The Atmosphere of Climate Change: An Anthropological Study Using Visualization, Imagination, Film, and Artificial Intelligence as Conceptual Tools to Explore the Construction of Atmosphere

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Nicole Miller

Supervisor:
Christian Suhr

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Abstract

This thesis examines the atmosphere of climate change using visualization, Artificial Intelligence (AI), film as an exploratory medium, and imagination-based interviews. The result is a series of thirteen short films coupling interviews with archival footage, as well as a collection of neural network generated images of "climate change". The focus is on how humans' relationship to climate change functions to socially construct an atmosphere around the topic. It seeks to encourage an awareness of atmospheric construction and the power dynamic inherent in it. The process and methodology implemented reflect "thinking through atmosphere" as a means to explore the topic. The relationship of imagination, narratives based on media and experience, and media images is shown to be dynamic, flexible, and influenced by each aspect of the system. As a result, awareness of one's agency in constructing atmospheres allows for a future-oriented approach to imagining which has the potential to lead to actionable change concerning climate change.

"I was picturing it in an observation room. In a white laboratory area where there are windows to look through and view it. And scientists come in with protective gear to observe it and measure it. And in my mind it's like floating in the center of this room. Whether by its own merit or by something that's suspending it, it's in the room, and then it was probably about the size of a basketball....The scientists interacting with it don't know [how to get rid of it] and they are wary of it. And they just know taking it out of that room would harm other people. So they don't know how to dispose of it. They don't know what would happen if they just destroy the container - if it would destroy it all or what."

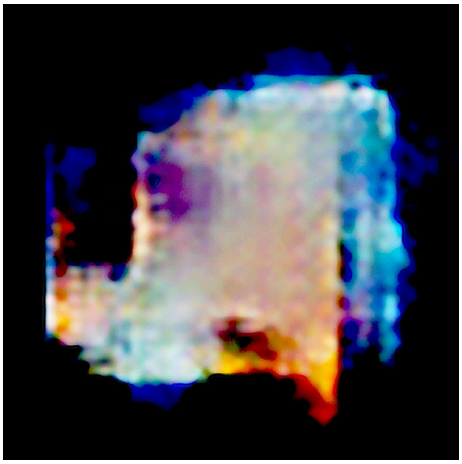


Figure 1: Artificial Intelligence generated image of climate change.

Anthropology and Climate Change

Anthropology is uniquely situated to study climate change because climate change is heavily correlated to human activity. The study of climate change is not new to anthropological research, and theoretically configuring anthropology in relation to the issue has been a prominent topic (Torry 1983; Raynor 2003; Batterbury 2008). Research coinciding with traditional anthropological methods has most often featured fieldwork on the repercussions of climatic events in more critically affected locations (Crate 2008; Hitchcock 2009; Henshaw 2009). Perhaps the reason for this approach is because the factor of visibility makes research more straightforward when actions and effects are easier to observe. Visibility is key for a field that regularly uses the method of participant observation. Conversely, studying the gradual and largely invisible effects of climate change is more difficult to approach. As a result, there has been much less anthropological research in locations where climate change is not as directly observable.

Kathryn Yusoff and Jennifer Gabrys (2011) have been especially influential on my research through their assertion that climate change is not just a scientific problem but also has a cultural and social situation due to the influence of imagination which necessitates further examination. They argue that imagination has a prominent role in constructing the idea of climate change and that creating stories can be used as interventions for reimagining climate change (526). I am particularly interested in expanding this idea to practical applications.

Approaches in visual anthropology have also been utilized in climate change research. Especially in sites where climate change is more easily witnessed, visual anthropological methods have the advantage of being able to document, compare, and disseminate information in more fluid and intuitive ways than traditional writing. Visual anthropology also affords the benefit of being able to incorporate design interventions, which can be used to understand local perceptions of climate change. An example of this is the project by Rhoades, Zapata, Aragundy (2008), which used photographs to elicit responses on how a local volcano showed climatic change over time from an affected town in Ecuador. Expanding across fields and scales, media has been studied for its influence of cognition on climate change (Jones and Song 2014). Eskjaer (2017) has also analyzed media representations of climate change specifically in Denmark. While imagination, local perception, and media are essential for understanding human perspectives on climate change, minimal research has attempted to connect these aspects to understand how humans socially shape climate change and how climate change is affecting and affected by the constructed atmosphere around it.

I am interested in studying the overarching phenomenon of climate change: how imagination is related to the reality of the problem and how the relationship of humans to the atmosphere around it is socially constructed. Visual anthropology is uniquely situated to study the invisible aspects of human relations and social systems, rendering them more visible. This project intends to expand from the individual imagination to the global asking:

> *How do the imaginations of concerned citizens and media images intersect to create an atmosphere around a hyperobject such as climate change?*

Methodology and Approach of the Project

This paper and the resulting thirteen short films I have created focus on several of the components of fieldwork I performed in 2019. Initially, my aim was to find connections between imaginings of climate change and the media, but during interviews, there was a distinct mood evident on the topic. As a result, I found considering atmosphere necessary to connect imaginations of climate change to media images. My main aim is to explore methodology useful for "thinking *through* atmosphere" by using the processes of fieldwork and filmmaking as a tool

to reflect on atmosphere for the anthropologist, the film viewer, and participants. In particular, the film space is useful not only for "thinking through atmosphere" but also for conveying often hidden information about atmosphere.

In order to study the atmosphere of climate change, I intended to link the space of participants' imagination to global media discourse on the subject. To do so, I designed semi-formal interviews which called for participants to actively engage in visualizing a tangible object as a representation of climate change. I requested participants to give their "climate change object" a color, form, and texture. I then asked questions about an external experience or media image of climate change that was memorable. I consciously designed the questions to encourage thinking about climate change in a new way through novel questions that the participants had not considered before. This approach encouraged critical thinking and a heightened engagement in the response of the participants. Critical thinking engagement is also transferred to the viewers of the films. My request for metaphorical thinking made it easier to situate responses in the external world. The following are the questions that I asked:

> *"Imagine climate change as a tangible object with a color, shape, and texture and describe its appearance.*
> *What is the size of the object?*
> *In what environment is it most natural to find this object?*
> *How does the object interact with humans?*
> *How does interaction with the object feel in your body/what are the emotional reactions?*
> *Is there a method humans can use to get rid of this object if they want to?*
> *Why do you think you associate this color, shape, and appearance with climate change?*
> *Explain a local experience of climate change where you've observed its effects.*
> *Can you remember any specific media images you've seen of climate change?"*
> [Miller 2019]

I also collected media images of climate change from Google Image Search. I used the image collection in a collaboration with a researcher at the Royal Danish Academy of Fine Arts implementing Artificial Intelligence to generate new "climate change images" as a means to study the social construction of atmosphere in existing media images. The participants' imaginings were studied in relation to their individual experience, their external stimuli, and a broader context of media images surrounding climate change. The outcome is a series of short films using audio from interviews, archival film footage, and neural network generated images of

climate change to highlight atmospheric properties.

My fieldwork was carried out in Scandinavia, focusing on Copenhagen and Malmö. Participants were sourced using connections made through networks of several climate change action groups, as well as referrals from participants. My utilization of climate action groups resulted in commonalities, where approximately most participants were between 20 - 40 years of age with at least a university level of education. During the course of my fieldwork, I conducted interviews, along with numerous other interventions. The interviews are the focus of this research.

The intent was not to study climate change in a bounded location, as is traditional in anthropology. Instead, because the local perspective I am interested in lies within the singularly individual minds of each person, I did not completely delimit the field. Although I was physically present mostly in Copenhagen, I found the more I interviewed people, the more international the project became; many participants were not from Scandinavia, participants from Scandinavia had previously lived or currently lived abroad, and many people had traveled internationally to areas which are more visibly affected by climate change (such as Senegal, Mauritania, and the Arctic Circle). To make the project more inclusive, the ideal participant was defined as a global citizen interested enough in the topic of climate change to agree to be interviewed. In fact, before the interviews most participants warned me they felt they did not know enough about climate change to be a valuable source of information. However, the interview questions were intentionally designed to allow participants to think creatively, without any specific expertise on the subject, reflective of the inclusivity I hoped to promote.

Benedict Anderson (2007) created the term "imagined communities" to define the sense of belonging to a group. He highlights how nationalism is indicative of a socially constructed idea of the community based on shared ideas and an imagination of a bond with others (Anderson 2007, 5-8). Communities are social constructions created through shared beliefs. I, the anthropologist, am in some ways constructing the community although many of my participants already were actively engaged in climate change discourse. An imagined community became accentuated through participation in my project. I see it as necessary for anthropology to move beyond communities defined only by physical space, shared ethnicity, culture, or nationality, particularly if the aim is to study concepts as large in scope and far-

reaching as climate change. My positioning in this research is that every perspective is equally valuable, especially when my focus is on singular aspects of humans, like imagination. To understand a hyperobject - an object so large that we can hardly see it and which we are profoundly encompassed within - it is necessary to look at it from as many angles as possible.

In summary, a primary intention of this project was for my research to introduce variations on traditional methodological approaches that can be further used in anthropology. First, the introduction of novel questions in interviews that require metaphorical thinking allows imagination and the invisible to be more easily studied. Second, I show methods for exploratory investigation on the construction of atmosphere. Third, I implement the use of film as a medium to directly study atmospheric construction. Fourth, I introduce a potential for machine learning and AI to have relevant applications for cultural studies. And lastly, I attempt to examine the human relationship to climate change as the main object of focus by identifying an existing, "imagined community" of concerned global citizens as the central group of my fieldwork. These slightly experimental approaches provide an opportunity to see how anthropological methods can be expanded and used by researchers in the future to create new knowledge about the human relationship to climate change.

The Invisible

It is necessary to address shifting phases of visibility and invisibility when observing climate change. Because anthropology focuses heavily on human relationships to invisible objects it is a field already oriented to study invisible aspects of climate change. Additionally, by examining Timothy Morton's (2013) writing on hyperobjects, factors contributing to climate change's invisibility can be directly addressed through research methods.

Invisibility and Visibility

Imagination, atmosphere, and climate change can all be argued to be mostly invisible. Climate change in particular presents a problem in that the immediacy of action needed is in conflict with its level of visibility in many highly industrialized countries that are best positioned to reduce CO2 emissions and affect change. When climate change is easily visible the results are often catastrophic: hurricanes, floods, droughts, desertification, and wildfires are extreme natural

disasters which serve as indices of climate change. In many parts of the world, including Europe and Scandinavia, these events are uncommon, which means the visibility of the phenomenon is low when looking for direct evidence. In Scandinavia, awareness of climate change comes first from scientific evidence proving the climate is changing. Then this awareness is brought to the public through media discourse and community and governmental action. After exposure to science and media narratives, events like seeing dried grass or experiencing an unusually hot summer become indices of climate change. As such, indices of varying levels of severity and drama can be seen globally. In many European locations these indices are more subtle, rendering climate change as mostly invisible. Literacy in perceiving the subtle indications of climate change could be trained; I attempt to inspire literacy through appealing to a subtle awareness of climate change perception outside of dramatic happenings. But in the end, climate change can be understood as mostly invisible because it is not a concrete, tangible object like a stone, it is
not clearly present most of the time in most locations, and it shifts in form and manifestation.

There are several ways in which climate change became visible for participants I interviewed. Two prominent themes are shifts in subtle environmental awareness and the absence of environmental events that were a regular part of childhood.

"I definitely felt last summer that the white color, the more sun, was something you could experience. It was nice with the sun in Denmark, but it also felt not completely right. I felt guilty

of enjoying the sun. That it was really nice but you couldn't really put aside that it might not be for the best. It might not be for enjoyment."

This excerpt demonstrates the subtle change in environments linked to climate change awareness. The participant notes that the sun "felt not completely right" and the change in whiteness from the sun was something that could be subtly noticed, but the minimal shift in this difference is indicated by the acknowledgment that it didn't feel right. The change in this example was so small that it merely caused a feeling that could be classified as unsettling, leaving the participant with guilt. This is demonstrative of how low the threshold for visibility versus invisibility is; a minor change in visibility occurs but the difference is almost unnoticeable

except through experiential awareness.

Other participants noted how things differed in their childhoods. In the following excerpts, the elements both participants remember are currently absent. Paradoxically in the absence of snow and bugs climate change becomes visible through emphasis on the negative space where those things once were.

"Thinking about snow - when I was a kid I remember a lot more snow and I think there hasn't been snow in the same way for the last ten years. The snowy winters are only a weird memory."

"Another thing is more a conversation, but my mom, when I was at home, we were out picking up garbage in the woods and then she was like 'there are no bugs' and I was like oh yeah. When I was a kid you got loads of bugs on your windscreen and you'd have to clear them off. I thought back to that being a thing when I was a kid."

The negative space that is filled by a lack of snow and a lack of bugs is also space that otherwise is unnotable. But, it is significant in contrast to the past as an index of change and the passage of time. For example, images of a forest without bugs out of context are unremarkable however, when they are compared to memory, there are subtle differences between experiences over time which make the impact of climate change visible. In this regard, media images and still photography are limited in what they can convey because they are often removed from a personal narrative and cannot easily show the movement of time. Film, and in particular

montage, allows for linked narrative, visual imagery, and the passing of time to become observable. I attempt to use montage as a tool to recall absence and to perceive subtle adjustments in environmental perspectives.

"I can't help but think of Greta Thunberg. A picture of her is what I see when I think of climate change. Or like a forest fire - a catastrophe more or less. They don't show people at the beach enjoying weather because it could be an image to use in some sense".

Additionally when asked to recall a media image of climate change, many participants remarked that images of people enjoying nature were not commonly used, but were equally as able to communicate the idea. Instead, the negative images of large-scale catastrophe were more memorable in the minds of participants. Experientially, however, the reminder of a past

enjoyment, and a future loss can also be markers of visibility of climate change. This observation also raises awareness around the influence of the commonly catastrophic media images used. The atmosphere of those images, from their higher level of visibility, is one of destruction, rather than conveying subtle shifts in time or a deep felt loss of everyday experiences. Subtlety and everyday loss are mostly invisible without connections in time.

Invisible Objects and Anthropology

A question that is central to anthropology is: *how do we study invisible things?* This question is not new to anthropology by any means. The discipline is rooted in studying human culture. Culture is similar to climate change in that there are indices of its existence but it is an abstract concept that cannot be collected. Anthropological expeditions in the 1800s, often worked primarily to collect evidence of ”exotic” material culture, but reflecting on these expeditions, physically holding a cultural object did not mean the anthropologist understood a culture. As Tilley (1999) explains, there is a relationship that is intrinsic to understanding between metaphor and material culture; objects acquire meaning through the human infusion of meaning and can only be representations of culture but not the culture itself. Anthropologists'

difficulty in studying culture is similar to the difficulty in distinguishing climate change from its indices. As anthropology progressed from equating material culture with culture itself, the discipline became oriented towards using information about social relationships to understand culture, and examining material culture for evidence of process, ritual, and social behavior. Clifford Geertz (1973, 89) was influential in shifting anthropology to understanding culture as a system and a process. Due to this shift, currently, anthropology is focused on methods for studying the invisible. It has also focused heavily on story-telling, from informants as well as anthropologists, as a means to convey cultural processes. Similarly, I ask participants to tell me a story about an imagined climate change object, and then I convey the story through the viewer in film. Anthropology and the study of culture means we are always making the invisible visible through our collective use of stories.

The next question for studying an invisible object is: *How far does the invisible extend?* Historically a movement from studying material culture to social relationships has extended to include nonhuman actors, networks of actors, and relationships between objects and humans. The field of cognitive anthropology reflects an expansion from the external world to the internal world of actors. In short, the expansiveness of the invisible is related to anthropology's expansion to study almost any object and connect it to humans. The expanding territory of anthropological research is positive in that it allows more complex theories and views to be formulated, and it can be applied to study very abstract concepts such as climate change. A negative of this turn is that it becomes difficult to delimit the field when the possibilities are infinite.

Philosopher Timothy Morton (2013) gives insight into new methods of studying invisible, large-scale phenomena; he defines the properties of "hyperobjects" as 1) viscous, 2) non-local, 3) operating on a non-human timescale, 4) having shifting levels of invisibility to humans, and 5) they can be detected when the inter-relationships between objects is studied (Morton 2013, 1). I intend to emphasize my focus on these properties as a means to study climate change. I address: 1) viscosity by strengthening connections between humans and climate change through the creation of film, 2) non-locality by using the film space and mental space as nonlocal sites for exploration, 3) timescales by incorporating a time-based media, archival footage, and projections on the future, 4) invisibility by using visual methods to render invisible aspects of climate change more visible, and 5) interobjectivity by de-centering specific humans or groups but instead focusing on common relationships to climate change and commonly shared connections.

"Thinking on a planetary scale means waking up inside an object, or rather a series of "objects wrapped in objects": Earth, the biosphere, climate, global warming" [Morton 2013, 119]

Previous climate change research and anthropological research heavily emphasizes location, but as the properties of hyperobjects show, climate change reaches farther than individual locations. In order to study climate change and its relationship to humans on a larger scale, connections to the global need to be actively pursued. Fieldwork on sites specifically affected by climate change is often limited to studying one index of an expansive subject.
Additionally, anthropology doesn't often study locations less visibly affected by climate change. Anna Tsing's (2015) approach of connecting multiple local narratives of the Anthropocene on an

international level gives a framework that can be applied through working in scales to connect the local with the global. My intention is to focus on human relationships to climate change as the object of study rather than humans themselves. This necessitates decentering the emphasis from individual actors and re-centering it on relationships to climate change. The use of working in scales from the individual imagination to the global media allows a less obstructed viewing of climate change as an entity.

The challenge we are faced with in trying to understand and explain climate change is that it is everywhere, we are always intertwined with it, and because we are enveloped in it, it is difficult to sense and see. The properties of a hyperobject highlight aspects of climate change that make it difficult to see. As my focus is on rendering invisible aspects of climate change visible, I utilize these properties as a starting point for examining the topic. I aim to show aspects of the invisible through film, which are otherwise not easy to pinpoint or identify, namely the atmosphere around it.

Theoretical Framing

This project seeks to understand how climate change relates to humans and how humans relate to it. Morton (2013, 103) argues that before we could see it climate change was with us, but when we became able to perceive it through weather patterns and data, we thought of it as becoming real, creating the current state of "ecological awareness". Data and scientific studies make up a substantial part of how climate change is understood. But human measuring tools cannot detect every aspect of climate change. This point highlights how human perception of a hyperobject is correlated to anthropocentric worldviews which greatly influence how we perceive the world. Here, Uexküll's (2010) writing on the *Umwelt* of organisms is relevant. Uexküll notes that a tick by necessity perceives the world based on the biological limitations of their physical body and the limitations of their senses (2010, 51). Humans are also limited in what they can perceive based on their biological bodies. Human positionality, both bodily and through tools made, is intrinsic to how we perceive the world. Often it is forgotten that because we are humans there are things beyond the scope of human perception or human measurement. For climate change to truly be the object of study, an acknowledgment of humans' positioning, as well as a decentering of the human (to counter anthropocentrism), is necessary. Our human-

ness and particular perception influence how climate change is perceived, and this relationship is important to acknowledge in order to understand humans' relationship to the climate crisis.

I seek to address more abstract aspects of human perception such as imagination and atmosphere of which there are not a significant number of measurement tools existing to gather information. Atmospheres and imagination encompass many factors outside of humans due to our situation in the world environment. Bruno Latour's (2005) Actor-Network Theory (ANT) provides a guiding framework for examining this positioning. ANT proposes that humans and objects are all nodes of an interrelated network of connection (Latour 2005). The post-structuralist turn in anthropology is reflected in this theory, when it becomes difficult to draw clear boundaries between a human and a rock, a computer, or other objects which are equal nodes in the ANT model. Humans are one node in an interconnected network rather than separate distinguished entities. ANT highlights the importance of relationships between all nodes of the network, rather than focusing on just one actor. Tim Ingold (2012) takes this model farther by asserting the idea of the network existing as "entangled webs" which are dynamic and weighted. Ingold gives dimensionality to the network model emphasizing the relationships even more, as the "entangled webs" approach focuses on how relationships between interconnected actors are always shifting in time and changing. My interest in studying atmosphere comes from this revised model. I examine atmosphere as an invisible space between the shifting entangled webs of an ANT model. In other words, as the actors and their relationships change, an atmospheric shift occurs as a correlated effect.

For example, if a person owns a dog and has a relationship with their dog, that relationship may change based on events that occur and environmental surroundings (which are other nodes in the network). If the dog were to bite its owner, the event and resulting shift in the relationship between the dog and its owner would cause a shift in atmosphere between the two. This also would be affected by the owner's imagination in relation to being bitten. The owner would likely perceive the dog differently afterwards, perhaps imagining the event again or imagining the dog's attributes based on the event. This is very similar in fact to Morton's

defined property of interobjectivity to hyperobjects, where he describes a "mesh" which forms a network between all interconnected actors and constitutes the *possibility space* of what could happen between them (2013, 83).

I argue that focus on this *possibility space*, which can at times be seen when observing a shift in atmosphere, is crucial for researching the relationship between humans and climate change. *The possibility space provides insight into future and past relationships to climate change*. Focusing on how atmosphere has been influenced and can be shaped culturally around climate change tells something about how it could shift in the future, and how humans cause an effect in the *possibility space.* The *possibility space* within a network of climate change actors is useful for orienting the future of humans' relationship to climate change.

These theoretical ideas are meta-level and broad in scope. The framing of the project requires grounding in the tangible and the concrete. Using Tsing's (2015) approach of working in scales and connecting non-local information, I attempt to work between the imagination, external stimuli, and global media images of climate change to form an analysis between the macro and micro levels. The framing of the project takes into account the subjectivity of humans' general perception within a broader objective, yet unknowable system. I coupled more subjective methods such as interviews imagining hypothetical objects with the arguably more objective focus on color and contrast in media images, aided by use of a neural network. I attempt to achieve a balance when studying the invisible from a human point of view where the local, the global, the human, the non-human, the objective, and the subjective are all configured inside climate change as a hyperobject.

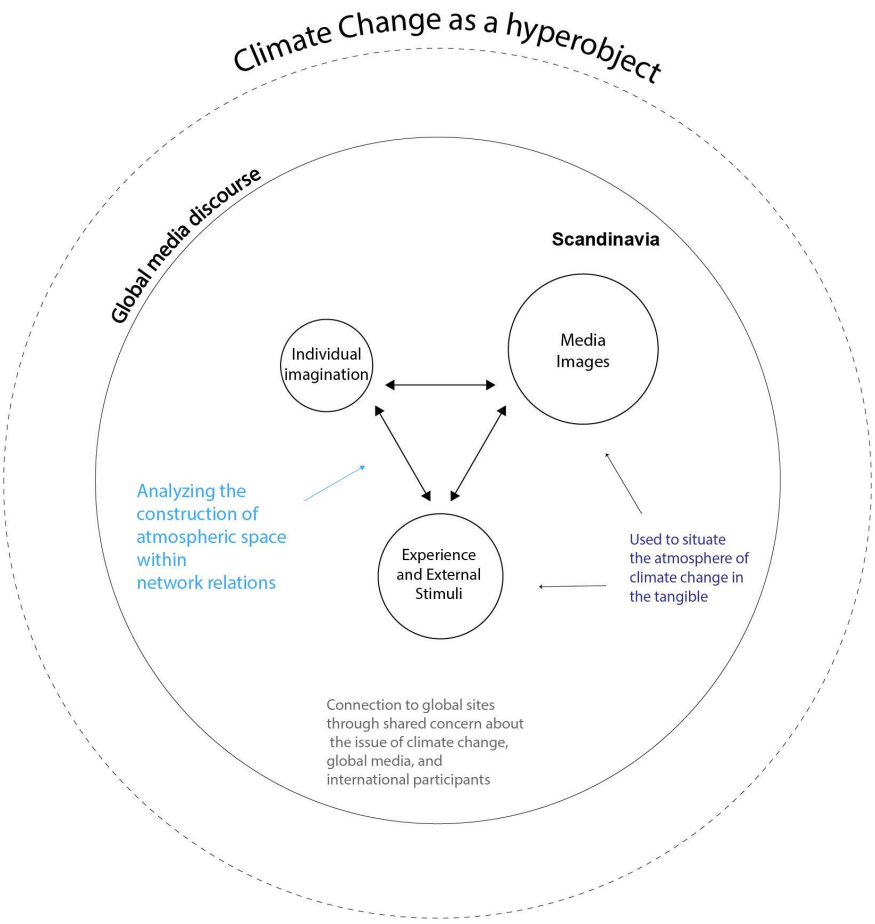


Figure 2: Diagram of the theoretical framework of the project

The importance of understanding the atmosphere around climate change is multi-layered. First, gaining insight into the collective atmosphere around climate change, by investigating the coalescence of the individual and the global, highlights the process of atmospheric cultural construction. This has not been a prominent subject in anthropology due to the elusiveness of the topic and its abstract nature. Secondly, awareness about the culturally constructed nature of the atmosphere around climate change makes evident that it can be shaped by humans. This in turn means the atmosphere around climate change can be *changed* by humans. Rather than only encouraging small steps to reduce carbon emissions at home, to use less energy, or to act against climate change, understanding of our human relationship to the problem provides insight for initiating change. Strategies for action will always be less effective if the construction of the problem is not fully understood. Additionally, recognizing individuals' influence in constructing

the atmosphere of climate change (i.e. by imagining what it is like) gives individual agency to intentionally shape perception of climate change. New solutions can arise from addressing the problem of climate change differently by thinking through atmosphere.

The Atmosphere of Climate Change

Tim Ingold (2012) argues that understanding atmosphere is fundamental for understanding how living beings are situated in the world. Atmosphere describes the connection between nodes of a network, yet it also shows our immersion in a seamless state of being shared by all of the nodes in a network (Ingold 2012, 84). It is a space where humans are both isolated and singular but also immersed and connected. Anthropological work on the specific study of atmosphere has been relatively limited, mostly focusing on atmosphere as an aspect to address in studies of specific physical spaces (Edensor 2012; Bille 2015; Pink and Leder Mackley 2016). However, the 2019 publication of *Atmospheres and the Experiential World* by design researcher Shanti Shumartojo and visual anthropologist Sarah Pink, advocates for atmosphere as a highly relevant topic for anthropological inquiry. They argue atmospheres are significant because of their ability to be constructed and therefore manipulated, attributing the imagination as a key factor in the construction of atmosphere (Shumartojo and Pink 2019, 100). Shumartojo and Pink highlight a particularly notable quality of an atmosphere: it coheres people in groups based on their spatial and temporal relationship to the atmosphere (121). Reflecting on my choice to use an imagined community of global citizens around climate change, this point is highly relevant. The atmosphere of climate change reflects another cohesive factor among groups of concerned citizens due to their shared positioning in relation to climate change. Most atmospheric studies focus on specific spaces, and Shumartojo and Pink concur in the importance of that approach, which is where my project deviates. Rather than situating this project in a specific physical space, this project attempts to construct a more ambiguous space (through use of the film space) to study the atmosphere of a pressing issue rather than a specific place.

Furthermore, Shumartojo and Pink define the process of "knowing *through* atmospheres" as a separate research approach from "knowing *in* atmospheres" (35-46). While *knowing in atmospheres* is focused on the spatial situation of atmospheres, *knowing through atmospheres*

allows atmospheric studies to be a medium for learning about something else (35, 43). By revising the terminology slightly to *thinking through atmospheres* I seek to reveal information about atmospheric constructions, awareness of them, as well as possibilities for reshaping atmospheres by using their study as a tool to obtain knowledge. Shumartojo and Pink conclude that atmospheres are useful because of their linkage to possibilities and the future because they can be useful for understanding the potential for what may happen, which means individuals may start to think of how what they do influences what happens next (126-129). This future-orientation is similar to Morton's envisionment of the *possibility space* within the mesh of hyperobjects (2013, 82-83). Imagination-based interviews engage participants to take agency in shaping the conveyed atmosphere, which can be influential when they realize they make conscious choices in constructing an atmosphere. Atmospheric studies are significant in their ability to be forward-thinking and intersect with the *possibility space* of change and futurity.

Expanding on the research of Shumartojo and Pink, the atmosphere of climate change should be understood as a partial cultural product, influenced in shape by humans. Atmosphere is related to aesthetic and sense-able properties and can be described as a mood, feeling, or ambience around a subject or environment (Böhme 2016, 2). The word has frequently been used in art without a clear definition for what it means and how to identify it (1). Philosopher Gernot Böhme states atmosphere is a necessary property for conceiving of a "new aesthetics", and it requires an understanding of the peculiar situation of atmosphere between the subjective and objective, which has made it difficult to study (2016, 8). Böhme asserts that stage design is an exemplary means to study atmosphere in that stage designers actively work to create an atmosphere, which then must be received by audience members in order to be effective; stage designers show both how atmosphere is produced, but also how it is understood (2). Although Böhme focuses heavily on the spatial presence of atmosphere in relation to architecture, his highlighting of stage designers as conscious constructors of atmospheres can also be extended to filmmakers and anthropologists.

Imagination

In creative acts, imagination is a key component, and it can be argued that cultural production is therefore always a creative act. There is some anthropological precedence for

imagination research, but I argue that imagination's connection to the external world makes it even more important to study. The techniques of visualization and expanding on imagination-produced content are methods for making connections between the imagination and the external world more explicit.

Imagination in Anthropology

As Vincent Crapanzano (2004) notes anthropologists have studied imagination, albeit often indirectly, because of its intertwinement with other topics. Crapanzano was among the first to make the anthropology of imagination a topic unto itself with his book *Imaginative Horizons*. He states that his interest lies in the inseparable and dialectical relationship between reality and the imaginary, where they mutually shape each other (Crapanzano 2004, 15). Following Crapanzano's publication of *Imaginative Horizons*, Amira Mittermaer (2010) researched the imagination as well. Mittermaer worked to connect imagination and dreams to the external people and situations that make dreams culturally relevant in Cairo. She shows a more applied technique to studying imagination by situating it in the real world. More recently Ingold (2013, 735) writes that it is more difficult in fact to separate the happenings in the world from our imagination as mediators of those happenings: "Indeed the problem is the very opposite of what we take it to be: not of how to reconcile the dreams of our imagination with patterns in the world, but of how to separate them in the first place." The importance of understanding the connection between imagination and the world's patterns becomes more apparent when the social construction of reality is considered.

This research expands on Arjun Appadurai's (1997, 138) where he briefly mentions the concept of the "social imaginary" asserting that real-world systems and imagination are inseparable, mutually affecting each other. The emphasis in Appadurai's mention of the imagination is on the relationship between individual imagination and larger social systems. Sociologist C. Wright Mills (1959) coined the term "sociological imagination" to explain the connection between the reality of the individual and the reality of society; the imagining of an individual contributes to (and is shaped by) a collective imagining of society, producing a feedback loop of mutual influence. Imagination is explicitly related to culture in that it is applied

to create culture through collective imagining and agreement, and imagination is also employed in assessing and responding to culture. As a result, the individual imagination is vital for understanding atmospheres, but collective imaginings are also important for understanding atmospheres that shape the world. Participants in my fieldwork exemplify this by having singular imaginings of climate change based on their personalities and experiences but also commonalities with other accounts which contribute to a greater collective imagining of climate change. I focus more on the commonalities as a means to see a larger system of atmospheric construction as work.

The difference between Crapanzano and Mittermaer's previous works and the writing of Appadurai and Mills is the scale emphasized. Merging the two scales, imagination becomes a crucial point of anthropological reflection because it individually is influential, but also collectively creates an imagination which contributes to reality. The space of the sociological imagination and how it is constructed is very close to the concept of atmosphere I aim to study, in that it is based on collective connections of imagination and real-world happenings. The atmosphere around climate change is composed of imaginings on different scales, by different actors, and there is room not only to expand the anthropology of imagination but to link it on the individual, local, and global levels to real-world systems. I propose the individual and collective imagination are critical due to their relationship to real world systems which affect social response and engagement with climate change.

Visualization

Visualization can be useful for connecting imagination to the external world. In similar fashion Alfred Gell's (1998, 222) conception of "extended mind" contends that consciousness and created objects have an isomorphic relationship. Created objects are relevant in their relationship to consciousness and imagination. Lakoff and Johnson (1980, 6, 86), in their book *Metaphors We Live By* assert that metaphors are important because human thought processes are metaphorical, and metaphors are, by extension, remarkable in their ability to construct social reality. Visualization allows for the use of metaphorical thinking which is extremely valuable for its ability to ease the study and conceptualization of imagination by giving it a visible form

situated in connection to external stimuli.

The use of visualization techniques is not new to science. In the anthology *The Aesthetics of Scientific Data Representation: More than Pretty Pictures* (2018) numerous cultural scientists write about the role of science in conveying information that is mostly invisible using visualizations. Hannestad (2018) discusses astronomers' attempts to visualize the invisible universe of outer space, and how the visualization is important because it allows humans to grasp an understanding of the vast universe more intuitively than through classic scientific data. Philipsen (2018) discusses "critical design" as an approach merging artistic and scientific representation to engage with the power and representational aspects embedded in visualization. I have used visualization in both ways; it can be a critical tool for reflecting on the content of films, as well as a means for viewers and participants to intuitively engage with the topic of
climate change.

During the interviews I conducted, the last question in the visualization portion of the interview demonstrates the ability of visualization to not just affect but transform one's perception of a phenomenon. "*Is there a method humans can use to get rid of this object if they want to?*" This question demonstrates an ability to influence a cognitive shift where the participant can take agency in shaping the world into what they want it to be. For example, one participant illustrates this in their response to this question after describing climate change as a burning egg carton:

"I'd put it in a vegetable garden. Kind of cover it with soil, then plant some seeds. It's not burning when I'm planting it in the soil. In the vegetable garden, in the ideal world where I want it, it's not burning. ***But that's not how it is - that's how I want it to be.****"*

The last sentence is evidence of a cognitive shift where the participant is able to change their image of climate change and shape it into a more favorable, future-oriented image which coincides with their conception of an ideal world. Visualization allows the possibility for agency in perceiving the future of climate change.

Asking participants to visualize climate change as a tangible object with color, form, and texture allows for the creation of an "object" which can be analyzed and depicted. Visualization and metaphorical thinking allow imagination to become mental images that can be visualized and represented. The purpose of the visualization technique is two-fold. First, it hypostasizes the invisible; something abstract is given a more concrete reality. Secondly, it allows for agency of the participants. Because the participants are able to have creative freedom, this directs the course of the project. The films produced are based on this creative freedom. In addition, the ability to control the visualized object and make decisions about its form and properties allows for a feeling of influence over climate change. The participant can choose how they see climate change and how they represent it, rather than passively consuming media images of other presentations of it. Awareness of their perception of climate change is activated through the introduction of a new line of questioning.

"*How would I dispose of a rusty steel ball?...I'd probably either melt it down or see if I could corrode it in acid - in an industrial way because I think of it as an industrial object. I'd see it would eventually be weathered through."*

The above excerpt demonstrates the inevitable connections that can be made between imagination and external stimuli. The participant describes climate change as an old oil drum crushed into a rusty ball and refers to industrial processes as a marker of the object and its removal process. The linkage to oil and industry referenced by this description illustrate qualities of climate change that have been influenced by public information about it. Metaphorical thinking allows these connections to become more visible and communicable.

Situating the Imagination

The purpose of situating the imagination is to configure it within a web of external stimuli where the socially influenced, externally connected aspects of imagination have a tangible basis. The process of hypostasizing climate change is enhanced by situating accounts of imagination in references to outside stimuli. Film further enhances this process, as it is uniquely able to connect the imagined visualizations to external references.

How can imagination be situated in the external world?

One approach to this question, while considering the entangled webs of imagination, climate change, and all of the objects in between, is to expand the webs' network of connections. Donna Haraway's (1988) conception of "situated knowledge" lends itself to this approach, as she argues for the need to contextualize knowledge in order to gain a complete perspective and understanding of it. The more connected something is, the more "real" it seems, with a multifaceted existence allowing it to become clearer. In order to apply this theory in practice, Joseph Dumit's (2014) "Implosion Project" is used as a guiding frame. Dumit's approach gives a clear structural guideline for establishing connections. Giving more dimension to an imagined "climate change object" is beneficial for making it more concrete. Dumit proposes looking at fourteen dimensions, such as the material, educational, mythological, and symbolic dimensions of an object to expand on its depth and connect it to a vast web of information (2014, 351-354). In order to situate the imagined objects created by participants, aspects of some of these dimensions were considered. This approach was taken both to understand the context of interviews, but also to construct videos visualizing the object based on the situation of the content within external world references. For example, details of the material dimensions can add depth and enhance understanding of multiple facets of an object.

"[The texture is] kind of shiny, wet in the middle, more like dry or stony on the outside. Like something that is on the way to die I guess... For example if you have a fruit on the table it dries on the outside and stays wet on the inside for a while, until it becomes dry on the inside too. It would be like that so I guess it's a bit like watching dying."

While describing texture this participant connected a drying fruit to expand on their mental visualization. They reveal the texture of climate change is in their mind as similar to "watching dying", which links not just the fruit but the concept of death to the participants' object. Additionally, the connection allows a more accurate mental transfer of the object to the reader's imagination as well.

"... it's black, it has a rough surface - funnily if you think of a squid... It's similar in the ways it kind of can move in all direction, and it can become tiny, tiny and go into little places and become big like a squid can spread out it's arm."

This excerpt demonstrates how the participant utilizes a squid to enhance the metaphor of the object. In this case, the symbolic dimension comparing the object and a squid creates an association with a foreign entity dissimilar from humans that is elusive, slippery, and erratic in movement. These examples show how connections to external stimuli influence imagination while also rendering imaginings of climate change more concrete.

Thinking Through Atmosphere

When situating the imaginings of participants, a common atmosphere of science fiction was identified as an atmospheric area to think through. The relationship of media images to human perception of atmospheres also provides a means to think through atmosphere while observing its shifting nature. Lastly, the implementation of machine learning techniques allows a neural network to think through atmosphere by simultaneously altering human perception and giving insight into mental processes of human atmospheric construction.

An Atmosphere of Science Fiction

A commonality in many interviews was a relationship to science fiction and horror films in common themes. Investigating the mythological dimension connected to entertainment provides more insight into what the atmosphere of climate change can be compared to.

The narrative at the beginning of this paper could easily be mistaken for a scene from a science fiction movie. Scientists gather around an observation room where they study a mystery substance with no idea of its exact properties or the effects of their actions. This type of narrative was typical of many participants I interviewed. This particular narrative was substantially descriptive, whereas others merely reference unsettling sci-fi and dystopian characteristics in their descriptions of the object. The following excerpts illustrate commonalities in a science-fiction atmosphere.

*"It feels like some sort of **dystopian** nightmare. Like a **science fiction film**. Or a Japanese manga... There is an old western where they sit in the **desert** and there are some body double robots that are underneath the earth and you have to hide. Which was probably the first scary film I saw as a kid."*

*"[It would have the] texture of a **desert**. Basically the **texture of death**. And what you see in sort of **post-apocalyptical** films and stuff like that. They usually take place in the desert."*

*"It's a bit 'A Space Odyssey'-ish with the humming **representing evil**. It's very clinical and ruthless."*

*"If you walked into a basement and saw a glob of neon orange goo it would be **disconcerting and confusing**."*

*"It's tricky because it's like anamorphic...maybe a shapeshifter but it can come underneath the doors and through sprockets in the windows and it's tiny tiny tiny, then it becomes big. Then when you sleep, **you die**."*

*"It's this green plastic slime on a football. Half of the football...is covered in this slime. It comes from watching cartoons as a child where the cliche neon green color represents **radioactive waste**."*

Here slime is acknowledged for its cultural connection to radioactive waste and presence in children's cartoons. Slime also has mythological connections to 1960's horror movies such as *The Green Slime*, which relates the story of scientists that accidentally bring back a mystery substance from space that grows into a monster. The "mystery substance" theme is common in these narratives. The theme is also represented in the opening excerpt about the laboratory and the short film *The Blob*.

*" It functions like a solar eclipse - you only get to see it sometimes, but once it goes away you're like oh, it's just another solar eclipse. **Then you feel like it's okay... but it's not**."*

This last excerpt from the film *The Hologram* exemplifies a subtler mood that could be classified as "uncanny." It is similar in account to other interviews where participants describe the experience of feeling the sun is more intense, in that something happens that creates a disruption between what is normal and what is not. This subtle mood can be found in almost every interview I conducted. Participants routinely talked about an unsettling feeling and awareness that something is not as it seems when describing a minor event such as the sun seeming brighter or an eclipse disappearing. The last sentence illustrates the feeling that something is wrong. "Then you feel like it's okay, but it's not." The commonalities between

most accounts of climate change as an object often imitate aspects of science fiction films, even emphasizing the same themes such as death, being chased, uncertain science, and the desert being a post-apocalyptic environment. By creating a narrative around their imagined climate change object, participants construct a new world in a specific atmospheric space. It is one where everything is not as it seems, where danger is lurking. The connection made to external stimuli and media references by situating the mythological dimensions of references gives the imagined objects an atmosphere with meaning that can be understood more easily; an overarching feeling that accompanies discussion about climate change is that it is unsettling, with unknown variables, causing humans to feel uneasy. It is related to science, but it is a science that feels fictional and unreal in its uncanniness.

Relationship of Imaginings of Climate Change to Media Images in Constructing an Atmosphere

"I went to New Zealand with my sister, and we went to see the glaciers. And I was expecting to see something very pristine and big big blocks of ice because that's kind of the aerial view that you get of them. But when you go to the end of the glacier and it's melting into the sediment it looks almost volcanic and there is a lot of dark sediment and it's very dark. And that particularly was a very startling image because it almost kind of looked like a martian landscape, one of destruction. And it wasn't necessarily. Because the acceleration of the glacier could be caused by climate change and the landscape there might have been normal. But I remember it being a shock against what I thought it would be. It was something very dark where I was expecting something lighter."

In 1968, when the members of the Apollo 8 mission photographed the Earth from space, the human view of the planet changed. Psychologists refer to the *overview effect* to denote how a different view of the Earth changed perceptions of the Earth and led to new ways of engaging with the world; seeing oneself from outside of one's self changes one's outlook on their placement in the universe (White 1987). For the first time, the Earth was shown not a series of disjointed locations that one could traverse, but as one entity. The Earth was shown as one connected planet on which we all were sitting in separate places, but sharing water, land, and atmosphere.

Figure 3: *Earthrise* photograph

The example of the *Earthrise* photograph demonstrates how media influence can change human perception. The *Earthrise* photograph is the first overview picture of the Earth, making way for a visual trope of photographs and images. In representations of climate change, the Earth as a whole entity has been often used to represent climate change. Our current conception of climate change is partially due to the ability to photograph the Earth from above. Furthermore, our developing ideas on climate change are likely also influenced by the similar images we intake through the media daily. As such, the link between media representations of climate change and the human imagination of it together create an "atmosphere" of climate change, as they mutually influence one another.

The quote at the beginning of this section illustrates a reaction by a participant similar to that of the *overview effect* in that their viewing of media images of glaciers before seeing one in person caused them to imagine glaciers based on aerial photography. Once arriving at the glacier and seeing it from a different perspective, they remark about being shocked. The atmosphere around the topic became one of "destruction" with imagination linking images of "martian landscapes" to climate change and glacial retreat. The perspective from which a phenomenon is viewed as well as past experience influences the atmosphere and imagination of it.

The *overview effec*t of the Earth image is a significant example of how the atmosphere connected to an image became so influential that it shifted humans' perception of their world. It

is evident that the atmosphere around images has power over people. It is then important to recognize what those atmospheres are and how they are constructed so that affected actors may assert agency.

The *Earthrise* photograph highlights some elements of the atmosphere construction process which I focus on. First, the image is produced and made available on a global scale, causing it to serve as visible stimuli reflective of the idea of the whole of Earth. Secondly, the image is reused and recirculated creating narratives around its presence. Lastly, individual imaginations (and the collective imagination) respond to the image by formulating mental images of the Earth from an overview positioning. Narratives, imaginings, and media create a connected system influencing an atmosphere around the idea of the world.

I have approached climate change focusing on media, imagination, and narratives as working in a system to construct an atmosphere around climate change. In particular, interviews I conducted show science fiction and horror films as connections to climate change which engage with all three variables; popular films are media, with narrative plots, which activate the imagination of the viewer. The feeling of the uncanny present in science fiction films is influential on the atmosphere constructed around climate change, as are media presentations of climate change.

Neural Networks and the Study of Atmosphere in Media Images

"Me: Is there a media image you recall that reminds you of climate change?
Participant: I don't have one media image - just a big cloud of stuff that isn't easily separated."

This response reflects the atmospheric content I wanted to extract from media images, assuming that viewing many images creates an overall atmosphere around the topic. In order to study the inseparable cloud of atmosphere around images, I implemented the use of a neural network.

Because atmosphere is a difficult to pinpoint concept due to its invisibility and often indescribable qualities linked to emotion, there is some difficulty in investigating it. When reducing atmosphere to aesthetic properties such as color, contrast, shape, and composition, some elements contributing to atmosphere can be identified in a quantifiable manner. These properties are similar to those used in art history for interpretations of works of art.

In conjunction with individual interviews about imagination, I have gathered a collection of 2,000 photographs of climate change using Google search for the term "climate change". There is some difficulty for a human to analyze a data set this large for commonalities. In addition to quantitative limitations of human analysis, the human elements found in the images become an obstacle for discerning the subtle and more aesthetically-based atmospheric qualities of the images. For instance, many of the images contain the earth, but interpreting the images based on color and shape becomes more complicated when human cognitive programming recognizes both the symbolic meaning and signified objects in the images. Atmospheric analysis is diverted by human filters which condition humans to be visually literate. Working against these filters is a task that makes achieving a solely aesthetic interpretation more difficult.

To address this problem, I collaborated with a Research Assistant at the Royal Danish Academy of Fine Arts in Copenhagen who works with machine learning applications in architecture. I collaborated with him to use machine learning as a tool to aid my analysis. My goal was to have a neural network "think through atmosphere." In early discussions about the technical details, he informed me that what I hoped to do would not result in clear images of climate change. The methods I was interested in are typically used for projects such as the generation of new human faces or pictures of cats. Because cats and humans have a particular external form, a neural network can be trained to recognize and replicate them based on common visual similarities in the image. With climate change the result would not be the same because the object is so visually elusive and diverse in its representations. We decided that it would be interesting to use a neural network to study an extensive network of climate change images and then generate images reflective of the atmosphere of all of the images

collectively.

Artificial Intelligence and the training of neural networks is based on imitating the processes of the human brain to solve problems. The novelty of my application of machine learning is in the use of it to reduce human filters to allow a formal analysis of the aesthetic qualities present in the collection of images and to illustrate the overall atmospheric qualities of a network of images.

The technical procedure used is as follows, which is markedly similar to a human's intake of images. We implemented a Generative Adversarial Network (GAN) framework (Goodfellow, et. al 2014), and a neural network was trained to study 2,000 climate change images as the input data. Training consisted of two networks working together where one, "the discriminative network", functions as a teacher, and the other "the generative network", functions as a student (1). The student attempts to create a "climate change photo" beginning with noise, and the teacher judges if it is real or fake based on similarities to the input set, giving feedback to the student on why it is not correct. The student becomes better and better at accurately generating something that can pass as a "climate change photo" by repeatedly attempting to recreate pixels of a "climate change image" showing patterns of aesthetic elements such as color, shape, contrast, and composition. I like to think of this as the student imagining climate change. As training progresses, the more each generation of images gains precision and appears as a smoother, decisively made image with a higher correlation to the input set. The outcome of the process on this set is similar to human intake of media images, where in the end a single image of climate change may not be memorable. Instead a blur of aesthetic qualities or intuitive feelings of the images one has seen may be more prominent in the brain. The neural network creates more precise images in the same way a thought slowly becomes more explicit in a human's mind or the flow of a film becomes more complex after starting from black.

The outcome of the neural network's training is a generation of 16,000 images which depict the atmospheric qualities of climate change through recognition of the repetitive aesthetic

elements in the input set; the generated images serve as a medium for visualizing the atmosphere of climate change. The resulting atmosphere is similar to participants' imaginings based on their own input of media images. However, it is most interesting because it is representative of an underlying, prevailing mood in the network of images that are widely circulated in the media.

It is evident through the apparent connection in similarities to the images and the "imagined climate change objects," which will be discussed later, human imagination of a mostly invisible concept like climate change is heavily influenced by the input of abundant images and mentally processed in relation to their atmospheric properties; the imagination of a concept is correlated to its input images. This application of a GAN framework is novel in that it gives insight into the construction process of creating an atmosphere. It gives visibility to how media influence has contributed to a cultural construction of the atmosphere of climate change that lives in the imagination of media consumers.

Figure 4: Samples of different generations of images. The images progressively grow more realistic and clear with more nuanced pixel patterns from left to right.

Atmospheric Construction in Films and AI images

It is also necessary to acknowledge factors which contribute to the construction of atmospheres. Common indices of climate change, specific aesthetic properties to convey climate change, as well as new connections identified in consciously-created films provide a means to analyze atmospheric construction and the factors that are common to climate change's

atmosphere. This is significant because in the construction of atmospheres lies the ability for influence, power, and change-making.

Indices of Climate Change

The input images used to train the neural network reflect common indices of climate change. Philosopher Charles Peirce (1991) differentiates between an icon, a symbol, and an index; icons resemble what they are depicting, whereas an index gives an indication of what is depicted, and a symbol has no relation between the visual depiction and the meaning. Input images of climate change are iconic in that they resemble what they depict. A photo of a fire resembles the fire in reality. However, climate change images are iconic in their depiction of specific indices, not in depicting climate change itself, because climate change cannot be captured in a single photograph. This is why the indices are vital to examine; they are the means by which we are able to see climate change. On a symbolic level, human interpretation is applied to the images and indices in order to recognize them as a symbol of the idea of climate change.

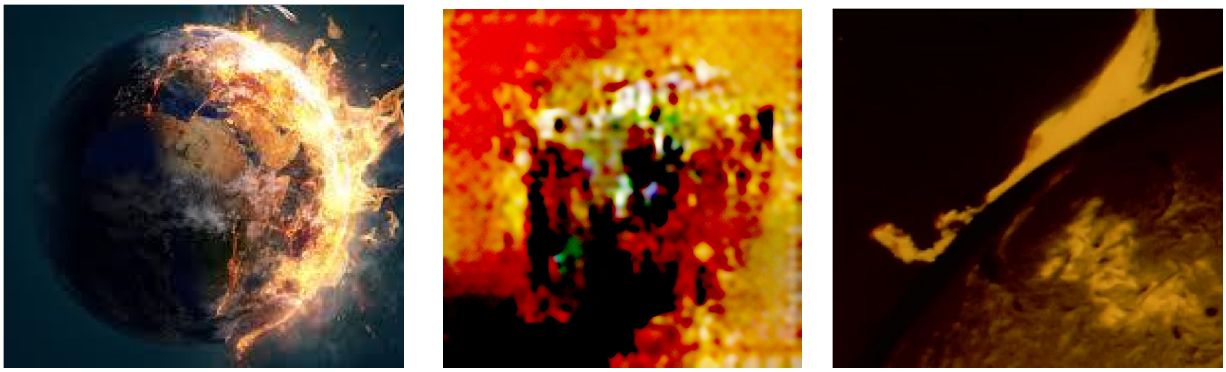
There are some standard indices in the images of climate change that are used to visually acknowledge its existence. For instance, in a photograph of a wildfire, the fire is an index which suggests that climate change exists. Many of the climate change images encountered are repetitive in their use of indices.

Many indices and symbols are repeated in conventional climate change images, which can be seen in a sample set of some of the 2,000 input images (**Appendix A)**. The first is the use of the Earth or the sun as a changing form. The Earth is often depicted as flaming or melting. The spherical shape is pervasive in many images, even in subtle composition. This was reflected in my interviews as approximately 40% of participants imagined climate change as a circle, sphere, or ball, often referencing the relationship to the Earth or the sun when asked to reflect on this choice.

Secondly, fire is a standard index of climate change. Many images illustrate the Earth on fire or simply depict large scale fires accompanied by smoke. Many participants cited images of

the Amazon burning as influential because the timing of many interviews I conducted coincided with these prominent media images. As a result, smoke and fire were often found in the search images and referenced by participants.

A third common index of climate change is melting ice. The input images show glaciers, glacial retreat, and flooding in a landscape perspective. Many images are of landscapes in the process of changing through extreme events. Indices like these are typical of visualizing climate change, and the patterns were also represented in interview responses from participants. As such, their relevance in creating an overall atmosphere around climate change can be seen, where their repetition and underlying tone seems to affect imaginings of climate change.



Connections between media images and imagination of climate change. *Figure 5* : an input image of climate change found in Google Search. *Figure 6* : Neural network generated image. *Figure 7* : Still from *The Hologram*

Figure 5 shows the Earth on fire, which is a typical symbol used in the media. *Figure 6* is a neural network generated image of climate change that removes the recognizable elements and the index of fire, but similarities to the sample input image still remain in color and shape. *Figure 7* is taken from archival footage of the sun when the participant mentions solar flares when imagining their "climate change object". Visual similarities between the media, the atmosphere, and imaginings of climate change are apparent in this sample set of images.

AI images and Any-Space Whatever

The AI images generated are reflective of Delueze and Guattari's (1987, 570) distinction of *smooth space*. They differentiate two different types of spaces: *striated space* and *smooth space*. In *striated space*, a clear orientation and a central perspective constructed by elements of human engagement is key. In *smooth space* they state that "its orientations, landmarks, and

linkages are in continuous variation." (Deleuze, & Guattari 2013, 573). The space of the generated images is less oriented, less clear and more abstract in its ability to be interpreted; the training of a neural network demonstrates a means by which to remove the central perspective and human orientation of a 2D image to create a fluid smooth space.

Appendices A and B demonstrate the change from a striated space to a smooth space, where a clear orientation and a grounding in human influence is subtracted. Through this process, newly generated climate change images are removed from indices of climate change and instead intuitive elements become more visible. The process used helps to directly visualize the atmosphere of climate change by focusing on invisible abstract qualities and de-emphasizing specific indices and specific objects and environments. In the *smooth space* of the images the underlying atmosphere shaped by humans can be seen.

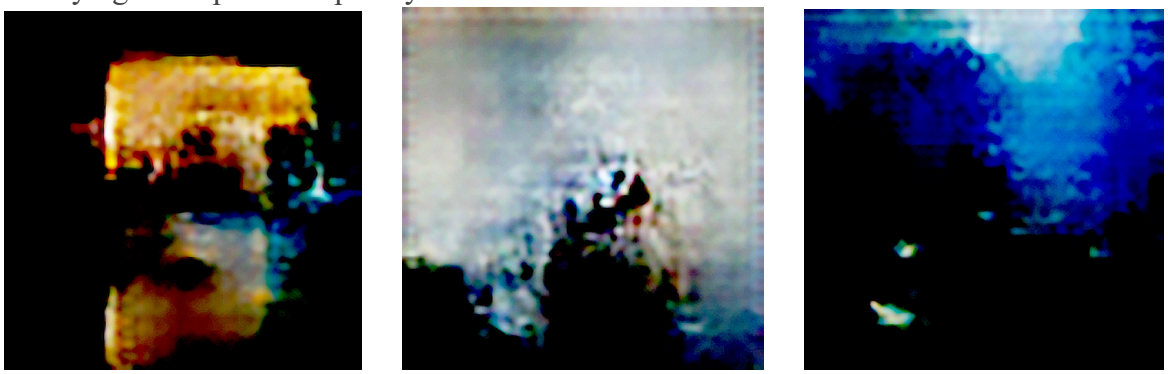


Figure 8: AI images as examples of "smooth space"

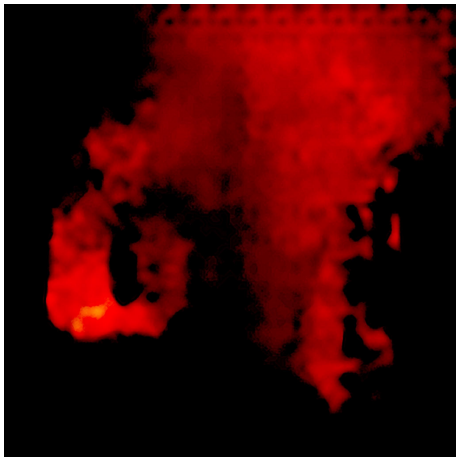
Atmosphere in Film

Films have their own space, which the filmmaker constructs, whether directly or indirectly, consciously or subconsciously working to create an atmosphere. As an aesthetic quality, every film has an atmosphere based on the choices of its creator. The film space can be seen as "knowledge at the birth of knowledge" when new connections are made (MacDougall 1998). Film (and image production) is helpful for seeing the invisible connections between actors in networks.

The space of the film is unique, particularly when isolated from recognizable external environments. Deleuze's (1991, 120) use of the term *any-space whatever* to denote a space that is using shadows, whites, and colours to create a disconnected space that appears strange and new. This space is exemplary of an atmospheric space where contrast, color, and composition

are favored in place of grounding to specific locations. For this reason, I have attempted to focus on the construction of *any-space whatever* in short films to focus on the aesthetic and atmospheric properties of the interviews used.

I have constructed the film space with similar qualities to the aesthetic elements of atmosphere in the AI-generated images, but prior to generating the images. A sample set of generated images (**Appendix B)** shows stark contrast, increased dark space, and colors that favor blues and reds. The film space similarly reflects ample black space, stark contrast, intense whites, and colors that alternate between predominantly blue and red color palettes. By adjusting the shadows, whites, and colors as prescribed by Deleuze, I am able to construct *any-space whatever* which matches the patterns found in the neural network generated images of climate change.



Examples of *any-space whatever* with similar shapes, color intensity, and contrast. *Figure 9*: Still from "The Fire" *Figure 10* : A neural network generated image of climate change

By taking the familiar and making it strange, emphasizing the unfamiliar abstract elements of images, *any-space whatever* is viewable. The elements of *any-space whatever* cause the resulting set of images to feel distant and uninhabitable in their dissociation from specific places or external stimuli. The generated images also demonstrate movement, where the feeling of something happening dominates. Rather than feel still or subtle, they appear changing and harsh from the level of contrast, dynamism of colors, and blurriness of content. However, the intent of generating neural network images of climate change is not to articulate a precise atmosphere from them. I suggest atmosphere is often beyond means of verbal articulation which is why I emphasize film and images in my approach. However, the set of generated images are

useful as a tool which allows for underlying aspects of images made by humans and influential on atmospheric construction to become observable. Subtle elements indicative of a constructed way of seeing through emphasizing a particular atmosphere are visible.

Film and New Connections

The series of films accompanying this paper are organized in sets: 1 - 3 are Experiences of climate change, 4 - 11 are Imaginings of climate change, and 12 - 13 Neural Network generated media images of climate change. The sets of these images are reflective of overlap in a system working to create atmosphere.

Films 1 - 3 work in scales, first starting with subtle hardly perceptible signs of climate change in Copenhagen, moving to the recounting of a flood in Copenhagen, and finally shifting to a story of desertification in Mauritania. Films 4 - 11 reflect a variety of voices and their imaginings of climate change, which individually have an atmosphere but also work collectively to illustrate an atmosphere of climate change. Lastly, films 12 - 13 show how commonalities in media presentation of climate change are correlated to atmosphere and the *possibility space.*

All of these films make connections across many properties of a hyperobject. First, because the medium incorporates the element of time, the shifting nature of climate change and its gradual change can be portrayed. In the Experience set of films, changes are visually subtle. Additionally, the shifting nature of the visibility and invisibility of the phenomena is represented by inserting black space and overlaid images. In terms of interobjectivity, the decentering of the human is achieved by only using fragments of audio interviews with images. This choice emphasizes instead the relationship between the words spoken, the imagining, and the conveyed representation; it allows climate change to be the central actor in the films through a high level of anonymity among the participants. Next, the strong connection of the words uttered to the images allows a viscous quality where the film functions to stick these things together. Lastly, the films are extremely non-local in that no identifiable place is evident in any film, and only minimal references to Copenhagen and Mauritania exist in the conversations of the Experiential series of films. The films in fact exemplify nonlocality through their use of the film space to forge a new location in *any-space whatever,* which also functions as the *possibility space* and a space for thinking through atmosphere.

I used the film space as a means to visually represent the thought space of the participants. Each film in the Imagination set starts out black. As the interviews progress and more description is invested, the visual element materializes to a more complex form by the end. The images and thoughts are often offset to show the dialogical process through which thoughts are often formed in one's mind; images and words are connected and work in coordination to produce whole thoughts. On many levels visualization is used as a tool to think: for the participants, for myself as the filmmaker, and for the audience. By combining archival films with audio from interviews, a montage format is able to transcend the limitations of human vision through the linkage of previously unconnected materials (Suhr and Willerslev 2012). The films themselves feel as though they are part of a network of interrelated things, through the use of montage where juxtaposition reveals new connections.

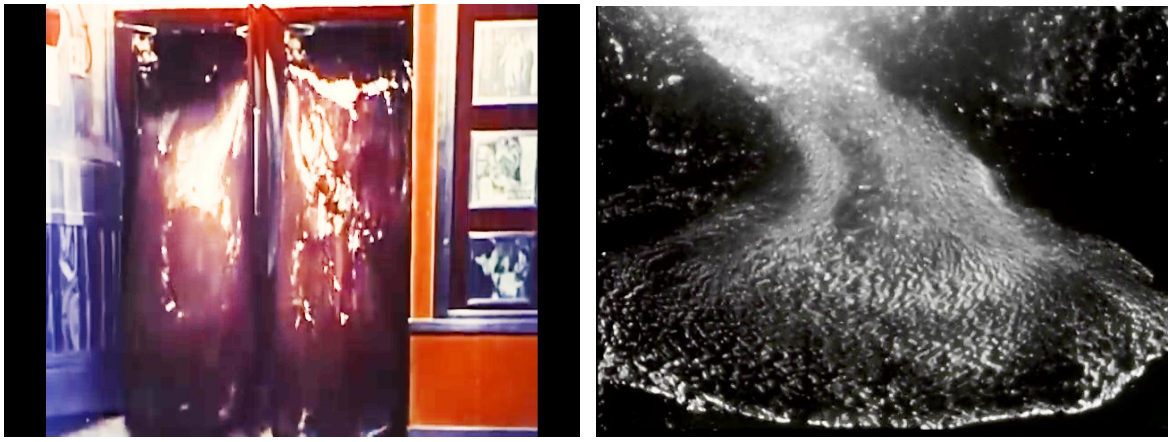


Figure 11 : Still from *The Blo*b , *Figure 12* : Still from *The Shapeshifter*

There is overlap in: the descriptions of many of the films, the corresponding images, and the unsettling feeling of the imagined objects. For example, *The Blob* and *The Shapeshifter* have very similar properties, inspiring fear in a similar way. "The Blob" is slow-moving and viscose, and is shown in *Figure 11*, seeping through a door. "The Shapeshifter" is described as leaking like molasses and as having the property allowing it to come under the doors and through the holes in the windows. The visuality of the films render the similarities of these two accounts visible.

The films as a collection are fragmented views on the hyperobject of climate change, illustrating the complexity of the topic, showing many small perspectives as part of a larger whole. The Imagination Set progresses from basic shapes such as the sphere in the film *The Ball* to fire and smoke, to eventually end with *The Hologram* and *The Shapeshifter*. The last two films of the set are increasingly complex in form with properties that change as the interview progresses. Halfway through the interview the participant in *The Shapeshifter* changes the object color to black, further emphasizing the elusiveness of the object and the characteristics she describes.

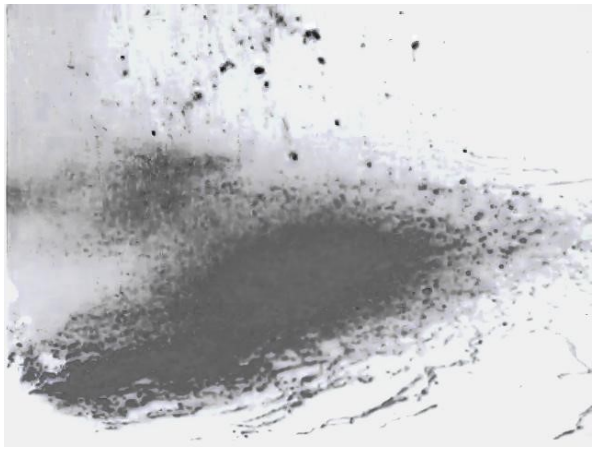



Figure 13 and *Figure 14*: Stills from *The Shapeshifter*

"The world is white, but the object is black." Essentially, this shift ending the Imagination film set highlights the ability to rethink perception of climate change including it as intertwined with the world. It is not designated to the foreground or background but instead is interrelated when the foreground and background are entangled. The interviews intersect with the properties of climate change as a hyperobject often in their description of objects. The Imagination Set increasingly emphasizes complexity, deception, layers of visibility and invisibility, distortion of what is real, and an elusiveness of the topic. It is through the films, however, that elusive connections can be intuitively recognized.

Connections in Time

Film is well-suited to show time and change. In these films, time works on several levels. First, archival footage provides a link to the past and a nostalgia that pervades the aesthetics of the film. Second, the participants' interviews are linked to the present and feel current as they speak. Third, the future is related in that the viewer does not know precisely where the interviews and the films will lead in the next frame. The interview question asking how humans can get rid of their climate change object is also future-oriented, pointing towards a future that is yet to happen outside of the film. In particular, the nostalgic element of the films is significant in its effect. Nostalgia and the past are associated with a sense of longing for what once was, and the use of archival footage from a removed and more distant time lends itself to create the sense of longing created from absence, which is a significant theme in interviews I conducted. Through the passage of time, film helps to denote something as different or missing in the environment.

Effect of the Films and Intended Use

The result of the project is a series of films as well as generated images which can be seen as visual fragments that provide a glimpse into participants' imaginings of climate change. Overall they reflect some insight into a collective, prevalent atmosphere of climate change through their relationships to media images and external world references. They were created to be publicly shared among the network of climate change action groups I have contacted, as well as on the KADK website through my collaboration and positioning as a researcher. A central goal of these films is to create awareness about the atmosphere of climate change and its socially constructed nature. The intended effect on the viewer is to inspire thought about: their own imaginings of climate change, what atmosphere exists around climate change, and how they could influence climate change through imagination and atmosphere.

Film 13 uses interactive means to convey film as a *possibility space*. The interactive element of the film gives the space gains more depth. More so than the other films, it allows for a more immersive experience in the film space, where the viewer becomes actively engaged with the environment by using the cursor. This choice is also reflective of a greater theme in the project, which is that individuals have agency as to how they perceive atmosphere. The opportunity to move around in this generated atmospheric space gives some agency to the viewer

to determine how they position themselves and view the film.

"Hyperobjects force us into an intimacy with our own death (because they are toxic), with others (because everyone is affected by them), and with the future (because they are massively distributed in time). Attuning ourselves to the intimacy that hyperobjects demand is not easy. Yet intimacy and the no-self view come together in ecological awareness." [Morton 2013,139]

Morton asserts that hyperobjects create an intimacy with death, with others, and with the future which can be achieved when the self is lost. The relationship with death was a clear theme in the interviews I conducted as well. Film can address intimacy with others and the future in that the imaginings of others can be communicated and the subtle aspects related to death are acknowledged over a passage of time lasting the duration of the film. The future-oriented aspect is particularly important and addressed by Morton as well as emphasized by Shumartojo and Pink's work on atmosphere in anthropology. One of the central effects of the films is the ability of the participants as well as the viewer to reflect on their view of climate change and the future. The question "Is there a method humans can use to get rid of this object if they want to?" illustrates this potential for transformative thinking. Although many participants answered that there was no way to get rid of it, some utilized the opportunity to alter the course of their narrative:

"I guess I can hide it….First I thought to put a jacket on it but I wouldn't like my jacket to get dirty. So I guess I'd put a wooden plate on it. I'd tell people they shouldn't move the wooden plate or stand on it. If they asked why, I'd feel embarrassed that I was hiding it and maybe tell them what it is and then show them."

A participant realized that hiding the object, and thus hiding climate change, might not be the best option and changed the course of the imagining to begin a dialogue with people rather than hiding the object under a wooden board.

"You can get rid of it, but it would just kind of disappear after awhile over time. There are a million different ways to get rid of it - not one way."

One participant reflects a positive attitude towards climate change by acknowledging there are many courses of action that can be taken to get rid of it. Even if the action is not specific, the opening of multiple possibilities for decisive action reflects a shift towards an optimistic future.

And perhaps the most optimistic example, reflecting a clear grasp of agency in determining the outcome is the following excerpt from the film *The Hologram*:

"I'm thinking I'm going to make this super, like, happy ending. What if everyone just like gathered into one section of this thing, right? So it couldn't envelop every single person individually. It would have to envelop every single person and try to sort of battle everyone at once. Everyone's emotions, everyone's you know, so then everyone would also have someone next to them. They wouldn't feel alone or feel like their battle was senseless. It would eventually just [whooshing sound] disappear and turn into little lights and there would be bright blue skies."

Figure 15: Still from "The Hologram" showing the "happy ending" of everyone collectively working together.

The participant acknowledges that he can create a happy ending. In his account, he acknowledges the problem of feeling alone in battle or like one's battle is "senseless" and ensures that everyone would not feel lonely by having someone next to them. His narrative resolves the ending in a way that is counter to the feeling of the uncanny so common in most accounts and relies on an intimacy with others as a method to eliminate fear. He demonstrates the ability to shift the atmospheric space around climate change through a future-oriented perspective constructed through his own agency.

Filmmaker and Anthropologist as Change-maker

My fieldwork and the subsequent creation of films, caused not only participants but myself to become aware of my influence. Through every decision made in producing a film, I recognized my own role in constructing an atmosphere which would then be presented to an audience. This functioned to raise my own awareness of how much power and control can be held by shaping and manipulating an atmosphere around a topic. By affecting the imagination the world can be shaped (or at least our human perception of it).

Participants also gave feedback about the shift in their own awareness through dialogue after interviews. In *The Blob* the end of the film includes the participant's thoughts on the project where she states: *"I didn't realize how this was such a good metaphor. It just seemed visually to make sense*." She acknowledges the call for metaphorical thinking as useful in conveying her perception of climate change. Similar feedback was given from most participants, indicating surprise at what they discovered about their own thoughts from thinking metaphorically. The imagination-based interviews seemed to have an impact in their ability to shift awareness around climate change by encouraging thinking about the topic in new ways. Participants gained awareness of an atmosphere of which they had only previously been subconsciously aware. One participant illustrates this well in their comments:

"It was fun being asked these questions because when you ask me about more intuitive images, I don't separate things. That all just blends together into a more intuitive fear."

In relation to climate change, fear associated with it is often one of the factors that influences how much the issue is addressed. Being aware of the atmosphere of fear, as well as talking about it in imagination-based interviews, seemed to make the topic more approachable and the underlying feelings about it more comfortable to address when connecting it to a creative, mentally- designed object. At first, most participants felt unknowledgeable about climate change, and after interviews, the same participants revealed surprise at their ability to engage with the topic creatively. This shift in awareness is vital for the human relationship to climate change. Feeling that one is knowledgeable and able to act influences one's willingness to confront the topic.

Conclusion and Discussion

Because one of the main objectives of this project was to inspire a new dialogue about climate change by asking different questions, I would like to continue this discussion here and introduce new questions that could be further explored based on my research.

Above all, my aim was to apply methodology focusing on "thinking through atmosphere" in order to explore how this process could be beneficial for the generation of new anthropological knowledge and experimental methods. By linking an ANT network focusing on the inter-relationship between actors, atmospheric theory, and Deleuze's writing on space in film, I attempted to render an invisible atmospheric space more visible. Additionally, I also set out to open an awareness of the futurity of climate change through emphasis on the *possibility space* as a space where social and individual actions can have influence. This was done by implementing an interview question about getting rid of climate change. The methodology demonstrates ways in which "thinking through atmosphere" can be applied. I used: visualization-based interview questions, the film space as a means to "think through atmosphere" for myself, as well as viewers, and machine learning to highlight the constructed nature of atmospheric properties in images. I see this exploration as a design intervention. Design interventions have been noted as being more oriented towards the future than traditional anthropology while exploring possibilities inherent in processes, actions, and relations (Kjaersgaard et al. 2016, 1).

This project functions to visually establish connections between imagination, media, and external stimuli by demonstrating similarities that point towards an intertwined system of atmospheric construction. The content of interviews, media images, atmospheric AI images, and the films is not easily separated which provides a means to view atmosphere through the interplay of these factors. This raises the question of what other methods can be applied to visualize and interpret atmospheres of climate change in anthropology. I suggest the application of micro-phenomenological interviews (Lind 1993; Petitmengin 2006), focusing on a heightened sensory awareness when recalling a memory, as a helpful tool in further visualizing and

situating an atmosphere in the body in connection to specific experience related to climate

changes.

Researching climate change in a less critically affected location, it is evident that understanding of climate change is related to subtle changes in the environment. This is reflected in the noted absence of phenomena like snow or bugs, or the subtle understanding of the world feeling different (ie. brighter, hotter, or drier). Because of the subtlety that classified many of the experiences in climate change in Scandinavia, my research has shown the need to study absence as a form of visibility. Focusing on absence and gradual change departs from typical visual tropes of media images which often depict sudden, extreme change. Film as a medium, allows the emphasis of absence and subtle time shifts better than photography and text. The importance of absence in understanding imaginings and atmosphere around climate change brings to attention the importance of memory. This raises the question: *How can humans respond to absence if they are not aware of what was present before? How can absence in relation to climate change be effectively communicated to an audience?*

As anthropology becomes more focused on studying processes, film is useful through its ability to convey the passage of time, which is key to dynamic and shifting systems. As anthropology explores larger objects of interest which are non-local, the film space opens up a space where hyperobjects can be focused on and non-local connections can be communicated. In particular, film and imagination are well-suited to studying the social construction of atmosphere.

Possibility space can more easily be explored when participants are introduced to novel questions they had not considered the answers to beforehand. This was beneficial for three reasons. First, the responses to interview questions reflected a spontaneous thought forming about the topic, thus avoiding the problem of potential repetitive narratives that have been previously absorbed about the topic. Second, because the questions are novel, it requires a level of active engagement different from questions that have been asked before, thus avoiding narratives that have been more rehearsed. A more critical engagement with the

questions is needed to respond. Finally, the novelty of the questions affords the ability to inspire new thought in the viewers of the films, which in many cases is the ideal intent of film and

anthropological work - to inspire new thought. The participants use their imagined climate change objects to create new narratives around climate change, allowing them to reimagine it. An avenue for further examination could be to expand on this theme and create more novel questions about climate change, encouraging creativity to be incorporated in responses so that new narratives are constructed emphasizing imagination.

Because of the scale of climate change, new methods and interdisciplinary collaborations are useful in exploring different perspectives of hyperobjects to render the invisible more visible. In this case, the introduction of machine learning to isolate atmospheric properties of a network of climate change images was useful for seeing the socially constructed atmosphere of climate change. It also demonstrates a potential use of machine learning to be applied to cultural studies. It helped in this project to decenter the human and focus on a different type of vision that a neural network could be trained to visually convey. *How can neural networks, which are designed to imitate the human processes of the brain, be further used in anthropology and cultural studies to give insight into the construction of culture and social reality?*

Additionally, through analyzing imagination, external stimuli, and media image, as a working system, discerning a shifting atmosphere in the *possibility space* between threads of a network is possible. Ultimately, atmospheric studies are a relatively new and important field of study in anthropology. A power dynamic is inherent in the construction of atmospheres, and awareness of an atmosphere's constructed nature is useful for maintaining agency. As *possibility space* is future-oriented, and ideally anthropology is a future-oriented discipline in its acknowledgment of affecting change and influencing people, agency over the *possibility space* for participants is essential for change-making. Another finding from this research was the correlation between imaginings of climate change and science fiction films and a feeling of fear and the uncanny. The "intuitive fear" participants often related to climate change is likely counter-productive to actionable change. Anthropologists could consider how they can influence a more positive narrative through their influence in order to encourage positive change in the future.

In this project, I believe the films I created function in their ability to influence awareness and further thought. Because anthropology is centered around people, the potential for change-

making is especially emphasized in the ability to inspire new thoughts about social reality in humans to create awareness of their impact on the future. An area of further research is potentially how the social construction of atmosphere can directly be influenced by participants with the intent to affect the future. *How can "thinking through atmosphere" be implemented by anthropologists to more directly initiate change-making around the topic of climate change? And what could more positive atmospheres of climate change* ***look like****?*

"Try to contain it and make sure it doesn't leave the basement."

Character count: 95,957

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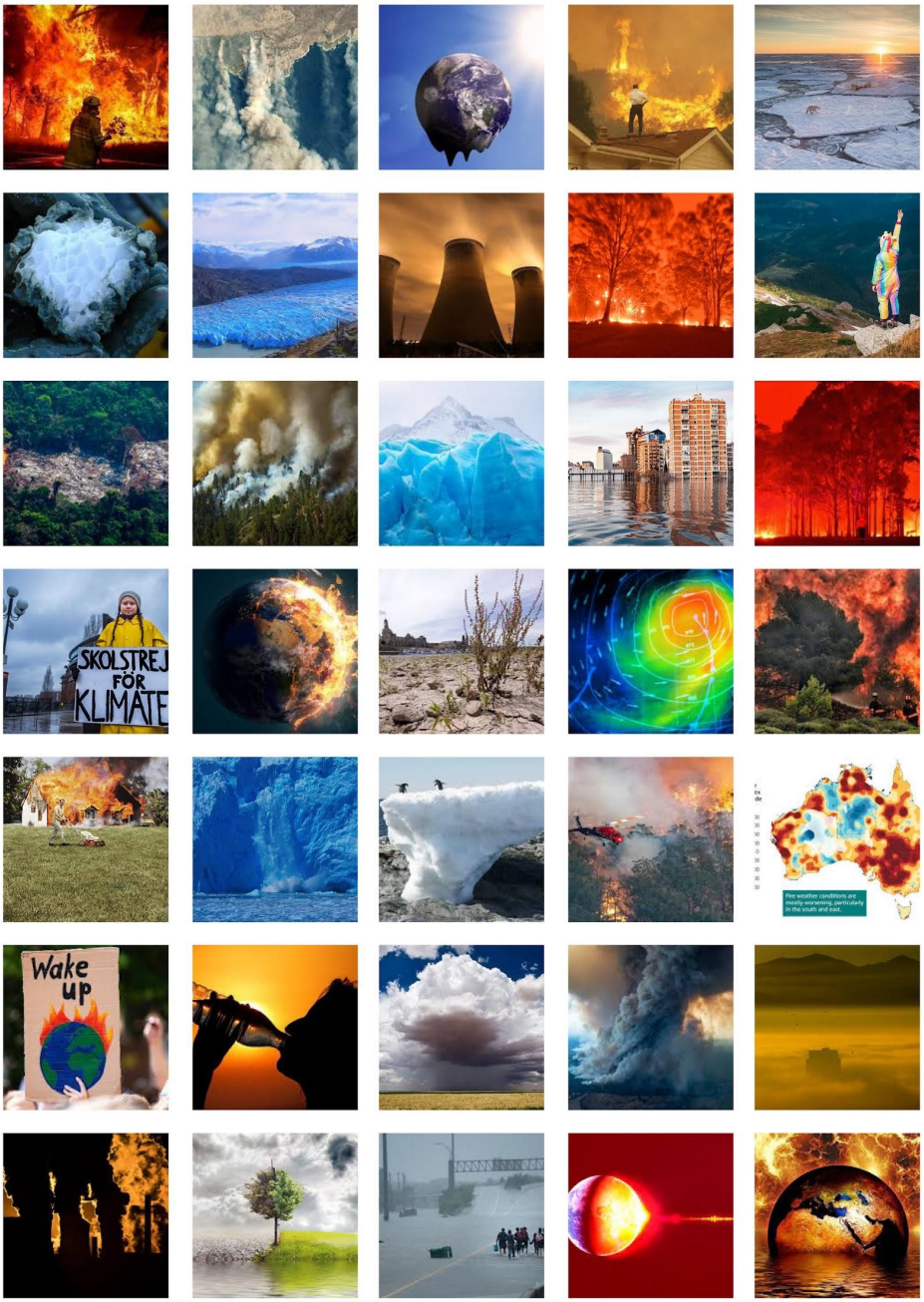
Appendix A

Sample set of some input images of climate change found using Google Search.



Appendix B

Sample set of some neural network generated images of climate change.

Appendix C: Image Sources

Figure 3
Earthrise. NASA.December 24th, 1968. Retrieved from: https://www.nasa.gov/multimedia/imagegallery/image_feature_1249.html

Figure 5
The Earth on Fire. Retrieved March 3, 2020. http://softnakrewin.over-blog.com/2020/03/Jeff-Bezos-announced-a-10-billion-fund-to-fight-climate-change.html

Figure 7
Still from *The Hologram.* Original footage from the US Air Force. 1950. Retrieved from https://archive.org/details/4122_Solar_And_Terrestrial_Radiation

Figure 11
Still from *The Blob* trailer. Directed by Chuck Russell. 1958 https://archive.org/details/sinema-trailer_the-blob

Appendix D: Film References

Films were created using public domain archival footage from the Prelinger Archives: https://archive.org/details/prelinger

With the exception of footage from *The Blob* 1958 film trailer which was sampled from Internet archives:
https://archive.org/details/sinema-trailer_the-blob