutral expressions, too, evoke conscious or unconscious reactions from others, not to speak of the fact that neutrality is always indeterminate and can hint at a range of different dispositions, such as apathy, ignorance, or masked attraction or rejection. On the basis of numerous experimental exercises, the research groups produced video recordings and images of people and avatars with varying intensities and densities. Then, as if the images were being viewed through a mirror, the actors successively adjusted, improved, and made the expressions more precise and expressive. As a secondary effect, the procedure could be used to help train acting students improve their repertoire of expressions.

By engaging with "their own" "facial avatars," the actors tested out a form of theatre geared towards direct examination of experiences of others and of oneself. These experiments were then monitored with eye tracking technology and other physiological measurements.

From the very beginning, however, the uniform definition and typology of emotions and their physiological correlates in human facial expressions was an object of heated debate. The debate primarily concerned Paul Ekman's theory of the universality of certain emotions, their expression, and the ability of people—independent of culture—to recognize them. In a number of studies, Ekman identified at least six transcultural basic emotions that are embodied in characteristic expressive gestures: anger, joy, sadness, disgust, and surprise; an earlier list also contained contempt (Ekman 2007, 2009). But aren't emotions too fleeting to be definable? Is there ever an emotion that isn't already composed of a number of sometimes contradictory emotions? And can emotions be divided up into a vocabulary that can then, like a language, be channeled into complex "emotional claims"? Certainly, in everyday language, we distinguish between emotions like fear, joy, and melancholy, but when we are asked how we feel at a given moment, we often have difficulty pinning it down or get wrapped up in contradictions because too many impressions hit us at once. Indeed, emotions, which are always rooted in the body, are similar to a microscopic composite of antagonistic moods. They can always absorb different nuances or abruptly switch into their opposite, so that fear can simultaneously be felt as pleasure and sadness can be associated with the expectation that things are beginning to change. So, what is "an" emotion? The one-dimensional register of emotions put forward by Ekman (1972) is just as much of a theoretical fiction as the functional identification of emotion and facial expression undertaken by classical physiognomy and its reiteration in algorithmic "automated facial emotion recognition" programs (Weigel 2020). Emotions are hybrids: they can neither be precisely defined nor precisely comprehended. They fluctuate regularly. And in their simultaneity and fullness, they can neither be mastered nor totalized.

FIG. 6
EXPERIMENTAL FMRI SPACE AT THE EPILEPSY CENTER AT KLINIK LENGG, ZURICH

Nevertheless, we should not dismiss the fact that humans try to read the emotions of others immediately in their facial expressions. *What* a particular expression says is less significant than the difference between expressivity and neutrality. Actors, in turn, are concerned with *how* certain interpretations can be evoked. The experiment's design was thus intended to encompass and work with all these points. The images produced in the "avatarization experiments" reflected mimetic opposition. They were gradually edited and perfected such that they could be utilized as stimuli for the third part of the research project, the *empirical neuroscientific studies* (Thomas Grunwald, Peter Brugger, Hennric Jokeit, Lorena Kegel, Peter Hilfiker, Oona Kohnen, Martin Kurthen, and Teresa Sollfrank). The images of human "facial expressions" (actors) and digitally modelled, emotionally animated "expressive surfaces" (avatars) were systematically compared such that the brain activity triggered by viewing the different visual stimuli might provide data that would support the hypothesis that humans relate to the faces of other humans differently than they do to artificially generated faces.

Thus, each of the three disciplines began with situations that, though embedded in their fields, were comparable; their material and findings could be placed into relation with one another and discussed together. The empirical studies were conducted by means

of neuroimaging (fMRI) and EEG measurements on subjects with epilepsy and a control group without epilepsy. The experiment thus worked with two sets of overlapping variables: expressive versus neutral facial expressions and the responses of persons with epilepsy and without. The importance of the neuroscientific study should be neither overstated nor understated, because it only offers clues or traces, not solid evidence or proof. Still, the experiment was designed such that the results of the two groups would make it possible to draw inferences about whether epilepsy patients' reactions to strong emotions (fear) significantly differ from those of people without epilepsy.

Moreover, the simple, almost intuitive inquiry required that the three groups engage in extensive negotiations. They ranged from honing the common terminology—a *conditio sine qua non* for good collaboration—to gaining an understanding of one another's methods to agreeing on how the findings would be interpreted. Because of the project's interdisciplinary nature, the participants also had to agree on the limits of how the findings would be applied and the limits of the different perspectives. The preparation of precise stimuli was also a time-intensive undertaking. But in the end, the collaboration's research question, methods, and findings complemented one another very well.

METHOD, COLLABORATION AND TRANSFORMATION

Interestingly, the collaboration forced the researchers working on the philosophical part of the project at the Institute for Theory to expand the scope of their inquiry in various ways. Alongside the original question concerning the internal connection between *relationality and alterity* (comprised of the genuine ethics, passibility, and responsivity of social relations), other relevant aspects of the problem became visible over the course of the research. First and foremost was the aforementioned speculative hypothesis about the "uncanny valley" and the debates about it among cognitive psychologists that have been ongoing since the 2000s. Like the no less fictive "Turing Test" in research on artificial intelligence, the "uncanny valley" provides a useful evaluation metric for photorealistic visualization strategies in film, computer games, and various forms of virtual reality. While a machine's ability to pass the Turing Test (which, up to this point, has never happened) implies a certain indistinguishability between human and artificial intelligence—a possibility anticipated by the spectacular successes of Deep Blue and Alpha Go—the leap over the uncanny valley similarly represents a new level of visual illusion. Contemporary examples of this include deep fakes and the computer generation of faces of people who "do not exist," which are nearly impossible to differentiate from real human faces. The dangers summoned up by these technological advances, particularly for the social status of truth and falsehood, are clear.

FIG. 7
AI-GENERATED FACE OF A PERSON WHO "DOES NOT EXIST"
FROM HTTPS://THISPERSONDOESNOTEXIST.XYZ IMAGINED BY A GAN (GENERATIVE ADVERSARIAL NETWORK) STYLEGAN2 (DECEMBER 2019)

Another paradigmatic topic were so-called "real dolls." These life-sized, realistic "dolls for adults" offer a material occasion to probe, from the vantage of sexual fantasies, the rather abstract question about the difference between interhuman social relations and human-avatar interactions. Other humanoid "companions" confront us with similar issues, so that we can generally speak of a "dollification" of human relations in the era of the "technological other." Dollification denotes the reciprocal process in which dolls begin to resemble humans while humans begin to resemble dolls, a process facilitated by both plastic surgery as well as digital media

and their ability to create "hypermimetic designs." The "technological other" is a "dollified person" who has ideal proportions and assumes all the qualities of a "real doll." This led to a series of questions that concerned, on the one hand, both the conceptual distinction between dolls and robots—as artificial beings *with* bodies—and, on the other, between masks and avatars—forms of artificial "faciality." A central position came to be occupied by the inquiry into what constitutes a "face," what it induces, the extent to which it affects and challenges us, and the source of the deep significance of the cardinal medium of the mask in all cultures. Central, too, were reflections on the realistic presence of faces of people who "do not exist." Are there reliable attributes—too much symmetry, hollow eyes, and the like—that can help us distinguish between real faces and avatar surfaces, or is the situation more like the legend of Phidias, who created his ideal statues of gods by composing them of the most beautiful body parts of different people? On another note, what makes masks so unique? What gives them their special ritual energy and symbolic power?

The research on avatars touched on fundamental questions and conundrums in cultural anthropology. The projects sought to distinguish cultural figures like the doppelganger and literary subjects like that of Théophile Gautier's novel *Avatar* from the avatars of photorealistic computer games, whose virtuality derives primarily from algorithmic, binary constructions (Günzel 2012, Beil 2012). Ultimately, the analysis sought to reconstruct the history and structure of the "avatar," its uses, and its contemporary resurgence, which pointed us back to the notion that the avatar has an autochthonous place in "digital cultures." While this conclusion might stamp the avatar as an artificial product of mathematical-algorithmic simulations (Klevjer 2022), it also led to what we might call the "discontinuity thesis" of the philosophy of technology, which asserts that "digital figurations," AI-controlled robots, and other humanoid machines represent the dawn of a new era. This era's artificial beings mark a stark departure from their historical predecessors, such as the living statue Galatea, the Golem of the Old Testament, Mary Shelley's Frankenstein, as well as masks, dolls, puppets, and the like more generally. The essays in this catalog unfurl some of the consequences of these insights.

The *aesthetic-artistic method* of the Institute for the Performing Arts and Film at the Zurich University of the Arts draws on the techniques of *artistic research,* which considers art itself as a genuine medium of knowledge and knowledge production. Debates about the term "artistic research" and its multiple meanings have been ongoing for about thirty years. Clear, though, is that it should be seen neither as its own artistic genre nor as a unified method. For artistic research, art *as such* is a mode of research that makes its own singular contribution to the production of cultural knowledge, and this without the necessity of an interdependent exchange between the arts and sciences. Rather, dialogue between the arts and sciences arises only when both sides are granted equal standing and encounter one another on their own terms. The aesthetic-artistic part of interdisciplinary collaboration, in short, can only succeed when it pursues its own questions and goals. Guided by the same initial hypothesis, the research of the Institute for the Performing Arts and Film did not just focus on producing adequate, standardized images for the natural scientific part of the project. It also engaged with the question of what "expression" means, how it can be embodied by a face, and how it changes in real time. This helps explain the extensive experiments and the numerous prototypes generated through multiple takes, repetitions, adjustments, and edits. For their part, the prototypes themselves constitute aesthetic objects of their own genre. They functioned like mirrors that revealed how an emotion, whether it be fear or joy, can be expressed in a comprehensible fashion by the surface of an artificial figure. In turn, repeated engagement with them facilitated the classic work of dramaturgic mimesis. Thus, the experiment's set-up did not just consist in an automated real-time translation of actors' facial expressions into avatars. Rather, the ongoing process of improving both the actors' expressions and their avatars helped the researchers and participating actors develop a sense for what a certain expression *is* and *says*. This necessitated repeated performances and evaluations. Subjects—male and female actors—were carefully selected. They rehearsed a

range of expressions in a range of different situations and received help from a coach. Over 450 segments and sequences were produced and archived for the purpose of finding fitting cuts for the neuroscientific experiments. Simultaneously, the group created aesthetic installations that enabled actors to have, in almost therapeutic fashion, an encounter with their own avatar. Like theater more generally, this encounter, too, played with transformation. In this sense, the avatars enabled a ludification of the self. They opened a dialogue with identities whose theatrical aspect was at once a means of self-reflection.

A series of unexpected hurdles did trip up the group's work, however. This necessitated that participants regularly reconstruct and refine the experimental set-up. The production of convincing emotional expressions with a clear meaning with real-time translation into avatars was problematic because the uniqueness of the individual actors could not be subordinated to standardization and generalization. Moreover, skepticism about the universal validity of Ekman's catalog of basic emotions saw itself confirmed over the run of the research. There is no emotional expression that has just one meaning. This necessitated the "mirror" situations outlined above, which enabled the actors to reflect on, relate to, and observe themselves. The team then got the idea of using similar techniques for rehearsals and actor training. One reason was that the confusion of identity and otherness in encounters with the avatar version of oneself and its "face" helped actors develop a feeling for how they themselves made expressive gestures. Finally, online surveys allowed the researchers to collect and analyze data, even though, for reasons of experimental validity, the questions were limited to emotions like sadness, joy, and fear, which forced the team to return to Ekman's categories.

Another complication derived from the fact that expressions can be interpreted in multiple ways. The researchers paid particular attention to differences in how recipients viewed and were affected by the images of actors and those of the digitally generated avatars with their artificial gestures and expressions, which play an important role in animated films, computer games, and film presentations. In order to tackle the issue of how people relate differently to human faces and avatar visages, the researchers studied the limits and possibilities of interactions between living people and avatars by using motion-capture technology. This provided a practical test of the initial hypothesis that went beyond the experiment with the non-moving images, thus significantly widening its scope. One important finding was that *movement* is an essential component of the *affective legibility* of emotional expressions. Emotions and their communicability are not a function of frozen facial expressions, but of animation. Emotional expression is a highly fluid event, a transition. The insight led to the hypothesis that avatars—in contrast to the experience of the actor's "face"—derive their attraction primarily from their movements and not from what we would call facial expressions, because their surface visage is relatively schematic and does not "see anything." Certain features of the actor's face like their eyes, eyebrows, and the position of both can indeed be modelled without issue. However, their gaze cannot be modelled any more than folds and wrinkles can be used to generate an accurate representation of an actor's face. But, then, can we really say that avatars have an expression at all? Sure, their features give them "character," but this character does not have a personality with its own history. Some of the contributions in this catalog engage in more detail with this and other differences.

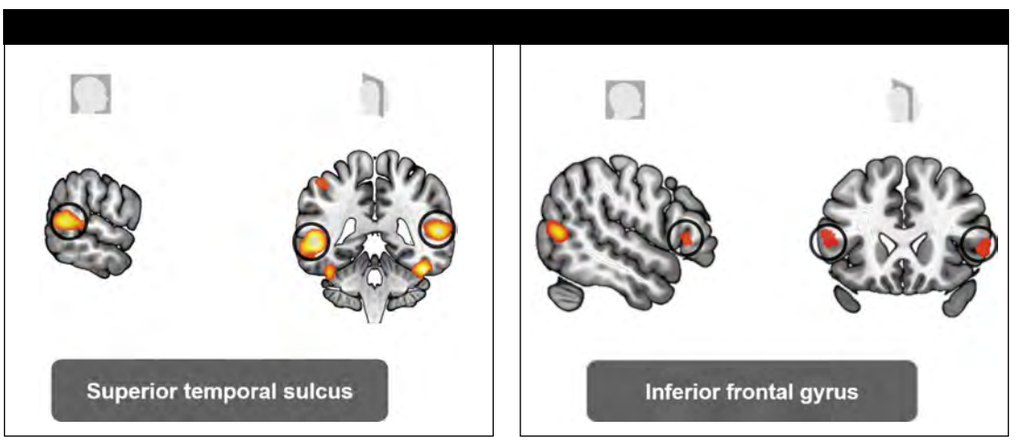
A byproduct of the group's practical aesthetic research was a series of statements about the qualities of artificial beings and their deficiencies, which, despite the advances in photorealistic technology, stick to the artefacts and undermine their effectiveness. For their part, these insights were highly relevant for the philosophical section of the project. They might be provisionally summed up by saying that the difference between human "faces" and artificial "surfaces" derives first and foremost from the "holes" that define the face, as Gilles Deleuze and Félix Guattari write in *A Thousand Plateaus* (1987, 167–191). Bodily orifices, as negative spaces, play an essential role in facial expressions. Simulating them is difficult, because the absence marks the limits of simulation, the point where there is literally *nothing*

FIG. 8
NEUTRAL FACIAL EXPRESSION AVATAR PRODUCED AS PART OF THE PROJECT'S RESEARCH.
FROM INSTITUTE FOR THE PERFORMING ARTS AND FILM, ZURICH UNIVERSITY OF THE ARTS

to simulate. Thus, it is the "empty" or "unfilled" cavities in human "faces" that, in avatar form, simply become black surfaces that mark the places where the inside "turns" outward and forge a connection between subjectivity, expression, consciousness, and comprehensibility. Because the eye is the focus of attention, just as the mouth is the site of articulation. Both gain their significance from the impossibility of representing them, precisely because they are not the product of projection or a screen. Rather, they are the product of a depth that necessarily remains abyssal.

Standardized visual representations of the expressions of human "faces" (actors) and their avatar counterparts served as the foundation for the *empirical, neuroscientific experiments* at the Swiss Epilepsy Clinic. They worked with tools with high *spatial* (fMRI) and *temporal* (EEG) sensitivity in order to detect differences, first, in how people process very pronounced facial expressions (of fear) in contrast to neutral facial expressions and, second, in how people process human faces in contrast to nonhuman visages. Data was collected from two groups: a group of patients with temporal lobe epilepsy (TLE) and a control group of subjects without epilepsy. Comparisons between the two data sets aimed at uncovering significant influences of TLE on emotional cognition. Guiding the inquiry was the question as to whether there were significant differences in emotional perception and the associated activation of certain regions of the brain when subjects saw human and nonhuman stimuli and when they saw their own face and its avatar version. In other words, the analysis sought to disclose whether humans react differently to human "faces" than to simulated expressions of the "visages" of artificial beings. One sign of such difference would be the identification of discrepancies in the brain activity of subjects with epilepsy and those without. The analysis primarily homed in on the degree of difference in reactions to clear facial expressions with a very strong emotional or affective dimension. Comparative studies on patients with autism and schizophrenia had already suggested that such differences exist.

The empirical researchers worked closely with those producing the images of actors and their digital avatars. Out of 468 possible sequences, they selected 128 video segments and then edited them for the purposes of the EEG and fMRI tests. They also put together an online questionnaire where test subjects could enter their assessments of how they experienced the intensity of human and computer-generated faces. Finally, they conducted 56 tests with people with and without epilepsy. Three lines of questioning informed the study. First, which regions of the brain indicate differing activities between the dynamics of human emotional expression and those simulated by avatars? Second, do patients with temporal lobe epilepsy show any difficulties in perceiving and recognizing the visible expressions of humans and avatars? And third, what consequences should be drawn from this for the design and application of such avatars that have different neurological effects on epilepsy patients and the control group? On all three questions, both studies (fMRI and EEG) led to promising findings that were published in the peer-reviewed journals *Social Cognitive and Affective Neuroscience* and *Frontiers in Neuroscience* (Kegel et al. 2020, Sollfrank et al. 2021). This catalog contains a summary of the most important results.



FIGS. 9 AND 10

RESPONSIVE BRAIN REGIONS IN FMRI.

FROM THE EPILEPSY CENTER AT KLINIK LENGG, ZURICH.

RESULTS AND INTERPRETATIONS

The three groups did indeed work with different perspectives and aims, but the research project's interdisciplinary design with its various methods and fields of expertise forged a complex, three-dimensional system that converged in theoretical, aesthetic, and empirical insights on the fundamental differences in how people interact with other humans and with avatars. Special focus was placed on precisely defining the limits of each subproject's scope and, by extension, on relativizing the reach of the individual contributions, whose most fruitful conclusions were born out of their interconnections with one another. Thus, the *philosophical* research of the Institute for Theory, with its emphasis on the aesthetics of relationality, initially accomplished little more than refining questions, defining concepts, drawing comparisons, and repeatedly hitting on the key difference between "face" (actor) and "visage" (avatar). On the theoretical level, this difference—and really, determining this was the decisive point—lined up an indissoluble structure of binary relations between human and non-human, living and artificial, reality and possibility, and being and appearance or "as" and "as if." The deconstruction of these differences by media and cultural studies only touches on the reasoning behind them. However, they remain intact for pragmatic purposes and for everyday life. They structure social experience and cannot, despite skeptical analysis, be simply skipped over. Reducing them to a network of relations and smoothing them out into a series of distinctions without difference in which humans and non-humans hold the same status constitutes one of the post-humanist misunderstandings that obscure contemporary discourse. Not only are they driven by a manifest confusion of "difference" with "dichotomy." Even more, each dissolution of oppositions leads to obvious contradictions, the least of which is the supposed indistinguishability between human and technological traits, though the latter are themselves a human construct. Of greater significance, however, are hypostatizations of deconstruction. Deconstruction speaks not of *factual* indifference, but, at the most, of the impossibility of grounding strict separations; it only points out potential overlaps between the opposed terms, not the inexistence of differences as such. That these differences remain indispensable is evidenced by the *terminological distinction between relationship and relation,* which was foundational for the entire research project. While relationship denotes human connections that always involve interdependencies and mutual recognition in a context of structural asymmetries, relations describe formal classifications and mappings. Alterity is the primary component of human relationships. The same does not hold for confrontations with artificial objects, technological artefacts, and other constructs for the simple reason that alterity cannot be programmed. Where relationships are equated with relations and thus become exchangeable and substitutable, our conception of the social is hollowed out.

Moreover, avatars are simulated beings without *persona* and thus without *agency.* In the cases where they seem to have a persona, it is, in the best-case scenario, simulated. Simulations are based on algorithms or mathematical functions, in which all decisions are determined by preprogrammed formulas. The same holds for their alleged agency. They do not act with intentions, but only behave according to binary choices and aleatoric processes. Thus, the most they are capable of is generating similarities. *But similarity is different from equality.* In contrast, assuming that human agents are on equal footing with algorithmic actions diminishes the reality of the social and reduces humanity to an algorithm. And in so doing, it preemptively settles the ongoing debate in philosophy, the social sciences, computer science, the study of cognition, and cultural and media studies about human and artificial intelligence, on the distinction between thinking and computation and the mathematical coding of consciousness in favor of the universality of the digital.[4] Positing equal encounters between humans and avatars, which can only be normal in dystopian science-fiction novels

4 See the critical perspective in Betancourt (2020).

and films, implicitly accepts the so-called simulation hypothesis, which has been analyzed in particular detail by Nick Bostom (2003). The hypothesis holds that it is possible that our lives and experiences, our ideas and creations are nothing but simulations generated by some supercomputer built by a higher civilization than our own, nullifying the difference between "us" and technological artefacts. People like Elon Musk have embraced this idea as having a probability of more than one in a billion. However, there are many reasons why it is not just unsustainable, but simply absurd, because it not only lacks all sense of the social—its genuine *koinonia*—but also all sense of what consciousness and thinking are, which are always consciousness of consciousness and thinking of thinking in the mode of the double genitive. This also jettisons the meaning of freedom and action as well as what it means to exist as a human with desires, inadequacies, and shortcomings—and thus the need to have creativity, art, and philosophy.

But the simulation hypothesis is also wrong for mathematical reasons, because it necessitates not only the simulation of nearly ten billion individual human brains and bodies, but also their many interactions with one another, including all their recursive simulations and meta-states. The sheer calculation of it all would exceed the possibilities of the universe (the capacity would not only demand the simulation of "A," but also all of its potentialities, which would propel the necessary actions into the exponential).[5] If we were just simulated beings that only ever encountered other simulated beings, then we would live in a completely different world with a bunch of reductive descriptions and categories. One of the goals of the philosophical section of the *Actor & Avatar* project was, to an extent, to rescue the *indispensability of classical philosophical distinctions* as a countermeasure to their almost bizarre dissolution. The idea was not to reinstitute the old hierarchical order of metaphysics, but to make clear that *without them,* we cannot meaningfully talk about ourselves, our own environment, our sociality, and our "community" with technological artefacts and other things or creatures. It follows that, *as* distinctions, they have the status of *conditiones sine quibus non,* not more, but also not less.

FIG. 11
AVATAR: THE WAY OF WATER (2022)
© DISNEY

No less mistaken is the "constructivist theory" favored by some researchers in cultural studies. The theory holds that all perception and cultural life forms are constructed; in doing so, it has some affinities with the simulation hypothesis. For its part, though, it is not outright wrong, but it is one-sided, because it is forced to maintain the non-constructedness of materiality as the condition of all construction. After all, something that is constructed has to originate in something else that is itself not constructed. Otherwise, one falls into the same kind of recursion problem as with the simulation hypothesis or into an infinite regression. Where construction dominates too much, there is nothing that makes construction possible. The necessity of presupposing the existence of something non-constructed also maintains for intersubjective relationships, which can never entirely be a product of relational modelling, but instead are always determined by the relata and where the relation

5 On the opposite position, see Manzotii, Smart (2016).

stems from. This is the reason for the project's emphasis on the duality of "relationships" and "traits," which underscore that the social is defined by its passivity. Every construction is the production of *poiēsis* and thus of an *actio* that collides with the *passio* of the social, because the passive cannot be deduced from the active.

Alongside such questions of scope and validity, problems of representation and its limits also played a central role in the research project. They were explored by using the example of avatars in order to draw broader conclusions, which can be applied not only to visual media and strategies, but also to digital, algorithmic, and performative forms of shaping, function, and control more generally. The fundamental impossibility of totalizing human experience as a *social a priori* and the limits of its methodological and medial possibilities stood front and center. The inquiry into how people encounter and comprehend artificial beings, and in particular robots and avatars, served as points of comparison for developing insights into mimesis in theater, film, computer games, graphic novels, and anime.

Some segments of post-humanist discourse and cultural and media studies assert that there is no substantial difference between human and non-human agents. The philosophical section of the current project determined that this claim chronically ignores the essential asymmetry and passivity of affects in social relations with others, while unduly valorizing the experience of "other Others" in hyper-mimetic simulations. In contrast, the collaborative research found that artificial beings *must be treated as fundamentally different* from living persons, acknowledging that they can only ever be "similar" to humans, but never *equal or equivalent* to humans. In short, interacting with artificial beings is always defined by a deficient similarity. This point is illustrated poignantly by lifelike "real dolls," which, as extreme embodiments of avatars, gradually gained in significance over the course of the project. The interdisciplinary research thus rejected the supposed radicality of post-humanist theories. Decisive are *forms of relationship and their consequences,* because *social interactions between humans* are fundamentally different from those between humans and artefacts, technologies, and animated beings, since the latter are founded in the former. Decisive, thus, is to carefully analyze the specificities of this difference and the reasons behind it. This also holds for objects entangled with affects, such as dolls. The heuristic assumption of the *primacy of social relationships* thus occasioned the group to study interhuman forms of relating with more nuance than in most work in cultural, media, and art studies (actor-network theory, media ecologies, etc.). The real challenge posed by the philosophical part of the collaboration consists in the repeated reminder that our relationships with people are distinct from those with things and artificial agents, and that social communication (in the sense of getting a response) means something different than a mere algorithmic exchange with artistic figures modelled on technological operations. The purpose of this insistence was not to rehash the anthropological discussion on the chasm between humans and technology—this would be pointless, since technology itself is a human construct. Rather, the idea was to delineate criteria for the still valid distinction by separating social relationalities from other forms of relation.

Over the run of the research, this project and its conceptual concretization found support in the promising findings of the *neuroscientific experiments* conducted at the Swiss Epilepsy Clinic. Further research is certainly necessary, because the experiments were focused on a narrow question and could only offer fragmentary evidence. Nevertheless, the experiments on strong facial expressions—and particularly those conducted with fMRI—came to the by no means obvious positive conclusion that there are both similarities and differences in the ways that people process human "faces" and avatars' "visages." It would be going too far to view this as confirmation of the project's initial hypothesis. Still, that the findings do suggest a significant difference is in itself interesting. In comparison to neutral facial expressions, those expressing fear made by both humans and avatars more strongly activated, in subjects without epilepsy, the inferior occipital gyrus, the ventromedial prefrontal cortex, the temporal lobe, and the left amygdala (and in the processing of human facial expressions the right amygdala, too); in subjects with epilepsy, the activation

was less pronounced. For their part, neutral facial expressions performed by both humans and avatars elicited roughly similar brain activity, especially in subjects without epilepsy. These striking differences between how the perception and processing of human and artificial facial expressions activate the brain appeared when subjects were confronted with explicit expressions. Differences were especially notable in the anterior and posterior cingulate cortexes, the anterior insula, in the anterior and posterior superior temporal sulcus, and in the inferior frontal gyrus.

Beyond that, the clinical fMRI tests revealed differences in neurophysiological processing of facial expressions in persons with epilepsy and those without. While facial expressions of fear, in contrast to neutral facial expressions, normally activated the right amygdala and the left superior temporal sulcus in the control group, the brain activity of patients with temporal lobe epilepsy appeared reduced. The reduced brain activity was identifiable in the mesial prefrontal cortex, the superior temporal sulcus, and the inferior frontal gyrus. These findings underscore the clinical significance of temporal lobe epilepsy for the processing of emotional expressions and provide data that should be considered in future clinical studies on how humans process facial expressions made by other humans and by artificial beings.

In EEG studies of subjects without epilepsy, the event-related potential (ERP) in the timeframe of 300 milliseconds after the stimulus presentation demonstrated a significant difference between the "visages" of avatars and human faces. In particular, the amplitude of negative components was higher at 300 milliseconds after exposure for human expressions of fear in contrast with neutral expressions, while the amplitude of positive components was higher at 500 milliseconds after exposure for both expressions of fear and neutral expressions made by avatar "visages." This suggests that human faces might cause a stronger initial arousal than non-human "visages," while avatars' "visages" are associated with a more delayed, stronger, potentially negative emotional reaction. However, a significant difference in responses to facial expressions of fear and neutral facial expressions in both timeframes only maintained for human faces, but not for artificial faces.

The analysis of oscillations in the electrical activity of healthy subjects' brains determined that all faces/visages (neutral and fearful, of humans and of avatars) triggered an increase in activity in the form of a desynchronization of oscillations in alpha brain waves. Still, all values of responses to the neutral expressions of avatars were significantly greater than those for "emotionless" human faces. This might suggest that all stimuli have to be processed just because they attract the subject's attention. Underlying this is the assumption that increased synchronization of theta brain waves is associated with an increase in cognitive processing and memory activities. The data supports the claim that an increase in theta wave synchronization, which is correlated with a greater expenditure of resources, is caused by facial expressions of fear, regardless of whether they stem from human faces or artificial "visages," while neutral facial expressions do not evoke such synchronization. On this particular point, different responses aligned with face type were only observed in response to neutral facial expressions. This suggests that processing the impulses given off by avatar "faces" requires more resources than with human faces, while facial expressions of fear, regardless of their source, might max out the brain's capacities, so that the different type of face carries little weight. In sum, the fMRI and EEG data underscore two points: First, there are differences in how our brains process human faces and artificial "visages"—at least in the case of strong facial expressions. Second, on the level of methodology, they show that the measurements used can generate meaningful insights about how people process human faces, artificial "visages," and the facial expressions of both. This might help future research develop better methods to more precisely analyze the effects of epilepsy on emotional and social cognition. The studies and their findings can be found in this catalog.

Thus, we are confronted with a striking congruence between the results of the philosophical inquiry and the neuroscientific empirical research—even if we can only treat these congruencies as "clues," since the cooperation of philosophy and empirical science cannot extend further than that. The *aesthetic-artistic research* of the group at the Institute for the

Performing Arts and Film opened up another perspective. One aspect was its experimental method of creating visual stimuli for the neuroscientific studies through repeated takes, rehearsals, and recalibrations. This represented a considerable effort and more reflexive sensitivity than is normally the case with empirical studies, which generally work with material that is more or less given. Moreover, together with the Immersive Art Spaces of the Zurich University of the Arts, the group conducted its own studies on the *experimental practice of self-encounters*. After all, translating their own expressions into avatars required the actors to continuously "work" on their own faciality—not only on how they made certain expressions, such as those of fear, joy, or neutrality, but also on their sense of self as such. While the philosophical working group identified interactions with human faces in contrast with avatar faces as an insurmountable difference, the aesthetic-artistic research group played with this experience and experimented with "overcoming" it. Aesthetics and art primarily work not with realities, but with possibilities. This is decisive for the future of artistic practice in theater, film, and, more and more, interdisciplinary art, because these forms' experimental spaces create their own experiential frameworks that have always engaged with the problem of encountering oneself.

FIG. 12
JOHANNES GUMPP, SELF-PORTRAIT
1646, FLORENCE, THE UFFIZI GALLERY

While artists have historically always used mirrors for their self-portraits (see Kruse 2008), today's digital technologies create "other mirrors" that have more to do with "doppelgangers" and the free, artistic shaping thereof. Virtual encounters with one's own "face" in an image are made possible by techniques like animating or altering it, or by motion-capture systems and other three-dimensional virtualization programs like those used in film studios. These encounters give actors the opportunity to experiment with their own identity, to double or distort themselves, in order to spur communicative processes that not only reveal the potentials of avatars, but also make visible the differences in how people relate to other humans and to artificial beings. These differences, of course, stand at the center of the collaborative research project. But this section focused less on the nature of this difference and its ethical consequences and more on art's "joyful play" with transformation, which has been part of its practice since Dionysian theater. After all, the archetypal god Dionysus originally stood less for intoxication and revelry in pleasure—these were later additions to his meaning—and more for *metamorphosis* and *masks*. Thus, the inquiry into the use of avatars in digital theater was also an inquiry into its relation to the classic mask. It is this desire for "becoming other" that generates its own experiences, knowledge, and perhaps even "fear" (see Aristotle), which has its own reflexive dimension that exceeds mere pleasure. The social relevance of art and the modes of research enabled by it have their own singular, unmistakable power. Beyond the

FIG. 13
KYLIX WITH DIONYSUS WITH THYRSUS AND VINE BRANCH BY MAKRON, CIRCA 480 BC.
FROM THE GODS OF THE GREEKS, BY E. SIMON, 2021.

visualizations produced for the neuroscientific experiments, the rich collection of images of faces and their various avatarizations represent artificially induced moments of "becoming other" that could be studied from other, art-specific vantage points. The current catalog documents not just a selection of the images and their experimental use. Multiple contributions also deal with the aesthetic productivity of the various playful interactions between "actors" and "avatars."

PRODUCTION OF THE CATALOG AND THANKS

We would like to thank the many people who helped put together this catalog. First, we want to thank the Swiss National Science Foundation, whose generous funding made the collaborative interdisciplinary research project possible. We also want to thank all the members of the three research groups, as well as the many others who supported, enriched, and pushed forth the research with their ideas, reflections, and critique, including Hennric Jokeit, Peter Brugger, Martin Kurthen, and Peter Hilfiker, Gunter Lösel, Marius Mahler and Oona Kohnen. International partners played a key role in this project. Thank you to: Alexander Gerner from the University of Lisbon, Stephan Günzel from the Technical University of Berlin, Michael Mayer from the Sinergia group at the Zurich University of the Arts, Corinne Soland, Martin Fröhlich and Christian Iseli of the Immersive Arts Space at Zurich University of the Arts, Nadja Ben Khelifa of the Freie Universität Berlin, James Tobias at UCR, Allison de Fren at Occidental College, Los Angeles, and photographer Elena Dorfman. We were grateful that many other authors participated in the discussion, among them Martina Heßler of the Technical University of Darmstadt, Rune Klevjer of the University of Bergen, Käte Meyer-Drawe, professor emeritus at the Ruhr-Universität Bochum and Gabrielle A. Hezekiah of the University of British Columbia. All their contributions made possible this rich compendium full of heterogeneous ideas and materials, which can be read against the grain or out of order and further developed on their own terms or on in conjunction with other approaches. Alongside selected test images and figures on their experimental production, it also contains images from art and design, which were a source of inspiration for the research groups in different ways. It contains texts, essays, and brief studies composed by members of the research groups and by guest authors and cooperation partners. Finally, it contains many documents and extracts from literature and texts published elsewhere. They all revolve around the research topic in a broad sense. They offer a range of perspectives on the same subject and open up a discursive field that invites readers to continue the work in different ways. Some complement or overlap with one another, while others explicitly contradict one another. But above all, they diverge in their forms, which range from academic articles, such as the reports on the findings of neuroscientific experiments, to artistic pieces on the "experience of oneself with one's avatar," which gained significance as a tool of actor training, to essays that stand on their own. We thus hope that readers will treat the catalog as a diverse assemblage that is not so concerned with delivering complete answers as it is with articulating new questions, engaging in reflection, discussion, and experiment, and perhaps spurring other disciplines to develop their own inquiries into these issues.

For all translations from German into English, we are grateful to Laura Radosh.

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