Procedural Rhetoric in Operational Optical Media: How Humans Are Persuaded to See the World

Paula Nuñez de Villavicencio
University of Waterloo

Abstract: Visual rhetoric functions as an effective tool to critique the ways in which visual media—things we look at—persuade the viewer to the goal of the image. However, with the emergence of smart glasses and other augmented reality headsets, this article calls for the need for a new rhetorical approach to modes of looking. Using Ian Bogost's concept of procedural rhetoric, this article critically examines how optical media—things we look through—persuade viewing subjects by producing institutional and technological modes of visuality.

Friedrich Kittler argued that with the advancement of military media, technologies would produce "subjects who no longer need any persuasion" to send the final message in the receiver's life (*Gramophone* 118). Using the coincidence rangefinder as an analogue case study, this article illustrates how the act of looking through forms of optical media persuades subjects to adopt culturally dominant epistemologies, and in the case of warfare, to send the final message.

Keywords: optical media, visual rhetoric, procedural rhetoric, smartglasses

Résumé : La rhétorique visuelle fonctionne comme un outil efficace pour critiquer les façons dont les médias visuels – les choses que nous regardons – persuadent le spectateur de l'objectif de l'image. Cependant, avec l'émergence des lunettes intelligentes et autres casques de réalité augmentée, cet article insiste sur la nécessité d'une nouvelle approche rhétorique des modes de vision. En utilisant le concept de rhétorique procédurale d'Ian Bogost, cet article examine de manière critique comment les médias optiques – les choses à travers lesquelles nous regardons – persuadent les sujets spectateurs en produisant des modes de visualité institutionnels et technologiques.

Friedrich Kittler a soutenu qu'avec l'avancement des médias militaires, les technologies produiraient « des sujets qui n'ont plus besoin de persuasion » pour envoyer le message final dans la vie du récepteur (*Gramophone* 118). En utilisant le télémètre à coïncidence comme point de comparaison, cet article illustre comment l'acte de regarder à travers des formes de médias optiques persuade les sujets d'adopter des épistémologies culturellement dominantes, et dans le cas de la guerre, d'envoyer le message final.

Mots-clés : médias optiques, rhétorique visuelle, rhétorique procédurale, lunettes intelligentes

Once we have seen something, we have already started to destroy it.

– Paul Virilio, "Perception, Politics and the Intellectual"

Introduction

To protect its shores from invaders and enemies, King Minos of Ancient Crete had Talos—a giant bronze automaton made by the God Hephaestus—walk the perimeter of the island, his gaze out to sea, ready to defeat an enemy at first sight (Mayor 10). The effectiveness of Talos lay not only in his ability to sink enemy ships by throwing large stones at them, but in his ability to accurately sight and identify enemies at a distance. Ballistics mean nothing without a proper sighting, and unless soldiers and technologies are persuaded to see an enemy, no shots will be taken. Friedrich Kittler argued that with the advancement of military media, technologies would produce "subjects who no longer need any persuasion" to send the final message in the receiver's life (*Gramophone* 118).

Jeremy Packer and Joshua Reeves illustrate that in the case of drone warfare, the automation of military technologies removes the hesitancy and foolishness of the human subject by replacing the human with AI (Packer and Reeves 18). Unlike ancient Talos and contemporary drone warfare, this article attends to circuits where it is still necessary to persuade human subjects, and to how technologies of looking do the work of persuasion (Packer et al. 15). Looking through optical media such as telescopes, smart glasses, or gun scopes persuades viewers of their own faulty subjectivity and of the goal of the discourse network the optical technology is embedded within: in the case of warfare, to accurately identify the enemy (Núñez de Villavicencio). Using Ian Bogost's concept of procedural rhetoric, defined as the process of persuading a subject to change opinion or move to action through enacting set rules of behaviour (125), this article critically examines the role of optical media in producing institutional and technological modes of visuality. It considers how the affordances of optical media always already determine the meaning-making practices in our visual communication processes.

In "The Rhetoric of Videogames," Bogost describes how within a set of rules, a space is created for play, and how humans within this circuit have the space to make meaning only according to the rules already in place (Bogost). In his piece, Bogost is describing videogames, not military practices. However, in his description of army videogames such as *America's Army: Operations*, a first-person shooter game released by the US Army in 2002, Bogost describes how these experiences functioned as a site of procedural rhetoric because they gave players the space to explore and make their own meaning within the constraints of war and its accompanying rules (Bogost 128). Bogost highlights the ways in which the emergence of new media in the form of photography and cinema in the nineteenth and twentieth centuries demanded the development of the subfield of visual rhetoric to account for these technological turns, as visual communication "cannot simply adopt the figures and forms of oral and written expression" (Bogost 124). Visual rhetoric functions as an effective tool to analyze the ways in which visual media—things we look at—persuade the viewer in line with the goal of the image. However, with the emergence and popularization of smart glasses, heads-up displays (HUDs), and other augmented reality and virtual reality headsets and glasses, this article calls for a new rhetorical approach to modes of looking, where it is recognized that studies of optical communication, to use Bogost's phrase, "cannot simply adopt the figures and forms" of visual rhetoric because while they attend to the persuasive effect of the content we look at, they do not contend with the way the media we look through persuade viewers to see and make specific meaning.

In echoing Bogost's call for new rhetorical approaches for studying visuals and videogames, this article also considers how the act of looking within the constraints set by optical technologies embedded in discourse networks sets up spaces for play where meaning-making occurs within the affordances of the technology. For example, the emergence of smart glasses demands a new rhetorical approach that contends with the act of looking through media and not only at media. Bogost "suggest[s] the name procedural rhetoric for the practice of using processes persuasively," a sub-domain of procedural authorship where meaning is made not by the production of words and images, but by the construction of rules of behaviour where subjects are persuaded through enacting these behaviours (125).

This article takes up Bogost's terminology to examine optical media and the ways in which subjects are persuaded to see the world by the rules of behaviour or affordances produced by the optical media within specific discourse networks. However, it should be noted that the term *optical media* has traditionally been used to refer to looking-at and looking-through technologies alike, such as television or a magnifying glass respectively. To effectively cleave these into those looking-at technologies to which visual rhetoric already applies (and whose visual rhetoric has already been examined through semiotics, art history, and so forth), such as television and printed or digital images, and those looking-through technologies that require a new positioning, such as glasses and telescopes, a distinction must be made between traditional optical media and what I will call operational optical media (OOM).

Examples of OOM include analogue media such as reading glasses, microscopes and telescopes, and digital media such as smart glasses, HUDs, and headsets. These are the technologies we must look through to witness images, screens, and reality. The following sections devote space to the examination of OOM as a persuasive technology and offer a case study in the optical rangefinder, an analogue precursor to radar and an essential visual tool in the early twentieth century. Although this paper stems from an interest in contemporary digital OOM, historical analogue OOM function as an effective case study because they illustrate how the act of looking through a lens, whether or not it is supported by augmented reality, always already persuades the subject to make circuit-specific meaning.

Operational Optical Media

There are five key elements that distinguish operational optical media from traditional optical media and persuade the viewing subject to make meaning valuable to the system: OOM are selective, they function in real-time, they are individuated, they co-produce images, and they have the capacity for space-axis manipulation, all of which produces an operational viewing that is persuasive in nature. To best understand OOM characteristics, we will offer the example of reading glasses.

Selection can be approached as both a filtering practice and an encoding practice. Situating these practices within a discourse network, defined as "the network of technologies and institutions that allow a given culture to select, store, and process relevant data" (Kittler, *Discourse* 369), gives us a context for approaching the practice of filtration. Filtering visual data—as it is not yet contextualized or shaped and therefore not quite information yet—is a practice that already defines which data are relevant to a system of context. OOM will filter data in distinct ways, depending on the goal of their use. Or put another way, OOM will filter signal from noise. But this can be a difficult process to recognize. Approaching selection as an act of encoding will better define the process of filtration as a communication practice.

Consider Claude Shannon and Warren Weaver's well-known model of communication. Communication can be defined as the movement of data or information. There are five distinct aspects to the Shannon-Weaver model of communication: source, encoding, transmission, decoding, and storage (Shannon and Weaver 7). The source of a visual communication—the message, content, or signal—cannot occur without light. In the absence of light there is no message, save that no message exists. For the purpose of this illustration, fire will stand as our source, the small flame at the top of a candle. The second aspect is the encoding of this light, the filtration of physical rays of light through a lens that allows some rays to pass through and deflects others. Selection of signal from noise, or the filtration of scattered light rays, occurs through a number of agents that transform the signal. Among those agents are the cornea, iris, and lens in the eye that refract and focus rays of light to produce an image on the back of the retina (Piccolino and Moriondo 133). Readers who have driven at night only to realize that they have forgotten to put on their glasses will immediately recognize this act of filtration, where all blurred light sharpens from its star-like shapes into clear distinct headlamps and car lights. Those who have never been burdened by face-worn technology can rest comfortably in the knowledge that the lenses in their eyes can naturally filter signal from noise to produce standard visual content.

The third aspect of visual communication is transmission. This occurs through the optic nerves, which carry the encoded signal to the parts of the brain that will decode the content, producing an image and, as the last step, storing it (Piccolino and Moriondo 133). The image that is produced on the back of the retina is further encoded by the rod and cone cells, nerve cells, bipolar cells, horizontal cells, amacrine cells, and ganglion cells that line the thin membrane at the back of the retina (Piccolino and Moriondo 133). That is, a plethora of cells work together to filter relevant data from the rays of light that have already been selected, producing a signal that is then transmitted by the optic nerve to areas of the brain that then decode it and store it—the final two aspects of the model.

Critical work that has focused on those visual technologies that humans look at, such as film and painting, has carefully considered the capacity of the medium to store encoded signals and transmit messages to the viewer. In the case of OOM such as reading glasses that enact the selection process before the eye selects and encodes again, their affordances determine what can be consumed by the viewer, limiting the capacity for what can be seen, where it can be seen, and how it can be seen, e.g., small print held a short distance from the face (Packer et al. 179). As selection media, OOM determine relevant data, preceding all other components in a discourse network and establishing the foundation for what kinds of visual knowledge can be produced. To be clear, OOM determine what visual data can enter a discourse network, but they are incapable of storing or processing the data into knowledge; those processes belong to other technologies. The relationship between operational optical media and optical media as they are traditionally referred to is a difference in kind, not in degree. For a person who requires glasses, optical media such as an advertisement and all its encompassing visual rhetoric can only enter into a discourse network upon the selection of visual information through the reading glasses (OOM), which present it to the eyes of the observer.

As a selection technology, OOM are also based on real-time images. Without the capacity to store content, they cannot perform a time-axis manipulation (Kittler, *Gramophone* 34). Unable to bring past images to the present or to freeze and hold images for some time, OOM can only work on encoding the visual reality that is before them at that moment. And that visual reality is individualized. Should the viewer looking through the OOM shift their position and focus on a different image, the OOM would not be able to bring the previous image forward or anticipate the following image. Reading glasses do not contain meaning or visual information within them, but rather act only when there is a viewer who proceeds to look through them at any one time in order to look at reality in real-time, but they cannot fast forward or rewind content that is stored.

As selective, real-time technology, OOM are part of a co-productive system of images. This is one of the most foundational aspects of OOM: they are only co-producers of images and cannot produce an image on their own. Traditional optical media such as the camera can store or present images regardless of whether an individual is there to look at them or not. An art gallery, for example, will hold multitudes of paintings or photographs witnessed by moving groups throughout the day, but at night when people have left the building, the images continue to exist, unchanged until the next day when a new group of visitors arrives. In the case of OOM, in a process similar to contemporary practices of meaning-making whereby semiotechnologies (see Langlois) produce meaning with humans, the visual content cannot be perceived without both the human and the technology. The image that would be witnessed by the human without the OOM is not the same image as the one witnessed through the OOM—they are different perceptions and different forms of reality. As any reader who currently feels the weight of reading glasses on their nose will intimately comprehend, the painting witnessed with the OOM allows for the production of a meaning that is different from the meaning that could be produced without them.

Another aspect of OOM, space-axis manipulation, refers to the capacity of these visual technologies to subvert and simulate human perception, a correlative to Friedrich Kittler's time-axis manipulation, which stipulates that media have the ability to compress and expand data and to effect nonlinear time (Kittler, *Gramophone* 34). Compression and expansion are two processes that allow data to be processed and transmitted at varying paces. *Compression* refers to large amounts of information which are processed and transmitted in a shorter time interval, such as fast-forwarding or increasing the speed of play, and *expansion* refers to the opposite, where smaller amounts of information are processed and transmitted in larger time intervals, such as slow-motion video. Both compression and expansion alter the temporal perspective.

Compression and expansion of data also alter the spatial perspective. This is best explained through the telescope and the microscope which have magnifying lenses for the vast and the miniscule, respectively. Telescopes and other long-distance visual aids such as binoculars compress visual information, bringing distant cars, signs, and landscapes, or stars and galaxies millions of kilometres away in space, close to the viewing subject, altering their spatial perspective. Microscopes and other magnifying lenses do the opposite, processing and transmitting small print or minuscule cells as data to larger space intervals. By expanding the amount of space that small text takes up in the field of vision of the viewer, reading glasses alter the spatial perspective through expansion. Although compression and expansion are described as processing and transmission processes, it is essential to recognize that, unlike time-axis manipulation, space-axis manipulation occurs at the selection stage in the discourse network. Before these optical media can transmit distant information or help process minuscule data, the lenses determine and select what visual data can be accessed and what information can be transmitted or processed.

If time-axis manipulation describes transforming the perception of time—re-presenting past events to bring them to the future, or in the case of AI and algorithmic systems, predicting the future in order to act on the present—then space-axis manipulation brings the distant reality to the forefront, the infinite space to the finite, or the micro to the macro. In a sense, OOM move the viewer in space so that they are closer to the reality they experience. These transformations or manipulations of how humans perceive spaces are an essential component of our reality-building and meaning-making practices. Above all, as co-producing, selective, real-time, space-axis manipulating optical media, these technologies shape what the human subject can see, and how they approach visual content—in other words, they shape the conduct of the viewer and persuade them to view reality in specific institutional and technical ways. Seen through the lens of procedural rhetoric, these OOM set the rules of behaviour for vision, and ultimately establish the parameters within which viewing subjects can play and make meaning.

Although they have the capacity to modulate the conduct of users, what separates OOM from other traditional optical media is that they are entirely individuated. Where traditional optical media can be accessed simultaneously by groups of individuals, OOM can be used only by one individual at a time. Photographs, films, and other such visual surface content can be observed by two or more people from different distances or different perspectives, and though people may derive different meanings from the content (an act of decoding or processing) they are not personal experiences. OOM, on the other hand, require the physical gesture of approaching the source through the technology, whether by placing the apparatus on one's face, bringing one's eye to the lens, or positioning one's entire materiality in reference to the medium. They can only produce the image that is made with the individual viewer. Should a new viewer make the same gesture, they would not witness the same image. A pair of glasses can only be used by one subject at a time, and therefore the image produced can only be shared with the OOM.

A final element of OOM—their operational affordances—is important not only for what it does to produce an image, but also for how it shapes human conduct and subjectivity. Operational images, as defined by Harun Farocki, are those images that do not represent an object "but rather are part of an operation" (17). These are images that are unburdened by meaning (Pantenburg 118), "do things in the world" (Paglen 1), and are instruments not intended for the human eye (Sissel Hoel 13)—these are images for the machines that make them. Operational images are not intended for a human audience, while the images co-produced by operational optical media always are. However, the similarities between operational images and operational optical media are the key driving force for our understanding of what OOM "do" in the world. Similar to operational images, OOM do not represent information—they can hold or give no meaning. The human must always be the one to produce meaning upon inspection of the image. Operational images are produced by computers for computers: they are machine-made images. And like operational images, images co-produced by OOM must always be considered for what they are—technologically and institutionally produced. And finally, like operational images, OOM do things in the world. These technologies intervene in our production of reality. They affect our orientation in the world, and as such modulate our reactions and behaviours in the world (Elsaesser and Alberro 9). OOM persuade the viewing subject to see not only reality but also themselves within a specific scope of meaning.

Due to these factors, the practice of looking through OOM sets up a space for meaning-making that enacts an experience similar to the "play" found in the games experience Bogost describes (Bogost 122). This paper's argument is not meant to reproduce Marshall McLuhan's "the medium is the message" (9); it does not argue that meaning is construed only through and by the OOM. The meaning is established by the act of using the OOM within a specific discourse network and can only be produced in tandem with the human. After all, the rules of procedural rhetoric are not equivalent to affordances, but rather constitute an ongoing process similar to the process of subjectivation wherein the viewing subject participates in the production of the image and is persuaded by the process of production rather than by the end product alone. To create meaning, the viewing subject must do the work of play within the structured optical environment produced through the affordances of the OOM: to adopt Bogost's phrasing, the rules of visual behaviour allow for the "authoring of arguments through [the] processes" of visuality (Bogost 125). Employing the work of the Toronto School of Communication, in tandem with Kittler's conceptualization of the discourse network and media escalation, we can best examine how Bogost's procedural rhetoric produces institutional and technological modes of looking through a case study of the optical rangefinder.

The Optical Rangefinder

Based on existing surveying technologies, the coincidence optical rangefinder was first developed by Scottish Professors Archibald Barr and William Stroud in 1888 in response to an advertisement put out by the Secretary of State for War on behalf of the Lords of Commissioners of the Admiralty (Moss and Russell 13). The optical rangefinder is a surveying technology used to determine the range of moving objects at a distance in order to successfully fire on the enemy. It played a critical role in ballistics, leading to the invention of radar in World War II and other visual technologies. The coincidence rangefinder consisted of a long cylinder with two external apertures, one at each end, and internals prisms that allowed a viewing subject to witness two half images simultaneously (see fig. 1).

Figure 1. Coincidence rangefinder of the Polish Destroyer ORP Witcher (1935).

The range of the target was determined based on trigonometry by carefully turning the internal prism angle until the two half images were seen in coincidence or as a whole image (see fig. 2). The range would then be indicated on an external gauge and communicated to the firing tower.

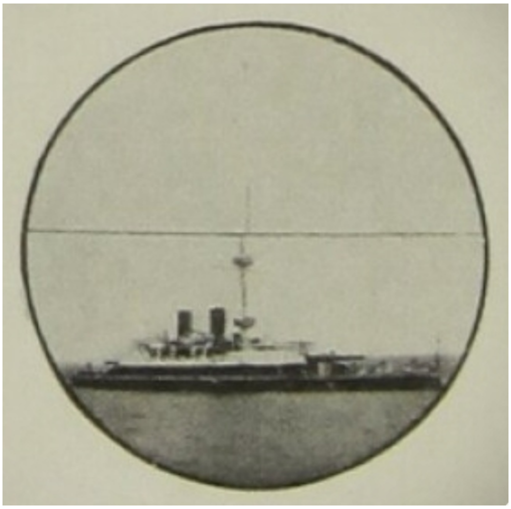

Figure 2. Aligning two halves in the coincidence rangefinder (Cheshire 251).

The optical rangefinder is an ideal example of an OOM that persuades the viewer—in this case, the soldier—of their own faulty subjectivity (Packer et al. 175), and within the discourse network of warfare, it also influences the viewer to frame reality through what Jeremy Packer and Joshua Reeves call an *enemy epistemology*. Packer and Reeves define enemy epistemology as the work of producing and constructing an enemy: "the media used to collect, store, and process data for the location of enemies and threats determine the kind of enemies that are possible" (Packer and Reeves 8). In the discourse network of warfare, the relevant data are those that allow for effective and accurate knowledge of the enemy, an echo of the meaning-making in *America's Army*, the military videogame Bogost highlights, where players participate in a cultural activity, developing values over time (Bogost 119). Here too, media determine our situation as they work alongside our perceptual capacities to filter threats in the environment and persuade soldiers to produce signal from noise.

The work of all OOM is to select and filter what constitutes culturally valuable information, which determines what knowledge can be made. Recognition of an enemy is a processing practice; it is the application of selected information and stored information. An enemy is also a cultural product. However, information practices that depend on the use of media are shaped according to the affordances of the technology. In terms of enemy epistemology, "every new medium shifts the realm of the intelligible, creating new enemies specific to its particular capacities for capturing and processing data" (Packer and Reeves 8). Viewing subjects are disciplined to identify these targets based on the dynamic visual information selected through the OOM. The process of visual recognition is considered "epistemological labour—the work of sensing, remembering, and knowing" (Packer and Reeves 121).

But this work of knowing through the optical rangefinder belongs to the operational optical media episteme, the epistemological environment determined through the visual information selected, transmitted, and processed through the OOM. It is the epistemological labour conducted through the OOM that transforms the viewing subject and makes the user of the optical rangefinder the same as Talos—a weaponized subject. In seeking to align both images into coincidence (see fig. 2) in order to track the moving range and identify the target, the soldier is prepared to see only an enemy. The enemy is found when the top image and the bottom image perfectly line up as if they were one whole image. The material and cultural affordances of the optical rangefinder produce a space for meaning-making where soldiers can identify only an enemy or noise. A bird through this OOM has no meaning and is not relevant to the discourse network. Only the work of producing or knowing an enemy can be done through this device and, importantly, it can only be done with the human eye involved.

This weaponized subject plays an essential role in the circuit of ballistics.

It is the regimenting of the eye to anticipate and organize space through the optical rangefinder in ways the naked human eye could not that ultimately disciplines the subject into a weaponized position. The question of nearness in military operations is always one of problematizing—the turning of a process, object, or experience into a problem that requires actions, exercises, and changes in thought (Foucault 49). Packer and Reeves illustrate the problem by arguing "[w]e keep our friends close and our enemies closer because we have limited perceptual bandwidth. We can only sense so far. Nearness is a premedia solution to perceptual limitations" (Packer and Reeves 41). However, the optical rangefinder solves the problem of perceptual nearness at the cost of disciplinary action that subjectifies the viewer and determines the possibilities of reality. Optical rangefinders are not predictive media. They cannot be sure where the target is going, they can only track it. This is not a symbolic state—when the subject views reality through the configured lens, the lens shapes the existing world. Because these are transmission media and not storage media, there is no recording, so the symbolic in this interaction does not matter. What is important here is access to relevant data.

The assemblage of optical rangefinder, soldiers, communication pathways, target, setting, and firing tower—that is the circuit—produces the viewing experience. The optical rangefinder acts as the conduit for the vectors of subjectivation, simultaneously magnifying and tracking the motion of the target and of the viewing soldier. The viewing audience has already been problematized and modified through both training and the established enemy epistemology, so the optical rangefinder's process of magnification also becomes a process of subjectivation. This comes down to the affordances and design of the technology, which emphasize a procedural rhetoric (Bogost). Furthermore, the culture in which this technology is used has already trained the viewer in order to position them as part of the weapon. As with most OOMs, the viewer is simultaneously the producer and the consumer of the visual experience, always at the centre of the discourse network, and always doing the work of meaning-making through the process.

The weaponized subject is also dependent on the "martial gaze," a term Antoine Bousquet uses to refer to the history of mechanization and eventual automation of perception accelerated by military imperatives (Bousquet 10). This is to say that the weaponized subject is embedded in the developing genealogy of visual culture through military practices that produce the entangling of humans and technology in an effort to automate perception for the goal of enemy identification. This developing escalation of the martial gaze is one where, Bousquet argues, "the human sensorium has been slowly and surely directed, mediated, and supplanted in service to the ultimate imperative of targeting" (Bousquet 12).

Contemporary technologies such as drones have moved beyond the human optical search function and are described by Packer and Reeves as "bypass[ing] the cornea, thalamus, and visual cortex by plugging right into military hardware, operat[ing] with a perceptual grammar that sloppy human organs simply can't process" (Packer and Reeves 141). The sloppy human organs in question—the eye and all the parts that make up the visual cortex—are and have been rendered faulty by the new modes of problematization employed by discourse networks that demand the antagonistic escalation of war and its associated media (Packer et al. 175). This escalation, which led to radar and AI, is distinct from the media escalation that did not seek to remove the faulty optical subject, but instead desired to feed it higher quantity and more precise visual data (Packer et al. 175). The eyes, more than the mouth, consume and are made hungry by the never-ending cornucopia of visual culture. The genealogy of OOM in warfare is a genealogy of visual feeding technologies fattening viewers so they become weaponized subjects.

Optical media, as Friedrich Kittler and Paul Virilio explain, were the solution to the problem of aiming ballistics in the twentieth century, magnifying the battle environment, and augmenting the ability to select and shoot the target (Kittler, "Media Wars" 122; Virilio 70). But even at their inception, OOM functioned as a filter. The greater the ability to magnify, the smaller, more discrete are the bits of visual information that are allowed to pass through to reach the eye. This article frames the weaponized gaze through the optical search function that seeks to capture the enemy and select the signal amid the noise through visual technologies, thereby creating the weaponized gaze. The weaponized gaze is trained to select the enemy from the environment but differs from the martial gaze in that it acknowledges that in capturing the enemy, it has also already captured the viewing subject and set them into the centre of the discourse network.

The weaponized gaze is dependent on media escalation (the antagonistic relationship between technologies whereby technologies develop in an effort to overcome previous technology) to produce the faulty subject, because technological antagonism always reveals the faultiness of human vision (Kittler, *Gramophone* 255). The optical rangefinder, as with all OOM, in producing the desired visual content (determining enemy range), simultaneously persuades the user of their faultiness, their own inability to see what the system demands of them without the aid of the optical technology. In persuading the user of their own faultiness, OOM ultimately also persuade the user that technology is necessity for successful visuality. Bogost highlights the ways in which videogames make "claims about the world, which players can understand, evaluate, and deliberate," often through the cultural and visual content they contain (Bogost 119). OOM, while they do not have the ability to store content, have the capacity to make claims about the world that viewing subjects can evaluate. The optical rangefinder makes claims about how to effectively perceive an enemy. The viewing subject understands this and is able to evaluate the selected visual information in order to carry out the meaning-making process of identifying and firing upon the enemy.

The operationality of the optical rangefinder—its ability to do things in the world—is an act of persuading the viewing subject that they must see reality through an enemy epistemology to survive. In large part, this persuasiveness of the optical rangefinder is a result of the antagonistic relationship between technologies, and between technologies and the senses (Kittler, *Gramophone* 255). Media respond to media; humans are merely extensions (Kittler, *Optical Media* 29). Though a large aspect of Kittler's work looks at the ways war proliferates such antagonistic relationships, media in general seek to constantly overcome existing technologies or to improve on the human senses in the service of optimization, an increase in speed, or an ability to select more, store more, and process more. As Kittler illustrates, this media escalation is most obvious in war, where enemies consistently seek to shoot farther, hit stronger, and see the opposing side before they're seen. It is a technological race for survival. The optical rangefinder and its competitors are deeply situated in this discourse.

This media antagonism was a factor in the Russo-Japanese war of 1904, during which Japan ultimately sank twenty-nine of Russia's thirty-eight warships. Japan's victory was attributed not only to the greater number of optical rangefinders on Japanese ships (some twelve or thirteen per ship versus the Russian ships' two or three) but also to the training the Japanese soldiers had received (Moss and Russell 53). It was argued that because the Japanese soldiers were trained in using the Barr and Stroud optical rangefinders before the war, they were well-versed in sighting techniques and therefore made far fewer errors in calculating ranges than their Russian counterparts—ultimately, the errors of human vision cost the Russian fleet twenty-nine ships and the lives thereon (Westwood 227; Moss and Russel 54).

Success came not only to the party with the greater number of OOM, but also to the party that had more successfully trained the viewing humans in the act of institutional and technological seeing for accurate enemy identification. The soldiers trained in rangefinding, who successfully learned to see through an institutional and technological lens, were also persuaded of their own fallibility, to recognize that without the bio-technically produced mode of looking, they would have been unable to take down the enemy and would themselves have been felled. Human sight was already unable to keep up with guns able to shoot at 20,000 yards. Recognizing that the superior OOM was the one that best corrected the sailors' vision, their fears, and their material failings was integral to the subject position made for them. In looking through an optical rangefinder, the soldier is persuaded to find an enemy and simultaneously persuaded that without the OOM they are insufficient to meet the needs of the discourse network—the soldier without the OOM is a faulty subject.

After their loss, the Russian Navy recognized the importance not only of having access to the OOM, but also of training their men in the institutional mode of looking, and would go on to increase their orders for Barr and Stroud optical rangefinders, and to improve their training of soldier sighting (Moss and Russell 52). This short summary of the Russo-Japanese Naval battle highlights the ways in which the optical rangefinder succeeded not only in overcoming the viewing technologies the Russian Navy used, but also in overcoming human vision. Through these antagonisms, it persuaded the users of its necessity for effective looking and enemy production.

As Bogost states, procedural rhetoric is the name "for the practice of using processes persuasively" (125). The process of looking through the optical rangefinder—within an enemy epistemology—persuades, conditions, and gives shape to the content that allows for the making of meaning, and produces the weaponized subject. Like a child on a playground, the weaponized subject makes meaning in a possibility space by exploring their field of visuality within a rigid structure (Bogost 121). It can be difficult to explore free movement (to "play") in a rigid space of military rule and command, where every communication is honed to function with machine-like precision, which is what machine-centric warfare looks like. But in circuits where the human is still at the center of the loop, where analogue OOM demand a human as part of the assemblage, there is still space for some play, for some meaning-making, and for subject formation. This meaning-making practice, though it takes place under the operational optical medium's persuasive influence, is possible in the field of play afforded to the viewing subject through the selective, real-time, co-produced, individuated, and space-axis manipulating structure that OOM offer. Viewing subjects need not look at the guns in their team's hands in the video game *America's Army* to know that they are a first-person shooter, ready to identify and take down an enemy. They need only to look at the real-world environment through the lens of an optical rangefinder.

Conclusion

McLuhan argues that "it is only too typical that the 'content' of any medium blinds us to the character of the medium" (9). There is a rich field of scholarship that attends to the content of operational optical media, but not to the medium. Our attendance to visual communication and visual rhetoric has left us blind to the character of those viewing technologies that give us access to the visual world. This article draws on the work of Ian Bogost to illustrate the ways in which the process of looking through optical media persuades viewers in line with the goals of discourse networks and convinces them of their own fallibility. OOM are present in many ways, from popular analogue reading glasses to fashionable sunglasses, from scientific telescopes to military rangefinders. Contemporary operational optical media also incorporate reality augmentation technology, big data, and Internet of Things solutions into the human visual meaning-making practice.

A final contemporary example that weaponizes the subject through OOM is found within the F-35 fighter jet. The F-35 Lightning II is a stealth multi-role fighter jet used by military powers across the globe (Mola). The F-35 pilot helmet's Helmet Mounted Display (HMD), which integrates the jet and pilot, employs an electro-optical targeting system that is able to display infrared cameras, search for and track radar, determine target identity and distance, and advise weapon selection, among other capabilities. The F-35 assemblage has been described as offering "unprecedented advantage over adversaries" largely due to the many cameras and sensors mounted on the jet and displayed on the HMD that give pilots access to the visual environment below, above, behind, and in front of them (Lockheed Martin). Individually made for each pilot's head size and gaze, the F-35 HMD acts as the conduit between human and machine in an effort to optimize the information processes dictated by the dynamic and dangerous settings (Lockheed Martin). The F-35 pilot helmet establishes the relationship between the pilot, target, and environment, transforming the jet into a large net capable of capturing visual data and filtering it through the HMD to the pilot. What is compelling about this augmented reality HMD is the insistence on keeping the human in the loop and reproducing a visual playground for the persuasive process of meaning-making in an enemy epistemology.

Looking forward, this article also calls on readers to think about the use of smart glasses in labour and entertainment settings and to consider how viewers are persuaded to see the world around them. With the rise of heads-up displays, smart glasses, and other smart operational optical media, it is essential to consider not only the content they display, but the very affordances of the technology that always already determine what we can see, where we can see, and how we can see.

Works Cited

Bogost, Ian. "The Rhetoric of Videogames." *The Ecology of Games: Connecting Youth, Games, and Learning*, edited by Katie Salen, MIT Press, 2008, pp. 117–40.

Bousquet, Antoine J. *The Eye of War: Military Perception from the Telescope to the Drone*. U of Minnesota P, 2018.

Cheshire, Frederick. "The Modern Rangefinder: The Eighteenth Traill-Taylor Memorial Lecture Delivered Recently before the Royal Photographic Society." *The British Journal of Photography*, Nov. 1915, pp. 251-66, archive.rps.org/archive/volume-55/728031?q=modern%20rangefinder.

"Coincidence Rangefinder of the Polish Destroyer ORP Witcher." *Główna Księgarnia Wojskowa*, edited by J.I. Targ, 1935. *Wikipedia*, 9 Mar. 2007, commons.wikimedia.org/w/index.php?curid=1765260.

Elsaesser, Thomas, and Alexander Alberro. "Farocki: A Frame for the No Longer Visible: Thomas Elsaesser in Conversation with Alexander Alberro." *e-flux*, no. 59, Nov. 2014, www.e-flux.com/journal/59/61111/farocki-a-frame-for-the-no-longer-visible-thomas-elsaesser-in-conversation-with-alexander-alberro/.

Farocki, Harun. "Phantom Images." *Public*, no. 29, 2004, pp. 13-22, public.journals.yorku.ca/index.php/public/article/view/30354/27882.

Foucault, Michel, and Paul Rabinow. "Polemics, Politics, and Problemizations: An Interview with Michel Foucault." *The Foucault Reader*, 1st ed., Pantheon Books, 1984.

Kittler, Friedrich. *Discourse Networks 1800/1900*. Translated by Michael Metteer and Chris Cullens, Stanford UP, 1990.

———. *Gramophone, Film, Typewriter*. Translated by Geoffrey Winthrop-Young and Michael Wutz, Stanford UP, 1999.

———. "Media Wars: Trenches, Lightning, Stars." *Literature, Media, Information Systems: Essays*, edited by John Johnston, Routledge, 2012, pp. 117-29.

———. *Optical Media: Berlin Lectures 1999*. Translated by Anthony Enns, Polity, 2010.

Langlois, Ganaele. "Meaning, Semiotechnologies, and Participatory Media." *Culture Machine*, vol. 12, 2011, culturemachine.net/wp-content/uploads/2019/01/7-Meaning-437-890-1-PB.pdf.

Lockheed Martin. "F-35: The World's Most Advanced Fighter." *F-35 Lightning II*, 24 Jan. 2024, www.f35.com/f35/news-and-features/f35-the-worlds-most-advanced-fighter.html.

Mayor, Adrienne. *Gods and Robots*. Princeton UP, 2018.

McLuhan, Marshall. *Understanding Media: The Extensions of Man*. Edited by Scott Boms, Gingko Press, 2013.

Mola, Roger. "Super Helmet." *Air & Space Magazine*, Sept. 2017, www.airspacemag.com/military-aviation/super-helmet-180964342/.

Moss, Michael S., and Iain Russell. *Range and Vision: The First 100 Years of Barr & Stroud*. Mainstream Pub, 1988.

Núñez de Villavicencio, Paula Catalina Sanchez. *Optical Media from the Middle Ages to AI: Integrating Humans, Sight, and Information*. 2024. University of Toronto, PhD dissertation. *TSpace*, tspace.library.utoronto.ca/bitstream/1807/139762/3/Sanchez_Nunez_de_Villavicencio_Paula_Catalina_202406_PhD_thesis.pdf

Packer, Jeremy, and Joshua Reeves. *Killer Apps: War, Media, Machine*. Duke UP 2020.

Packer, Jeremy, et al. *Prison House of the Circuit: Politics of Control from Analog to Digital*. U of Minnesota P, 2023.

Paglen, Trevor. "Operational Images." *e-flux*, no. 59, Nov. 2014, www.e-flux.com/journal/59/61130/operational-images/.

Pantenburg, Volker. "Working Images: Harun Farocki and the Operational Image." *Image Operations: Visual Media and Political Conflict*, Manchester UP, pp. 49–62, https://doi.org/10.7228/manchester/9781526107213.003.0004.

Piccolino, Marco, and Andrea Moriondo. "Retina and Vision: The Imperfect Image." *Taking Eyeglasses Seriously: Art, History, Science and Technologies of the Vision*, edited by Raimonda Riccini, La Triennale di Milano, 2002, pp. 133–48.

Shannon, Claude E., and Warren Weaver. *The Mathematical Theory of Communication*. U of Illinois P, 1975.

Sissel Hoel, Aud. "Operative Images: Inroads to a New Paradigm of Media Theory." *Image-Action-Space: Situating the Screen in Visual Practice*, edited by Luisa Feiersinger , Kathrin Friedrich and Moritz Queisner, De Gruyter, 2018, pp. 11-27, www.degruyter.com/document/doi/10.1515/9783110464979-002/html.

Virilio, Paul. *War and Cinema: The Logistics of Perception*. Translated by Patrick Camiller, Verso Books, 2009.

Westwood, J. N. *Witnesses of Tsushima*. Sophia University and Diplomatic Press, 1970.