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The "enhanced" warrior: drone warfare and the problematics of separation

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Abstract Unmanned Aerial Vehicles, or drones, are increasingly employed for military purposes. They are extolled for improving operational endurance and targeting precision on the one hand and keeping drone crew from harm on the other. In the midst of such praise, what falls by the wayside is an entangled set of concerns about the ways in which the relationship between the pilots and their operational environment is being reconfigured. This paper traces the various manifestations of this reconfiguration and goes on to situate our being-with drones in a broader set of sociotechnical practices that shape our understanding of visual technologies. Our inquiry is grounded in technical reports of performance, media coverage of accidents, as well as a detailed first-person account of a former drone pilot. Our analysis suggests that being-with drones is disciplining our perception in subtle ways that remain underexplored. We conclude that when it comes to appraising technologies that interface with the human sensorium, functionalist claims of enhancement are inadequate to the task and propose that phenomenology's commitment to the phenomena themselves can serve as a useful corrective.

Keywords Drones · Embodiment · Perception · Postphenomenology · Posthumanism

1 Introduction

Recent years have witnessed a rapid proliferation in production and use of Unmanned Aerial Vehicles (UAVs), or drones for short. The rise of UAVs is symptomatic of a broader

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trend toward remote flight that has found use in areas as diverse as law enforcement, aerial photography, and film production. Apart from such civil and commercial applications, however, a major area of growth for remote flight is pilotless military aircrafts that allow remote surveillance and targeting of persons and structures. Mike McConnell, former director of national intelligence, has succinctly described drones as "flying, high-resolution video cameras armed with missiles" (Chamayou 2015, p. 12).

Thinking of drones as flying, missile-equipped cameras might be misleading, however. A fully functional UAV system relies on a vast network of people[1] (from operators and analysts to military support personnel on the ground), technologies (from megapixel sensors, multiple motion video feeds, and far-infrared cameras, to a layered communications network that enables the coordination of this vastly distributed system) as well as the control center that at the heart of this assemblage. The latter, called Ground Control Station (GCS), is where all remote data is received, decisions are made, and commands are dispatched. In addition to the pilot, the GCS houses the sensor operator whose job is to control the Predator camera and "search for and lock onto targets," as well as the mission coordinator who communicates with "troops on the ground in the combat zone, intelligence analysts, and others in the chain of command." (Mindell 2015, p. 113)

From a military vantage point, taking the cockpit out of the aircraft has multiple implications for aircraft design, division of labor, and possible mission objectives. With respect to design, the resulting decrease in aircraft weight and size improves efficiency, especially since safety requirements that constrain the design of manned aircraft are rendered irrelevant. As a result, UAVs can typically stay airborne for more than 24, or in the case of the latest solar-powered UAVs, 81.5 hours[2]. With respect to division of labor, many tasks that would, in piloted flight, fall within the purview of the pilot are now relegated to either a remote operator or an onboard computer. Moreover, since the communications suite uses satellite links, the GCS can be located stationed where it is safe, secure, and convenient. Finally, with respect to mission objectives, many military experts see tremendous potential in the UAV arrangement. The overhauled design and the transformed division of labor have attractive corollaries such as greater scope, range, and endurance, in effect allowing drones to carry sustained surveillance and combat operations in remote parts of the globe. Mindful of this unique feature set, the military has used drones during so-called 3D ("dull, dirty, and dangerous") missions (Tice 1991) including long-haul flights and reconnaissance operations that require hours and hours of hovering over an area, or combat situations that incur high risk to the pilot.

The greatest appeal of drones, however, is not that they avoid the drudgery of reconnaissance or that they render operations safe or "clean," but perhaps that they give birth to an "enhanced" warrior that is at once remotely secured, visually augmented, and smartly weaponized. It is the figure of the "enhanced" warrior that will be the focus of this paper. The guiding intuition here is that the received view handles the fundamental fact of remote flight – that there is no pilot aboard – with peculiar ease. This seeming ease is complicated by what Suchman (2015) has called "the problematics of

[1] The average number of required personnel for remote and piloted flight are 168 and 100, respectively (Benjamin 2013) (See also (Mindell 2015)).

[2] http://dronelife.com/2015/07/29/solar-powered-uav-sets-new-endurance-record-with-81-h-flight/

separation." One aspect of this separation is the physical distance between the remote operators and the craft. Suchman digs deeper, however, compounding the raw fact of physical distance with a "reorganization of the human sensorium" that has, according to Walter Benjamin, always accompanied technologies of war.

It is to these separations and reorganizations that we turn in this paper. Theoretically, the analysis takes pages from phenomenology and science and technology studies (STS.) It relies on several resources including Merleau-Ponty's phenomenology of perception, James' radical empiricism, Ihde's postphenomenology of human-technology-world relations, as well as the more recent scholarship in the fields of radically embodied cognitive science and STS. The focus will be on a specific drone system, i.e. the MQ-1 Predator. Several reasons motivate this choice. First, twenty years of human-machine co-evolution and 2,000,000 flight hours (along with the Reaper) have made the Predator a most complex creature, "the most important American tactical UAV" (Guilmartin 2015). Second, it is the aestheticized image of this particular aircraft that talk of military drones conjures up in the minds of many. As such, it occupies a special place in the cultural imaginary and has been subject to many commentaries by activists, journalists, military experts, and pilots (Rothstein 2015). Last but not least, focus on the Predator will allow us to take advantage of the intimate account (Martin and Sasser 2010) of a former drone pilot, Lt. Col. Matt J. Martin, who conducted and assisted remote operations over Iraq and Afghanistan for several years. Martin's first-person narrative is of particular interest to us due to his experience as both a drone and a fighter jet pilot. The juxtaposition of remote and in situ piloting allows Martin to make experientially-informed comparisons that lay at the foundation for our inquiry.

In what follows, we will conceptualize three ways of being-with drones. The first and second involve the experience of flight and fight, respectively. With a nod to O'Regan and Noë (2001), who inquire into the "feel" of driving a Porsche, ours is an attempt to understand the "feel" of operating a Predator drone. As in driving, the query will raise a constellation of issues that revolve around embodiment and embeddedness. But the passage from Porsche to plane is encumbered by not only remoteness but the diversity of the tasks required of the piloting crew. After analyzing the experience of the piloting team in the first two sections, we will look at some of the background conditions that make drone technology show up the way it does. Section three, then, will situate drone technology within a broader historical material-semiotic trajectory of which it is a recent moment. Before we close, we take stock and revisit Benjamin's thesis regarding the reorganization of the human sensorium by technologies of war. We also call for a more critical engagement with technologies that interface with human bodies, particularly those touted as enhancements.

2 Relations and reconfigurations

2.1 Pilot-plane: embodiment

> "Sitting in a GCS, for all it *looked* like a flight cockpit, wasn't it." -Col. Matt J. Martin

From an operational perspective, the duo of the pilot and the sensor operator (here on out, drone operators) function as a hub, a coordinating center where downloaded sensory information is brought together, interpretations and decisions are made, and action commands are dispatched back to the aircraft for execution. As noted earlier, a major subset of the communication between the operators and the drone is navigational in nature, intended to create as seamless a pilot-plane relation as possible.

From a phenomenological perspective, the pilot-plane relation, when successful, leads to a transformation of the bodily boundaries by technology – what Ihde (1990) has called an "embodiment relation." The operators-drone-world relation is here reconfigured as [operators-drone]→world, with the brackets signifying the incorporation of the drone apparatus into the very medium through which the world is experienced. This happens, for instance, when Martin crouches forward to look over the nose of his aircraft (p. 22); when, after some practice, he starts referring to the Predator and himself as one entity (p. 34); or when the plane feels "sluggish" to him (p. 63).

To the extent that it takes place, this absorption into the operator's bodily sense has functional benefits. "The best Predator pilots felt the airplane," Martin's superior consistently counsels, "even though they weren't actually in it" (p. 23). The advice is both an indication of the importance of establishing a seamless human-machine unity as well as an implicit recognition of its precariousness. Of the several hurdles that render this link between operators and the drone precarious, a subset is due to latencies of signal transmission across long distances. In Martin's case, for instance, the traveling of a signal back and forth between GCS input and aircraft response causes a lag of about two seconds, which stretches the sensorimotor loop long enough to compromise the tight coupling required for some actions during navigation.

How the breakdown of this coupling affects the conduct of remote flight depends on the activity, or rather on how temporally "decouplable" (Chemero 2011) the relationship between operators and aircraft is during a specific activity. Different activities during flight can be said to lie on a spectrum of temporal decouplability. At one extreme are the less eventful, more predictable stretches of flight navigation where open-loop control – determining the next action based on the current step and a built-in model – is sufficient. Here, a combination of automatic procedures and short-term planning can compensate for the lack of immediate feedback. Open-loop control has come a long way. When flying a drone to a specific destination or a general patrol area, for instance, all the operators need to do once the aircraft is in normal flight mode is to specify a desired destination. Contrast this to the way some forms of manned flight still require the pilot on a reconnaissance mission to spend the bulk of their time aboard either correcting coordinates obtained by the computer navigation system or maintaining an optimal position for monitoring purposes (Martin and Sasser 2010, p. 10).

On the other end of the decouplability spectrum lie exigent situations such as takeoff and landing that are not amenable to open-loop control. Here, successful engagement relies on agility which, in turn, depends on real-time coordination between perceptual systems and the world. Examples of such actions from a situated pilot's repertoire include diving, slamming the stick right or left in a hard turn, affecting sudden shifts of speed, or improvising various workarounds

once unexpected complications arise (as they inevitably do.) The miniature cycles of perceiving, acting, and adjusting involved in such maneuvers have a carefully orchestrated temporal structure. Once this sequence is disrupted by a delay, loss of control can ensue and crashes can happen. To avoid these outcomes, latency has to be reduced[3]. It is with this purpose in mind that the military has resorted to handling takeoff, landing, and in-flight emergencies from a second control center, called a Launch-Relaunch Element (LRE), which is co-located with the aircraft in the same geographic region. Given their significantly lower latency, LREs are (literally) better positioned for handling exigencies and reducing accidents.

The notion is that the LRE and the GCS can handle exigent and normal episodes of flight, respectively, and shift control between themselves at the right time. For this arrangement to work, knowledge of the right time to shift control should be available at all times. While this might be a viable assumption in predictable emergencies, it is scarcely so when it comes to unexpected incidents such as failing wing control modules (Martin and Sasser 2010, p. 244), jammed ailerons (p. 244), or mortar attacks (p. 193) that, as Martin demonstrates, are not that uncommon either. In such unforeseen circumstances, it might be the case that by the time the drone pilot passes control to the LRE team, a minor incident has already escalated into a full-blown emergency. Unexpected events call for on-the-fly responses that call into question the neat division of labor between the LRE and the GCS. This might be one reason why, despite the provision of an LRE, emergencies and crashes are still more common during drone flight compared with manned flight (McGarry 2015).

Could this gap be bridged if technical wrinkles were ironed out and latency were eliminated entirely? Although it is not impossible to imagine control stations of the future achieveing a close-to-real-time temporal coupling to their operational environment, it is doubtful that fully coupled control stations could bridge the said gap. The reason has to do with the perceptually impoverished nature of the coupling. Sensorimotor deficiencies frequently appear in reviews of drone accident reports (Williams, 2008; Thompson et al. 2005). The absence of perceptual information contributes, according to these reports, to about 1 in 6 accidents in general and 1 in 4 accidents identified as related to human factors. To put this in perspective, accidents in manned flight have scarcely been linked to a deficiency in perceptual information, in part because pilots are able to take advantage of all their perception has to offer to get a better grip on their situation. To give but one example, olfaction signals might not seem terribly critical at first glance, but, as Williams (2008) notes, for a pilot, the first indication of an in-flight fire might be (and in the past has been) the smell of smoke.

Let us take a closer look at the sensorimotor profile of the operators whose capacities are severely constrained when compared with a pilot, both in terms of the variety of available modalities as well as the information available to each modality. When it comes to sensory information, the Predator is an almost exclusively visual creature. But it is not clear at the outset whether this poverty of sensory information is an impediment

[3] Mindell (2015) notes that about half a second of control delay is due to the speed of light. The rest occurs "in video compressors, routers, and all the other equipment that processes the data" (p. 117).

to remote navigation. This is because the relationship between sensory limitations and success in navigation is not as straightforward as one might think. Indeed, some observations about the experience of pilots suggest that specific sensory limitations might not impede navigational capacities at all. As any pilot knows, some of the perceptual – especially vestibular – information available in flight can give rise to illusions and thus be highly misleading. One such illusion, called "The Leans" (Williams 2008), for instance, occurs during a gradual turn in flight: If the rotational acceleration of the turn is too low for the semicircular canals to detect, the pilot will undergo a misleading perception upon leveling the wings: s/he will feel the aircraft banking in the opposite direction and is prone to react by mistakenly leaning in the direction of the original turn.

Illusions like The Leans are a product of the unfamiliar sensorimotor conditions of flight. In both phylogeny and ontogeny, the development of human perceptual-motor capacities involves wiring and training that link what we perceive with how we act under the constraints of a specific environment. Our development, for instance, is specific to the terrestrial environment and not readily generalizable to conditions of flight and the idiosyncratic sensorimotor contingencies that arise therein. This is why much of a pilot's training is geared towards learning to rely disproportionately on vision (Reed 1988), "the most important and most used sense for the pilot" (Williams 2008).

In light of this discussion, the sensory constraints of remote navigation might, oddly enough, be said to lend it an advantage. One could argue, for instance, that by blocking misleading information (e.g. vestibular), the sensory constraints of drone flight end up helping, rather than hindering, remote navigation. That argument would be premature however because sensory information that can be misleading when it is foregrounded by attention can nonetheless play an important background role. Put differently, the visual system depends on other perceptual systems for its optimal functioning. As Ingold (2000) notes, "[s]eeing with the ears stopped is qualitatively different from seeing without, for the simple reason that a good deal of the information controlling the movements of the organs of sight, including the eyes, head and whole body, is picked up by hearing." Perceptual systems in general are not snap-in modules that run independently, but processes that interconnect with one another to form a sensory whole.[4] Martin affirms this embodied holism as he is reminded of the usefulness of multisensory signals during manned landing. "[Y]ou saw the attitude of your plane through direct and peripheral vision, heard the spool-up of the engine, felt the ground rush, and knew instinctively when to flare and ease the airplane onto the runway" (pp. 245, emphasis added).

Beyond its sensory holism, Martin's description also highlights the interface between sensing and motor activity, i.e. how any perception system is always already an action system. Indeed, from an ecological perspective, flight falls under the category of "visually guided action" that also includes steering, braking, intercepting, and avoiding objects (Fajen 2005). A visually-guided agent who wants to get the best sense of its bearing relies on the adoption of specific practices, postures, and positions, which, in

[4] Following Merleau-Ponty, Highmore (2010) makes an intriguing suggestion in this regard. He invites us to think of synesthesia – the condition where stimulation of neural pathways typically associated with one sensory modality invokes involuntary sensations in another modality, e.g. numbers appear to have a specific color – as "an extreme case of a more general condition of sensual interconnection" (p. 120).

turn, hinge on several degrees of freedom afforded by the mobility of the eyes in the eye socket, the eye socket in the head, the head on the body, and finally, the body on a support surface. These degrees of freedom are absent in the drone configuration. Martin likens the feel of operating a drone to "riding a roller coaster without being able to turn your head or look up or down." Contrast this with the rich description of the bush pilot Beryl Markham (1942):

> "To me she is alive and to me she speaks. I feel through the soles of my feet on the rudder-bar the willing strain and flex of her muscles. The resonant, guttural voice of her exhausts has a timbre more articulate than wood and steel, more vibrant than wires and sparks and pounding pistons. She speaks to me now, saying the wind is right, the night is fair, the effort asked of her well within her powers. I fly swiftly."

Through anthropomorphism, Markham directs our attention to the richness of the interaction between her body and the body of the plane. Characterizing the exchange as a dialogue, she raises to the level of speech some of the implicit give-and-take that otherwise remains unnoticed in the background of perception. Merleau-Ponty (2012) considered this unnoticed, vague background to be the necessary ground for perception's figures. For him, this "perceptual ground" is not an add-on to the current focus of perception but its condition of possibility. Situated perception, according to Merleau-Ponty, has a fundamental figure-background structure.

It is important to keep this structure in mind when considering the incorporation of multi-sensory signals to reduce drone accidents. Based on the premise that sensory deficiencies contribute to accidents in drones but not in manned flight, Williams (2008) counsels the incorporation of more as well as more diverse sensory information into the GCS. He examines several proposals in this vein, ranging from synthetic displays to spatial auditory displays to joysticks that send haptic alerts, etc. What all such proposals have in common is their binary representation of phenomena as those that can be safely ignored by the operators as opposed to those that have to be directly attended to. In terms of the figure-background structure, we might say that everything is either present-as-figure or absent. What finds no expression in this binary is the mode of presence that Merleau-Ponty attributes to the vague something-or-others of the perceptual background. The critical role this mode of presence plays is underscored in NASA's advice, based on drone flight test experiences, that a microphone be incorporated in the drone aircraft to simulate cockpit environmental noise in the GCS (Tvaryanas et al. 2005).

As another instance that speaks to the importance of the perceptual ground, consider a haptic alert system designed to inform the operators of an upcoming turbulence. Here, the operator team receives either a 1-second vibration to his/her joystick if measurements go over a specific threshold, or no vibration at all (Draper et al. 2000). Again, the binary design precludes any middle-ground mode of presence. Although test results show improvement compared with visual feedback, the design suffers from two related flaws. Williams (2008) notes the first: there exists no predefined threshold over which an event is a legitimate turbulence and under which it is just a negligible bump. To the extent that there is a threshold, it is a fuzzy one. Second, failing to recede into and become part of the perceptual background, the on-off

vibration, like any kind of display warning, remains yet another source of information demanding regular attention and scanning by the operators. In its design, therefore, it violates the economy inherent in embodied processes of attention. Compare this with manned flight, where an imminent turbulence is perceived through multiple proprioceptive and haptic cues through the effect such conditions have on the airframe and the joystick. These cues do not cease to exist before or after a turbulence. They are present but withdraw into the background, serving to inform the pilot, as Markham suggested earlier, that conditions are favorable for flight

Qualitative distinctions like the indeterminacy of the perceptual ground are sometimes given short shrift in discussions of sensory deprivation. DARPA's latest gigapixel cameras (Madrigal 2013) might provide drone crew with yet more information, but the extent to which more information can compensate for the absence of ambiguous modes of presence that are integral to situatedness is debatable. It remains to be seen whether more immersive, experientially-rich alternatives to representational, binary interfaces, such as simulation and virtual reality, can become viable options in the future. At present, technologies like those we surveyed here are a reminder of how representations can be inadequate to the task of reproducing the structure of situatedness.

2.2 Spectator-spectacle: embeddedness

"A picture held us captive." –Wittgenstein

In the previous section, we focused on remote flight, which involved the operator navigating the plane from afar. In this section, we shift emphasis to remote fight. At stake here is a fighter's ability to gain "situational awareness" (Suchman 2015), i.e. an overall sense of what is going on that involves understanding "the operational environment in all of its dimensions – political, cultural, economic, demographic, as well as military factors." The shift of focus from the plane to the battlefield in turn occasions a shift of emphasis from embodiment to embeddedness, from the drone withdrawing into the body to the drone withdrawing into the world (Ihde 1990).[5] In the latter case, drones (and technology more generally) become a transparent referent to something in the world beyond itself. For a skilled map user, for instance, a map affords an encounter with the world it refers to, the landscape its symbols signify (Introna 2011). Following Ihde's formulation, in such cases, the operators-drone-world relation can be described as operators→[drone-world].

Relations of embeddedness are at work whenever the operators develop feel intimately connected to the battlefield. One example is when sensors and pilots, who are positioned thousands of miles away from the battlefield, nevertheless start whispering to one another during tense moments (Mindell 2015, p. 119). The example shows, among other things, that some degree of embeddedness has already been achieved. The outstanding question is just how much. Military officers have argued that the

[5] We have deliberately avoided the descriptor that Ihde (1990) as well as the rest of the postphenomenological tradition has used for this relation: "hermeneutic." Our concern here is that contrasting embodiment and hermeneutics, as postphenomenology tends to do, will end up reproducing some of the stifling dichotomies that relational thinking was expected to overcome. A more thorough-going relationism takes material semiotics seriously and recognizes, with Latour (2005), that hermeneutics "is not a privilege of humans but…a property of the world itself" (p. 245).

artifactuality of the drone feed does not make it any less real, drone personnel insist that the drone feed still shows "mothers with children… fathers with mothers… kids playing soccer" (Bumiller 2012), and some have argued that targets are "rehumanized" through the video feed (Coeckelbergh 2013).

A popular argument on the side of the skeptics, one that Martin takes issue with, compares drones with video games. Some reporters suggested that many drone operators are part of the proverbial video game generation, or that the interface design follows that of console controllers, or that the common virtuality of gaming and drone operating renders the two experiences disturbingly similar. While there is something undeniably crude about the video game analogy, it does raise serious questions. What type of awareness of or access to the operational environment does the drone spectacle afford? To put it more phenomenologically, what possibilities for disclosure and concealment does the so-called eye in the sky present us with?

Let us begin with a widely reported case where situational awareness crops up, i.e. an event where a group of Afghan villagers were bombed, leaving 23 dead and 12 other injured (Cloud 2011). The group first raised the suspicion of the drone crew because they had formed a convoy early in the morning. Here is part of the chat transcript between the drone operators and the imagery analysts that followed:

> "Our screeners are currently calling 21 MAMs [military-aged males], no females, and two possible children. How copy?" the Predator pilot radioed the A-Team at 7:38 a.m.
>
> "Roger", replied the A-Team, which was unable to see the convoy. "And when we say children, are we talking teenagers or toddlers?"
>
> The camera operator responded: "Not toddlers. Something more towards adolescents or teens."
>
> "Yeah, adolescents," the pilot added. "We're thinking early teens."

Subsequent intelligence showed that the villagers, who consisted of "shopkeepers going to replenish their supplies, students going back to school, people going for medical treatment, families off to visit their relatives," were traveling as a convoy for fear of a vehicle failure or a Taliban attack. The disaster illustrates the potent and potentially misleading character of the label MAM (referring to Military-Aged Males) as a basis of inference in targeted killings[6]. An ensuing investigative report described the reporting of the Predator crew as "inaccurate and unprofessional," and purportedly brought about a ban on the use of MAM as a useful classification. As the quote shows, the onus, in this report as well as in analyses of the incident, was put entirely on a combination of individual negligence and bad classification. But we might want to pause before we brush off instances like this as one-off, preventable accidents. To be

[6] Appeal to MAM has not been restricted to targeting. MAM has also been used to label potential collateral casualties post strike. As an intelligence community source recently told The Intercept, "'[i]f there is no evidence that proves a person killed in a strike was either not a MAM, or was a MAM but not an unlawful enemy combatant, then there is no question… They label them EKIA [Enemy Killed In Action]'" (Devereaux 2015).

sure, as the transcript above shows, the reporting was inaccurate and MAM is a particularly dubious category. One might well wonder, however, why the use of a nondescript label that can easily be applied to all adult males was sanctioned to begin with.

From William James' (1885) perspective, this outcome is at least in part due to poverty of perception. Meaning, for James, originates in the kind of relationship with the world that perception allows and that he calls "acquaintance"[7] (ibid). On this account, a relationship not based on acquaintance risks unhinging meaning. His warning in this regard is perhaps more pertinent today than it was in his time. "But in this universal liquidation," he writes, "this everlasting slip, slip, slip, of direct acquaintance into knowledge-ABOUT, until at last nothing is left about which the knowledge can be supposed to obtain, does not all 'significance' depart from the situation?" (ibid). Knowledge, thus construed, is a nudge that reorients perception and attention. What is being reoriented is still the body that will, in the final analysis, imbue knowledge with a sense. This is why James goes on to declare the acquaintance afforded by perception "insuperable." "The flux [of perception] can never be superseded. We must carry it with us to the bitter end of our cognitive business, keeping it in the midst of the translation even when the latter proves illuminating, and falling back on it alone when the translation gives out" (ibid). Put differently, to speak of situational awareness in the absence of an acquainting perception is to forget that the latter is not simply a means of achieving the former, but its fundamental condition of possibility. For our purposes, perception's insuperability has at least two aspects: contingency and normativity. As we will see, these constitute important ways in which, in the words of James, "translation" by drones "gives out" and a return to phenomena becomes necessary.

Emphasis on contingency is meant to capture the irreducibly ad-hoc aspects of behavior that are not entirely amenable to conceptual codification. Consider the label Combatant, for instance. Identifying combatants from afar is no easy task. And while the military's use of drone surveillance for this purpose is usually deemed preemptive, as Chamayou (2015) reminds us, according to the laws of armed conflict, a civilian only becomes a combatant when they "'participate[] directly in hostilities'" (p. 144). The question here is what exactly it is that the drone is preempting in cases where no actual hostilities are taking place. The classification here seems to involve a sleight of logic where the referent of the classifier has subtly expanded to include would-be combatants as well as actual ones. As such, it runs the risk of blurring the line between perception and cognition, the actual and the possible.[8]

To case of MAM betrays a similar move. This is perhaps most visible in the exchange cited earlier where what at first seems like a simple enough observation triggers an analytic discussion between drone crew and the A-team ("We're thinking early teens.") The difference between seeing teens and thinking teens is the difference between how something appears in perception and how it is judged to be by cognition. A similar shift from the actual to the possible is at work in "pattern of life" analyses that determine whether to strike or not

[7] Merleau-Ponty (2012)'s notion of "sense" and Gibson (2014)'s "familiarity" play similar roles in their respective theories.

[8] This distinction is doubly critical in contexts where drones are currently being deployed—e.g. Afghanistan, Iraq, or Yemen. Here, geographic boundaries around the combat theater are difficult to draw and combatants commonly mingle with the civilian population.

based on observations of suspicious behavior and lifestyle patterns that have been associated with increased risk of insurgency in the past.

Labels like MAM or Combatant, as well as pattern of life analyses are part of a broader move towards basing military action on preemptive action whose input is provided by a vast bureaucracy of military personnel and paraphernalia. What motivates this move is a demand for situational awareness in the absence of an acquaintance with the situation. Far from being exclusive to recent military technology, the problem of manufacturing situational awareness has been a challenge for the design of technologies that interface with humans in general. For decades now, one popular response has been to construct "user models" that will then predict how the target user base of a computational artifact is supposed to behave. From this standpoint, labels like MAM and Combatant can be seen as a disturbing application of the old user model approach to a new area.

On top of matters of contingency, perception, as Merleau-Ponty says, is normative, i.e. it is impregnated with a set of norms. The issue is best illustrated and most disconcerting when considering how such norms govern the perception of the body itself. Again, a tragic anecdote, this time of friendly fire, might prove illuminating. In October 2011, a marine staff sergeant and a navy medic who were first recognized as 'friendlies' were subsequently judged to be insurgents and killed by drone fire. An investigation found the cause of the attack to be "a fatal mix of poor communications, faulty assumptions and 'a lack of overall common situational awareness.'"

Our reservations against such a diagnosis should be familiar by now. In the report by Zucchino and Cloud (2011), after watching the drone feed, the father of the marine was quoted as saying "You couldn't even tell they were human beings—just blobs." What the bodies-as-blobs spectacle of the drone feed lacks is a set of relational norms that tie the perceiver to the perceived in an implicit yet characteristic way. In his argument for the relative ease of killing from behind compared to face-to-face, Grossman (1995) has highlighted the importance of norms of direction. Face-to-face killing, he notes, has to overcome "some natural form of resistance" (Coeckelbergh 2013).

More systematically, Merleau-Ponty (2012) introduced norms of distance, orientation, and appearance, and argued that the significance of the perceived objects, including living bodies, critically depends on such norms. "…[S]een from too great a distance, the body loses its living value, and is no longer anything but a puppet or an automaton. The living body itself appears when its microstructure is visible neither too much, nor too little, and this moment also determines its real form and size. The distance between me and the object is not a size which increases or decreases, but rather a tension that oscillates around a norm." (pp. 316, emphasis added.) For Merleau-Ponty (2012), then, perception is pregnant with a set of norms. Contrast this view with the intellectualist perspective, which treats all views of the body as equal manifestations of an identical Body concept. The latter view reifies the living body, turning it from 'being-for-the-gaze' into 'being-for-the-thinking-subject' (p. 264). It is in so doing, in shifting from gaze to thought, that it loses its grounding in a particular perception with specific norms.

Martin witnesses this reification from on high, or as he puts it, from his "God's seat." Here are his chillingly honest reflections on his first attempt at killing via the drone feed: "I was concentrating entirely on the shot and its technical aspects. Right range, right speed, locked in. The man wasn't really a human being. He was so far away and only a high-tech image on a computer screen. The moral aspects of it — that I was about to assassinate a fellow human being from ambush — didn't factor in. Not at the moment. Not yet" (pp. 43-44).

Note, however, that this is only Martin's first attempt at firing a strike. With time, the signification of the image does evolve in his experience, similar to the way a map becomes transparent to the skilled map user. This transparency is partly what the video-game argument misses and experienced drone crew insist on. The drone view does show "mothers with children… fathers with mothers… kids playing soccer" (Bumiller 2012).

At the same time, the map should not be confused with the terrain. The differences in the transparencies and affordances of bodily processes on the one hand and their technological substitutes on the other should not be erased. Coeckelbergh (2013), for instance, has claimed that surveillance technologies allow targets to be "rehumanized" and "refaced," so much so that, in the final analysis, visual technologies used in drones might ironically serve to undermine targeted killing and turn drones into "anti-killing" machines. While we do not intend to deny the "empathic bridging" that Coeckelbergh attributes to surveillance technologies, attending to the mechanics of this bridging process and comparing its affordances to embodied seeing should help qualify claims of empathy. As Vallor (2015) suggests in a careful critique of Coeckelbergh's position, "the richer moral context [provided by visual technologies] arguably does little good, since the technology affords [drone pilots] no other mode of practical engagement with their targets than passively observing or killing them." Vallor's comment is meant to remind us of important differences in the empathic capacities of different visual technologies, and of their non-neutrality more generally. In a kindred analysis, Ihde (1990) has spoken of the "magnification-reduction structure" of our dealings with technology. Technologically-mediated interactions are not replicas of the bodily processes they reconfigure or replace. Rather, they amplify some aspects of experience at the expense of others. Against this backdrop, claims of refacing and rehumanizing are hardly adequate for appreciating the ways in which these technologies rediscipline perception and action. Again, critiques of "re-embodiment" should not be taken as evidence for disembodiment. While the (immediate) stakes are certainly lower for remote pilots, to claim that they are disembodied subjectivities is neither phenomenologically credible (Ihde 2009) nor empirically defensible (Clark 2004). Claims of disembodiment also run the risk of essentializing the human body (Haraway 1990) and with it the boundaries (of agency) between humans and machines. Drone subjectivities are neither disembodied because they are remote nor re-embodied because they have a view of the battlefield. Rather, they are differently embodied, new subjectivities.

2.3 In-out: ontology

> "If you do something for long enough, the world will accept it…. International law progresses through violations." –David Reisner, former head of the Israel Defense Forces legal department.

At various points in his autobiography, Martin's torn subjectivity epitomizes what Haraway (1991) has called a cyborg.[9] He undergoes episodes of experience that resist classification into easy categories like subject vs. object, human vs. machine, or in vs. out, and raise difficult questions about agency, embodiment, and identity. Cultural resources influence the ways in which experience in such situations gets disambiguated (Seligman, 2010). How do the resources available to Martin persuade him to make

[9] Latour (1993)'s notion of a "hybrid" and Bennett (2001)'s "crossing" share affinities with Haraway's cyborg.

sense of the drone configuration? Do they frame it as a legitimate enhancement or a twisted aberration? Our aim in this section is to return to the drone configuration some of its ontological strangeness. This calls for "revers[ing] the movement of the film" (Latour, 2002) of which a piece of technology in technical action – e.g. drones in a reconnaissance mission – is the outcome. Drone technology, thus understood, is a "fold" of multiple agencies in different times and spaces (ibid). Put phenomenologically, we ask What are the conditions that allow drones to show up the way they do?

The import of the question is not just philosophical but political as well. As a former director of national intelligence observes, the drone program "plays well domestically, and it is unpopular only in other countries" (Scahill 2015). The reasons behind the unpopularity of drones in other countries have been explored in several insightful analyses.[10] Why exactly is it, though, that they "play well domestically"? How is it that faith in the program is scarcely questioned by the public in the face of reports that suggest, for instance, that civilian casualties can be ten times higher for drones compared with conventional aircraft (Ackerman 2013)? How are the problematics of separation discussed earlier legitimated? To the extent that legitimating the use of a technology is linked to its naturalization, the phenomenological question of being-with drones is already a political question.

To explore the link between legitimation and naturalization, we can return to Martin. Although he puzzles over the effects of situatedness on some occasions – at one point, for instance, he wonders whether his encounters would be different if they were "up, close and personal" (p. 219) – such moments of doubt are minor hiccups in an otherwise positive appraisal of his being-with the drone system as a seamless man-machine hybrid. Martin's positive valuation is rooted in his belief that the boundaries that separate man from machine in this configuration work well: the human decides and the machine executes. He reminds us that the Predator "while a modern automated aircraft, was not autonomous. The requirement for human guidance at every step of its operations was its limitation — but also its strength and the reason why the system was so successful" (p. 218). Of particular interest here is how Martin understands the relation between autonomy and automaticity. In his view, sensing and acting are automated in the aircraft while autonomy is associated with a repository of "higher" cognitive capacities (e.g. decision-making, ethical judgment, analysis, etc.) that remain the sole possession of the human pilot. The separation thus serves the double purpose of (i) augmenting and improving the accuracy of the sensorimotor capacities of humans, while also (ii) freeing up cognitive resources that facilitate "thinking clearly at zero knots and one G" (p. 104). The major achievement of the drone configuration, on this view, is to purify as much as possible autonomy and automaticity from the vestiges of one another.

Naturalizing any division of labor requires what John Law (1996) has termed "labors of division." In the case of the division between autonomy and automaticity, these labors enact the separation of mind from world by constructing an inner and an outer province with little if any overlap in function. Sensory systems capture and project the world onto a mind screen; the mind processes the information displayed on this screen and issues commands; those commands are then relayed to and carried out by actuators. Our access to the external world is mediated via representational tokens made from sense impressions. Sensorimotor systems gather information from the world "out there," while cognition deals with the representational realm of thought "in here." An extreme version of this dualism posits a "mythical place inside

[10] See, for instance, (Gregory 2011), (Benjamin 2013), (Chamayou 2015), and (Gusterson 2016).

brains where sensory inputs, thought, and ideas are all inspected by a 'central meaner' whose well-informed choices determine our deliberate actions" (Clark 2004, p. 138).

But Martin's parsing of his experience in autonomy vs. automaticity dualities is not peculiar to him. To suggest so would be to psychologize the matter. Dualism has deep-rooted precedents that permeate our sociotechnical practices. The design of the drone system itself seems to follow a metaphysical blueprint that conceives of the control station as the autonomous brain or processor. At work here is an "essentially disjunctive" metaphysics where, "the space of vision is one from which you, the viewer, are excluded, a space where things are but you are not" (Ingold 2000, p. 266). Receptor systems attached under the fuselage of the aircraft ("in the world") sense; readouts from sensors are relayed to the GCS, where information is represented on screens for the operating team ("in the head") to process; commands are communicated back to the craft (back "in the world") to be carried out by effectors. The sensory systems perceive; the (pilot in the) GCS thinks; the plane and its weapons act. This input-processor-output scheme was the basis of information-processing psychology and its applications to human-computer interfaces (where it came to be called "The Model Human Processor" (Card et al. 1983)).[11]

Many things fall through the cracks of the autonomy-automaticity dichotomy. The vast sociomaterial assemblage, spanning three continents, that enables and conditions drone flight is hereby reduced to the simple binary of automatic machines and autonomous agents. The latter is perfectly epitomized by the ubiquitous image of the slick Predator calmly but ominously hovering in midair (Rothstein 2015). In his rich history of how the Predator came to be, Mindell (2015) shows how particular design choices were informed by the identity of the Predator as an automatic machine rather than a node in a vast sociotechnical network, resulting in what he has called "a human-factors nightmare" (p. 141). In their survey of drone accident reports, Tvaryanas et al. (2005) detect a bias towards blaming individual actions and immediate rather than organizational causes for drone anomalies and mishaps.

Beyond the case of the drone, the autonomous-automatic binary – and its associated pairs like immaterial and material, transcendent and immanent, head and hand, center and periphery, subject and object – pervade our cultural imaginary. Our emphasis here is on how this binary has informed and influenced the ways we have historically understood visual technologies (Jay, 1999), i.e. as devices accurately depicting an objective world for a Cartesian cogito to behold. The lens of the telescope was once seen as a mirror erected in front of reality; the canvas of linear perspective painting was interpreted as a "transparent window" onto reality; the film of photography was taken to endow Nature with "the power to reproduce herself directly unaided by man" (ibid). The drone, it should be noted, comes on the heels of technologies like lens, canvas, and film, and the binaries inscribed into our ways of thinking about them.[12] Small wonder,

[11] Edwards (1997) has charted the emergence of this style of thinking, what he calls the "cyborg discourse," from the networks of people and technologies that were formed during World War II and the Cold War, Ekbia (2008) has traced its dogged persistence in various schools of thought in Artificial Intelligence, and Bardzell (2011) has critiqued its inadequacy when dealing with the full range of human computer interactions.

[12] From the perspective of postphenomenology, the drone, like other visual technologies, is an *epistemology* engine, i.e. a technology that propagates its inscribed epistemology. For posthumanist scholars in STS, however, drones are *ontology* engines that can help us think better about possible life-matter symbioses. It should be clear by now that despite the usefulness of the phenomenological lens, our metaphysics is more in line with posthumanism. For an insightful juxtaposition of the two views, see (Pickering 2006).

then, if it tempts us into thinking, in the words of one Air Force Major General, that "you can see everything, that you can hear everything, that you know everything" (Suchman 2015). Taking this mentalistic way of thinking to its logical conclusion will imply that the difference between situated and drone-mediated vision is miniscule, merely a matter of where the images get projected onto: a metaphorical screen inside a head or an actual screen inside a drone control station. To de-naturalize drone vision requires de-naturalizing "natural" vision first.

The difficulty with de-naturalization is that which is naturalized usually withdraws from the foreground of experience and is taken for granted. This taken-for-granted status is what James (1907) problematizes when he accuses epistemology of a "saltatory" fallacy for ignoring the "intervening parts of experience through which we ambulate in succession." For James, knowledge has a tendency to diminish the relations that made its results possible. Merleau-Ponty (2012) is more specific than James. By characterizing "the natural movement of knowledge" as one that "blindly passes through the perceptual operations in order to go straight to their teleological result" (p. 59), he brings in perception to explain why James' saltatory fallacy occurs. He complains that perception manages to "forget[] itself," become "ignorant of its own accomplishments," and treat our phenomenal experience as a brute given rather than an achievement (p. 19).

In one sense, the withdrawal taking place in perception is essential for our seamless functioning in the world. That does not mean, however, that it should be taken for granted when contemplating our relation with and access to the world. Moreover, being withdrawn, as Merleau-Ponty never tires of stressing, is different from being absent. It is an absence that can be made present and Merleau-Ponty's talk of achievement is intended to provoke a counterpoint to perception's amnesia. What enables perception's achievements, and is withdrawn but not absent, is what he calls "the body schema," the "implied third term" in all contact with the world that is responsible for a fundamental gearing of the body into the world and responsible for the structures and norms we have attributed to perception earlier: "[I]f there can be, in front of [my body], privileged figures against indifferent backgrounds, this is insofar as my body is polarized by its tasks, insofar as it exists toward them, insofar as it coils up upon itself in order to reach its goal." Elsewhere, Merleau-Ponty proposes that the body schema is a "manner of expressing that my body is in and toward the world" (p. 103).

In broad strokes then, what is missing from the disjunctive picture that pits autonomy vs. automaticity, and the drone configuration envisaged by it, is what James calls the body's ambulations and what Merleau-Ponty calls a schema. Care should be taken to distinguish the holistic function attributed to the body here from the function of particular bodily organs. To this end, Csordas (1994) has insightfully driven a conceptual wedge between the holistic body as toward-the-worldness and "the analytic body." Discussions of particular bodily organs and processes, Csordas argues, mostly foreground the analytic body. The body schema lies in the background of such discussions as the holistic substructure that establishes "the body's precognitive familiarity with itself and the world it inhabits" (Carman 1999). It is by capitalizing on this prehensive familiarity, this "immediately given invariant" (Merleau-Ponty 1964), that bodily processes perform the particular sensorimotor functions that mentalism emphasizes and the drone machinery replicates. What escapes replication, however, is the underlying schema that enabled and structured these discrete functions in the first place. The body schema resists being differentiated into either an internal subject that is endowed

with intentionality or an external object that is perceived/acted upon because it exists as the foundation upon which the differentiation is made and the separation into in and out is enacted.

Lest all this be too abstract, we can return to Martin. When contemplating in situ flight, he muses about how "you knew instinctively when to flare and ease the airplane onto the runway" (pp. 245, emphasis added.) Martin's description is an expression of the prehensive, toward-the-world anticipation of the body schema. If he is vague, it is in part because the analytic labor necessary to bring the body schema to the foreground is complicated by its status as a matter of course. This is why his attempt to articulate its role invites appeal to mysterious "instincts." Retroactive reflection arrives at the scene late, so to speak, and discovers a body that is already geared into the world. To say that the body schema remains in the background of experience does not mean that it is unexperienced. As Seligman (2010) reminds us in the case of seeing, we do not just see; we feel we are seeing something *with our eyes*.

There are other exceptional conditions and/or pathological situations where disruptions to the normal functioning of the body allow the body schema to come to the foreground (Fuchs 2001). Stroke patients, for instance, can become hyper-aware of their own movement when walking. As one patient exclaims, "'[t]hat's one of the hardest things for people to realize… it's as if you've forgotten how to walk. How could you forget to walk?'" (Ellis-Hill et al. 2000). Ellis-Hill et al. describe how after almost a year of conscious practice following the stroke, the patient became quite capable of walking. Nevertheless, the experience still lacked the "cultivated immediacy" of a coterminous body and self, and instead maintained a heightened awareness that Seligman has called "hyper-embodiment" (2010). Attention to everyday perceptuomotor functions like walking signal the body schema's refusal to withdraw into the background. The result is an objectification of one's body which separates individuals from their subjective experience and can lead to self-conflict and even schizophrenia (Sass and Parnas 2001). It might be that Martin's rendition of his lifeworld as "a schizophrenic existence between two worlds" (p. 44) is more than a colorful metaphor.

3 Conclusion

In his account of the history of computing in the Cold War era, Edwards (1997) retells the story of Igloo White, a covert US military operation that ran during the Vietnam War and, like drones, used contemporary technology to automate processes of surveillance and targeting. The parallels between Igloo White and drone warfare are striking. Edwards' description of the operation command center is eerily reminiscent of a drone GCS. "Visiting reporters" he recounts, "were dazzled by the high-tech white-gloves-only scene inside the windowless center, where young soldiers sat at their displays in air-conditioned comfort, faces lit weirdly by the dim electronic glow, [remotely] directing the destruction of men and equipment as if playing a video game" (pp. 3-4). Like drone operations, Igloo White was plagued by a vast discrepancy between official and independent assessments of its success. The official estimates, according to Edwards, "existed mainly in the never-never land of military public relations" (p. 4). At one point, apparently, the

Table 1 Three glosses on reconfiguration

Relation	Reconfiguration	Loss of
Pilot-plane	Embodied	Figure-background structure of perception
Spectator-Spectacle	Embedded	Contingencies and norms of perception
In-Out	Ontological	Toward-the-worldness of body schema

figure for successful truck kills exceeded the number of trucks estimated to exist in all of North Vietnam.

The parallels between drones and Igloo White emanate from their common origin in the cyborg discourse noted earlier. Both can be seen as points on a trajectory in military strategy and technology towards representing the battlefield inside a control room that acts at a distance – what one general has called an "automated battlefield" (Edwards 2003). The guiding intuition behind the vision of an automated battlefield seems to be that the "human and machine components [of the integrated system] could function as a seamless web" (Edwards 1997, p. 1).

This seamlessness is what we have called into question in this paper. Our main concern has been to show why the shortcomings of drones cannot, as is commonly assumed[13], be chalked up to mere accidents, or matters of technical inaccuracy, human error, and unprofessionalism. They are, at least in part, the result of embodied, embedded, and ontological reconfigurations. To suggest that these reconfigurations are unalloyed enhancements betrays a flawed way of thinking about the human-machine interface (See Table 1).

It is equally flawed, however, to imbue bodily processes with an a priori sense of immediacy or authenticity. Such associations, as Rosenberger and Verbeek (2015) have emphasized, are typically accompanied by a corresponding blanket rejection of more technologized configurations. This is unfortunate. There is nothing inherently sinister or "cold" about technological augmentation of war just as there is nothing inherently sanguine or "warm" about face-to-face combat. It is particular configurations and their agencies, both human and nonhuman, that should be de-naturalized and discussed.

The various problematics of separation discussed above further complicate the implications of Walter Benjamin's observation, noted in the introduction, that technologies of mediated warfare reorganize the human sensorium. As we saw earlier, Suchman (2015) suggests that Benjamin's notion of reorganization can be extended to the case of drones and the ways in which they insulate agents from the sensory effects of their actions. On the one hand, separations and insulations are not peculiar to drones and to suggest so would undermine Benjamin's historical claim. On the other hand, reorganization does seem to take a qualitative leap in this most recent form of warfare. Contextualizing drones helps here.

[13] The Intercept summarizes the mentality of the military as one where there is confidence that "[t]his process can work. We can work out the kinks. We can excuse the mistakes. And eventually we will get it down to the point where we don't have to continuously come back… and explain why a bunch of innocent people got killed" (Scahill 2015).

One way to look at the history of ballistic weapons is to see them as a series of tradeoffs between maximizing effectiveness – e.g. precision, accuracy, range, striking power, etc. – in the battlefield while minimizing the vulnerability of the warrior (Chamayou 2015; Coeckelbergh 2013). The tradeoff has seemed inevitable because proximity brings vulnerability while distance reduces effectiveness. We can conceive of this tradeoff as a problem in a hypothetical two-dimensional space with effectiveness and vulnerability as its axes, and different ballistic technologies – the bow and arrow, the catapult, and the atomic bomb – as various solution points.

Against such a backdrop, what is perhaps unique about the advent of drones is the claim that they sidestep this historical tradeoff through a series of sociotechnical intermediaries. For many drone triumphalists, the problem has finally found a solution where effectiveness is at its highest and vulnerability at its lowest. Of course, these claims are precisely what we have called into question throughout this paper. But the discourse surrounding drones is beguiled, it seems, by a flawed sense of situatedness crafted by sophisticated technologies that make it easy for pictorial blobs and automated action systems to insinuate full transparency and a feeling of being there. The end result is an illusion of enhancement, or, to paraphrase the Air Force Major General cited earlier, a sense of omniscience. The indelible trace of mentalism is hard to miss here. If a mind screen mediates contact with the world anyway, the thinking goes, how different could a video screen be?

But claims of technological enhancement are not peculiar to drones and here lies a broader takeaway for kindred analyses that pertain to the human computer interaction, including those technologies that are touted as "cognitive enhancements" (Bostrom and Sandberg 2009). Too often, as we have seen, the cyborg discourse obfuscates important differences between various kinds of embodiment by focusing on a narrow subset of cognitive functions that those bodies can perform with more or less success. From this functionalist standpoint, different bodies are better or worse means for attaining the ends defined by "higher" cognitive imperatives. This means-ends distinction rehashes the automaticity-autonomy binary we have been at pains to deconstruct in this paper. It is a testament to its deep-rootedness that it is shared between views that otherwise have little in common with one another, e.g. the radical transhumanism of those like Kurzweil (2005) for whom consciousness is downloadable and the body-friendly functionalism of those like Clark (2008) for whom embodiment is "negotiable" as far as cognitive functions are concerned.[14]

The case of drones should have demonstrated some of the failures of the functionalist thinking that conceives of the mind-body relationship in binaries of autonomy-automaticity or means-end which pervades the literature of "enhancement." When asked to "consider the cost-benefit ratio of a cheap pill that safely enhances cognition compared to years of extra education," (Bostrom & Sandberg, 2009, p. 313) the position adopted here problematizes the assumptions of the comparison. It calls into question the information-processing criteria that renders pills and education comparable, e.g. is education a matter of pill-replicable neurochemical modulation in particular synaptic locations or is it more embodied and embedded? It politicizes the comparison,

[14] Clark (2008), an otherwise sympathetic advocate of embodiment in mainstream cognitive science, goes so far as to charge those who take all bodily details to be implicated in perceptual experience with "sensorimotor chauvinism."

e.g. who's "cost" and who's "benefit"? Finally, it reminds us that taking a stand on this issue has downstream implications for how we will (re)define cognition itself, e.g. increasingly in terms of what is pill-enhanceable. Phenomenology is a useful resource here, not because of a general theoretical sympathy for the first-person perspective but, more specifically, because of its commitment to those otherwise undertheorized phenomena that are constitutive of experience, even if they are typically withdrawn from it.

Our treatment of the case of drones has hopefully dispelled some of the futuristic aura surrounding technologies of the mind. But, to reiterate, the alternative to the cyber-utopianism that typically accompanies functionalist discourse is not a regressive move that rejects technologies of the mind on a priori grounds. Premature arguments for or against enhancement risks missing a subtle point we have been at pains to emphasize here, i.e. claims of enhancement themselves can become next to impossible to substantiate once a technology starts interacting with other agencies that cohabit its assemblage. "[S]ome technologies end up invading the whole horizon of ends," Latour (2002) warns us following Jacques Ellul, "by setting up their own laws, by becoming 'autonomous' and no longer merely automatic" (p. 247). The onus is on us to stay attuned to these becomings.

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References

Ackerman, S. (2013, July 2). *US drone strikes more deadly to Afghan civilians than manned aircraft – adviser.* The Guardian.

Bardzell, J. (2011). Interaction criticism: An introduction to the practice. Interacting with computers, 23(6), 604-621.

Benjamin, M. (2013). Drone warfare: Killing by remote control.

Bennett, J. (2001). *The enchantment of modern life: Attachments, crossings, and ethics*. Princeton: Princeton University Press.

Bostrom, N., & Sandberg, A. (2009). Cognitive enhancement: methods, ethics, regulatory challenges. *Science and Engineering Ethics, 15*(3), 311–341.

Bumiller, E. (2012, 7 29). A day job waiting for a kill shot a world away. *New York Times.*

Card, S. K., Newell, A., & Moran, T. P. (1983). *The psychology of human-computer interaction.*

Carman, T. (1999). The body in Husserl and Merleau-Ponty. *Philosophical Topics*, 205–226.

Chamayou, G. (2015). *A theory of the drone*. New York: The New Press.

Chemero, A. (2011). *Radical embodied cognitive science.* Cambridge: MIT press.

Clark, A. (2004). *Natural-born cyborgs: Minds, technologies, and the future of human intelligence.* Oxford University Press.

Clark, A. (2008). Pressing the flesh: a tension in the study of the embodied, embedded mind? *Philosophy and Phenomenological Research, 76*(1), 37–59.

Cloud, D. (2011, April 10). Anatomy of an Afghan war tragedy. *Los Angeles Times.*

Coeckelbergh, M. (2013). Drones, information technology, and distance: mapping the moral epistemology of remote fighting. *Ethics and Information Technology, 15*(2), 87–98.

Coeckelbergh, M. (2015). The tragedy of the master: automation, vulnerability, and distance. *Ethics and Information Technology, 17*(3), 219–229.

Csordas, T.J. (1994). Introduction: the body as representation and being-in-the-world. In T. J. Csordas (Ed.), *Embodiment and experience: The existential ground of culture and self* (pp. 1–24).

Currier, C., & Maass, P. (2015, October 15). *Firing blind: Flawed intelligence and the limits of drone technology.* Retrieved October 17, 2015, from The Intercept: https://theintercept.com/drone-papers/firing-blind/.

Devereaux, R. (2015). *Manhunting in the Hindu Kush.* Retrieved October 17, 2015, from The Intercept: https://theintercept.com/drone-papers/manhunting-in-the-hindu-kush/.

Draper, M. H., Ruff, H. A., Repperger, D. W., & Lu, L. G. (2000). Multi-sensory interface concepts supporting turbulence detection by UAV controllers. *Proceedings of the Human Performance, Situational Awareness and Automation Conference*, (pp. 107–112).

Edwards, P. N. (1997). *The closed world: Computers and the politics of discourse in Cold War America*. Cambridge: MIT Press.

Edwards, P. N. (2003). Infrastructure and modernity: Force, time, and social organization in the history of sociotechnical systems. In T. J. Misa, P. Brey, & A. Feenberg (Eds.), *Modernity and technology* (pp. 185–225).

Ekbia, H. R. (2008). *Artificial dreams: The quest for non-biological intelligence.* Cambridge University Press.

Ellis-Hill, S., Payne, S., & Christopher Ward, C. (2000). Self-body split: issues of identity in physical recovery following a stroke. *Disability and Rehabilitation, 22*(16), 725–733.

Fajen, B. R. (2005). Perceiving possibilities for action: on the necessity of calibration and perceptual learning for the visual guidance of action. *Perception, 34*(6), 717–740.

Fuchs, T. (2001). The tacit dimension. *Philosophy, Psychiatry, & Psychology, 8*(4), 323–326.

Gibson, J. J. (2014). *The ecological approach to visual perception: classic edition.* Psychology Press.

Gregory, D. (2011). From a view to a kill drones and late modern war. *Theory, Culture & Society, 28*(7–8), 188–215.

Grossman, D. (1995). *On killing: The psychological cost of learning to kill in war and society.* New York/Boston/London: Little.

Guilmartin, J.F. (2015). *Unmanned aerial vehicle (UAV).* Retrieved October 28, 2015, from Encyclopædia Britannica: http://www.britannica.com/technology/unmanned-aerial-vehicle.

Gusterson, H. (2016). *Drone: Remote control warfare.* MIT Press.

Haraway, D. (1990). Investment strategies for the evolving portfolio of primate females. In *Body/Politics: Women and the discourses of science.* New York: Routledge.

Haraway, D. J. (1991). *Simians, cyborgs, and women: The reinvention of nature*. New York: Routledge.

Highmore, B. (2010). Bitter after taste. In M. Gregg & G. J. Seigworth (Eds.), *Affect theory reader* (pp. 118–137). Durham: Duke University Press.

Ihde, D. (1990). *Technology and the lifeworld: From garden to earth*. Bloomington: Indiana University Press.

Ihde, D. (2009). *Postphenomenology and technoscience: The Peking University lectures.* Suny Press.

Ingold, T. (2000). Stop, look and listen! Vision, hearing and human movement. In T. Ingold (Ed.), *The perception of the environment: Essays on livelihood, dwelling & skill*. New York: Routledge.

Introna, L. (2011). *Phenomenological approaches to ethics and information technology.* In E. N. Zalta (Ed.). Retrieved 1 14, 2016, from The Stanford Encyclopedia of Philosophy (Summer 2011 Edition): http://plato.stanford.edu/archives/sum2011/entries/ethics-it-phenomenology/.

James, W. (1885). On the function of cognition. *Mind, 10*(37), 27–44.

James, W. (1907). A word more about truth. *The Journal of Philosophy, Psychology and Scientific Methods*, 396–406.

Jay, M. (1999). Scopic regimes of modernity. In H. Foster (Ed.), *Vision and visuality.* Seattle: Bay Press.

Kurzweil, R. (2005). *The singularity is near: When humans transcend biology.* Penguin.

Latour, B. (2002). Morality and technology: the ends of the means. *Theory, Culture & Society, 19*(5/6), 247–260.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network theory.* Oxford University Press.

Latour, B. (1993). *We have never been modern*. Cambridge: Harvard University Press.

Law, J. (1996). Organizing accountabilities: Ontology and the mode of accounting. In e. a. Accountability: Power.

Madrigal, A. C. (2013, February 1). Darpa's 1.8 Gigapixel drone camera could see you waving at it from 15, 000 feet. *The Atlantic*.

Markham, B. (1942). *West with the Night.* Open Road Media.

Martin, M. J., & Sasser, C. W. (2010). *Predator: The remote-control air war over Iraq and Afghanistan: A pilot's story.* Minneapolis: Zenith Press.

McGarry, B. (2015). Drones most accident-prone U.S. air force craft: BGOV barometer. *Bloomberg Business.*

Merleau-Ponty, M. (1964). *The primacy of perception: And other essays on phenomenological psychology, the philosophy of art, history and politics.* (J. M. Edie, Trans.) Northwestern University Press.

Merleau-Ponty, M. (2012). *Phenomenology of Perception.* (D. A. Landes, Trans.) Routledge.

Mindell, D. (2015). *Our robots, ourselves: Robotics and the myths of autonomy.* Penguin.
O’Regan, J. K., & Noë, A. (2001). What it is like to see: a sensorimotor theory of perceptual experience. *Synthese, 129*(1), 79–103.
Pickering, A. (2006). Ontology engines. In E. Selinger (Ed.), *Postphenomenology: A critical companion to ihde* (pp. 211–218). State University of New York Press.
Reed, E. S. (1988). *James J. Gibson and the psychology of perception*. New Haven, CT: Yale University Press.
Rosenberger, R., & Verbeek, P. P. (2015). A field guide to postphenomenology. In *Postphenomenological investigations: Essays in human-technology relations* (pp. 9–41).
Rothstein, A. (2015). *Drone.* Bloomsbury Publishing USA.
Sass, L. A., & Parnas, J. (2001). Phenomenology of self-disturbances in schizophrenia: some research findings and directions. *Philosophy, Psychiatry, & Psychology, 8*(4), 347–356.
Scahill, J. (2015). *The assassination complex.* Retrieved October 17, 2015, from The Intercept: https://theintercept.com/drone-papers/the-assassination-complex/.
Seligman, R. (2010). The unmaking and making of self: embodied suffering and mind–body healing in Brazilian Candomblé. *Ethos, 38*(3), 297–320.
Suchman, L. (2007). *Human-machine reconfigurations: Plans and situated actions.* Cambridge University Press.
Suchman, L. (2015). Situational awareness: deadly bioconvergence at the boundaries of bodies and machines. *MediaTropes, 5*(1), 1–24.
Thompson, W. T., Tvaryanas, A. P., & Constable, S. H. (2005). *US military unmanned aerial vehicle mishaps: Assessment of the role of human factors using human factors analysis and classification system (HFACS).* 311th Performance Directorate, Performance Enhancement Research Division.
Tice, B. P. (1991, Spring). Unmanned aerial vehicles: The force multiplier of the 1990s. *Airpower*.
Tvaryanas, A. P., Thompson, W. T., & Constable, S. H. (2005). *US military unmanned aerial vehicle mishaps: Assessment of the role of human factors using human factors analysis and classification system (HFACS).* No. HSW-PE-BR-TR-2005-0001. HUMAN SYSTEMS WING (311TH) BROOKS AFBTX.
Vallor, S. (2015). Moral deskilling and upskilling in a new machine age: reflections on the ambiguous future of character. *Philosophy & Technology, 28*(1), 107–124.
Williams, K. W. (2008). *Documentation of sensory information in the operation of unmanned aircraft systems.* Civil Aerospace Medical Institute. Oklahoma City: Federal Aviation Administration.
Zucchino, D., & Cloud, D. S. (2011, October 14). U.S. deaths in drone strike due to miscommunication, report says. *Los Angeles Times*.