MASARYKOVA UNIVERZITA

FAKULTA SOCIÁLNÍCH STUDIÍ

The Martian Rovers: A Conceptialization of Puppets for Social Performance Theory

Master thesis

JAN SUDA

Vedoucí práce: doc. Bernadette Nadya Jaworsky, Ph.D.

Katedra sociologie
obor Sociologie

Brno 2021

MUNI
FSS

Bibliografický záznam

Autor: Jan Suda
Fakulta sociálních studií
Masarykova univerzita
Katedra sociologie

Název práce: The Martian Rovers: A Conceptialization of Puppets for Social Performance Theory

Studijní program: Sociologie

Vedoucí práce: doc. Bernadette Nadya Jaworsky, Ph.D.

Rok: 2021

Počet stran: 130

Klíčová slova: kulturní sociologie, social performance, ikonicita, loutka, mars rover, průzkum vesmíru

Bibliographic record

Author: Jan Suda
Faculty of Social Studies
Masaryk University
Department of Sociology

Title of Thesis: The Martian Rovers: A Conceptualization of Puppets for Social Performance Theory

Degree Programme: Sociology

Supervisor: doc. Bernadette Nadya Jaworsky, Ph.D.

Year: 2021

Number of Pages: 130

Keywords: cultural sociology, social performance, iconicity, puppets, mars rover, space exploration

Abstrakt

Tato práce konceptualizuje, s využitím Social Performance Theory a teorie o ikonách a ikonicitě v rámci kulturní sociologie, společně s historickým a současnými teoriemi loutkového divadla, případ teoretického konkrétního aktéra v *social performance* – loutky. Cílem je skrze teorie ikon a loutkového divadla navrhnout teoretickou konceptualizaci nového dvojitého aktéra, skládajícího se z loutky-objektu a jejího lidského loutkaře. Tento aktér je poté reflektován v samotné *social performance theory* s návrhem možných proměn uvnitř samotného procesu performance. Tento teoretický návrh je v druhé části testován na případu Marsovského vozítka Perseverance, skrze interpretační práci na jeho designu, *social performance* přistání na Marsu a jeho aktivitě na sociální síti. Tato práce poskytuje možný příklad pro hlubší zkoumání materiality a objektů a jejich potenciální role v *social performance* a to nikoliv jako *means of symbolic production*, ale jako aktérů, se kterými se obecenstvo může ztotožnit a kteří můžou sami poskytovat *cultural extension*.

Počet znaků: 153 961

Abstract

By utilizing social performance theory and the theory of iconicity in cultural sociology, together with historical and contemporary theories of puppet theatre, this thesis conceptualizes the case of an actor in a social performance – a puppet. The aim is to, through the theory of icons and puppet theatre, establish a theoretical conceptualization of a new dual-natured actor, consisting of a puppet-object and its human puppeteer. This actor is later reflected in social performance theory with an elaboration of the possible changes within the process of the performance itself. This elaboration is then tested on the case of the Martian Rover, Perseverance, through interpretative work on its design, the social performance of its landing on Mars, and its social media presence. This thesis provides a framework for the deeper study of materiality and objects and their potential role in social performance, not only as means of symbolic production but as actors with whom the audience can identify and who can provide cultural extension by themselves.

Statutory Declaration

I hereby declare that I have written the submitted diploma thesis concerning the topic of **The Martian Rovers: A Conceptialization of Puppets for Social Performance Theory** independently. All the sources used for the purpose of finishing this diploma thesis have been adequately referenced and are listed in the bibliography.

In Brno, 20 May 2021 .....

Jan Suda

Acknowledgments

I would like to express my sincere gratitude to my supervisor, doc. Bernadette Nadya Jaworsky, Ph.D., for having the patience with me and my long process of writing, rethink and reconceptualizing this thesis and through notes and commentary pointing me toward this final version. Also, my eternal gratitude goes to all my friends and family for keeping me motivated and helping me find motivation in the times where there was none.

Content

List of Pictures 15

List of Tables 16

1 Introduction 17

2 Theoretical Foundation 23

2.1 Social Performance Theory 23

2.2 Icons and Iconic power 27

2.3 Puppet 33

2.4 From an Icon to a Puppet to its Social Performance 40

3 Perseverance 47

3.1 The Body Design 49

3.2 The Social Performance 59

4 Discussion 91

4.1 One or Two Performances 91

4.2 One or Two Puppets 92

4.3 Theory and Reality 95

5 Conclusion 100

6 References 103

Appendix A Perseverance's Twitter Export 109

Appendix B Live Broadcast Interpreted 110

Name Index 128

List of Pictures

Picture 3.1 Visualization of the Perseverances body design (JPL, 2020c). 50

Picture 3.2 Pose of the rover with highlight as seen in the "Arm" tab (JPL, 2020i). 51

Picture 3.3 Perseverances first tweet (NASAPersevere). 62

Picture 3.4 Conversation thread including Twitter, NASA and Perseverance (Twitter). 71

List of Tables

Table 3.1 Binary coding of the script 86

1 Introduction

Throughout history, the idea of space outside our planet was a subject to a fascination that propelled a multitude of human activities, from inventions like a telescope to look more closely at what is happening up there, through artistic works like science fiction to philosophical disputation about the origin of all that is. The look at a night sky filled with stars can leave one wondering what is out there, with the feelings of anxiety for the lethal environment that outer space is and excitement for all the possibilities waiting there to be discovered.

Today space exploration becomes a vehicle of global desires and anxieties and gradually invokes the ideas of our collective future as a space-faring race, making extraterrestrial space a possibility for becoming a province of humankind. Even though outer space is so distant from our ordinary everyday experience in almost every way, it is enabled to experience through various space explorers, thus enabling the socialization and culturalization of it (Damjanov, 2018, s. 555). As the exploration of this space outside is more and more established in everyday life as something not necessarily typical, but at least usual, it also becomes part of our social life: *"Over 500 people, thousands of technologies (including over 6000 satellites) and uncertain numbers of nonhuman animals have traveled into space thus far, and few are recognized as a common cultural reference"* (Damjanov, 2018, s. 556). These space explorers became space celebrities, where regardless of their nationality, species, sentience, or social background, they together transformed how we conceive of our presents and futures in space (Damjanov, 2018, s. 555). Together with the help of media coverage and the environmental context of outer space, these entities and especially astronauts re-

vived the heroic figure of the explorer in modern times as exceptional that represents us as a single collective (Damjanov, 2018, s. 558).

This proliferation of a space explorer and its unique exploits enabled a new kind of highly capturing social performances. The most iconic one being the Apollo 11 mission to the Moon, a grand achievement for all the humans to follow as it was unfolding through extensive worldwide media coverage, making Neil Armstrong and Buzz Aldrin, the two astronauts that first stepped on the Moon, internationally famous and over time reaching global stardom (Damjanov, 2018, s. 557). However, the performances were not always outstanding achievements but also great tragedies, as in live broadcast of the launch of the space shuttle Challenger which upon lift-off broke apart, killing seven members of the mission aboard (Damjanov, 2018, s. 557).

Since the Moon landing, human explorers gradually disappeared from the foreground of a significant breakthrough in space exploration, their presence so far only confined in the International Space Station (ISS), which has been continuously occupied for more than 20 years. To this empty social space, however, a range of uncrewed missions stepped in. Some things appear particularly disposed towards fame and notable performances in outer space, thus becoming celebrity objects in their own right. The attraction towards an animated object makes it a powerful tool for mobilizing abstract desire. It is not a mere objectification of a person, but instead an animated technical object that is socially animated (Damjanov, 2018, s. 558). From the two Voyager probes that left the solar system as the first-ever human-made objects in the second decade of the 21st century, carrying Golden Records engraved with data that are supposed to present life on earth to alien intelligence (Damjanov, 2018, s. 559), to the International Space Station as the only

continuously still occupied outpost for humans outside their home planet since the first expedition in 2000 (Damjanov, 2018, s. 561). These objects are without doubt icons of the cultural landscape of space exploration.

However, the emergence of the new media, the social network, enables a new way of a distinctive field of public conversation, exchange, and engagement (Healy, 2017, s. 1), allowing further development of this object narration. Its a group of Internet-based applications that allow the creation and exchange of user-generated content (Lee, 2015, s. 535). Outer space is both an exciting topic for many people worldwide, thus generating exciting and engaging content, and currently, only a relatively few social agents have access to the means of production of this content. The American National Aeronautics and Space Administration (NASA) is one of those social agents, and its media office excels in using it.

With around 300 accounts across eight platforms (Facebook, Flickr, Instagram, LinkedIn, Pinterest, Tumblr, Twitter, and YouTube), NASA uses its access to exclusive content provided through many space missions like the Hubble telescope or astronauts on ISS, to not only inform the public about the current projects but actively engages with them by hosting live broadcast or Q&As. The variety of accounts concerns the agency itself and its employees and the projects and mission themself. Including the many objects the agency sent to space (Zurbuchen, 2019)

This is where the rovers come into the picture. Using accounts set up in the names of the rovers, for our purposes here, specifically Curiosity and Perseverance on Twitter, NASAs ghostwriters purposely inform the public about the respective missions by writing in the first person

as if the rover was communicating themself directly. Together with the usage of informal language littered with cultural references crafts an image of an animated entity (Damjanov, 2018, s. 561). It is also not only the case of social media. Jet Propulsion Laboratory (JPL), the part of NASA responsible for running the rover's missions, sets up live broadcasts of key moments of the missions like launches from Earth and landings on Mars. Those broadcasts follow a tradition of similar events, like the Moon landing; however, the demand for an individual is entirely supplied by the rover. This object-centered media enabled the telepresence of the audience in places where the possibility of an actual human presence is still far in the future.

This contextualization finally brings me to the goal of this thesis. Through my life-long interest in space and a similar one recently acquired for cultural sociology, I have tried to make sense of this phenomena using the social performance theory; however, soon, it became clear that this case of a rover activity cannot be understood either as a symbol since that would disregard its human-like performance, or an actor, since the approach as an actor playing a role of an object would not fully account for the materiality, the iconic features of the object. Therefore, following the underlying metaphor of social performance as a derivation from theatre, I came up with the idea of conceptualizing the case as a double natured entity of an animated object and its human animator fused into seemingly one actor – a puppet. This would enable investigation of both the material and the human side of the rover and its place in the overall performance.

With that in mind, the main questions I pose for this thesis are the following two:

Is it possible to account for an object's performative ability by conceptualizing it as a puppet actor?

And if so:

Does this understanding of it somehow deepen the understanding of social performance?

For answering these questions, I will first start with theoretical elaboration based on three bodies of theory: Social Performance Theory, Theory of Icons and Iconicity, and various historical and contemporary theories on puppet theatre. From understanding these, I will then move to conceptualize the puppet as a social actor and elaborate on its place in the social performance and how this new introduction possibly modifies the performance itself.

This theoretical elaboration will be then tested on the case of the Perseverance rover through interpretation of both its social media performance on Twitter and its more conventional performance of landing on Mars. For the former, I will interpret various textual and audiovisual data of the tweeting activity that the account made, and for the latter, I will be interpreting a recording of a live broadcast that accompanied the event of the Mars landing.

2 Theoretical Foundation

2.1 Social Performance Theory

> *"Cultural performance is the social process by which actors, individually or in concert, display for others the meaning of their social situation. This meaning may or may not be one to which they themselves subjectively adhere; it is the meaning that they, as social actors, consciously or unconsciously wish to have others believe. In order for their display to be effective, actors must offer a plausible performance, one that leads those to whom their actions and gestures are directed to accept their motives and explanations as a reasonable account." (Alexander, 2006, s. 32)*

Social performance theory gives us the means to understand narrative construction through acts of performance in social life. It is understood to have importance on both micro and macro levels. Here, I will be presenting a general understanding of this theory that best suits my following case.

The key elements of cultural performance, identified by Alexander, are systems of collective representation, actors, audience, means of symbolic production, mise-en-scéne, and social power. These elements encompass a variety of other, smaller but significant, parts that together *"(…)provide a framework for the interpretive reconstruction of the meanings of performative action."* (Alexander, 2006, s. 36)

Systems of collective representation are scripts and inert, background symbols of the performance that provide a referential framework for the actor to draw their performance. It is the world of symbols, motivations, archetypes, and other devices ranging from traditional myths to today's popular subcultures that construct the overall

narratives and codes of the performance (Alexander, 2006, s. 33). The roots from which the visible act grows.

Actors are the critical component of the performance because they decode and interpret background representations to extend those meanings and present themself to the audience. They can do so consciously or even unaware, but their goal is to make the observers identify themself, but not with the actor as a person, but the character the actor represents. The successful outcome of the performance is dependent on the actor's ability to do just that (Alexander, 2006, s. 34).

An *Audience* is an ensemble of individuals observing the performance. They are the people for which the meanings are displayed and cultural text interpreted. They encode the performance, and they do so by projecting themself into the characters and identifying themselves with them. There is a variety to the level of investment of the audience into the performance that is dependent on many conditions spanning from their interest, interventions by critics or outside distractions to barriers like the absence of physical presence for the performance, disabilities or, in our case, technology and temporality (Alexander, 2006, s. 35).

Means of symbolic production are material things that are at hand for the actors to use as iconic representations of the motives and concepts they are trying to present to the audience. They include not only objects but also the stage itself on which the performance takes place (Alexander, 2006, s. 35).

Mise-en-scene can be described as spacial and temporal confinement of the performance itself. It is also a director of the event, its atmosphere, the whole "scene "as presented to the audience. If actors are the ones in the center of the performance, mise-en-scene is the envi-

ronment around them, the sequentiality of the performance, dramaturgy, and choreography (Alexander, 2006, s. 36).

Social power is an external boundary to performance. It defines the validity of the event. It deals with the social conditions for it if it is relevant, if it will be allowed to proceed, or will require changes both before or after it happens. The performance is legitimized (or not) and socially directed by social powers (Alexander, 2006, s. 36).

Together, these elements provide us with a tool to examine social events and processes and uncover their deeper meanings via interpretation of the performance presented.

Whether they act alone or in numbers, the actor's primary goal is to project cultural meaning from performance to the audience (Alexander, 2006, s. 55). They do so, consciously or not, by being an active part of the drama and taking the actual inert text of the performance that is derived from a script and so on based on background representations and extending those elements towards their audience by walking and talking and by that achieving psychological identification and cultural extension. However, there are a few challenges on the road to successful social drama. The main aim is not merely pointing at the text but to authentically embody the role.

Authenticity is one of the essential conditions for success. It is the achievement of a seamless, consistent flow of the performance created from its fragments, infused with meaning, and presented by a skillful and affectionate act. If the performance is authentic, it appears genuine and sincere (Alexander, 2006, s. 55). Social powers will not appear as external forces influencing the performance and its outcome but will be perceived as driving the intended meaning or not perceived at all (Alexander, 2006, s. 56).

This authenticity is also not something that, once achieved, could be perceived as a finished thing. Especially in social dramas, the actor's ability to stay in their role and occupy it sincerely is in doubt both from the outside by the audience and from inside by themselves. However, these social actors benefit from the fact that they often occupy the role they are meant to act out (Alexander, 2006, s. 70). In the end, even if the symbols at hand are powerful, the stage well prepared, and the script well written, the performance fails if the actor fails. Nevertheless, on the other hand, even disastrous preparation can be resurrected by being acted out by a skillful performer.

So what happens if the actor is successful? As stated above, actors perform cultural extension by decoding and interpreting the text of the drama. They strive to reach a double fusion of the performance, between text and actor and between actor and audience. Fusing the actor and the text means creating a sense of autonomy. An actor is no longer a person on their own but an embodiment of the role they present. They take all the passive aspects of the performance prepared for them and bring them to life. This statement, however, encompasses a few mechanisms that need to be addressed.

The matter of fusion first starts with the background of cultural representations being extrapolated into the performance script. In social dramas, these scripts, the choices of which meanings, codes, narratives are to be used, are often inferred by actors themselves. If the script is well-conceived, it seems to the audience as providing a truthful message of the background culture it emerged from (Alexander, 2006, s. 58-9). Alexander breaks down the functions of the script into four categories: Cognitive simplification (exposition of the understanding of background culture), Time-space compression (unifying the action,

place, and time of the performance), Moral agonism (narrating in binaries), and Twisting and turning (engaging plot development) (Alexander, 2006, s. 59-62).

With the script in place, the performance then needs to be anchored and put into the scene. This is understood as mise-en-scene. Staging the performance at a real place in real-time depends on the other parts of the performance. It could be dictated by the script, dependent on the means of symbolic production that are to be used and, in the end, by the social powers themselves (Alexander, 2006, s. 63-4). It is the part of the drama where the fusion between the actor and the text occurs.

The part that social powers play in the performance and its double fusion is rather peculiar since it can affect this process in both of its stages. They can mediate the performance in its production stage in the form of censorship or restricted access to the means of symbolic production, as well as the distribution of the performance to the audience and the interpretation of it in the form of criticism, restricted access, and so on (Alexander, 2006, s. 66-7). Nevertheless, this is not the only obstacle that the fusion between the performance and its audience face. It is also the problems like differentiation of the audience, comparative interpretation with earlier performances, and involvement and engagement.

2.2 Icons and Iconic power

For purposes of this thesis, the theory of icons and iconic power as an expansion of cultural sociology provides a great tool for interpreting

various material objects scattered across the cultural landscape of space exploration.

The basic definition of the concept of iconicity as understood by cultural sociology is provided right in the first few lines of the introduction into *Iconic Power* by Alexander et al. and is as follows:

> *"Objects become icons when they have not only material force but also symbolic power. Actors have iconic consciousness when they experience material objects, not only understanding them cognitively or evaluating them morally but also feeling their sensual, aesthetic force." (Alexander, 2012a, s. 1)*

This concept and following theory have their roots in classical writing by Emile Durkheim, *The elementary forms of the religious life*, namely in his take on totemism. Totems as a collective representation carry a social force, communicate sacred and profane meanings and through rituals, where they act as an integral part, generate emotional identification (Alexander, 2012b, s. 25). This conceptualization, however, needed to be actualized into a modern differentiated society. Therefore the iconicity is established as the interaction of surface and depth of the object, where the aesthetic power of a surface cannot be reduced to what the surface means in the figurative sense. Icons are material signifiers of signified. They retrieve, activate, and articulate the depth of the signified by providing a sensory experience (Alexander, 2012a, s. 2). By that, they represent a compressed, easily accessible meaning that provides to members of societies *"a sense of participation in something fundamental whose fuller meaning eludes their comprehension and (…) the possibility for control despite being unable to access directly the script that lies beneath."* (Alexander, 2012a, s. 2) With the iconosphere, society then has access to various meanings through a sensual form.

However, icons themselves do not possess the only sort of inert representational value, but they are also actants with volitional qualities relative to human beings. They have a social life in which they can influence the community in various ways that were not necessarily intended in the moments of their concievement (Alexander, 2012a, s. 3-4). They can do so by their power which emerges from the intertwining of their aesthetic surface and discursive depth. The relationship between these two layers can also be fluid in that the surface of an icon does not necessarily objectively signify depth, but it can be more metaphorical and relativistic (Alexander, 2012a, s. 4-5).

Here I also adopt a notion by Alexander about the performativity of icons. Iconic power varies and can fluctuate depending on the performance of an icon. Even though an icon is an object and therefore it appears "as is," the response to its effect on society can be less impactful if the reception by its audience is faint. That depends on available means of symbolic production, mise-en-scene, and other elements of social performance described in the previous section. However, in the case of icons, there is one more influential element: social power, namely the role of critics. Critics stand in between the icons and their reception and influence the audience reaction to iconic power by interpreting. This influence does not fall merely into the evaluatory binary category of "if the icon is actually what it is worth or not," but they also provide context for the icon and act as sort of "enablers" of the possibility to experience the iconic power more deeply. They point out what to look for or how to feel and approach the icon. They interpret the icon for an audience, but on the other hand, also create an audience for an icon, using their social power and influence to draw attention to a particular object (Alexander, 2012b, s. 32).

Aside from that, the critic's main power lies in influencing the de- or refusion of icon and audience. By observing and reading into the icon, they can strengthen or weaken their power by accounting for their flaws. However, they do so, and the reception of their criticism depends on it by trying to read the truth of the icon. If their reading of the truth about an icon is accurate, then it is likely that the audience that will experience the icon firsthand will agree with the opinion of the critic (Alexander, 2012b, s. 33).

We can draw a parallel here with the actors strive for authenticity in social performance. If the actor's performance is authentic, if it is truthful, the audience will be compelled to fuse with the performance. A similar case is with icons; here, if the audience experiences the truth about an icon, if they deem its power as authentic, they too will likely fuse with the performance. The main difference here is probably that the iconic authenticity is more challenging to perceive, and therefore the role of the critic is more influential.

Even though critics do mediate the iconic power, the power is not dictated by them. Iconic power often builds up organically without specifical engineering by social powers. Typically icons in a social environment grow their power by invisible assertions and often are not subject to explicit reviews by critics (Alexander, 2012b, s. 34). Iconicity is instead a process than a fact. It fluctuates and has a temporal arc. Icons emerge from performative acts, live on their own with their power independent of the process that produced them, and later on "die." As Woodward and Ellison state in their work *How to make an iconic commodity*: *"Objects can descend back into the mass of cultural goods, lose their cultural efficacy, become anachronistic, and eventually be just plain ignored. There is a definite life cycle of the icon, involving movement*

from the edges to the centre of culture and eventually back out again, with phases of emergence, ascendancy, primacy, and then a downward part of the cycle involving descendants and expiration. All icons must have such a life cycle, though the cycles vary in duration and velocity. An object that seems to be at the absolute core of a culture's values will not seem that way forever; there is always a turn toward anachronism and irrelevance." (Woodward, 2012, s. 158-9)

An interesting insight into the inner structure of an icon provides Werner Binder in his addition to the volume *Iconic Power*, where he presents four dimensions of iconicity that deepens the original structure of the iconic surface. They are *reference*, *transcendence*, *syntagmatic openness,* and *paradigmatic openness*. Reference is a criterium of successful performative authenticity. It is concerned with how truthful the signifier refers to the signified. If the icon appears as a truthful manifestation or not. Transcendence then defines the ability of an icon to "overcome the shadow of its birth." It is more than the event or a person from which the icon emerged. Syntagmatic openness is a dimension of interaction between different elements of an icon that somehow breaches the visual surface and invites the spectator to investigate the iconic depth. It is the engagement of a composition that emanates tension and therefore draws the interest of the spectator. Paradigmatic openness refers to multiples of readings of an icon that are created by its elements that refer to other motifs and contexts, and therefore the interplay inside of an icon can have multiple interpretations (Binder, 2012, s. 106-7). This typification is centered around the interpretation of images, and its original language is the evidence of it. However, I believe that it can be broadened and, together with the following one, reconceptualized to the case of a social performance puppet.

Another conceptual insight into the iconicity that may prove helpful in this work but is equally worth mentioning is Malczewski's *sensuous* and *conductive surface*, which he offers in his paper *Materiality, iconic nature, and Albert Bierstadt's "Great Pictures. "* He presents these two concepts as an extension to Alexander's iconic surface, where he founds the original term as too broad and encompassing two independent forces – the autonomous contribution of form and the transmission of symbolic principles (Malczewski, 2016, s. 362).

Sensuous surface, Malczewski argues, is the actualized aesthetic power of material form. In other words, all material objects have a multitude of qualities ranging from weight to scent, from which all are potentially aesthetically significant but not all sociologically relevant. Identifying those relevant qualities can access the empirical aesthetic power (Malczewski, 2016, s. 362-3). A *conductive surface* is then *"the actualized power of a material object for transmitting symbolic principles. At issue here is the efficacy of the material object as a repository and conduit of symbolic content. Material symbols are not mere matter – they are matter transformed. Containing a power to represent society figuratively, material symbols are phenomena of a different order than mere material objects. (…) Conductive surface is in evidence when material symbols are effective as such when their quality as symbols is recognized."* (Malczewski, 2016, s. 363)

Sensuous and conductive surfaces, together with symbolic depth, provide a framework to explore various sociologically significant material objects analytically. There is one more interesting approach that Malczewski mentions, and that is his use of symbolic instead of iconic, or to be more exact, symbolic depth instead of iconic depth. This he

presents as the iconic depth is applicable for material symbols generally; hence, he uses the term material symbol (Malczewski, 2016, s. 362).

This Malczewski's phrasing brings me to one last issue concerning the theory of icons and their power, and even though it seems like a minor one, I feel the necessity to address it. It is the understanding of the meaning of the term itself. Where does an icon end and symbol begins? Are they interchangeable? The argument about understanding the nature of the icon itself is presented in the *Afterword* to *Iconic Power* by Giesen. There he discusses the idea of iconicity and the usage of the term, and even though he does not necessarily pose an answer to the questions above, he connects the icons nature with visuality: *"What we risk losing by broadening the meaning of the term to include everything socially important is, however, the strong link between social extraordinariness and its visual representation. Icons, we may argue, are visual media, and they partake in the nature of visuality as distinct from acoustic or olfactory signs. "* (Giesen, 2012, s. 249)

Giesen's argument is thought-provoking, but even with the risk, he presents I will be residing to the broader use of the term for practical reasons of distinction between material and figurative symbols on the following pages.

2.3 Puppet

> *"Regardless of their functions, meanings, and interpretations, puppets are a vast family of inanimate and anthropomorphic objects that human beings, over the centuries, tried to give life to, both figuratively and practically, manipulating them with hand, strings, cords, rods, and, in the case of automatons, with a complex system of cogs and gears, often causing philo-*

> *sophical discussions about the nature of life itself. " (Maselli, 2019, s. 18)*

What is a puppet? The most common usage of the term can spark various interpretations. The main two are an object, a figure created for the dramatic representation of a human being, manipulated by a hidden puppeteer for an audience. The other is a conventional metaphor for someone manipulated by a hidden "mastermind" to perform some hidden agency in broad social situations. I am going to disregard the latter for now and focus on the conceptualization of the former.

The history of puppet theatre and the general use of puppets in social life is both rich and nearly impossible to comprehend fully. However, Tománek tries to break down the topic and assumes puppets as performing objects played, and still do, important role across various cultures throughout the world: *"It is very likely that in every culture, man has tried to find ways of presenting himself through the fine arts or through other living creatures. (...) From the beginning, it was the rawness and ignorance of these instruments he used to manipulate the materials that made him seek out something that was the most essential. (...) Man strives for the activation of matter and its magical ability to come to life."* (Tománek, 2016, s. 126). However, studying puppetry from a historical standpoint is not an easy task. Despite having a long-ranging history in folklore, theatre, and religion, it was not until the 19th century when first theoretical discussions and works trying to map the historical evolution of puppetry appeared, and even those were concerned mainly with the European tradition (Bell, 1999, s. 15-6).

For my purposes here, I will only briefly describe the European tradition of puppetry since the works on it in the last century, and contemporary western puppet theatre provides much-needed problemati-

zation of the role of the puppet in the performance as well as theoretical discussion about dramatical puppet performance as a whole.

The most common form of a puppet (or at least the one that generally comes to mind when the term is mentioned), suspended from strings and manipulated by a hidden puppeteer from above, is generally known as a *marionette*. Taking as an example the Czech tradition of puppetry, the marionette was widely popular in the times between the world wars. It sprung an era of creativity in professional puppet theatres as well as by folks artists: *"String puppet technology became a real paradise for puppet "inventors" and craftsmen. A competition between the theatres to create the most realistic living "little human being" on the stage had also surfaced during this era"* (Tománek, 2016, s. 42). Almost every theatre had its inventions and improvements that allowed them, in their view, to make their puppets to be more human and life-like (Tománek, 2016, s. 42). Across Europe and even the world were many technological diversifications. Tománek mentions in his work, for example, Sicilian and Indian variations (Tománek, 2016, s. 43). In the case of marionettes, the stage was usually built so that the space above the puppet area was concealed so the puppeteer could move freely above. Another design used by folk traveling puppet artists was operating the puppets from above-behind, where the puppeteer stood behind the stage (Tománek, 2016, s. 61).

Another example of puppet technology is puppets operated from below. The stage for this type of puppet was conceived so that the puppeteer could hide below that "floor" of the puppet area and therefore manipulate the puppets above them and stay hidden. Outside of the European tradition is also an example of Vietnamese water theatre. The stage was partially submerged in water, and puppets were operated by

rods below it with the floor of the performance bein the water's surface, while puppeteer stood behind the stage also partially submerged in water (Tománek, 2016, s. 76). There are many other types of puppets, for example, operated from behind or shadow theatre (Tománek, 2016). However, the main ideas, illustrated by these examples, are, for now, two:

1. The notion of concealing the puppeteer, so the fact that the main actors of the performance – the puppets themselves – are somehow animated stays only implied by the nature of the performance itself.
2. They strive to make the puppets seem as close to life as possible.

Those are two of the main concerns of "classic puppet theatre," where the audience has contact only with the puppet itself (Tománek, 2016, s. 16). The appearance of another actor or the puppeteer themself inherently causes the explication of the nature of the puppet. The human on the stage reveals the "puppet characteristics" of the puppet. However, the reality of the puppet, the fact that it is an animated object precisely designed to act out the performance for which it was created, reveals another aspect of the puppet, which is arguably its most significant advantage. Its materiality and form.

Contemporary puppet theatre is not so strict about the stage being only for puppets, and to this, I will come later, but the usage of puppets and advantages of their form is today not only a matter of puppet theatre in the sense of classic staged performance and is better illustrated elsewhere. Emma Fisher, in her paper *The symbiotic relationship between puppetry and disability: The emergence of a strong contemporary visual language,* states in her introduction: *"The puppet can be anything;*

it can do what the actor cannot. If it looks no different and acts no different from an actor it has failed" (Fisher, 2020, s. 16). Then she describes the puppet as something other than a simple representation of the standard human form and illustrates her performances, where she used the possibility of intentional puppet design to reclaim the voices of those that have been othered, namely the people with disability (Fisher, 2020, s. 17-8) (Duyn, 2020). The ability of a puppet to look, represent and become in its form something that a human actor simply cannot is a powerful "performative tool." Not having a determined state and the necessity to act in a certain prescribed way, they have the freedom to perform to enable discussion about almost anything. It can become a vehicle of an agency (Fisher, 2020, s. 17).

This ability of puppets also enables them to be used outside of theatrical performances. In psychotherapy it is used mainly in dealing with children, where they can facilitate a safe conduit for self-expression, elicit projection and identification and gain mastery over complex and even overwhelming challenges: *"My puppets Audrey Duck and Cat-a-lion and I are talking to Elsa, a seven-year-old about to have heart surgery at Boston Children's Hospital. I have given her four animal puppets to use, including a dog dressed as a doctor, a dragon, a lamb, and a goat. She picks up the dog/doctor and pretends to make a very precise cut-down of Audrey's chest. Another child, with the same puppets, who has been hospitalized for more than a year for multiple surgeries, pretends to cut Audrey into a million pieces and feed her to the doctors"* (Linn, 2020, s. 104).

The therapeutical aspects of puppetry are not reserved only for children. Andrea Makrovits describes her work with puppets in her paper to help her workshop participants reparating heavy memories tainted with traumas from political violence (Markovits, 2020, s. 150).

As seen in the examples above, the puppets can come in various forms. Also, virtually any form can become a puppet. The stylization can vary significantly if it always connects to a living model that evokes a figurative archetype, or at least its behavior. It can be even a non-figurative object that behaves in a certain way that invokes the illusion of human performance (Tománek, 2016, s. 127). Therefore achieving possibilities in representation that would not be able in the classic human form of acting while retaining the ability to fuse the performance with its audience.

Deriving from the previous discussion, I then define, for now, a puppet as an object that is, through means of sensory experience, actively performing a role recognized by its audience as if it was performing on its own.

2.3.1 Puppet and its Puppeteer, Designer, and other Actors

While the puppet performs on stage and can, with proper usage of its form, anthropomorphize into almost anything, it needs a puppeteer. The human behind the act always brings the object to life; they are the ones who give the puppet its agency, its role to perform. Without it, it is a mere object that, while it can still retain its meaning, its purpose, cannot actively perform on its own. The puppeteer is always there, whether *visible* or *invisible*. Also, it is important to note that there can be numerous puppeteers handling the same puppet or vice versa.

The role of a puppeteer, however necessary, is in reality relatively straightforward in the sense of its definition. In theatrical practice, the puppeteer is commonly hidden from the audience, and their performance is ideally visible only through the performance of the puppet they manipulate. This case I understand as an invisible puppeteer.

Throughout the performance itself, we do not know who the person behind the object's animation is.

As I hinted in previous pages, in contemporary puppet theatre, it is not unusual that the puppeteer is made visible. The moment the puppeteer appears on stage, they become a part of the performance. They become an actor themselves. It can take on numerous forms. The actor-puppeteer can act together with its puppet as a temporal narrator of the performance, act as another character, take up the role of the puppet, or even create the puppet on the stage as a part of the performance. When the puppeteer is made visible, they bring forward the nature of the puppet as an object. Therefore, they need to have a role of their own or divert the focus from themselves as much as possible. Otherwise, the presence of a human diverts the attention from the puppet, and the overall performance suffers (Tománek, 2016, s. 115-6).

As a designer, I understand the maker of the puppet as an object. The designer and puppeteer can be one person. On the other hand, when they differ, what inherently differs are the meanings imbued into the puppet. The designer creates the puppet with their interpretation of its meaning, of the role the puppet is supposed to act out, or even without the intention of the object becoming a puppet. Then the puppeteer takes the puppet into their hands and interprets its form, considering the overall performance themself. This difference can, of course, vary and is dependent on the cooperation of the two.

Historically, in a puppet theatre, another function appeared for increasing the audience fusion effect between the spectators and the puppets. That was the role of an interpreter. The interpreter could be either the puppeteer or another performer who stood in front of the puppet stage. There, physically placed between the puppet and an audi-

ence, they had numerous functions. Ranging from announcing the start of the show, playing music, collecting money, to encouraging the audience to interact with the show as illusory audience-performer, where their goal was to deepen the audience immersion into the performance: *"He "manages" the crowd not by silencing it but by facilitating the crowd's inclusion in the performance and modelling how to collaborate with the puppet and sometimes animal performers"* (Sheriko, 2020, s. 156).

2.4 From an Icon to a Puppet to its Social Performance

Having established the puppet in theatrical arts and other traditional social performances, I here move to bring this concept together with the theory of iconicity presented earlier and later to put it in its possible place in social performance. I argue that fundamentally a puppet is an icon that temporarily acquires an actor's status through performance.

Drawing on Binder's four criteria of iconicity and Malczewskis's two types of iconic surfaces, I propose typification that I will use and test out onward in the interpretation. It is *Personification, Transcendence, Body narration,* and *Body design.* I understand *Personification* as the puppet's ability to manifest itself as a moving and acting object that, through its actions as a living creature, overcomes its nature of being just an animated thing. Its material form animated on a stage provides an authentic reference to a figurative archetype, to a human-like persona. The ability to "illustrate "a person is closely linked with the ability of the puppeteer to animate the puppet accurately. If the manipulation of the puppet is not well executed, the puppet can hardly acquire the necessary stage validity as an actor.

The *Transcendence* of a puppet is understood here as its ability to overcome the constraints of the human body. If the puppet successfully establishes itself as an actor, it can act like a human being and augment the act with its inhumanity. The ability to "illustrate" a person, but also through its material nature overcome it. The identifiability also refers to a puppet's relationship with its puppeteer. Although the puppeteer essentially brings the object to life, giving it its agenda and role and therefore its identity, they are influenced by the puppet's design, the "puppet's own intentions" (Kent, 2018), and possibly the reaction of the audience. The puppet transcends a human form and the intentions of the puppeteer that first brought it to life.

Body narration then refers to the features of the puppet that brings out its anthropomorphism. Its materiality and the meanings and dynamic between the elements. Suppose we were to analyze the narration of the body of a puppet, we need to look at its physicality and analyze the possibilities for narrating it into a life-like body. However, referencing the sensuous surface typification mentioned earlier, not all the parts of the object are equally sociologically relevant for its function as a social performance puppet since it is likely that it was not designed in a social environment with the intention of it becoming a puppet.

As a *body design* of a puppet, I regard its overall physical appearance. It is the base for the puppet body narration to come from. Body design encapsulates the multiple possible meanings and narrations of its body inertly present in its basic inactive form.

Since the puppet is a product of a puppeteer and a designer, the criteria above must be understood through the human actors. The designer's intentions frame the body design of the puppet. It refers to the way the material form was shaped and the purpose of its shape. This

domain, the puppeteer, if they are understood just as the animator behind the movement of the puppet, cannot possibly influence. If the puppeteer were to alter the material form of the puppet throughout the performance, they immediately take on also the designer's role. The puppeteer's primary concern is with the puppet's other three attributes since those are manifested by the performance.

Similarly, as the criteria of icons, the four characteristics are concerned with the surface of the puppet and invite the audience to immerse themself into the depth of the object. The puppet's depth is what I claim to be, its main difference and most significant advantage against considering it only as an icon. It is where not only its cultural meanings and symbolic lies but also its identity acquired through the act of performance.

Even though the purpose and meaning of social performance that includes puppetry stay the same as the conventional one, the process itself is altered by the presence of the animated object in several ways. I theorize here that the only thing that stays virtually unchanged are the systems of collective representations, the background culture of the social performance, to the point of the script. The script changes only in a "technical" way to accommodate a puppet's presence in performance; however, its role as a derivation of the background culture that is at hand for the actor to use in the performance, and to fuse with it, stays the same. The main changes come into play with the rest of the elements of social performance.

Before the puppet is animated, and after its performance ends, it is considered a means of symbolic production, as an object that can be potentially used to enhance an actor's performance. However, when a puppeteer takes the puppet on a stage and starts their performance,

they start the process of transformation of the object into a figurative actor who has seemingly their agency, and by acting in a way that evocates in an audience the illusion of a live human-like figure, they imbue the puppet with its own identity. The nature of puppet as a social actor is dualistic. It consists of the object-puppet and its puppeteer, and for their performance to be successful, they need to fuse into seemingly one actor. This fusion depends on both the ability of the puppeteer to manipulate objects authentically and to immerse themself into the act enough so that the manipulation of the puppet seems human-like and therefore can acquire an identity. It also has to be supported by the animated object in its design that enables anthropomorphic body narration. If the fusion is successful, the puppeteer should extend themself into the puppet and perform the role of an actor through the object.

The fusion of object-puppet and puppeteer into one double-natured "two-faced" actor that is the puppet then enables the conventional double fusion of social performance to happen. The fusion between the actor and the text happens through the puppeteer as they act out the prepared script of the performance. The fusion between the actor and the audience happens through the object-puppet, where the audience sees the role acted out. The successful fusion with an audience is similar to the conventional case of performance: projection into, and identification with, the actor. However, it is also dependent on the audience's ability to "accept the act" that the actor they are to identify with is, in reality, an animated object. Overcoming this obstacle requires the puppet to be human-like enough in the two attributes mentioned above – personification and body narration. Those then pave the way for the emergence of the identity into which then can the audience project themselves. If all three cases of fusion are successful and maintained,

then as long as the puppet is performing, it stays in the role of an actor. Therefore the goal of the performance, the cultural extension, can still proceed similarly as if the performance was acted out conventionally by a human actor.

The other two aspects of social performance, the mise-en-scene and the social powers must also account for the puppet's presence. The dramaturgy, spatial and temporal confinement, stage preparation should reflect the unique need of the puppet to have their own space in the performance, where the attention is focused on them since the fusion between the puppet actor and the audience is likely to require more work than a conventional one. However, the production of stage space for a puppet actor allows more freedom since it does not necessarily have to accommodate a human actor's needs if that actor is not needed for the performance and if the object-puppet performs in a different space than its puppeteer is located. The issue of a place for the puppeteer in the performance also needs to be resolved. Whether they will be visible and where they will be placed, as not to breach the illusion of an object-puppet as an independent actor. I could go here into more extensive elaboration on the possible requirements of a mise-en-scene for the performance of a puppet. However, since I do not deem them vital for now, I will put them aside, but I expect to dwell on those particularities more deeply in the next part of the thesis.

Social powers should play a big part in the possible success of puppet performance. They can help overcome the problem of fusion between the actor and the audience in a sense that they could provide necessary stage validity for the puppet through interpretation of the performance and mainly through referencing to the puppet similarly as they would to a human actor, therefore encouraging this "doublethink,

"this acceptance of the act that is performed. I argue that the social powers are more prominent in securing the fusion, or to that matter defusion, of audience and actor in this type of performance. One particular case of a social power that is worth mentioning here is the case of a possible interpreter. Interpreter, drawing on a similar case in the theatrical theory of puppetry and a critic in iconic theory mentioned above, could stand in between the actor and the audience. Then, through their commentary of actions in the performance, interpret the events on the stage and facilitate the (de)fusion. It is something that I expect to encounter in the following interpretation of the Mars rovers as well.

Lastly, I need to address few issues in the relationship between the puppet-object and its puppeteer. When the puppet is first brought to life, when it first acquires its identity, it then reciprocally influences the actions of the puppeteer. Through the fusion between them, the puppeteer should understand that the puppet is established to act in a certain way, and if they manipulated it to act in a way that would go against its identity, it would breach the authenticity of the puppet's performance. It is not to be understood as the puppet; once it is established, it cannot evolve or even change its identity; however, this has to be done carefully and has to have just that would be deemed reasonable by the audience.

This understanding of the role of a puppet puts it somewhere between the icon and a human actor of social performance. If an object acquires an identity, it is not anymore just an icon. However, it also cannot match the performative ability of an actor. If a human actor were to appear on a stage beside the puppet, the puppet, even though it does not necessarily cease to maintain its identity as a performer, can become inferior in its performative power. Same as in a theatrical per-

formance, the appearance of a human on stage brings out the nature of the puppet.

When the performance ends and the puppet-object returns to the realm of means of symbolic production, it carries with them the inert possibility of identity that was infused into the object through the performance, thus becoming sort of a "proto-puppet, "that, if to be animated again, can refer to the previous performance and more easily achieve fusion. However, for the puppet to be reused, it also requires the other actors to be familiar with its previous performance and possibly for the audience to know of it. Nevertheless, this new meaning of an icon is only temporal and is likely to deteriorate quickly if the object is put out of use for a prolonged time.

3 Perseverance

The Mars rover Perseverance launched from Earth on 30th of July 2020 and landed on 18th of February 2021 on the surface of Mars in Jezero Crater as the fifth addition to a family of NASA Mars rovers already present there. It weighs a few kilos over a ton (weighted on Earth) and is 3 meters long, 2.7 meters wide, and stands 2.2 meters tall with a robotic arm that can extend another 2.1 meters. Therefore its proportions are about the same as of a car. Its mission is officially considered at least one Mars year (687 Earth days) (JPL, 2020a). It has three main goals: searching for signs of ancient microbial life, characterizing the climate and geology of Mars, and collecting carefully selected and documented samples for a future return to Earth (JPL, 2020b). For this purpose, the rover has various scientific instruments to facilitate this endeavor. However, my main focus will not be on the possibilities of scientific discoveries that could alter our perception of the red planet but the rover's possible function as a social performance puppet.

This section will be divided into three parts. The first one, The Body Design, is where I will be describing the physicality of Perseverance and its potential for future body narration. This part of the theoretical conceptualization of puppet can be done separately from the actual performance since the body design is a native feature of the object itself, and through performance is then activated. The second and third chapters will then be concerned with the interpretation of the actual performance of the rover. It is divided in two since my goal is to interpret two different instances of social performance in which the rover appeared. The first one is part of its long performance on social network Twitter, where I will be analyzing if and how the rover estab-

lishes itself as a puppet (NASAPersevere). The second is then the performance of its landing on Mars, and it is a more traditional social performance that is spatially and temporarily defined as 2 hours long live broadcast (NASA, 2021).

The method I will be using for this is an abductive interpretation of various textual and audiovisual material. This thesis aims to test the theoretical elaboration provided earlier as a viable explanation for a phenomenon of objects seemingly posing as an actor of social performance. The interpretation will follow a line of thinking presented by Reed. First, through a minimal interpretation of data, the description of what relevant is going on with the phenomena presented to identify a set of surface meanings present in the social situation, then resignifying those surface meanings through a piece of theory, to at last offer a maximal interpretation, to uncover deeper underlying meanings that constitute a portion of a landscape of meanings of the cultural narration of space exploration (Reed, 2011). This framework will help me navigate with relative freedom through the provided material to find purchase for the conceptualization and possibly offer deeper insights.

For the first part of the interpretation, I will be analyzing a series of tweets posted by, and as reactions to, the Perseverances social media account (NASAPersevere). This data is either provided exported in a datasheet appendix (Appendix A) to this thesis or in the cases where the interpretation requires the whole picture indented in the text. For reference purposes, each tweet from the datasheet is provided with referencing cumulative ID number (reactions from different accounts towards Perseverance are referenced by MID number and comments by CID number) in brackets: [ID 0]. The datasheet is divided into several parts respectively towards the division of the performance itself – Ex-

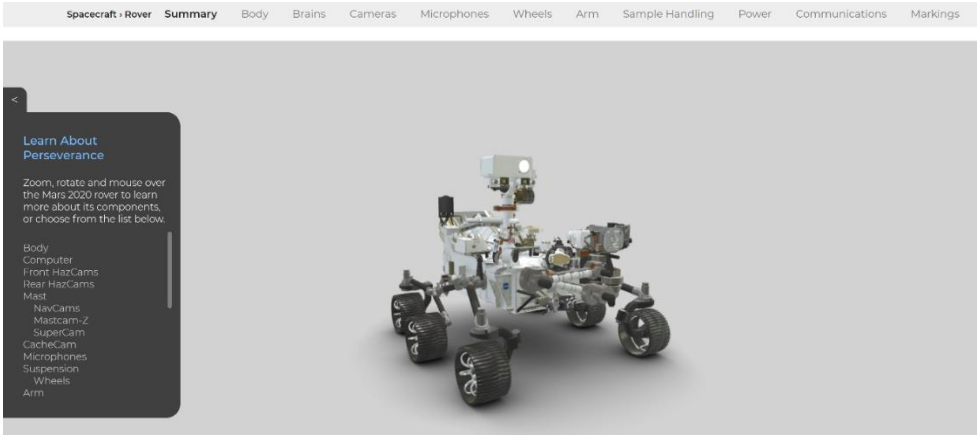
position Phase, Cruise Phase, Landing, Mission Phase – and Mentions and Comments. However, in this thesis, my main focus will be on the Exposition phase and briefly on the Landing. Analysis of the broadcast is done first by the minimal interpretation provided in appendix (Appendix B) since the broadcast is over 2 hours long, and therefore the minimal interpretation spans 11 pages. Each instance of the broadcast description is provided with a timestamp in brackets: [00:00]. Those will be used for reference in the text.

Finally, the reason behind choosing this particular example to illustrate the concept of puppet, aside from my interest in the topic of space exploration, is the presence of a powerful narrative behind non-human objects venturing into the unknown and harsh environment of outer space. Since the gradual disappearing of new significant human exploits outside of the terrestrial origin, the range of technical objects performing breakthroughs in discovering the universe outside acquired a particular attraction with the possibilities of the new media in the 21st century made it available for a broad public to effectively engage with those objects (Damjanov, 2018, s. 558). The Mars rovers then were able to telepresence humans on another planet through broadcasting images from it (Damjanov, 2018, s. 561). This new way of communication has put the rovers in a position where they can, I argue, be animated into puppets of space exploration quite easily, and their fusion with the audience here on Earth can be achieved with relatively little effort.

3.1 The Body Design

For exploring and interpreting the possibilities of the body design of the Perseverance rover, I will be using its 3D model that is provided in the

overview of the Mars 2020 mission on the NASA official webpage. This model is presented as a visualization of the rover's body for public use, and it is its most easily accessible and comprehensive description. It is also the one that is medialized, though indirectly, by referencing the mission overview in which this model is included, by the Perseverances Twitter account in its first appearance on this social media platform (NASAPersevere). As a result of this, I deem it the go-to location for the general public, the audience, to explore the body design of Perseverance by themselves.



Picture 3.1 Visualization of the Perseverances body design (JPL, 2020c).

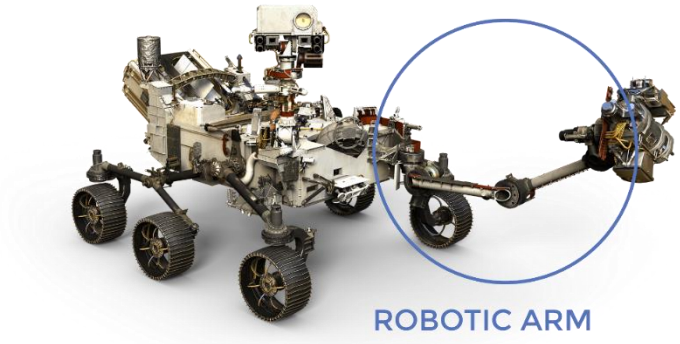
In picture 3.1 above, we can see the 3D model that appears on the page as the visualization first renders. The viewer can then move and turn around the render to view the presented body from different perspectives. On the left of the window is located a clickable menu, where if clicked on one of the rover's provided parts, the visualization centers on that specified element providing a very brief description of it and a link for more information. This more thorough information can also be accessed through the menu above the visualization, which then brings

the viewer to a description of that part of the rover, its function, technical details, and scientific instruments.

From this first view, we can gather a few body design elements that will possibly be relevant for the latter social performance. The most prominent parts that strike us first are the wheels, the torso, and the "head" of the rover. With the guidance of the left menu, we can then explore its various main instruments. However, from their provided names, it seems there is already some anthropomorphic body narration present natively in the rover's design. I am referring here to the body and the arm, again, in the left menu. The body as a torso of the rover is easily discerned without the necessary clicking on the word itself. However, the arm is not, since it is currently folded in the front of the visualized model.

The name "Mast "refers to the box-like element with a camera that evokes the interpretation as a rover's head. This notion is also partially supported by the brief description that pops out when the element is clicked on: "The mast elevates key camera systems and sensors, giving the rover a human-scale perspective on its environment" (JPL, 2020c). This perspective is not only concerned with the visual capturing of the world around but also with sound. That is the last significant, relevant feature that we can discern from this first view of the model. Perseverance is the first Mars mission that gives us the ability to hear the sounds of the red planet (JPL, 2020a).

Using the top menu, the viewer can explore the features of the rov-



Picture 3.2 Pose of the rover with highlight as seen in the "Arm" tab (JPL, 2020i).

er in much more detail. This menu is also where we first encounter a serious anthropomorphic body narration. Moving to those parts provides us with a new picture of a more stylized rover who performs a "pose" towards a viewer. All the tabs have the same picture except for "Microphones," the rover is stylized into a different pose, and "Markings," the picture is missing altogether.

As seen in picture 3.2 above, this pose can be easily interpreted as stylized into more human-like visualization, mainly because of the mast seemingly looking back at the viewer with a camera resembling an eye even with an eyelid. Also, the robotic arm stretched out, which can be interpreted as the rover presenting it to the viewer and with it the various instruments that could be referred to as its hand. Interpreting the picture this way is also supported by the texts in the sections describing the parts of the rover in more detail. There is more of a different kind of narration of the body design present.

In the "Body" tab, we can read that the torso is called a warm electronics box, "WEB "for short, and it is designed to protect the rover's computer and electronics, which are the equivalent of the rover's brain and heart. Therefore the body keeps the rover's vital organs protected and temperature-controlled (JPL, 2020d). The "Brain" tab mentions the rover's computer and memory that is, unlike with animals and people, located in its body. The brains are, in fact, two. One is for now "asleep" and can be awakened if the first one is at fault. The brain has "nerves" for balance and position used for precise movement of the rover. The brain also monitors the "health" of the rover, its temperature, and power levels, along with other features that keep the rover "alive" (JPL, 2020e). The "Camera" tab refers to the multiple various cameras located on the rover as "eyes" (JPL, 2020f). The "Microphones" tab describes

Perseverance as equipped by the engineers to be "a good listener" using its two microphones. Also, aside from cameras that have given us sight, robotic arms, hand, and feet have supplied touch, and chemical and mineral sensors have let us taste and smell, hearing is the last of the five senses that have yet to be exercised on Mars (JPL, 2020h). The title of the "Wheels" tab is inside the page extended to "Wheels and Legs," whereas legs are referred to as the rovers suspension system that is holding the wheels (JPL, 2020g). The "Arm" tab starts by comparing that Perseverance's arm can move "a lot like yours." It has shoulder, elbow, and wrist "joints." At the end of the arm is a turret that is also referred to as a "hand." This hand is equipped with a set of "hand tools." The arm lets the rover work as a human geologist: by holding and using science tools (JPL, 2020i).

The "Sample Handling" tab describes the rover's system of collecting and storing samples of the land. This sampling equipment is described as "in the rover's belly" (JPL, 2020j). The "Communications" tab describes the system of antennas that provide the rover with the ability to communicate with Earth. These are referred to as a "voice "and "ears " (JPL, 2020k). Finally, in the "Markings" tab are described several artworks, signs, and symbols present on the Perseverance itself or in some way traveled to Mars with it. Those are introduced by the following: "From bracelets to body art, humans have adorned themselves for thousands of years. The spacecraft that we send to Mars are no different!" (JPL, 2020l). The only tab void of any explicit metaphor to a human body is the "Power" one, where the rover's power source is described (JPL, 2020m). Otherwise, we can see that the physicality of Perseverance is already heavily narrated as human-like.

The fact that the anthropomorphic body narration is already presented here needs to be elaborated on further. My theoretic assumption, which I presented in the theory section of this thesis, was that the body narration aspect would be expected to happen through the social performance. However, here it seems that the narration happens even before the puppeteer takes up the object to perform. The difference between body design and body narration was theorized that the body design aspect encapsulates the qualities of the object, which could be later used to narrate the object as a moving and acting puppet. The parts that have the inert ability to be activated and through the performance narrated give the object the illusion of a human-like actor. Here it seems that the two aspects are more intertwined than assumed.

For this, I have two possible explanations. The first being that the body narration aspect is not exclusive just for the act of a performance, and it can also function as a sort of a bridge in the process of an object becoming a puppet before the performance even starts. This bridge could be the evidence of the designer (un)intentionally forming the physicality of an object to enable what could be referred to as an organic body narration, the process by which the object seemingly on its own invites the narration of its design as a human-like figure. In other words, the resemblance to a human body seems obvious enough that it does not require any more interpretational work.

The second explanation is that the performance already started. The source I used for this subchapter, as stated above, is the easiest one to reach for the general public. It is a part of an overview of the whole mission on the NASA webpage, but it is also reachable through the first tweet of Perseverance's Twitter account. Therefore we can understand it as a part of Perseverance’s performance as a puppet. The body narra-

tion presented in the text, which describes the rover's various features, can be understood as an interpretation provided by the puppeteer, the author of the text. Even though the motivation of the author behind the metaphorical narration of the rover comparing it to a human body was, in my opinion, probably for the audience to easily understand the various instruments, it was used as part of the establishing act of the rover's performance as what I understand as a puppet. Therefore, by this logic, the textual narration could be used as an indirect body narration of the puppet-object into a puppet actor recognized by the audience.

I do not regard these presented explanations as mutually exclusive, and it is also possible that there is another possible explanation that is, for now, unclear. However, I will leave this issue unresolved for now and come back to it in the final discussion, where it will be interpreted together with the following analysis of social performances, which should help establish an adequate understanding of this process.

However, before I move to the next part of the analysis, there are still elements of the body design of Perseverance that even though are possibly not so influential in the term of narrating the object as a human-like figure, are socioculturally relevant for the whole performance. Those are various unique markings and attachments to the rover and names of a few scientific instruments. The most prominent example of culturally significant naming of scientific equipment on the rover is: "The Scanning Habitable Environments with Raman & Luminescence for Organics & Chemicals," shorted into SHERLOC and "Wide Angle Topographic Sensor for Operations and eNgineering," shorted to WATSON. SHERLOC is a complex geological tool for remote studying of Martian rocks, and WATSON is a camera that, among other things, supports the function of SHERLOC (JPL, 2020n). In this case, there is very little

interpretation needed for understanding the cultural reference used in the naming of these two instruments as reflections of the famous fictional private detective Sherlock Holmes and his friend Dr. John H. Watson, both created by Sir Arthur Conan Doyle in his literary works.

The markings and attachments to the rover are listed in the "Markings" tab of the model window. The first one is a message encoded in binary code in the parachute used by Perseverance in its landing phase on the red planet. When decoded, the message reads "Dare Mighty Things," which refers to the exact phrase used by Theodor Roosevelt. It is also a motto of Jet Propulsion Laboratory (JPL), the part of NASA that built the rover and whose team is running the mission. Together with the phrase, the GPS coordinates of the JPL facility where Perseverance was constructed are also encoded on the parachute (JPL, 2020l).

Several metallic plates bearing various messages are attached to the rover's body. Possibly the most prominent one is the "Explore as One" plate on which are located three fingernail-sized silicon chips with 10.9 million names of people that participated in a project "Send your Name to Mars. " In this initiative, people worldwide could have signed up for their name to be sent written on these chips, and in return, they acquired an electronic "boarding pass" to the mission, officially acknowledging them as a part of the mission. Etched on the same plate is an image of Earth and Mars on either side of the Sun, with sunrays carrying the message "Explore as One" written in a morse code. Other plates attached to the rover include its name "Perseverance," name of the mission "Mars 2020", illustration of five NASA’s mars rovers together in "Rover Evolution" plate, the flag of United States, the logo of JPL, plate with NASA insignia and "Bringing Back a Piece of Mars" plate, which refers to an extensive mission started by Perseverance that aims

to bring first samples of Mars back to Earth. The last plate that is mentioned in the Markings section is a "Tribute to Healthcare Workers" plate, which is meant to be an appreciation of "healthcare workers, who risk their lives to treat those in need" (JPL, 2020l), because of the global COVID-19 pandemic in the height of which the Perseverance rover was prepared to launch.

Following the plates, there are two more significant markings on the rover. The first one, "Rover DNA Tattoo, "is a small illustration inside the rover's front left wheel that pictures "two rover wheel tracks. One appears as if it is printed in the Martian sand, highlighting the technical achievements required to traverse the unknown. The other track, twisted into the shape of DNA, is a reminder that our space robots are of human origin and reflects the innate human desire for exploration" (JPL, 2020l).

The last one is located on Mastcam-Z Calibration Target, used to calibrate the cameras on the rover's mast. There are arranged drawings in between several calibration elements illustrating the development of life on Earth, culminating with humans and space flight. The motto on the lower part of the target reading, "Two Worlds, One Beginning, " refers again to the future Mars Sample Return mission. Along the edge of the calibration target is also written a phrase that can only be visible by future explorers examining the rover's body and cannot be reached by any of the cameras on the rover. The phrase reads: "Are we alone? We came here to look for signs of life, and to collect samples of Mars for study on Earth. To those who follow, we wish a safe journey and the joy of discovery" (JPL, 2020l). The last part, "joy of discovery, " is written in the five most frequently spoken languages on Earth: English, Mandarin,

Hindi, Spanish and Arabic, to celebrate the global search for knowledge and adventure (JPL, 2020l).

These markings and attachments presented here are not necessarily relevant to the body design of the rover in the sense of its possible conception as a social performance puppet. However, they provide the object with numerous outside meanings aside from its primary one being a mars exploration tool. This is something that Malczievski refers to as icons conductive surface or, in Binder's terminology, its paradigmatic openness. The aspects of an icon's physicality that infuse it with multiple symbolic contents. Most of the above features can be interpreted as enabling the rover to represent humanity in a range of socioculturally relevant areas. The meanings of the attached plates tend to picture the rover as an icon of what can be understood as universal scientific ideas of exploration, advancing the understanding of the unknown and feelings of participation in that endeavor for as many people as possible.

This universality is, however, in several ways ethnocentric. The first one is that most of the messages are inscribed in English, even those coded in the parachute and "Explore as One" plate, in binary and morse code respectively, still after decoded provide their messages again in English. This is also supported by the United States flag and NASA insignia that marks the rover of mainly American origin (this, on the other hand, possibly provides it with patriotic sentiments in the USA), even though various necessary instruments were provided by other agencies and countries like Norway, Spain or France (JPL, 2020l). Despite this, few details breach this ethnocentrism like the phrase "joy of discovery" written in different languages, but most importantly, the chips with 10.9 million participants from all over the world where the majority of people that "flew aboard of Perseverance to Mars" were

from outside of the United States and also from what is generally understood as a western part of the world: The first one being Turkey with 2.5 million of participants and second India with 1.78 million, therefore, having just a little more than the United States with 1.73 million. Other worth mentioning places include the Democratic People's Republic of Korea (North Korea), with just over 2 thousand participants, or Antarctica with 1.5 thousand names (JPL, 2020o).

A unique place in all cultural markings on rover has the "Tribute to Health care workers. " This plate is the only one that is not in some way connected to the main ideas of space exploration presented above, but its purpose is to appreciate health care workers worldwide for their perseverance in times of global pandemic. This appreciation also adds to the iconic depth of the rover as a not only explorer on a mission far from the Earth or representation of human ideals but also solidarity. All those additional meanings, those collective representations attached to the rover, present possibilities for their activation in the social performance by an actor.

3.2 The Social Performance

Before I dwell into the interpretation of various data, the boundaries and the whole arc of the performance need to be established. The character of this social performance is uncommon in several ways. This difference concerns mainly its mise-en-scene, its temporal and spatial setting. The temporality of it does not count in hours, days, or even weeks, but in years. It stretches from its start, which I identify as the first appearance of the main actor Perseverance, through the exposition phase until the lift-off from Earth, journey phase until the landing on Mars,

landing itself, mission phase until the mission that Perseverance was set to complete is deemed finished, and final retirement phase that lasts until the death of Perseverance, e.g., until the rover ceases to function. This distribution of the whole act into several parts is inferred with the idea of it in some way resembling the traditional dramatical arc of plot development. The exposition of the whole mission, its various goals and plans for accomplishing them, then the phase of the long journey to its target, the anxious landing, the exciting gathering of data, and then their analysis and final farewell to the explorer that gathered them.

The spatial setting of it is similarly peculiar since it is entirely virtual. As the main stage, I identify Perseverance's Twitter account. Even though parts of the performance happen physically elsewhere in various settings, the main channel through which the act is presented and therefore performed remains through the rover's tweeting. As of writing this thesis, the whole performance is not yet finished, and it is currently in its mission phase, which is expected to last at least one Mars year from the landing. However, the 14-years operational lifetime of Perseverances power core enables it to last for much longer. My main concern in this thesis will be with the first phase as I expect the central part of the puppet establishment there and the Mars landing since that is understood as the most critical and, therefore, the most dramatic event of the whole endeavor.

The sequentially of the performance is also affected by its nature of being extended and virtual. Generally, what I understand as one active act of the performance is one tweet made by Perseverance. However, this breaks down the whole performance into numerous individual acts in between, of which time of inactivity stretches. That would severely limit the actor's ability to fuse with its audience if not for engagement

tools provided by the social network itself like comments, likes, and retweets or the possibility to follow the account for updates on its activity. Identifying in what aspects and how much exactly the overall performance suffers from it being broken into individual acts for a prolonged time while also being presented virtually to an audience that is inherently much more fluid is not the aim of this thesis. This would require much more thorough problematization and theoretical exploration of the nature of social networks for which there is not enough space here. My goal here is to test out if the Perseverance successfully becomes a puppet and if the theory presented earlier is feasible for understanding this process. Therefore I will concern my analysis only with the original tweets and in a few times reactions to it from the audience through comments and from possible social powers through comments, retweets, and mentions of the account by them. This data will be interpreted through its qualitative value of whether they recognize the rover as a puppet or not.

3.2.1 The Conception and Exposition Phase

In this thesis's theory section, I elaborated that puppet, since its dual nature requires the puppet-object and puppeteer to act together, cannot exist outside its social performance. Its conception, the act of transition from an icon to a puppet, happens on stage in front of an audience, and the successful completion of this is dependent on the audience ability to overcome the fact that it is just an animated object and accept the illusion of a human-like actor presenting themself to them. This conception is not an instantaneous act but is more likely to be a careful narration, presentation, and personification process. However, this process

nonetheless starts with the first act of animating the object when the puppeteer first takes it up.

To identify this first act of animation and therefore find the starting point of this analysis, we need to move far back from its performance of landing on Mars and even its lift-off from Earth. I argue that its first act of Perseverance as a puppet was its establishment on social network Twitter via its first tweet back in spring 2020 when the rovers name Perseverance was announced:

Picture 3.3 Perseverances first tweet (NASAPersevere).

The tweet can be broken down into several parts: (1) the naming itself, (2) brief description of the mission, (3) link to the official mission overview, and (4) the visualization provided through the link.

What makes it a powerful act in the sense of the process of establishing the rover as a puppet is the referencing to itself in the first person. "Call me Perseverance" is a phrase that could be very well-spoken as an introduction by an actual human. The informal narration of the tweet also supports the first impression of someone introducing themself. Then the invitation of the reader to follow its journey: "Follow me. Let's go." Underlined by an illustration where the rover is looking at the reader with its arm stretched out towards them completes the introduction and invitation.

Out of 198 direct replies to the tweet, more than half (108) referred to the rover in some personified way. Here are a few examples of such responses:

"Well, hello Perseverance! Nice to hear from you." [CID 7]

"I like your name." [CID 99]

"hello I love you already." [CID 189]

"Make sure to aleast find Pathfinder. If you give the guy a new battery you two can travel together" [CID 204]

Almost a third (32) already gave the rover the shorter nickname "Percy"out of those responses. Therefore, the audience seems to support the act of the rovers puppet nature and we can see some part of them already fusing with the reality of the animated object taking up the actor's role. This example I take as well-executed personification work of the puppet. The human-like behavior enables it to achieve the status of a full-fledged actor and for its identity to emerge in the process.

The virtual setting of this act and the performance at large provides for the puppet an easier way to hide its puppeteer out of the audience's focus. The puppeteer, the human ghost-writer(s) in this instance, who wrote this first tweet and continually kept maintaining the rover's Twitter presence is undisclosed and invisible. There is not a hint of this puppeteer behind the puppet-object from the perspective of the audience, besides the obvious one that it cannot be possibly genuinely written by the rover, and we can state that the fusion between the two parts of the actor is successful since the first act of the performance. The audience experiences the performance only through the facade of the puppet.

The name Perseverance was chosen through a competition organized by NASA, "Name The Rover, " for American students, where they could submit an essay explaining their suggested name. From 28 thousand entries, several volunteers chose nine finalists, which were then subjected to a public poll from which the final name Perseverance emerged (Amos, 2020). This is another instance of public engagement tool, however, again, concerning only the American public.

Followed by this first tweet, the account made 76 others (excluding direct replies to other accounts) until the 30th of July 2020, when the successful lift of from Earth happened, including the lift-off itself and its aftermath, therefore ending what I established as the first phase of the performance.

Throughout this phase, the Perseverances main activity revolves around introducing its various features, their functions, the details of the mission, designers that built the rover, reporting on the progress in preparation for launch, and informing the audience about when the launch is set to proceed and how many days are left to that date. The

rover maintains the authenticity of the performance through continuous reporting in the first person and consistent informal language.

The introduction of elements of its design is performed by the rover referencing to them as parts of its body or as tools it will be using for research purposes:

> *"With the keen eyes I've been given, I'll zoom in on Mars with a clarity like never before. My primary camera, Mastcam-Z, will even let me see details that human eyes can't."* [ID 27]

> *"When I get to Mars, I'll hunt for clues that could have been left by ancient life. To help zero in on the right rocks, I'll use two investigative tools in my kit: SHERLOC and WATSON."* [ID 33]

These are the examples of what I conceptualized as body narration. Here it is, however, two folds. Even though all of the rover elements are essentially equally just various parts of the object, they are narrated in two different ways, either as parts of its human-like body or as tools that will be used for accomplishing set science goals. This is visible in the first citation above, where the rover refers to its primary camera (the most prominent camera located on its head-like mast) as an eye that was given to it. The brief follow-up explanation of its function could also be interpreted as performed transcendence of the human body: "...let me see details that human eyes can't." Therefore, this example is of the puppet's body narration and its ability to function in a way better than an ordinary human being. Aside from this body narration, Perseverance also mentions a few of the markings plates. The most advertised one is the "Explore as one". Aside from mentioning that this plate carries the 10.9 million names, it also used its morse code message to

engage the audience by encouraging them to find it and decoding it themself [ID 12]. Another explicitly mentioned plate was the tribute to healthcare workers, followed by words of appreciation towards the global medical community [ID 41].

Out of the 76 tweets, Perseverance referred in 35 of them to its "team", whether while sharing the preparatory work they have done on the rover and the launch process, introducing them to the audience, or appreciating the work they have done. This is interesting so that while the puppeteer(s) stay invisible, the designers of the puppet object are thoroughly acknowledged.

It is clear from the tweeting history that the closer the launch of Perseverance on its mission to Mars, the more engaging the activity becomes. From the tweet "The countdown is on (...)" [ID 78] on 21st of July – nine days before the launch itself – 75 out of 101 total tweets, where the rover replies to others, in this phase were posted, majority of which with words of thanks to people wishing it good luck with the launch, through the hashtag #CountdownToMars. The rest of the replying engagement throughout the whole exposition phase was then concerned with replying to various questions about the rover, its mission, or the team behind it, whether as part of 3 Q&A events or outside of them.

Since about two months before the start, the rover began posting more about the preparation leading to it, often mentioning the days that remain before the scheduled launch window. It informed about a few setbacks that moved the date further away [ID 45; 43]. It informed how it was moved into the rocket itself and onto the launchpad [ID 51]. It informed of possible ways to watch the launch live through official NASA broadcast [ID 134]. All of this activity can be interpreted as a

strategy for building up anticipation, excitement, and anxiety from the coming launch and engaging with the audience, extending those feelings. The build-up towards the culmination point of this first phase of the performance ended with the lift-off. The lift-off was narrated through live-tweeting of the process starting 30th of July at 11:51 with the same hashtag #CountdownToMars present at the end of each tweet:

> *(11:51) "Onward to Mars, together."*
>
> *(11:52) "Solid rocket boosters away, and I'm really picking up speed."*
>
> *(11:54) "I'm past the bumpiest part of the ride -- goodbye to my protective fairing, and hello to the great beyond."*
>
> *(11:57) "First stage booster is away. Centaur upper stage is now giving me the next burst of speed."*
>
> *(12:02) "First Centaur burn is complete. Now a bit of relative calm, as I coast for ~30 mins in Earth orbit, in preparation for burn No. 2. That's what will send me interplanetary."*
>
> *(12:35) "Here we go: the second Centaur burn has begun. The final push."*
>
> *(12:43) "Rocket burns complete. Last step: separate from Centaur and be on my way."*
>
> *(12:48) "I'm flying free now, having separated from the Centaur. That was quite a ride! Thank you, @ULAlaunch and @NASA_LSP."* [ID 169-76]

This narration of the launch itself describes each of the stages that the rocket bearing Perseverance went through. All the posts mentioned

above were void of any supporting visual media like images or videos, except for the first one that announced the rocket's lift-off from the ground, which was accompanied by a photograph of the actual act. This lack of visual media, together with the real-time narration, provided deeper immersion of the audience in the sense of immediacy where there is no time for anything else but words. The lack of additional content reinforces this immersion since it is very contrasting to the usual rover activity. Almost every tweet (and most of the replies that were not a simple "thank you") made by the account so far was accompanied by a link for further information or some form of visual media. They were crafted to provide as much information as possible while still retaining the anthropomorphic personification. So the hard turn towards simplicity could have been perceived as something out of the ordinary, capturing, tense, and therefore immersive.

This issue brings me the question of a script of the performance at large and with it the systems of collective representation it was drawn from. The uncovering of the script behind the actor's actions becomes rather apparent and easily discerned through the Exposition phase. From the presented data and interpretation of it, we can infer the primary function of the Perseverance is through its activities to inform the audience about everything that is going about with the mission. It stands as the central informational hub from which, if the audience is following it through its whole journey, can a person find out everything of interest about the mission. It acts as sort of a filter of the most important and interesting pieces of information and then extends it to the audience through the personified narration. It is what the cognitive simplification function of the script should look like. The script provides the actor a way to extend the understanding of the complex culture of

space exploration towards the audience. The engaging plot development is described as the actor's movement from the pure explanatory acts in the first part of the phase towards increasing the tension and drama of the performance in anticipation of the launch culminating in the lift-off itself. Concerning the time-space compression function of the script, one unusual thing happens. Throughout the whole phase, the performance is unified in the actor's actions on the social network. However, when the event of launch comes, this unification is broken down spatially. The performance not only happens on the Twitter account but also through the official NASA broadcast of the event. This possibly complicates the performance for the rovers acts on Twitter since it moves the main focus of the performance from it to the event happening else, but which is still part of its performance. However, to this problem, I will return since it also happens in another event of this performance - the landing on Mars, which is more crucial and dramatic than the launch, and therefore I will be focusing more attention on it. As for the semiotic codes and possible binary narration of the performance, it is clear that the sacred is thoroughly narrated, but the profane nonexistent. The most prominent codes consistent throughout the first phase are perseverance, community, participation, exploration, safety. However, they lack their profane binary opposition for now. On the other hand, the main possible antagonistic force is yet to manifest itself, and that is the harsh environment of outer space.

The outside social powers influencing the fusion between the performance and the audience are the various verified accounts engaging with the rover. Here, the social powers are elaborated mainly for their (in)validating power over the rover's performative abilities.

The one interesting case of social power is Twitter since it does not pose as just the distribution power that enables the performance to happen, but also as hermeneutical, as can be seen from this example:

Picture 3.4 Conversation thread including Twitter, NASA and Perseverance (Twitter).

In this thread, we can see the Twitter account itself actively engaging the rover as an actor, therefore reinforcing its validity – the authenticity of its activities as a person. The interventions of the main NASA account can be seen as a mediating influence towards furthering this validation. On the other side of these examples of engaging with the rover itself are the ones that mention the rovers account but does not converse directly with it, instead of with the people behind the whole mission:

President Biden (@POTUS):

> *"Congratulations to NASA and everyone whose hard work made Perseverance's historic landing possible. Today proved once again that with the power of science and American ingenuity, nothing is beyond the realm of possibility."* [MID 70]

Vice President Kamala Harris (@VP):

> *"Congrats to @NASA and all of their partners on their successful mission. Today's historic landing embodies our nation's spirit of perseverance—building on past accomplishments and paving the way for future missions."* [MID 71]

In the aftermath of the launch and the transition towards the journey phase of the performance, one other important aspect of the rover's personality was revealed. Through the celebratory tweet of eight years since landing on Mars, the Curiosity rover posted the following message:

> *"Eight years ago today, I landed on Mars. Feels like only yestersol! My exploration of the Red Planet continues (https://t.co/t55YTfoj5A), while @NASAPersevere's is about to begin. She'll #CountdownToMars and land in much the same way I did."* [MID 39]

Perseverance then responded to this tweet with the following, therefore incorporation it into its performance:

> *"Congrats to you and your team, @MarsCuriosity. From the wild ride of landing to your eight years across the surface, you've blazed quite a trail. Can't wait to join you on Mars.#CountdownToMars"* [ID 191]

The vital aspect of the former quote is the revelation of Perseverances gender identity as a female. Concrete gender identity helps reinforce the rover's personification through possible third-person references to it made by other actors and outsiders. It also can be used as an indicator that tells us if those relevant others accept the rover as a human-like actor and not only an object. The rover is no longer "it" but "she". Therefore it moves the understanding of its nature from an object to a human-like actor. This gender referencing becomes an essential part of the performance in the next stage that will be interpreted here, the landing on Mars[1].

3.2.2 The Landing

[1] For the purposes of this thesis I will continue to reference to the rover as "it", since it is still a subject to an elaboration whether it can be understood as a full fledged actor or symbol used for the performance.

The landing happened on18th of February 2021 at the end of the Cruise phase that lasted seven months. In this section, I will present the performance in two layers. The first one will be brief, and it is the twitter side of the performance. The second will then be a real-time official commented online broadcast provided by NASA. The main focus of both parts of the analysis will be the rover's performance as a puppet and if the two parts are connected and fused into one performance or not. The Entry, Descend, and Landing stage (EDL) was supposed to be the most critical and, therefore, most dramatical part of the whole mission, often referred to as "7 Minutes of Terror" (JPL, 2020). The rover worked hard through the days before the 18th to build up the drama and tension, similarly as in its launch from the earth. However, the supporting visual media of the tweets were much more dramatic than the ones accompanying the build-up to launch. Almost every tweet was supported with at least an image, but many were accompanied by video or GIF animations.

A prime example of this is a video embedded in a tweet from the 12th of February [ID 308]. Almost four minutes long presentation of how the EDL stage will most probably go through was narrated by various members of the Mars 2020 mission with dramatic music playing in the background. The narration itself was also very anxious and tension-building. The video was then reused by the rover in the following days as above mentioned GIFs as previews of various stages of EDL.

The rover opened its activity that day with:

> *"Today's the day. Trip to Mars, 99.9% complete. The most dangerous part comes last: the final seven minutes. Watch my landing live starting at 11:15 a.m.*

> *PST / 2:15 p.m. EST / 19:15 UTC. #Countdown-ToMars"* [ID 351]

After this, only two other tweets followed before the start of the main event. The Frist of them was a reaction to an account TwitterGov, which announced a unique emoji to a hashtag #CountdownToMars and its variations in four other languages to commemorate the day's event. Perseverances reaction to that read: "@TwitterGov International collaboration = interplanetary success" [ID 352]. The second tweet included the preview from the video depicting the EDL stage mentioned above [ID 353].

After this, the rover announced the live broadcast itself, stating that the reader can watch it live using the embedded link that leads to it with information that the touchdown is scheduled to happen in 90 minutes [ID 354]. Then, as the broadcast was streamed elsewhere, the rover continued with its updates, similar to the lift-off from Earth. The only difference being that this live-tweeting was supplied by animations taken from the mentioned video that each illustrated the respective stage of the event described in the tweet. This supplementary symbolic content visually engages the audience and helps facilitate the immersion into the act itself. The live-tweeting then followed as:[2]

> *(19:32) "No team could have prepared me better for what's to come. Whatever Mars throws at me, I'm ready as I'll ever be."*
>
> *(19:35) "Final readiness check for Entry, Descent, and Landing:*

[2] Both hashtag #CountdownToMars and links to the animations were omitted in this list.

✔ Mission team
✔ Communications stations
✔ Spacecraft
A little over an hour to go. Let's do this."

(20:38) "The hardware that got me to Mars has done its job, so it's bye-bye to the cruise stage."

(20:49) "This is it. I'm entering the top of the Mars atmosphere. No looking back. Seven minutes to touchdown."

(20:50) "Feeling the heat, and the Gs! I'm past peak heating and deceleration. Now in guided entry phase, maneuvering to zero in on my landing target."

(20:52) Boom! Just fired my parachute and felt the jolt as it opened. Slowing down even more. Speed: ~950 mph (~1500 kph) Altitude: ~7 miles (~11 km). "

(20:53) "Whoosh – I've ditched my heat shield and am looking straight at Mars for the first time! Just over 2 mins to landing."

(20:53) "Radar locked and cameras on. Looking for a safe spot for touchdown. About to cut free from a perfectly good parachute. I'm all in."

(20:54) "Here goes! Lighting the engines on my "jetpack" for final descent. Wheels down in less than a minute."

(20:55) "I'm safe on Mars. Perseverance will get you anywhere."

(21:01) "Hello, world. My first look at my forever home. [Perseverances first picture of Mars]" [ID 355-66]

The importance of this live-tweeting is similar to the launch. Reporting the peak milestone of the mission as it is happening in the present moment. Therefore temporarily capturing the audience in the event as it unfolds. However, another part of the performance is happening elsewhere. The stages are two, and for them to merge into one performance, there has to be a connection. However, this connection is only one-sided since the rover on Twitter directs the audience to the place of the live broadcast, but from the broadcast's side, there is no direction back. The connection back to the Twitter account happens only at the end of the show. This causes a split, where the audience watching the live stream is not aware of the part that is happening on Twitter, if, of course, the audience did not come to the broadcast from the provided link by Perseverance. Therefore the two stages cannot be fully fused into one performance.

When the broadcast is opened, the fourth wall between the performance and the audience is divided into two sections. The first one, which stretches across the majority of the screen, contains the broadcast itself. The second is reserved for comments from the audience and can be closed to allow an uninterrupted experience. The comment section is an important feature that lets the individual watching the stream though physically alone, connect to the other members of the audience and therefore facilitates the cohesion of the whole mass of people. It is important to note that even though this cohesion is established, it is not as powerful as it would be if the audience were in some way physically present. Underneath the main broadcast area is the name of the broadcast: "Perseverance Rover Mars Landing"; the link to a profile of the provider of the broadcast, which is NASA; a share button that lets the spectator share the link to the event with other people; a hearth button,

letting the spectator send a hearth emoji that appears on the screen above the button for all the audience to see and therefore is another, more straightforward, tool for members of the audience to engage with each other; and few other technical setting options that let the spectator adjust the stream to their liking. The last information included natively in the window itself is the number of people currently watching the broadcast. However, since this analysis is done on recording the live broadcast, the count features the overall number of people who watched the live stream and later its recording. The count reports 3.4 million people.

The entire broadcast is a dramatic performance in itself. It has an introductory phase, part with the exposition of the whole mission, pre-culmination anticipation, as the spacecraft is getting closer and closer to Mars atmosphere, the dramatic peak of the EDL - "7 Minutes of Terror", the aftermath of celebration and excitement and then slow closure with a musical piece at its end.

The main actors of this performance are four in total. Leading the performance is Raquel Villanueva from JPL Digital News and Media Office, and her role is being the host of the event. She is the first person that the audience encounters after the welcoming screen and video. Cohosting with Raquel is her colleague from the office, Marina Jurica. As the main host, Raquel is present almost throughout the whole event and facilitates its cohesion because she connects the various parts together. On the other hand, Marina mainly conducts interviews with other supporting actors of the performance – various members of the Mars 2020 mission team and members of NASA.

After Marina, Swati Mohan, the Perseverance EDL Engineer and part of the Landing team, is introduced as a commentator that will

guide the audience through the event from the mission control room as a technical expert that will give updates on the current status of the spacecraft[3] and later takes over the commentary through the EDL phase, the peak of the performance. The last part of the leading ensemble is introduced much later (1:11:00). The JPL Chief Engineer Rob Manning will be aiding Swati in commenting on the EDL phase and the events before that. He presents a contrasting element to Swatis's technical focus and precision. His narration is a bit chaotic and emotional, possibly because of the nervosity and anxiety from the upcoming landing, which clearly shows when the camera is focused on him later in the performance.

Discerning the Perseverances establishment as an actor is not so easily achieved. The rover still seems present as an actor, as a puppet, but this presence is induced from several aspects. This establishment is also not explicitly tied to the rover's previous performance on social media. Its Twitter account is not mentioned throughout the performance aside from one instance at the very end (2:06:40) where Raquel prompted the audience to follow the account for future updates on the mission. Even though the rovers account advertised the broadcast, it is possible that part of the audience came upon the stream by different means. Because of this, the establishment has to be worked through again for the new part of the audience to fuse with the rover as an actor.

As elaborated in the theoretical part of this thesis, many things have to work in favor of the rover to act as a puppet actor. It has to have

[3] Borrowing the terms from the performance I will refer to the rover as a spacecraft while it is outside of Mars atmosphere, vehicle throughout the EDL phase and as a rover as it separates from most of its equipement prior to landing.

its own allocated space in the performance, where the focus could be present only on it. This focus is achieved relatively easily since, to put it frankly, physically, the rover has the most space around it that any actor could ever want. However, this is a double-edged sword. The problems of spatial and temporal connection of the rover to the performance needed to be resolved to achieve its effect. The spatial is obvious. The rover is located impossibly far from the actual physical place where most of the performance is produced. The temporal is that since the distance is so great, the time the signal from Perseverance travels to Earth is not instantaneous but 11 minutes and 22 seconds. Therefore the response window for the mission control to influence the unfolding events with the rover is almost 23 minutes. This fact is mentioned several times throughout the performance. These two problems are resolved through mise-en-scene and script. The performance occurring in the mission control is regularly diverted towards the events that are happening with Perseverance through updates from Swati, which are more frequent the closer the performance is to the central action part - the EDL phase. These updates are directed to be a narration of the received pieces of information by Swati and provide visual imagery that illustrates the described events as if the audience was closely looking at the Perseverance in space. This mean of symbolic production is thoroughly used not only in the updates but later also in the EDL phase, where there is much more screen time allocated for it. This then lately heightens the focus on Perseverance and its performative space.

The temporal problem is resolved by omission. Even though it is mentioned several times, it is not problematized to be continuously reminded to the audience. Every progress that happens with the mission is regarded by the actors as if it happened now and here, instead of

minutes ago and far away. This is, however, conducted carefully narration-wise, not as a reference to the events like "now the spacecraft enters this phase and does this" but by phrases like "We've received a signal" or "We've received confirmation" or "Now we are entering the atmosphere". This way, the statements stay truthful both to the temporal difference and scientific accuracy and still puts the audience in the center of the action by putting those parts of the performance in the present and not the past.

Those are the environmental prerequisites for enabling the rover to act in the performance, but it still needs to transition from icon to puppet. The body design of the rover is thoroughly discussed in various parts of the broadcast. However, the body narration is almost nonexistent in the term of explicit narration by the actors. The most significant opportunity for this is when Systems Testbed Engineer Ellio Morillo takes the stage and does a quick tour of the rover's body while standing next to its scaled model. However, Ellio's narration is purely technical in the sense that he refers to the features that he describes in their correct terms like "Mast", "Robotic arm", "Turret", "Cameras, " and so on. The only instance of explicit body narration is through "heartbeat tones". As explained in the broadcast several times, the tones are a signal that the rover sends to Earth continuously throughout the Mars and EDL phase approach, whose only purpose is to tell the mission control that the rover is still "alive" and functional. Therefore, the rest of the body narration can only be inferred by the audience from various presented stylized visual material.

Nevertheless, one thing that was not elaborated in the theoretical part is that the movement on the stage itself, the physical actions that the rover makes can be interpreted as a sort of body narration too.

However, that does not mean the body narration as a human-like figure per se, but purely as an action that breaches the perception of the icon as a stationary object. Those moments are plentiful throughout the performance but are not as influential as explicit body narration would. However, the lack of more extensive body narration makes the transition from an icon to a puppet more challenging for Perseverance.

The personification of Perseverance is facilitated mainly through one crucial aspect, and that is the use of its correct established pronoun "she/her". Several actors in the performance, when talking about the rover, refer to it as: "We tell her where we want her to end up, and she has to figure out the safe and best way to get there. (...) Now she drives three times as fast as Curiosity could drive. (...) So shes fast," [46:00] or "Perseverance is still in space right now. (...) So far she is healthy and on course," [06:10] or "At this point forward Perseverance would be on her own to execute the Entry, Descend, Landing, over five hundred thousand lines of code." [12:20] This personification through pronoun is however not consistent throughout the performance, and the actors that do that are in the minority. In most of the interviews, when Perseverance is referred to, it is described as "it, " or the pronoun "we" is used as in what will we find out through the rover, what we will have to go through to get to Mars and so on.

What is missing from this performance concerning the rover's performance on Twitter is its clear voice. However, no connection is made to the Twitter account, and therefore the rover lacks its already established line of communication with its audience. The rover still communicates as an actor would but in a different way, through the information it sends to Earth. First, it is through its transmitter, later when the transmitter is turned off through the heartbeat tones and then by

relayed communication line by Mars Reconnaissance Orbiter (MRO) [34:20]. However, this line of communication is not easily accessible for the audience to interpret as such, so this is where the role of interpreter of the performance moves in. Swati Mohan does this by describing what is happening and translating the communication between mission control and the rover from technical terms into understandable narration for the audience. This cognitive simplification is reinforced by Swatis's reference to the rover as "she", which also helps the audience to fuse with the rover as an actor possibly. Swati is not the only interpreter, although she is the most influential one. In the later part of the show, Rob Manning also helps to narrate the rover by providing an emotional interpretation. By evaluating the events that are happening with Perseverance in the binary moral code of good and bad, he further interprets the actual pieces of information provided by Swati, instructing the audience how to feel about them:

> [1:23:00]
> *Swati: Under a minute until Cruise stage separation.*
> *Rob: "I have to admit I am quite excited and anxious. And hopeful."*
>
> [1:23:50]
> *Swati: Separation succesful.*
> *Rob: "Yes!"*
>
> [1:24:40]
> *Rob: "This is going to go very quickly from here on out."*
>
> [1:25:40]
> *Swati: Spacecraft is orienting itself to the correct position for atmospheric entry.*

> *Rob: "The vehicle is pointing in the right direction. Thrusters are warmed up and doing their job."*
>
> [1:35:34]
> *Swati: Perseverance is past the point of maximum deceleration.*
> *Robs sighs of relief and repeated quiet "Yes" can be heard in the background.*

The relation between the puppet-object and puppeteer and the fusion of those into one actor also reflects the spatial and temporal difficulties of the performance. The last direct puppeteering act is performed as the spacecraft transmitter is turned off by the mission control [13:40]. From that point forward, the rover is operating autonomously as it was programmed to do. This information reveals the human puppeteers behind the rover as a team that programmed its behavior. Their position towards the puppet-object is differentiated both spatially and temporally. The spatial one is quite obvious, but the temporal is understood as the actual act of programming the rover, which happened way back in the past when the rover was being designed. This temporal separation is ambiguous in the sense of its influence on the rover's performance.

On the one hand, it puts the puppet-object in a position where it seems as operating truly autonomously without any direction. The fact that it is programmed to act somehow, even though explicitly mentioned, undergoes a similar process of omission as the 11 minutes of temporal delay. The focus of the audience is not in this way diverted elsewhere. On the other hand, this preprogramming severely limits the puppet's possible actions on the stage. There is no flexibility of reactions, no possibility for improvisation, aside from the already pro-

grammed margin of error or the rover's flexibility of choosing its landing point. Therefore the puppet's performance is limited in its authenticity as a human actor.

The one scriptural aspect that has the most screen time through the broadcast is the cognitive simplification of the systems of collective representation, which is important to open a way for the audience to understand the various events to immerse themself into the performance. This simplification is done especially in the first part of the broadcast while there is still time before the spacecraft approaches the atmosphere through various means. The interviews conducted by Raquel and Marina with several key members of the Mars 2020 mission team, where they discuss the various aspects of the mission like its importance [14:00], the challenges in preparing the rover [26:50], the importance of the landing site Jezero Crater [31:00], the communication network [34:20]. The informational graphic moments "Mars facts", where general trivia about mars is shared [20:00; 26:30; 40:30; 52:10]. Similarly to this, another audiovisual media facilitates the simplification and with that also dramatic narration. The "7 Minutes of Terror" montage [36:50], together with the one explaining overall the whole mission [9:11], provides exactly that.

Another presented a video about the team's challenges through the whole mission so far dramatically brings outside meanings into the performance [23:10]—namely the challenges of the COVID-19 pandemic. The video is supplied with somber music and shots of people working with safety measures in place. The interpretation of the narration provides deeper insight into the structure of the script and its binary coding. There are two main layers of binary narration present throughout the performance. The first one is the team against challenges here on

earth, the second the rover against the harsh environment of space and landing circumstances.

TEAM		ROVER	
Sacred	**Profane**	**Sacred**	**Profane**
Safety	Hard	Ready	Tough
Health	Unexpected	Smart	Hazard
Exploration	Unknown	Autonomous	Danger
Connected	Isolation	Capable	Treacherous
Perseverance	Challenge	Interesting	Risk
Ambition	Time Schedule		Surprises
Tenation			

Table 3.1 Binary coding of the script

This binary narration serves to heighten the dramatic potential of the performance and carry the substantial collective representations, especially the ones concerning the rover, the actual event that is happening as the performance continues. The team narration then humanizes the process of preparation and the overall image of the NASA institution as real people solving real problems. The team persevered through the challenges and unexpected events and managed to prepare the rover in time for the launch window.

When the critical part of the performance, the actual EDL phase, the 7 Minutes of Terror, approaches the supporting acts subsidies, and the focus is moved towards Perseverance. Visually it means the broadcast circulates between the shots on Swati and Rob as the leading commentators, for now, the mission control, where monitoring of the event occurs, and simulation of the current position and actions of the space-

craft. We can hear various Landing team members inside of the mission control room calling out progress, which is then translated by Swati for the audience and occasionally further interpreted by Rob. As time progresses, the tension build-up by the actions that are being done by the spacecraft becomes gradually more frequent. As the Perseverance separates from the cruise stage and later enters the atmosphere beginning the EDL phase, Swati regularly updates the vehicle's velocity and distance from the surface and reminds the continuous receiving of the heartbeat tones. Rob occasionally comments on various statements, that they are as expected and everything looks good. At few critical moments of the descend, the tension is released by applause and Rob's emotional exclamations to overcome a critical point. This first happens when the parachute is deployed, and then as the vehicle is coming closer and closer to the ground becomes more frequent. Before the landing itself, there is a moment of quiet as the simulation pictures the rover on the surface of Mars, but it is only after few seconds when the mission control room bursts out in joyful standing ovation as Swati says: "Touchdown confirmed. Perseverance is safely on the surface of Mars" [1:41:05]. Swati then follows with a short description of few processes that are happening right after landing. This is the last she is present in the performance after this follows footage of the mission control room with occasional emotional comment from Rob.

In the aftermath of the landing, the atmosphere of the performance shifts into relief and happiness. Two moments reinforce this mood further: the acquirement of the first picture and zeroing on the place where the rover landed. The first image is received nearly 2 minutes after the landing and is followed by another round of applause. The second image comes a few minutes later. Then when Rob starts narrat-

ing those pictures for the audience, which camera captured it, what can be seen on them, he is cut off by another applause as the mission control room sees for the first time where the rover landed geographically, this Rob promptly narrates as well: "We even know where we landed! This is the most amazing thing. The vehicle told us where it landed because it figured it out. (...) This is a sign. NASA works. NASA works! (...) This is what NASA does. This is what we do as a country" [1:46:30].

The performance is then slowly concluded with several other interviews where NASA's Acting Administrator and later on JPL Director share their excitement over the landing, and Surface Mission Manager describes the next steps in the mission as the rover landed. At the end of the broadcast, Raquel parts with the audience directing them to Perseverances Twitter for future updates on the mission. Then the broadcast ends with a rendition of a song "Life on Mars" by David Bowie, performed by artist Yungblud, followed by one more look at three pictures sent from Mars and the logo of NASA.

All of this is done to maintain the audience engaged and invested in the performance. Throughout the whole show, there are also participatory moments where the audience can contribute. This engagement is done mainly by showing tweets posted on Twitter with the hashtag #CountdownToMars in the broadcast itself two times. Those are also commented on by the cohost Marina [16:24; 1:06:00]. Every conducted interview is also ended by a question submitted to the broadcast by various students across America or social media. A virtual photobooth is presented for the audience to use, where they can stage themself in few places connected to the mission like Mars or Mission control room [1:10:20]. This strategy of putting the audience into the performance or giving them the feeling of inclusion is used to overcome the barrier that

the nature of the online broadcast inherently poses. However, the broadcast itself suffers a few times from technical difficulties [26:50; 1:11:00; 2:06:40] that potentially hurts the fusion process between the audience and performance.

Everything, however, comes down to one point, and that is the nature of cultural extension facilitated by the performance towards the audience. What are the key ideas the performance is meant to transmit to the public? Through the sense of identification and projection into the performance and the actors on stage, the audience should understand and internalize the meanings and codes projected onto them. Those are inferred from the script and interpretation above, and the main points seem to be: The venturing into the unknown, a new phase of space (or Mars) exploration, participation and community, diversity, education, optimism for the future of science, outstanding achievement done by NASA.

From those listed above, I need to briefly mention the process behind two of them: diversity and education. Diversity is shown mainly implicitly in the broadcast as three of the four main human actors of the performance are women, and throughout the interviews and videos, culturally diverse members of the Mars 2020 mission team are present. This, together with the narration of real humans overcoming real challenges presented earlier, shows NASA as not "a big complicated governmental agency" but an organization filled and moved by a diversity of really passionate people. Education refers to parts of the broadcast focused on the role of students in the present and future space exploration and the importance of education. Aside from the mentioned student questions, there is also an interview with the two students who gave the names to Perseverance and Ingenuity and an interview with

Emily Calandrelli, who is a host of Netflix educational show for children Emily's Wonder Lab (Costello, 2020).

4 Discussion

4.1 One or Two Performances

Both of the cases I interpreted above concern their supposed main actor – the Perseverance rover. I came into the analysis with the idea that the second part, the live broadcast, is only an extension of the first one, the long performance on social media. However, against this assumption speaks the lack of explicit double-sided connection. Even though the rover plays a crucial part in both performances, the system of collective representations, from which both of them come from, is the same, and the script is only marginally different, the rest of the productions are too different from being considered with reasonable confidence as that one is the extension of another, without the interconnectivity. The more logical explanation seems to be that even though the performances are two, the transition that is facilitated first by the rover's tweet including the link for the broadcast performance, and at the end of the broadcast by Raquel directing the audience back to the Twitter account, is fluid and convenient and therefore almost natural for the audience. That does not secure the merge into one but ensures that the two performances share an audience or a significant portion of it. This, however, cannot be said about the audience for sure since it would require a more thorough analysis of the audience itself through concrete quantitative data.

Since the two performances are so similar, it is reasonable that we can think of them as "different renditions of the same play". The background culture is the same, and the final cultural extension towards the audience carries similar codes and narratives. Only the execution, the

mise-en-scene, the means of symbolic production, and the much broader ensemble of actors is different. The script is only partially different since it is the connection between the background culture and the execution of the performance.

4.2 One or Two Puppets

Both of the cases of the puppet share the same body design since they are both, in fact, animations of the same object. However, as theorized, the puppet is constructed from object and puppeteer, but the humans behind the actions of the same object are different. In the first one, they are the ghost-writer(s) posing as the rover on social media. In the second, they are the programmers behind the rover's autonomous actions. This does not necessarily mean that they are indeed a different puppet actor altogether. Even though the programmers are the puppeteers behind the second case, their influence over the puppet is only marginal. They only "told the puppet how to move, how to act", but the substantial part of what makes the puppet, as a social actor, lies elsewhere. The puppet needs to be performed in personification and body narrating ways. It needs to assume a figurative archetype through the performance to fuse with the audience.

Through interpretation, I recognized that those two aspects are indeed present in the live broadcast. However, they are problematic and have limited functionality since they are not well established. The puppet's most personification is done by referring to it in the third person pronoun "she". Then some minor personification also stems from Swatis Mohan's commentary. However, together with the almost nonexistent body narration, it is not enough to reasonably argue for the rover

being a full-fledged puppet in this instance by the conceptualization provided. It is more likely that through the performance, the audience was keener to fuse with the other actors, with their emotions, especially as the rover landed. On the other hand, it would not be correct to disregard the possibility altogether. As theorized in the first part of the thesis, when the puppet leaves the performance, it should still retain the attributes it gathered from it for some time after, entering the state of a "proto-puppet", from which it can be established back on a stage more quickly. This requires the other actors to be familiar with its previous performance and possibly for the audience to know of it. These requirements should be partially met since at least part of the audience likely came to the performance from the link provided by the rover in its first performance, but concerning the actors, it seems only a portion is referring to the rover as they would if they also acted in the first performance. So it seems that a portion of the audience while retaining the memory of the imminent previous performance, could fuse with the rover as an actor, and at their homes, they were indeed in the EDL phase cheering something like: "Go, Percy!" Nevertheless, if we look at the bigger picture of the whole performance, the role of the puppet actor is not well established enough to be considered as one.

On the other hand, the performance on the social network is a performance of a puppet in the way as theorized. There is both substantial personification and body narration that, together with the sole focus being on the puppet actor itself, makes its fusion with its audience achievable fairly easily. So to answer the dilemma in the title of this subchapter, I can with reasonable certainty say that there is one puppet and a possibility of one.

What was not thoroughly described in the interpretation is the aspect of transcendentality of the puppet. The reason behind this is that in this specific case, it is pretty apparent provided by the nature of the rover itself as a space explorer that ventures all the way on Mars. It carries with it a set of scientific tools fixed to its body, and even the body itself is enhanced in a way that human beings could not possibly achieve. The transcendence is performed but most of the time only implicitly since it does not need an explication.

The only thing left here that needs to be addressed is the rover's identity. As stated in the theory section, all the previously mentioned aspects are only a gateway to the puppet's identity, which is the part of it that the audience fuses with. From the interpretation of the cases above, especially from the performance on Twitter, the identity of the rover is likely to be off at first an insider. Someone who offers close-up information about the science behind its whole mission, about its various parts coming together, about the people behind it, and the broader sociocultural context of its mission. Someone who is the central focus of the whole endeavor but informs thoroughly about what is happening in a friendly and engaging manner that invites questions and reacts to others. Someone who is patient, thoughtful, and excited about the next event and makes sure to let other people know it.

Furthermore, as it leaves the Earth for its mission, another layer of identity is added - an explorer. Someone who ventures into the unknown to bring new exciting discoveries and promises to answer essential questions. This part engages with people and makes them fuse with the actor and accept the performed cultural extension.

4.3 Theory and Reality

As I reflect on the findings from the interpretation part of the thesis, there are a few modifications that need to be accounted for in the theoretical conceptualization of a social performance puppet.

The role of other actors was not thoroughly elaborated. However, referring to the live broadcast, it seems that their influence is not only that of an explication of the puppets object nature, but they can also reinforce its role by interaction with it and therefore guide the audience into thinking about it as a "costar".

The extension of body narration into pre-performance, as elaborated in "The Body Design" section, could be possible, and even though I recognize it in this case mainly as a part of the performance itself, since the body narration present in the textual description of the parts of the rover in the overview of the mission is referred to numerous times in the performance itself, not all the aspects are present in the performance. There is no mention of the sample caching system being located in the "belly" of the rover, for example. Therefore it is possible that the body narration is not exclusive to the performance but can be understood as a sort of preactivation of the body design of a puppet.

The other expansion of the body narration attribute is the movement on a stage itself. The puppet's body is not narrated only explicitly but is also implied in how the puppet is animated into movement. This movement, however, must be purposeful, there must be clearly discerned intention behind the movement, or at least it must be narrated as intentional.

Nevertheless, after all this, the main question still is unanswered. Does a puppet provide us with insight into a deeper meaning of social

reality? Does it help us see further into the landscape of meaning that is its social performance, here especially since it is so unusual?

As argued several times throughout the thesis, the main advantage of a puppet against an icon is its depth of identity. To add to this: The main advantage of a puppet against a conventional actor is its materiality.

Taking up an object and animating it into a puppet makes it an actor, but that actor is not constituted by only humans acting the role. At the time of the first act, the first movement of the object, the first words of the rover, "Call me Perseverance," is still a tabula rasa, an empty shell of possibilities that, through performance, through personification, body narration, and transcendence, acquire its place in the performance, its identity. This identity, even though it seems human-like, it is not. It is a purposeful identity carefully created by the puppeteer to serve the purpose of the performance. It could be understood as a mean of symbolic production only hidden, internalized into an object.

To put this claim into perspective, the main two layers of the rover's identity appear to be an insider and an explorer. The identity of an explorer is crafted by the puppeteer, the ghost-writer, to follow an already established tradition of a line of thinking laid in the past by human explorers. This tradition spans back to the Cold War era, commonly referred to as the "Space Race". As a conflict of national narratives between the USA and the Soviet Union that waged a technological war of whom will be the conqueror of the "firsts" of the newly opening final frontier of human exploration (Siddiqi, 2010, s. 426-8). Who will have the power to narrate the victory as not only national but universal and inherently whose system – Capitalism or Communism – will the narrated as the more capable (Siddiqi, 2010, s. 429). This global visibility

made the first range of explorers like Gagarin and then Appolo missions even more prominent and influential as the embodiment of what it is like to experience the unknown, the thrill of adventure (Siddiqi, 2010, s. 427). After the Space Race, the "firsts of space exploration" reachable by humans were conquered, and throughout the time, the human missions were somewhat normalized, and the interest of the general public shifted elsewhere. However, the narratives were set. They only lacked a proper representation, a proper explorer venturing into the unknown.

Using an object and ascribing those meanings onto it while animating it to resemble a human seems to have provided just that. However, it was not only the explorer and insider identity but also the accent of broad representation that is evident throughout the interpretation of the performance, of not only nationalistic narration but attempting to encompass humanity universally through participation and recognizing the cultural diversity, that could extend onto the audience the experience of what would it be like to journey to another planet, to touch it, to hear it, to experience it fully. Moreover, since a human actor cannot in this time provide those experiences, the puppet could act as a substitute.

The construction of identity provides another tool for the puppeteer to use. They can craft a pristine human-like entity. One that is seeming without a fault that would potentially discredit its performance if animated well and authentically. The lack of profane narration by the rover itself, the lack of explicit agonistic narration towards any part of social life that could possibly compromise it in front of an audience coming from those places, makes its ability to gather a wider audience of people, in exchange of less dramatical performance, more influential.

The question, however, arises, why is there a need for a broad audience? It may seem that I am advocating here for another era of the Space race, but this is a claim rather too bold and is not my concern here, even though a possible pathway to it seems to open. Instead, I argue that the accent of a rover to gather as much diverse audience as it can is concerned with the internal configuration of NASA. Since NASA is governmental and, therefore, a publicly funded agency, which yearly budget needs to be negotiated and justified (The Planetary Society, 2021), the simple transfer of social capital into a political and then economic one could provide a reasonable explanation. This is moreover reinforced with a statement that three of the six categories of socioeconomic impacts of NASA as an organization could either directly or indirectly be influenced by gathering a vast and diverse audience: Leverages interest in science and technology, promotes collaboration, and supports foreign policy and inspires people around the world (The Tauri Group, 2013). Therefore the possibility of NASA as an evident constitutive social power to stage a performance where it would use the sentiments of old space exploration narratives for the creation of an actor that is both relatively easily controlled and has the potential to gather a broad international and diverse audience, through its fluid and less constricted ability to be identified with, seems too good not to be considered.

This is, however, only one explanation of a possible deeper structure behind a puppet actor, but it provides an answer to the ultimate question posed above, that the concept of a puppet could be used to explore deeper meanings of social reality.

5 Conclusion

In the introduction of this thesis, I posed two questions that guided the development of this text. The first one concerning the analytic potential of the puppet concept in explaining the phenomena of an object seemingly being in the role of an actor of social performance. To this, I can, with reasonable confidence, argue that it indeed does, at least for the case presented here. The theoretical elaboration seems viable for interpretation of the case of Perseverance and encompasses the various attributes that contribute to making the rover an actor in her performance. However, that does not mean that the conceptualization is necessarily viable to be used in explaining other possible cases of puppetry in social performance. This would require trying its applicability in several other cases to ensure there are no loose ends that would leave some parts of the puppet actor phenomena unresolved or resolved incorrectly.

As possible future cases where this conceptualization could be helpful, I refer mainly to the performative interpretation of social media at large. Whether it would concern the cases similar to the one presented here, where some object is performed into a seemingly human-like activity or more abstract nonhuman actors, this would be, for example, the various cases of brand social management, where social media managers craft an image of a specific brand on a social network, and this image is personified. However, analysis of this type of phenomena would require a more thorough discussion about the body design and body narration since these cases possibly do not have a physical object behind as a reference as was the case presented here.

The answer to the second question, if the puppet concept, as presented here, deepens the understanding of social performance, was provided as a possibility at the end of the thesis. Even though I used an interpretational method to provide a deeper maximal interpretation of the landscape of meanings, my main aim was to test the conceptualization of one case and its possible implications, which took a significant portion of the thesis. Therefore the insight into those deeper understandings is here very limited.

However, in the end, I believe that the presented construction provides a tool that could be used to explore a deeper structure of human performative interaction with material reality, how a material object could be used to impose not only as an object that can have a deeper meaning ascribed to it but also how one can, against all odds, project themself into it.

6 References

ALEXANDER, Jeffrey C., 2006. Cultural pragmatics: social performance between ritual and strategy. ALEXANDER, Jeffrey C., Bernhard GIESEN a Jason L. MAST. *Social performance: Symbolic action, cultural pragmatics, and ritual*. Cambridge: Cambridge University Press, s. 29-90. ISBN 9780521857956.

ALEXANDER, Jeffrey C., 2012b. Iconic Power and Performance: The Role of the Critic. ALEXANDER, Jeffrey C., Bernhard GIESEN a Dominik BARTMANSKI. *Iconic Power: Materiality and Meaning in Social Life*. 1. New York: Palgrave Macmillan, s. 25-35. ISBN 978-0-230-34005-3.

ALEXANDER, Jeffrey C. a Dominik BARTMANSKI, 2012a. Materiality and Meaning in Social Life: Toward an Iconic Turn in Cultural Sociology. ALEXANDER, Jeffrey C., Bernhard GIESEN a Dominik BARTMANSKI. *Iconic Power: Materiality and Meaning in Social Life*. 1. New York: Palgrave Macmillan, s. 1-12. ISBN 978-0-230-34005-3.

AMOS, Jonathan, 2020. Nasa's next Mars rover will be called Perseverance. *BBC News* [online]. [cit. 2021-05-19]. Dostupné z: https://www.bbc.com/news/science-environment-51761833

BELL, John, 1999. Introduction: Puppets, Masks, and Performing Objects at the End of the Century. *TDR* [online]. Cambridge: Cambridge University Press, **43**(3), 15-27 [cit. 2021-05-19]. Dostupné z: http://www.jstor.org/stable/1146765

BINDER, Werner, 2012. The Emergence of Iconic Depth: Secular Icons in a Comparative Perspective. ALEXANDER, Jeffrey C., Bernhard GIESEN a Dominik BARTMANSKI. *Iconic Power: Materiality and Meaning in Social Life*. 1. New York: Palgrave Macmillan, s. 101-116. ISBN 978-0-230-34005-3.

COSTELLO, Emily a Jenny KY, 2020. Emily's Wonder Lab host Emily Calandrelli was told audiences 'wouldn't relate' to a female-led science show. In: *The Morning Show* [online]. Sydney: 7News [cit. 2021-05-20]. Dostupné z: https://7news.com.au/the-morning-show/emilys-wonder-lab-host-emily-calandrelli-was-told-audiences-wouldnt-relate-to-a-female-led-science-show-c-1349867

DAMJANOV, Katarina a David CROUCH, 2018. Global media cultures among the stars: Formations of celebrity in outer space. *International Journal of Cultural Studies* [online]. **21**(5), 553-568 [cit. 2021-05-19]. ISSN 1367-8779. Dostupné z: doi:10.1177/1367877917705915

DUYN, Corina, 2020. *Making the invisible visible: Exploring life with chronic illness/disability through puppetry* [online]. **11**(1), 117-123 [cit. 2021-05-19]. ISSN 2040-2457. Dostupné z: doi:10.1386/jaah_00023_7

FISHER, Emma, 2020. The symbiotic relationship between puppetry and disability: The emergence of a strong contemporary visual language. *Journal of Applied Arts & Health* [online]. **11**(1), 15-28 [cit. 2021-05-19]. ISSN 2040-2457. Dostupné z: doi:10.1386/jaah_00015_1

GIESEN, Bernhard, 2012. Afterword. ALEXANDER, Jeffrey C., Bernhard GIESEN a Dominik BARTMANSKI. *Iconic Power: Materiality and Meaning in Social Life*. 1. New York: Palgrave Macmillan, s. 247-251. ISBN 978-0-230-34005-3.

HEALY, Kieran, 2017. Public Sociology in the Age of Social Media. *Perspectives on Politics* [online]. **15**(3), 771-780 [cit. 2021-05-19]. ISSN 1537-5927. Dostupné z: doi:10.1017/S1537592717000950

JPL, Jet Propulsion Laboratory, 2020a. Mars 2020 Mission Perseverance Rover. In: *NASA's Mars Exploration Program* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/

JPL, Jet Propulsion Laboratory, 2020b. Mars 2020 Perseverance Landing Press Kit. *Mars Exploration Program* [online]. Jet Propulsion Laboratory, 1-72 [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/resources/25529/mars-2020-perseverance-landing-press-kit/

JPL, Jet Propulsion Laboratory, 2020. Entry, Descent, and Landing (EDL). In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/timeline/landing/entry-descent-landing/

JPL, Jet Propulsion Laboratory, 2020c. Learn About the Rover. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/

JPL, Jet Propulsion Laboratory, 2020d. Body. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/body/

JPL, Jet Propulsion Laboratory, 2020e. Brains. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/brains/

JPL, Jet Propulsion Laboratory, 2020f. The Cameras on the Mars 2020 Perseverance Rover. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/cameras/

JPL, Jet Propulsion Laboratory, 2020g. Wheels and Legs. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/wheels/

JPL, Jet Propulsion Laboratory, 2020h. Microphones on the Perseverance Rover. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/microphones/

JPL, Jet Propulsion Laboratory, 2020i. Robotic Arm. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/arm/

JPL, Jet Propulsion Laboratory, 2020j. Sample Handling. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/sample-handling/

JPL, Jet Propulsion Laboratory, 2020k. Communications. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/communications/

JPL, Jet Propulsion Laboratory, 2020l. Messages on Mars Perseverance Rover. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/markings/

JPL, Jet Propulsion Laboratory, 2020m. Electrical Power. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/rover/electrical-power/

JPL, Jet Propulsion Laboratory, 2020n. SHERLOC. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/mars2020/spacecraft/instruments/sherloc/

JPL, Jet Propulsion Laboratory, 2020o. World Participation Map: Mars 2020 Perseverance. In: *Mars 2020 Mission Perseverance Rover* [online]. Jet Propulsion Laboratory: Mars Exploration Program [cit. 2021-05-19]. Dostupné z: https://mars.nasa.gov/participate/send-your-name/mars2020/map/world

KENT, Lynne, 2018. Working with things: An exploration of materiality in the puppet theatre. *Garland Magazine* [online]. [cit. 2021-05-19]. Dostupné z: https://garlandmag.com/article/working-with-things/

LEE, Nicole M. a Matthew S. VANDYKE, 2015. Set It and Forget It. In: *Science Communication* [online]. s. 533-541 [cit. 2021-05-19]. ISSN 1075-5470. Dostupné z: doi:10.1177/1075547015588600

LINN, Susan, 2020. It's not me! It's him!: Interactive puppet play to help children cope. *Journal of Applied Arts & Health* [online]. **11**(1), 103-108 [cit. 2021-05-19]. ISSN 2040-2457. Dostupné z: doi:10.1386/jaah_00021_7

MALCZEWSKI, Eric, 2016. Materiality, iconic nature, and Albert Bierstadt's "Great Pictures". *American Journal of Cultural Sociology* [online]. **4**(3), 359-384 [cit. 2021-05-19]. ISSN 2049-7113. Dostupné z: doi:10.1057/s41290-016-0011-9

MARKOVITS, Andrea, 2020. Puppet theatre: A way to tell what cannot be told and to face pain. *Journal of Applied Arts & Health* [online]. **11**(1), 149-155 [cit. 2021-05-19]. ISSN 2040-2457. Dostupné z: doi:10.1386/jaah_00027_7

MASELLI, Vincenzo, 2019. Performance of Puppets' Skin Material: The Metadiegetic Narrative Level of Animated Puppets' Material Surface. *The International Journal of Visual Design* [online]. **13**(2), 17-37 [cit. 2021-05-19]. ISSN 2325-1581. Dostupné z: doi:10.18848/2325-1581/CGP/v13i02/17-37

NASA, 2021. Perseverance Rover Mars Landing. In: *Periscope* [online]. Twitter [cit. 2021-05-19]. Dostupné z: https://www.pscp.tv/NASA/1PlJQPZqLqZGE

NASAPERSEVERE. NASA's Perseverance Mars Rover. In: *Twitter* [online]. [cit. 2021-05-20]. Dostupné z: https://twitter.com/nasapersevere

NASAPERSEVERE. [Call me Perseverance...]. In: *Twitter* [online]. [cit. 2021-05-19]. Dostupné z: https://twitter.com/NASAPersevere/status/1235636460771921920

REED, Isaac Ariail, 2011. Chapter Four: Meaning. *Interpretation and social knowledge: On the Use of Theory in the Human Sciences*. University of Chicago Press, s. 89-121. ISBN 9780226706740.

SHERIKO, Nicole, 2020. Puppet Theater and the Interpreter's Role. *Shakespeare Studies* [online]. Associated University Presses, (48), 152-158 [cit. 2021-05-19].

SIDDIQI, Assif A., 2010. Competing technologies, nationalist narratives, and universal claims: Toward a global history of space exploration. *Technology and Culture*. **51**(2), 425-443.

THE PLANETARY SOCIETY, 2021. Your Guide to NASA's Budget. In: *The Planetary Society* [online]. Pasadena: The Planetary Society [cit.

2021-05-20]. Dostupné z: https://www.planetary.org/space-policy/nasa-budget

THE TAURI GROUP, 2013. NASA Socio-Economic Impacts. In: *NASA* [online]. Alexandria (Virginia): The Tauri Group [cit. 2021-05-19]. Dostupné z: https://www.nasa.gov/sites/default/files/files/SEINSI.pdf

TOMÁNEK, Alois, 2016. *Forms of puppets*. Second edition. Praha: NAMU. ISBN 978-80-7331-389-0.

TWITTER. [Take us with you...]. In: *Twitter* [online]. [cit. 2021-05-19]. Dostupné z: https://twitter.com/Twitter/status/1288789234984222724

WOODWARD, Ian a David ELLISON, 2012. How to Make an Iconic Commodity: The Case of Penfolds' Grande Wine. ALEXANDER, Jeffrey C., Bernhard GIESEN a Dominik BARTMANSKI. *Iconic Power: Materiality and Meaning in Social Life*. 1. New York: Palgrave Macmillan, s. 25-35. ISBN 978-0-230-34005-3.

ZURBUCHEN, Thomas, 2019. The Science of Social Media Strategy. *NASA Blogs* [online]. NASA [cit. 2021-05-19]. Dostupné z: https://blogs.nasa.gov/drthomasz/2019/09/03/the-science-of-social-media-strategy/

Příloha A Perseverance's Twitter Export

@NASAPersevere. Perseverance's Twitter Export. In: Twitter [online]. [cit. 2021-05-10]. Dostupné z: (see the "Appendix-A.xlsx" file supplied with the thesis)

Příloha B Live Broadcast Interpreted

[1:10] After a minute of only the welcoming screen present, the screen cuts to a montage that features a recording of the lift-off of the rocket carrying Perseverance from Earth back at the end of July, followed by the same preview of video illustration of the landing of the rover on Mars, that was used previously in the rover's tweeting.

[2:10] The audience is welcomed by Raquel Villanueva, the main commentator of the whole event, with a shot overlooking the main room of the mission control. She then follows with a description of safety measures in place that was taken because of the COVID-19 pandemic stating that the team members of mission control, commentators, various guest, etc. are scattered across eight rooms followed by 14 cameras facilitating the broadcast. Then two different available broadcasts are described: Feed featuring only the mission control room without additional commentary and, for the first time, a broadcast in Spanish.

[4:42] A cohost Marina Jurica is introduced, who follows with a description of the various interviews that are prepared.

[5:18] The host mentions that throughout the broadcast, they will be answering questions sent to them by students across the nation.

[5:40] Another cohost, Swati Mohan, is introduced. She is located directly in the mission control room, and her task is to "help translate" what is going on with the mission throughout the event.

[6:00] Swati gives an update on the current status of Perseverance. When she talks about the rover, she uses its established pronoun "she". After this, she also explains the 11 minutes information delay between Earth and Mars that is unavoidable because of the distance in-between. She then follows with an explanation that the current operating teams of the mission: the Cruise team, the EDL team, and the Surface team, are split into two areas and introduces several important members of the teams.

[8:15] Swati describes her work on the mission over eight years as a guidance and navigation control engineer.

[9:11] Cut to a video describing the rover's mission. The video is narrated by various members of the mission team. In the background, mildly dramatic music is present. The video consists of various animated montages illustrating the mars, the landing zone, the rover and its design and functions, the helicopter, the various goals of the mission. This montage is interspersed with cuts to the narrators or to miscellaneous other illustratory archive shots of engineers building the rover

[12:10] The end of the video is followed by Swati as she updates on the current status of the Perseverance. The operations team is determining whether they are ready to turn off the transmitter on Perseverance. This means that from the point of turning it off onwards, Perseverance will be "on her own" to automatically approach Mars and perform the EDL: "turning off the transmitter is like taking your hands off of the wheel. "

[12:50] The flight director performs a check-up of the mission control team members if they are ready to turn the transmitter off.

[13:40] The transmitter is turned off. Perseverance is operating autonomously. Raquel references Perseverance as "it".

[14:00] Interview where NASA Associate administrator Thomas Zurbuchen describes the importance of the mission and how Perseverance is going to start off a new phase in Mars exploration. Mentioning also Ingenuity helicopter and its "Wright brothers" moment that will happen. Question from a student. When describing the mission, uses the pronoun "we" as, what are the possibilities that we could found out.

[16:24] Connection with Twitter through various pictures that the audience posted as they await the landing using hashtag #CountdownToMars to be featured.

[16:41] Swati updates on another milestone of the event that is a check of readiness of two orbiters around Mars that are supposed to later establish a relay of communication from Perseverance to Earth.

[17:40] Cut into the mission control room to witness the announced act of communication check. Swati then confirms the readiness of the orbiters.

[18:40] Video visualization of NASA's interactive service "Eyes", where the audience can access an animation of the whole EDL phase as it is

predicted to happen and later on the visualization of the real-time EDL supplied by the received data.

[20:00] The first intermezzo of Mars Fact, describing the 11 minutes delay of signal.

[20:30] Interview where Perseverance systems engineer Matt Smith explains various technical terms that could be potentially heard later on in the EDL phase. He refers to Perseverance as "it" or "the rover" or "we". Question from Twitter.

[23:10] Cut to a video describing the challenges that the team faced preparing the rover for launch at the height of the COVID-19 pandemic—somber music in the background. The video is narrated by several members of the team. The visual side presents either the narrators themself or other miscellaneous archive footage of people working on Perseverance with new safety measures. The priority shifted from putting perseverance together to the safety of the people and figuring new ways how to work remotely. Perseverance is a very fitting name to this.

[26:30] Mars facts: "A day on Mars is about 40 minutes longer than a day on Earth. "

[26:50] [Broadcast glitches] Interview where Perseverance deputy project manager Matt Wallace describes the challenges that the team preparing Perseverance for the mission had to face. The contribution not only by various parts of NASA outside of JPL but outside the USA is also mentioned. The difficulty of landing in Jezero crater, but also its scien-

tific importance. It is his fifth rover mission. Focuses on the people in the team, therefore uses the pronoun "we". Rarely mentions Perseverance itself and references to it as "it".

[31:00] [Broadcast still glitches] Interview conducted by cohost where Perseverance deputy project scientist Katie Stack Morgan explains the importance of landing site Jezero Crater. There are clear traces of a river delta leading into the crater. Explains also the importance of the mission goal of finding traces of ancient life—question from a student about how Mars could sustain liquid water.

[34:20] Prerecorded monologue where Perseverance Communication Systems Manager Chloe Sackier lack introducing graphic] explains the network set up for communication with Perseverance—introducing the "heartbeat tones" the signal that Perseverance is continuously sending to Earth, which the only purpose is to report that it is still "alive". States that all the communication prior to the EDL stage and through it is only for monitoring purposes since Perseverance will be performing EDL on its own. Refers to Perseverance as "she". Cut to Chloe present in the mission control room working hard.

[36:50] Video "7 Minutes of Terror"was already used several times before in Perseverances tweets.

[40:30] Mission Facts: "The Mars 2020 mission spacecraft is carrying the most cameras ever to deep space. 23 are part of the Mars 2020 mission (which includes the Perseverance rover). 2 are on the Ingenuity Mars Helicopter.

[40:55] Interview where Perseverance EDL Lead Al Chen explains the various dangers that landing in the Jezero crater brings. Jezero is "the most dangerous landing site ever attempted, " and while significant, it is still "absolutely treacherous" for landing. The cliffs, deep sands, rock fields. It follows by explaining how the new technology helps Perseverance navigate through those dangers and land safely. Refers to Perseverance as "she". Question from Twitter on how the sky crane flies away as not to hurt the rover after it detaches from it.

[43:50] Swati updates that the mission control is about to receive confirmation that the rover turned off its transmitter. The confirmation is delayed 22 minutes from the command that prompted the action due to the distance. Swati follows with an explanation that once the confirmation is received, it will be about 4 minutes until the spacecraft transitions from the cruise phase to the EDL phase. "So far, things are looking good. "

[44:40] No commentary, direct live feed from mission control

[45:40] Swati confirms that the mission control received the confirmation.

[46:00] Interview where Perseverance deputy project manager Jennifer Trosper [lack of introducing graphic], who has worked on every NASA mars rover mission, describes the history and evolution of the rover in time. Describes how smart Perseverance is in relation to its precedes ours. Describes that it drives autonomously. Describes the sample cach-

ing system. Refers to Perseverance and Curiosity as "she". Jennifer is currently located in front of the room of the surface team, which will take over the mission once the rover lands. Question from Instagram about what is the material from which the wheels of the rover are made? Aluminum.

[50:20] Monologue where Mars 2020 Systems Testbed Engineer Ellio Morillo stands next to a scaled model of Perseverance and describes a few of its scientific equipment. This narration is void of body narration, it refers to the rover as a vehicle, and overall, it is mostly technical.

[52:10] Mars Facts: "The average temperature on the surface of Mars is -64 degrees Fahrenheit (-53 degrees Celsius). "

[52:20] Interview conducted by cohost where NASA Planetary Science Division Director Lori Glaze explains the importance of bringing back samples from Mars to Earth. IT will allow us to study Mars's geological history and detect possible signs of previous life on the planet. The sample tubes are one of the cleanest things ever created as not to carry earth life forms that would compromise the samples. Describes the importance of international cooperation in this endeavor. Describes the process of collecting the samples and bringing them back on Earth in the future. Question from a student. The next generation of scientists will be able to study the samples.

[58:10] The transition of mission control from the Cruise team to the EDL team. Speech by EDL Lead Al Chen towards the Cruise team. Appreciation of their work in helping the spacecraft reaches Mars.

"Thanks for literally and figuratively putting us in the right place to succeed. Let's land on Mars together."

[59:50] Speech by Flight Director where he thanks all the three teams for their work, followed by a speech from Mission Director echoing the previous words. He also mentions obstacles that had to be overcome, like the earthquake in the mission control at the time of the launch of Perseverance. Mentions that the room is only half full because of the pandemic.

[1:01:16] Applause after the three speeches. Flight Director: "And with that, Godspeed Perseverance."

[1:02:15] Cohost explains how Perseverance and Ingenuity got their names. Interview with the two students, Alex Mather and Vaneeza Rupani that came up with the names follows. Alex shares his experience of what it was like to be present for the Perseverance launch. Vaneeza shares how her winning of the naming contest sparked interest in space exploration inside her community. Both students, partially thanks the contest experience, aspire to work for NASA in the future.

[1:05:30] Cohost explains that the winning essays and other finalist ones are etched into the metallic plate ("Explore as One") next to 10.9 million names of participants of "Send your name on Mars. "

[1:06:00] Connection with Twitter through various pictures that the audience posted as they await the landing using hashtag #CountdownToMars to be featured. With commentary on the pictures by cohost.

[1:07:00] Interview conducted by cohost where Host of Emily's Wonder Lab Emily Calandrelli talks about how she educates kids about space exploration, which is interspaced with simple trivia about Mars. Educating kids in science helps in developing their ability of critical thinking. Lost of excitement in this interview

[1:10:20] Introduction of Mars 2020 virtual photo booth designed for the use of the audience.

[1:11:00] [Broadcast glitches a little] Introduction of JPL Cheif Engineer Rob Manning, who will be "breaking up key moments coming up". Rob's narration is a bit chaotic. HE looks very nervous. He describes a tradition of eating peanuts before critical parts of missions, which is accompanied by archive shots of mission control when lander InSight was landing on Mars and later when Curiosity was landing, where the team members are passing out peanuts between each other.

[1:12:45] Swati updates on how the event is going. It says that we are 20 minutes until the EDL stage. Explains that the following is a shot where Flight Director is summarising and reminding the team what is to happen.

[1:13:20] Speech made by the Flight Director.

[1:15:30] Rob reminds us of the "heartbeat" signal. It reminds us that there thousands of things that can go wrong. One mechanism out of many breaks, and it would be mission over. Uses lots of metaphors. If

mistakes are made, we will learn from them. The team is excellent, diverse, intelligent people. I am so proud of this team

[1:19:35] Swati: 14 minutes until EDL. The vehicle is preparing for Cruise stage separation. Followed by a feed from mission control that is narrated partially by Swati and partially by Rob. Rob's narration is affectionate and nervous but full of metaphors to allow an easier understanding of the technicalities for the audience.

[1:21:10] Swati: 12.5 minutes from EDL. 2 minutes until Cruise stage separation. Rob narrates that the rover is completely in charge and is doing what we taught it to do. Refers to Perseverance as "it". Describes what is going to happen next.

[1:22:10] Swati: 1.5 minutes from Cruise stage separation. 11.5 minutes until EDL. Rob narrates. Swati explains that the rover switched to "heartbeat tones" that have limited informational content; therefore, there will be no telemetry. This will be changed in 9-10 minutes when Mars Reiconnasece Orbiter (MRO) starts relaying the signal from the rover to Earth.

[1:23:00] Swati: Under a minute until Cruise stage separation. Rob: "I have to admit I am quite excited and anxious. And hopeful." Confirmation of receiving "heartbeat" tones.

[1:23:30] Before Cruise stage separation, there is a moment of quiet from all the commentators, supplied with a simulation of how the separation should proceed.

[1:23:50] Swati: Separation succesful. Rob: "Yes!"

[1:24:40] Rob: "This is going to go very quickly from here on out."

[1:25:00] Swati: Confirmation from coms that the Cruise stage after separation passed in-between the rest of the spacecraft and Earth, therefore blocking the heartbeat signal for a moment.

[1:25:20] In the down left corner of the screen, a graphic with a count-down until atmospheric entry appears, Currently 8.5 minutes.

[1:25:40] Swati: Spacecraft is orienting itself to the correct position for atmospheric entry.

[1:26:00] Rob: "The vehicle is pointing in the right direction. Thrusters are warmed up and doing their job."

[1:26:50] Swati: "We are waiting for the entry". Reminds of receiving heartbeat tones, which is proceeding as expected.

[1:27:40] Rob starts filling up the few minutes of quiet with an explanation of how the vehicle will enter the atmosphere. Is later cut off by Swati updates on the time remaining and receiving of heartbeat tones. Explains how the relayed signal from Perseverance through Mars orbiter will work and mentions expected outages in several moments of the EDL. 4.5 minutes from entry.

[Throughout this phase of the broadcast, the video cuts between Swati, Rob, mission control and simulation, updated by received data, of where currently the vehicle is and what it does]

[1:30:00] Swati: MRO is ready to receive the signal from Perseverance. Rob explains that we don't need the telemetry relayed by MRO, but "... we really need it for our own health and well-being today to keep our nerves and control."

[1:31:00] Swati: Everything is nominal. Rob, in the meantime, fills the time remaining with more explanations about the upcoming entry. His tone is very anxious.

[1:32:00] Swati: As Perseverance is approaching the atmosphere, it is speeding up as it is being pulled by the planet. 90 seconds until entry.

[1:32:40] Swati: One minute. The commentators quiet down for a moment again.

[1:33:00] Swati: Confirmation that MRO is now relaying data from Perseverance. 30 seconds until entry.

[1:33:53] Swati: Confirmation of atmospheric entry.

[1:34:52] Swati updates on the telemetry and what the vehicle does.

[1:35:34] Swati: Perseverance is past the point of maximum decelera-

tion. Robs sighs of relief and repeated quiet "Yes" can be heard in the background.

[1:35:50] Swati: Small outage in signal as expected during a peak heating phase "plasma blackout".

[1:36:40] Swati: Perseverance is flying straight to the target location and is about 16km above the surface.

[Rob is currently quiet, but occasional emotional sighs and breathing can be heard]

[1:37:50] Swati: Confirmation of the parachute deployment. This is followed by emotional reactions from all actors. The mission control room is applauding. Rob repeats "Yes!" several times. Swatis's voice is also clearly excited.

[1:38:10] Swati: The heat shield has been separated. Perseverances landing camera and radar can now see the ground. 12 km from the surface.

[1:38:30] Swati: Radar begins scanning the ground. 9.5 km from the surface.

[1:39:00] Swati: Radar has locked on the ground. Robs excited: "Yes"—another round of applause.

[1:39:30] Swati: The navigation system has produced a solution for landing location. Another round of applause. 2.5km above the surface.

[1:40:00] Swati: Backshell with parachute has separated. Vehicle performance through "jetpack" engines a divert maneuver to not get hit by the backshell—one kilometer above the surface.

[1:40:10] Swati: Vehicle completed navigation above the target landing location.

[1:40:35] Swati: Start of sky crane manuever.

[1:40:40] Mission Control: Lost heartbeat tones. Rob: "As expected, as expected. "

[1:40:45] Start by lowering the rover from its "jetpack" to the ground—twenty meters from the surface.

[1:41:05] Swati: "Touchdown confirmed. Perseverance is safely on the surface of Mars." Mission control burst in a joyful standing ovation. Swati continues to inform about the sky crane stage diverting of the landing zone and Perseverances continuous transmission through MRO.

[1:41:49] The celebration continues as we hear Rob's sighs of relief.

[1:42:00] Rob: "We got it. This is so exciting." Mission control: "We're gonna wait for the images. "

[1:42:10] Rob: "This is so surreal. Stay tuned. We might get some pictures." In the Mission control room, another big round of applause. Everybody is still standing and congratulating each other.

[1:42:30] Rob: "So much has been riding on this."

[1:43:26] The main host, Raquel returns to the commentary: "We‘ve just heard the news that Perseverance is alive on the surface of Mars." In the meantime, another Rob's "Yes" can be heard in the background together with a round of applause. After several seconds the camera cuts from Raquel, and we can see the first image sent by the rover. The picture is black and white and low resolution.

[1:44:00] The mission control room is asked by another team member if they would like to see where they landed. The member then starts zeroing on the location on the map of Jezero Crater. Continuos applause.

[1:44:38] Raquel explains that the image comes from a rover's hazard camera that is meant to scan the ground under the rover for obstacles; therefore, the resolution is low.

[1:45:00] Rob: "This is amazing."

[1:46:00] Moment of clean feed from mission control, where operators are calming down. The atmosphere seems happy and relaxed. Then the second image comes, similar to the first.

[1:46:10] Rob starts narrating the pictures, explaining the camera that captured them and what can be seen on them.

[1:46:30] Rob's explanation is cut off by another applause. Rob: "We even know where we landed. This is the most amazing thing. The vehicle told us where it landed because it figured it out. (...) This is a sign. NASA works. NASA works! (...) This is what NASA does. This is what we do as a country."

[1:47:20] Interview conducted by Raquel where Acting NASA Administrator Steve Jurczyk shares his joy of the successful landing and gives credit to the team that worked through all the adversity and challenges of landing rover on Mars and Covid. Then follows with what other missions are prepared for the future and how this mission enables that—question from a student on generating oxygen from Mars atmosphere.

[1:51:00] Interview where Perseverance Surface Mission Manager Jessica Samuels describes what will be the first steps of the Surface team as they take over the mission. Describes the preparation phase and how the team will work in the Mars time zone. They will be working mainly overnight when the rover sleeps—question from a student on how Perseverance will survive on Mars. The student also shows a drawing of "Perseverance on mars thinking of Earth, " which is highly anthropomorphized. Jessica refers to Perseverance as "the rover" and "it"; however, at the end of the interview, she also uses the pronoun "she".

[1:54:00] Interview conducted by Marina where Director of JPL Mike

Watkins describes what was unique about the landing and recapitulates a few scientific pieces of equipment and their function. This follows by describing the importance of robotic missions. Lastly, he thanks all the members of the mission and appreciated their work.

[1:58:00] Raquel mentions the upcoming flight test of ingenuity, which is followed by a video montage concerning the Ingenuity and its mission purely. The video is narrated by various members of the mission connected to the Ingenuity flight technology demonstration. Dramatic music can be heard throughout the background. The video features an archive shot of the Wright brothers and their first-ever flight; various archive shot from working on ingenuity itself, stylized animation of how the flight on Mars will probably look like, and a shot of the narrators themself.

[2:01:20] Interview conducted by cohost where Ingenuity Mars Helicopter Project Manager MiMi Aung at first describes her excitement and relief about the landing and then describes the whole Ingenuity mission as it is planned. Followed by a description of the importance of the Ingenuity mission and the advantage that the possibility of flight will bring to future missions. Mimi is very emotional throughout the interview. Question from Instagram, if the helicopter will be doing some science. The Ingenuity is only a technology demonstration but carries a camera for aerial photography.

[2:06:40] Raquel concludes the broadcast and directs the audience to Perseverance Twitter for future updates on the mission. Mentions also post-landing briefing. Introduces the last part of the broadcast where

the cover of David Bowie's song "Life on Mars" is performed by Yungblud, while the presentation of pictures posted on social media with the hashtag #CountdownToMars runs through. [Broadcast glitches several times throughout the song].

[2:11:10] After the song, the three pictures that Perseverance sent from the surface of Mars are presented, after which the NASA logo concludes the broadcast.

Name Index

Alexander, 21-28
Amos, 63
Bell, 32
Biden, 70
Bierstadt, 30
Binder, 29, 39
Bowie, 86
Calandrelli, 87
Costello, 87
Damjanov, 15-18, 47
Doyle, 54
Durkheim, 26
Duyn, 35
Ellison, 28-29
Fisher, 35
Giesen, 31
Harris, 70
Healy, 17
Jurica, 76, 83, 86
Kent, 39
Linn, 36
Malczewski, 30-31, 39
Manning, 77, 81, 85
Markovits, 36
Maselli, 32
Mohan, 76, 78, 80, 81, 85, 89
Morillo, 79
Reed, 46
Sheriko, 38
Siddiqi, 93-94
Tománek, 32-34, 36, 37
Villanueva, 76, 83, 86
Woodward, 28
Yungblud, 86
Zurbuchen, 17