Because My Garmin Told Me To:

A New Materialist Study of Agency and Wearable Technology

By

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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College of Arts and Sciences
University of South Florida

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Date of Approval:
February 26, 2019

Keywords: Wearables, New Materialism, Agency, Actor Network Theory, Triathlon

Dedication

For Pop Pops. From the very beginning you taught us to shoot for the stars and then gave us the love, support, and courage to do so. This is for you.

Acknowledgments

This project would never have been completed without the kindness, encouragement, and generosity of so many people. I would like to thank:

Val and the triathlon team at Outspokin Bicycles for the enthusiasm and generosity that made this project a joy to work on. Mary and Joe Walkush, for inspiring and helping me and to start this journey and to see it through. Also, my wonderful colleagues, Bonnie and Rich for their time, patience, and generosity in proofreading, helping to plot directions, and acting as sounding boards. I am so grateful for all of those nudges and reassurances over the years.

To my committee. Thank you for the guidance, and direction as this project came to fruition. Most of all, thank you for your kindness and flexibility in being a part of a very dynamic and at times uncertain project. Dr. Herndl, thank you for helping to right the ship when it got sideways and for plotting a steady course forward. The fact that this exists is testament to your kindness, generosity, and patience. I am overwhelmed with gratitude for all that you put in to this project. You have been a powerful and inspiring model of how much good the right person at the right time can do. Moreover, you've inspired me to try to be that person for others in the future. Thank you.

Mom, thank you for never, ever, wavering in your support of me. Your presence and steady hand has been a support for all of the mountains I've tried to climb in life and has made each journey so much richer. I have no words to express the gratitude and love I have for you. I have treasured every mile.

To my wife, Kat. Thank you for being my constant companion. In work and in life, your patience, kindness, and understanding have made wonderful things possible and then helped to bring them to life. Thank you for being my best friend. We did it.

John and Alaina – Daddy can play now.

And, finally, Pop Pops. Thank you for the unwavering belief and faith in me. This is for all of the swim lessons you got me, for every time you held the seat of my bike and ran behind me as I learned to ride, and for all those trips to the track. This is also for everything else that you did, so much more than I could say. I love you. This is for you.

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Abstract

Wearable technologies are being adopted in increasing numbers and the market space appears poised for continued growth in virtually all areas, from medicine, to self-quantification, to sports. While the overwhelming majority of work on wearables has been done on their medical applications and their role in shaping identity, this dissertation examines the roles that wearable technologies play on the decision-making processes in athletic contexts. Using new materialism and Actor Network Theory as lenses, I attempt to break from the Cartesian model that places human subjectivity and intentionality at the center of a rhetorical situation and, rather, allow that non-human actants are agentive. I examine the interactions that age-group triathletes have with their wearable technologies and the shifting agencies that accompany those interactions. These interactions call on disparate human and non-human actors in forming a series of temporary, shifting networks that utilize a distributed agency in the decision making process.

Chapter 1. Wearable Technologies, New Materialism, and a Decentering of Human Subjectivity

Why Wearables?

Over the course of the past decade, wearable technology and personal fitness tracking devices have increasingly made their way into mainstream lived experiences. These devices have moved from the stuff of science fiction movies to increasingly common presences in the daily lives of many people. Wearables are beginning to establish themselves as a stable, mature market. Increased visibility and widespread adoption rates are indications that these devices and technologies are very much in the public consciousness and that they are increasingly being interwoven into the infrastructure that helps us to make sense of our lives and interact with our worlds (Johnson and Johnson, 2016). Additionally, while we see these devices in increasingly greater numbers, they are being used in the spaces that rely upon physical performance as measures of success. In sporting realms, for example, wearable technologies have been used to gain a competitive edge and push the boundaries of athletic potential. Kieran Loftus, the director for Puzzle Sports, says, "Wearable technology has become heavily ingrained into professional sports, allowing adverse metrics to be taken into account and utilized within training and allowing for real-time decisions to be made subsequently" (Loftus, 2016). In an ever-increasing way, people are turning to wearable devices for guidance and insight into the choices that they make.

As wearable fitness technologies continue to proliferate into the fabric of our daily lives, users increasingly depend upon them to make sense of their everyday place and praxis. Given that these technologies are, relatively speaking, just now reaching maturity, it is important that our interactions with them be scrutinized. Rhetorical investigation into our relations with these technologies and their design can influence the manner in which we engage with them and shape future development. It is equally important that, rather than focusing our gaze solely on the manner in which we integrate these devices into our lives, attention is paid to the impact that they have on us. Seen through the lens of new materialist theory, wearable fitness technologies have agentive power and disrupt the subject/object relationship. This project serves as a step in developing rhetorical theory as it addresses the connections between human and non-human actors and explores the interactions between humans and technology more broadly.

A Case Study: KOM Hunting

At the end of 2016, cyclist Phil Gaimon retired from professional bike racing. As a longtime proponent of clean racing in cycling[1], Gaimon initially dedicated much of his newly found free time to going after the Strava[2] records of known dopers in his local area. These efforts gained fairly widespread notice, which he then parlayed

[1] It is widely accepted that performance-enhancing drugs are an endemic plague on professional cycling, especially since Lance Armstrong admitted to doping on 1/17/13. Since then, cycling has worked hard to restore its image as a clean sport. Gaimon was one of the more vocal members of this group, going so far as to tattoo the word "clean" on his arm.

[2] Strava is a widely popular social network for cyclists and runners that tracks activities via GPS. Workouts provide information such as pace, heart rate, elevation, etc. based on the metrics that are captured with various wearable technologies

into a recurring show on YouTube that he named Phil Gaimon's "Worst Retirement Ever." Though he abandoned his original mission to take the KOM's[3] of known dopers, Gaimon's mission on the show stayed consistent. His goal in each episode was to capture Strava KOM's on notable hill climb segments.

The first season of the "Worst Retirement Ever" was ten episodes in total. In each episode Gaimon adopts his signature goofy attitude towards his goals, playing his attempts off as frivolous. He frames his attempts as silly, amateurish hijinks, as something that pros simply don't care about. "The thing is, if you're a pro, like I just know that Chris Horner doesn't care about his Palomar Strava… Ian Boswell was stoked when I took his baldy segment. Like, it's fun… but this is all I have left" (Episode 1, Palomar). However, as much as Gaimon tries to portray his attempts as foolish and petty, it quickly becomes clear that his goals, these virtual awards, do matter quite a bit to him. Though Gaimon attempts to frame his actions as silly and insignificant, they are very clearly serious enough for him to subject himself to the rigors of significant training and profoundly difficult physical acts. They exert an undeniable impact on him, emotionally and physically.

> It's really tough to admit this, but from when I uploaded the file and I didn't know if I had it … I care. Like, I can't believe I care and it sucked to not get it and I just didn't think that any of this… I thought that this would be fun and entertaining. I didn't think it would move my emotional needle, but it did. (Episode 2: Mt. Diablo)

[3] KOM stands for King of the Mountain. In this context, it is a virtual award given to a cyclist who posts the fastest time across a predetermined segment in the Strava app. The origin of the term KOM originates from the sport of cycling, given to the rider with the fastest time through the mountain segments of stage races. For women, the term QOM, Queen of the Mountain, is used.

Gaimon's reliance on wearable technologies is clearly evident in virtually all aspects of his show. Though he calls very little attention to their roles directly, it is clear that he uses these devices in his planning, execution, and evaluation of his efforts. Ultimately, they determine his success or failure. Their use underpins everything, providing the platform upon which all of his efforts and assessments are carried out and the basis against which they are evaluated. In planning his effort, he refers to his power outputs measured over time, utilizing a power meter, altimeter, and GPS on his bicycle. "410 watts, kind of the first third, and then the flat parts save a little bit and try to recover and then blast the end. I think it's like 11 miles total" (Episode 1, Palomar). He uses GPS and a timer in the actual attempt. "I kind of paced it thinking like a really good day would be 53's, 52's" (Episode 3: Mt. Lemmon), and then laments his hesitation based on his perception of the data he saw on the devices. And, finally, upon completion of his attempt, he bemoans the inability of his bike computer (which he then comes to realize is, in fact, a limitation of his own technological savvy, as the device can, in fact, do what he cannot by telling him exactly where the segment begins and ends) to guide him farther or more exactly to the finish line.

> The annoying thing about any of this stuff is that, like, I time myself so I kind of know what time I did but I don't know where the segment starts […] You drive down to where you can find cell reception and you set up your personal hotspot and then you upload (Episode 1: Palomar)

Here, Gaimon is saying, in essence, that he was poorly directed by the computer. That, had the computer given him more information at an opportune

time, he would have behaved differently and that the outcome would have been more to his satisfaction. This is a de facto way of expressing joint culpability in failing to capture his goal of being the fastest person up the hill, or, the virtual title of "King of the Mountain," -- KOM. Nowhere does he specifically blame the device as the reason for his failure. Gaimon does not attempt to frame it as an equipment failure in the vein of a flat tire or bike issue. Rather, it is a cognitive, emotional, shortcoming. For Gaimon, the physical effort stands as it does. It's the intellectual efforts – the choices made and the contextual understanding – the confluence of time and speed and distance – what Aristotle refers to as Kairos, that fails him.

Ultimately, the KOM's and Strava leaderboards exist as a collection of pixels on computer screens that result from a series of data points collected, algorithmically processed, and then displayed on devices worn or attached to his body and bicycle. Despite their abstract and seemingly inert nature, they are impactful, asserting agency and directly affecting Gaimon's decision-making process, both in and out of training. On the simplest of levels, these devices and the data they present set both starting and finishing lines, as well as instructions on how to move from one to the other. Gaimon begins at the bottom of the hill with a timer set at 0:00. As he travels up the hill, towards his goal, the timer ticks forward and his computer measures distance and time until he reaches his digital end point, past which, none of the metrics matter to him anymore. Along the way he is provided data that explain what he is doing. Though the physical effort is his, the explanation and interpretation of that effort is not. The completion of a segment defines a

finishing line that, once completed, signals the end of his attempt and directs him to focus elsewhere.

In the event that someone "takes" a KOM from him, Gaimon does, on occasion return to the segment. "The Stunt was one of the earlier climbs that I got […] I got it, checked it off the list, and then forgot about it. And then, this guy […] took my Strava […] and I'm going to try to take it back" (Trolling on Stunt Climb, 4/6/18). Playful for the camera or not, there is a clear tone in his voice that he is annoyed and a very real sense that he does genuinely want his Strava title back. None of these emotional or physical responses are possible without the technology that defines the segment, the efforts, or the results and provokes the emotional stimuli that in turn motivate him to return to a segment that he had, by his own admission, forgotten about. It's clear that a combination of human and nonhuman actants play roles determining both Gaimon's thinking and behavior.

The worn ecology of GPS computers, speed and cadence sensors, power meters, heart rate monitors, etc. not only directs Gaimon's actions, steers his efforts, and triggers a range of emotional responses (joy/relief when he does take a KOM, frustration/anger when he fails to), it lingers, asserting itself in tangible ways. "Palomar, I have regrets. Palomar bothers me. Palomar… I've lost sleep over Palomar and I will continue to do so" (Episode 2, Mt. Diablo). It would be shortsighted to misconstrue a lack of consciousness on behalf of the technological ecology for a lack of agency, which simply refers to an actant's ability to impact the ecology of which they are a part. In the moment that Gaimon laments his failure to take Palomar, shows annoyance at losing the Stunt Strava, or joy at capturing the Mt.

Lemmon, he confirms what has long been accepted by New Materialist theory: nonhuman objects must be considered as active participants in the ecologies to which they belong. The worn devices influence decision-making, asserting themselves in ways that are often larger than the purpose they are intended to fulfill. They provoke emotional responses, shape our evaluations and judgments and modify our actions. Lupton, (2017) coins the term "data sense," which she argues, "involves entanglements of human senses and digital sensors with sense making. This approach underlines the embodied, affective and material nature of engaging with and learning from data" (pp. 1603-4). Lupton argues, and the Gaimon example makes clear, that data are not inert "things" that serve a singular purpose for human subjects. Rather, they are interactive, both informing and directing. These devices provide data that fill in for bodily sensations that are unavailable, providing insight and guidance that is not otherwise accessible to human actors despite the fact that they are the source. Lupton (2016a) continues by saying that athletes

> Talked about not really 'knowing' how their bodies were responding the exercise until they glanced at their heart rate monitor while running or cycling or reviewed their data after their exercise. These data were often viewed as more 'truthful' or 'accurate' than the haptic and other sensations they felt from their bodies as they were exercising. To many people the data visualizations generated from their personal information is sometimes more 'real' to them than the knowledge that their bodily sensations provide (p. 7)

Rather than existing simply as some sort of digital mirror into human performance, wearable technologies become vital participants in the process itself. They are generative of information that exists beyond physical sensation alone and are capable of influencing the decision-making processes. Neff and Nafus (2016) state that

> When people elicit sensations through tracking, they shuttle between observing physical signals felt in the body and observing the recordings of them. Working between the two, they better define or feel a phenomenon. The data becomes a "prosthetic of feeling," something to help us sense our bodies or the world around us" (p. 75)

The degree of the influence exerted by wearable technologies is largely contextually based and the result of the interactions among technological actants, human actors, and countless other analog nonhuman actants that make up any particular scenario.

Decentering: Making Space for Non-Human Actors

One of the aims of this dissertation is to decenter the human actors in these networks to gain an increased understanding of the potential of nonhuman things to assert themselves. Doing so allows us to understand not just who and what is involved in a network, but also the transactions and byproducts that result among them. New materialism and Actor-Network Theory (ANT) provide useful heuristics for stepping outside a traditional paradigm dominated by subject/object relationships that privilege human actors as the source and will of action. ANT

argues that both humans and nonhumans can be understood within a network wherein their identity is defined through their interaction with other actors (Cressman, 2009, pp. 3-4). Rather than accepting the hierarchical subject/object relationship as the de facto state of affairs, ANT allows us to shift the view of relations from a vertical one with the subject at the top to a horizontal one that looks at the interactions of its actors. This is what Bruno Latour (2005) refers to as an ontological "flatland" in which all actants have agency. The network becomes the object of study rather than a privileged position with it.

It is important, though, that we remember that the aim of decentering the human subject is not a doing-away-with any more than it is a carte blanch acceptance of the human's actant participation in a network. The aim, rather, is to better understand the coming together, the confluence of human and nonhuman. It's far too easy to zealously accept an approach such as new materialism and forget about the human component of the very relationships we seek to address. Melonocon reminds us that "Speaking of not forgetting the living, breathing body, technical communication is almost guilty of that very thing. The field has too long assumed an unproblematic and disembodied body" (p. 69). She continues, by citing Hayles (1999), arguing that the idea of embodiment "is contextual, enmeshed within specifics of place, times, physiology, and culture, which together compose enactment," and it is "akin to articulation in that it is inherently performative, subject to individual enactments" (Hayles, 1999, pp. 196–197). A new materialist lens requires that we account for the impacts of context. As such, we cannot rightly

make claims about wearable technologies without understanding the circumstances under which we engage with them.

Diving deeper, beyond a human-centered hierarchy of action requires that we restructure notions of the participants in an ecology and their ability to impact its boundaries. As Jane Bennett (2009) says, "The task becomes to identify the contours of the swarm, and the kind of relations that obtain between its bits… this understanding of agency does not deny the existence of that thrust called intentionality, but it does see it as less definitive of outcomes" (p. 32). As Bennett argues, understanding the swarm is made easier by looking at the configurations of human and nonhuman entities of which it is comprised. Actor-Network Theory allows us to do this by imbuing all participants, actants in the networks with agency. Latour (1996, p. 373) states

> An 'actor' in ANT is a semiotic definition -an actant-, that is, something that acts or to which activity is granted by others. It implies no special motivation of human individual actors, nor of humans in general. An actant can literally be anything provided it is granted to be the source of an action.

Through this lens it is possible to engage with the various actors of the network, not as objects manipulated by self-determining subjects but, rather, as co-participants in a larger, more vibrant assemblage.

In the ecology surrounding the Gaimon example, the most immediately visible actant is Gaimon himself. However, as a starting point, we need to focus more of our energies on understanding the interplay between him, his bicycle, and the computers and sensors attached to both of them as well. There are multiple

actors at work simultaneously here. "An actor-network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of" (Callon 1987, p. 93). These heterogeneous elements are, doubtless, too many to count. However, we can certainly count among them the data that are produced and tracked by the interplay of human and nonhuman actants involved in the wearing and use of wearable technology, as well as the results of their interactions, whether they be the formation of identities or emotions.

This notion of multiple human and nonhuman actors concurrently affecting and shaping the dynamics of the network is what Jane Bennett (2009) understands as vitality, or, "the capacity of things—edibles, commodities, storms, metals—not only to impede or block the will and designs of humans, but also to act as quasi agents or forces with trajectories, propensities, or tendencies of their own" (p. viii) and refers to her conception of distributed agency, which "does not posit a subject as the root cause of an effect" (p. 31). Rather, she allows that any aspect of the network (what she refers to as assemblages) has the ability to shape and (co-)determine the direction, development, and eventual outcomes of a given endeavor. Appreciating the agency of things to act in what Latour (2001) calls a "collection of humans and non-humans" (p. 174) expands our understanding of action, our relationship to technology and the rhetorical power of non-human objects. As wearable technologies become more ubiquitous, they constitute more and more of what Thomas Rickert calls the "ambient rhetoric" in which we live, act and work out our identity.

Wearables: Technology by Many Names

Before proceeding too much farther it is first necessary to outline what is generally meant by the term "wearable technology" and then, to further refine this understanding to enable a discussion that applies to an athletic context. Generally, the term "wearable" refers to any electronic technology that can be comfortably worn on the body. "[Wearable Technology] ranges from e-fashion, smart materials, wearable electronics, solar energy and 3D printing to bio-culture and nanotechnology" (Smelik, p. 456). In short, when we refer to wearable technology what we are identifying are electronic technologies that are attached to the body in a relatively unobtrusive way. The purpose of these technologies varies according to intent but often the intention is to "control, improve and enhance human lives and bodies" (Smelik, p. 456). Our interactions with wearable technologies take place in many contexts, which are continually expanding. Currently, wearables exert a strong presence in medical fields, professional and amateur athletics, and law enforcement, to name but just a few. In virtually all cases, the nature of the devices is going to be determined by the activities being performed. While the illusion of homogeneity is strong and the feature list among devices may appear largely redundant, wearable technologies are often purpose driven. The most visible (and general) of these devices belong to a classification commonly referred to as activity trackers.

These devices, such as products by Fit Bit or Garmin, are a class of wearables that harvest data from multiple sensors (accelerometers, Global Positioning

> System [GPS] chips, and heart rate monitors) to track a range of bodily metrics related to exercise, like steps taken or calories burned" (Gouge and Jones, p. 200)

These devices are not limited to any particular activity or purpose and, given myriad medical and wellness applications, can be applied and worn anywhere on or in the body in the form of pacemakers, artificial valves, joints, and even, animatronic limbs to name a few. However, the most common version of what we associate with wearable technology generally takes the form of a small band or watch worn on the wrist or chest. In addition to reporting the time of day, these devices often relay metrics such as one's heart rate, levels of physical activity, hours and quality of sleep, among others.

The range of what wearable technologies are used to measure and track in athletic contexts becomes broader as the equipment utilized becomes more specialized. For example, NCAA football programs have been exploring the potential of wearable technology by implanting sensors into helmets and pads to monitor the physiological status of athletes (Tracy, 2016). Similar steps have been taken with the women's national soccer team. Given the broad spectrum of capability and the increasingly diverse number of options available, activity trackers are often used by professional and amateur athletes alike to track their performances and are suitable for a vast array of use scenarios.

The term wearable technology is so broad that, without adequate context, it is difficult to understand what, exactly, it refers to. Piweki, Ellis, Andrews and Joinson (2016) state "one in six (15%) consumers in the United States currently

uses wearable technology, including smartwatches or fitness bands. While 19 million fitness devices are likely to be sold this year, that number is predicted to grow to 110 million in 2018" (p. 1). The term "wearable" simply covers too broad a spectrum of use to have an inherent meaning simply being non-biological. Even that distinction is quickly fading. As such, it would be a mistake to try to account for them all at the same time or through the same lens. Their points of engagement are different, as are the abilities of human actants to make sense of their data. Wearables utilized by health professionals or in hospitals are profoundly different than a Fitbit used by a recreational jogger, which is, again, very different than the power meter that Phil Gaimon uses as he attempts to capture KOM's. These differences lie largely in the manner in which human actors interface with the devices and the degree to which they are able to interpret the resultant data. None of this is to suggest any sort of value system or hierarchizing attempt. Rather, I want to make clear that each interaction between human and nonhuman actants must be contextually framed if we are to gain insight into the value that wearable technologies can add.

Despite the apparent similarities across a number of devices, the ways in which human and nonhuman actants engage heavily impacts the manner in which a device is going to be able to perform as an active participant in an ecological system. The use of screens, haptic feedback, and audio prompts invites meaningful interaction between human and nonhuman participants. Additionally, in order to (re)act accordingly, human agents must be able to make decisions based on the data they receive just as the devices act on the data that they receive. In other words,