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Reproducing the Speculative: Reproductive Technology, Education, and Science Fiction

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Walter, a Synthetic, quietly makes his rounds in the brightly lit, pristine interior of the *Covenant*, a Weyland Corporation Spaceship. Fingers pressed to the translucent, impermeable glass, he checks the status of each crew member as they rest in their cryochambers, suspended in chemically-induced comas until they reach their destined planet in seven years and four months' time. The ship's artificial intelligence system, Mother, chimes, "Seven bells and all is well." Reassured of their security, Walter moves on to the next zone, where another 2,000 cryochambers contain sleeping colonists from Earth. This zone also features a panel of drawers, each housing dozens of embryos—over 1,100 second-generation colonists. They are packed individually into river-stone sized ovoids; clear, solid, egg-like. Amid the rows, an embryo has died, and its artificial uterine-sack is clouded and dark. Observing it briefly, Walter takes it from its socket with a set of tongs and places it into a biohazard bin. The *Covenant* is on a mission to colonize a habitable, distant planet. Their ship contains everything that could be useful in setting up a new colony: terraforming vehicles, construction materials, and human life itself. Even though these frozen embryos aren't yet actively developing, they reflect a technology that allows for such a feat, while ensuring a population boom that is not dependent upon the limited space of mature female colonists' wombs.

This scene is part of the opening sequence of the latest film in Ridley Scott's *Alien* franchise. *Alien: Covenant* (2017) is the most recent science fiction film to illustrate advances in reproductive technologies, especially that of ectogenesis, or external gestation and birth. It is certainly not the first, however, and reproductive technology has long been a central theme throughout popular science fictional media forms.

Science and speculative fiction reach millions, and anthropologists who are interested in engaging with public conversations around science and medicine—and around expanding reproductive technologies in particular—must recognize the role these genres play in popular understandings of the social implications of new technologies. Science fiction offers important opportunities to engage students in particular in these conversations. Carefully chosen works of science fiction can be

valuable tools within the classroom to broaden understandings of scientific advancement and technological development, and to highlight the serious social effects of these technologies, especially toward minorities and bodies that historically don't matter (to invoke Butler, 1997).

In the remainder of this post, I offer some background on the public reach of science fiction and discuss the contributions this genre has made to the fields of reproductive ethics and feminist studies, with a particular focus on works that could be useful when teaching about these issues in undergraduate classes.

Science and Fiction; Reach and Influence

Science fiction is one of the most prevalent and capital-generating subgenres in popular culture media today. Among the top-grossing films of each year between 1995 and 2017, 56%—that is 13 out of 23 films—contained science fictional themes or elements (Nash Information Services 2017). In 2016, the top ten grossing movies fell exclusively into subgenres containing elements of science fiction and fantasy, bringing in an astounding \$9.25 billion combined worldwide (Guerrasio 2016; Box Office Mojo 2017). To say that these themes reach a massive audience is an understatement. The broadest collection of science fiction media still takes a textual form, however. Publisher's Weekly reported a 44% increase in print science fiction book sales between 2014 and 2015 (Milliot and Segura 2016).

The popularity of science fiction is often linked to current events. For example, *The Guardian* reports that sales of Margaret Atwood's 1985 book *The Handmaid's Tale* have soared after Trump's election and as fears of authoritarian control over women's reproductive rights has surged (2017). This is intensified by the premier of the Hulu television series of the same name. Looking toward the future makes sense when social, political, and economic tensions are high and raging fears of climate change, nuclear war, and the fate of the human species are hot topics in news segments and on social media.

But concern about these issues does not imply an understanding of them, and scientists often point to broad public unfamiliarity with science-related issues. For example, a majority of members of the American Association for the Advancement of Science believe that, while Americans value scientific research in general, significant gaps in public knowledge about science originate partly from a lack of interest in engaging with science news (Funk et al., 10-11). Indeed, a 2015 study indicated that a majority of Americans learn about current events, including science-related topics,

through social media (Greenwood et al., 2). This limited understanding of scientific concepts does not prevent Americans from having strong opinions regarding science-related issues (Funk et al., 6). Science fiction is a “literature of change” and, in this context, is uniquely positioned to assist people in understanding the complexities of the world around them (Brooks Landon, as quoted by Latham, 12).

Many scientists raise concerns that science fiction can negatively affect scientific literacy. For example, education researchers have argued that “a single viewing of a science fiction film can negatively impact student ideas regarding scientific phenomena. Specifically...that the film [*The Core*] leveraged the scientific authority of the main character, coupled with scientifically correct explanations of *some* basic earth science, to create a series of plausible, albeit unscientific, ideas that made sense to students” (Barnett, et al., 179, emphasis in original). But rather than lamenting that the public will learn flawed science from science fiction, Barnett et al. argue that educators should engage with these works to explain inconsistencies and encourage critical thinking (179). Anthropologists and STS scholars, as well, can use science fiction to encourage students to think more deeply about the social implications of science and technology and to envision alternative futures. As Rob Latham argues, science fiction is, in part, “a mode of analysis, a way of thinking about alterity and difference that has become a useful critical tool for feminist, antiracist, and other political work” (10).

Science Fiction in Reproductive Ethics and Feminist Studies

Rapidly changing reproductive technologies—from assisted conception to surrogacy, cloning, birth control, and more—have been a central area of concern in both science fiction and STS (see, for example: Strathern 1992; Franklin 1997, 2006, 2007; Rapp 1999; and Teman 2010). Recently, a new reproductive possibility has developed, as ectogenesis becomes increasingly feasible. Earlier this year, news headlines and social media feeds buzzed with excitement—and dismay—when researchers at the Children’s Hospital of Philadelphia Research Institute announced they had successfully shown that “fetal lambs that are developmentally equivalent to the extreme premature human infant can be physiologically supported in [an] extra-uterine device for up to 4 weeks” (2017, 1).

Ectogenesis has long been a topic of discussion in bioethics. The book *Ectogenesis: Artificial Womb Technology and the Future of Human Reproduction* (Shook and Gelfand, 2006) discusses critical moral philosophical, legal, social, and political considerations surrounding the controversial technology. Significant concerns intersect with already

heated abortion debates: would this technology be acceptable to pro-life advocates if it allowed the embryo or fetus a chance at life, even if outside the mother's womb? Ectogenesis may mean that "a woman's contribution to the birth of a live baby will be similar to that of a man, namely, both will only need to provide or donate gametes" (Shook and Gelfand 2006, 2). What might this mean for feminist movements—is ectogenesis a limiting technology, eliminating what has been seen as women's primary social worth, or is it liberating for women? Shulamith Firestone controversially insists that women will never be equal in society without the use of artificial womb technology (1970). Singer and Wells (2006) state that ectogenesis should only be available to those who want it, not imposed upon all of woman-kind as a vehicle of forced "equality" to men (19).

Alternative reproductive technologies are also a common theme within the broad genre of science fiction. The frequent repetition of certain motifs both reflects and produces a standard way of imagining the future, namely that humankind will inevitably depend upon a range of available alternative reproductive technologies—with ectogenesis a major player. Commonly, these technologies affect the perceived place of women in society. These fictional works can be especially useful for exploring minority struggles, sexual abuse, discussions of inequality, and reproductive politics. For example, the 2015 dystopian novel *The Only Ones*, by Carola Dibbell, though broad in its exploration of the future, asks how reproductive technologies may change as ethics are discarded in the wake of rapidly spreading disease. Parents who lost their children to devastating pandemics, mad with grief, save the skin of their dead young, hoping to clone them through parthenogenesis (conception without fertilization) and ectogenesis. Dibbell navigates the complications of identity legitimization with illegal parthenogenetic babies and the trials of motherhood given severe lack of resources and group-knowledge in child-rearing. Beyond that, *The Only Ones* displays the precarity of the future for females: they are valuable for the potential sale of their organs, gametes, and bodily-fluids on black markets, and can gain access to resources upon agreeing to undergo medical experimentation and exploitation, often leaving them internally marred and unable to continue gaining revenue through the sale of their gamete cells. In bringing lived experience back into the technicalities of reproductive technologies, *The Only Ones* challenges ethical positions, recalling Marilyn Strathern's *Reproducing the future* (1992), especially as she considers legislative definitions of parenthood in the wake of biological versus social ownership to the rights of a child born through artificial means. Additional fictional works which consider the changing roles of women in society, especially through alterations of reproductive means, include Charlotte Perkins Gilman's *Herland* (1915), Lois McMaster Bujold's *Vorkosigan* series (1986-2016), particularly *Barrayar* (1991), and

Sheri S. Tepper's *The Gate to Women's Country* (1993).

While the above-mentioned works have been significant in disseminating feminist concepts, it is important to decenter the white, Eurocentric, colonialist perspectives that continue to dominate the science fiction genre. Octavia Butler's work has been foundational in giving black individuals a place not only in literature, but in the future. "Unlike traditional science fiction's formulation of alienation, which often maintains distinctions of difference, Octavia Butler's work seeks to blur multiple boundaries: between Self and Other, between colonized and colonizer, between human and alien" (Pasco et al. 2016, 249). Her short story "Bloodchild" (1984) is an important staple in discussions of gender roles, especially in reproduction. She places reproductive responsibility upon the shoulders of men through the introduction of an alien species that, through a risky impregnation, seeds the torso of human males with their eggs. Though this work does not address ectogenesis specifically, it nevertheless is foundational in science fiction engagements with standard reproductive practices.

Butler is also an important figure in the development of Afrofuturism, an artistic movement which seeks to build a place for black people where previously there hasn't been one (Nelson 2002). Her focus on the experience of women of color marks many of her works as important pieces for thinking through social, racial, and sexist injustices that are essential parts of the disciplines of anthropology, gender studies, critical race studies, and STS, as well as others. Her work allows us to understand the human condition in a light that may deviate from the standard classic works of science fiction. Yaszek writes, "[b]y continuing to recover the history of women's science fiction in all of its diversity, and by continuing to talk about it amongst ourselves and with our colleagues from other fields of inquiry, we can make important strides toward the larger feminist effort to remember those women that history doesn't see" (Yaszek 2005, 288). Butler's *Lilith's Brood* trilogy—*Dawn* (1987), *Adulthood Rites* (1988), and *Imago* (1989)—and Nalo Hopkinson's *Midnight Robber* (2000) are additional Afrofuturist works that explore changing reproductive technologies and roles in the lives of women of color.

As illustrated above, race is deeply intertwined with imagined possibilities of advancements in reproductive technologies. The 2017 blockbuster *Guardians of the Galaxy Vol. 2* featured antagonists who genetically engineered themselves to be perfect specimens, each having been born out of "birthing pods." Significantly, their golden skin marked them immediately as alien, though the rest of their physiology remained human. As adversaries, they were no match for the protagonists, assumedly "naturally-born" characters, and became comic parodies. This implicated

concern over clashes between those born through the use of reproductive technologies versus their biological, *naturally* born counterparts is also evident in the 1997 science fictional drama *Gattaca*. *Gattaca* centers on a *Brave New World*-inspired future society in which social, economic, and political success is solely available to individuals who have been genetically engineered at conception. The integral take-away: a nearly all-white cast implicitly reveals whom these valued members of society *weren't*.

The film's emphasis on potential eugenic applications of selective-fetal development is founded on much older work as well, particularly a lecture by biologist J.D.S. Haldane entitled "Daedalus, or, Science and the Future" (1923). Haldane speculates about the future of scientists and the very nature of science itself through a fictional narrative. He traces the fictional genealogy of the implementation and advancement of ectogenesis in his (proposed) world, stating that the first ectogenetic child would be produced in 1951, after a series of trials on various animal species. Shortly thereafter, France would begin producing 60,000 children annually through the method. "[T]he news of [the] first success caused an unprecedented sensation throughout the entire world, for the birthrate was already less than the death rate in most civilised countries" (1923, paragraph 53). Haldane then adds the eugenic element to his speculation,

The small proportion of men and women who are selected as ancestors for the next generation are so undoubtedly superior to the average that the advance in each generation in any single respect, from the increased output of first-class music to the decreased convictions for theft, is very startling. Had it not been for ectogenesis there can be little doubt that civilisation would have collapsed within a measurable time owing to the *greater fertility of the less desirable members of the population in almost all countries*. (emphasis added, paragraph 54)

Conclusion: From Theater to Classroom

These examples barely scratch the surface of the multitude of ways science fiction has explored the ethics of advancing reproductive technologies. Many of the above examples raise significant topics for ethical conversations and can be paired with critical theoretical works already being discussed in anthropology classrooms. Increasingly, scholarly work in anthropology and STS is making use of science fiction. Feminist scholars such as Donna Haraway and Banu Subramaniam have used speculative fiction as a method of building theory. Beyond

Haraway's use of the metaphor of cyborg bodies (1991; 1991), her recent book *Staying with the Trouble* (2016) not only engages with Octavia Butler, but also makes use of Haraway's own fiction to imagine a world in which people make kin, not babies. Subramaniam employs well-known science fictional themes in many chapters of *Ghost Stories for Darwin*, including "Resistance is Futile! You Will be Assimilated: Gender and the Making of Scientists" (2014, 180). She also includes her own fiction, "Singing the Morning Blues: A Fictional Science" (70) to explore interdisciplinarity, as well as encounters between the researcher and the local. She writes, "I believe we need not only science fiction, but fictional sciences—imagining other configurations of knowledge making, reconstructing alternate inter- and a-disciplinary lenses, new conceptual practices, and more engaging plots and stories that are located in the interdisciplinary fissures of the sciences and the humanities" (72). Like Haraway and Subramaniam, we should embrace the ways science fiction is already entangled in critical theoretical and practical concepts.

Still, science fiction as a genre should be taken more seriously as a legitimate mode of understanding. Science fiction allows researchers the opportunity to see how people are interacting with and understanding complicated medical, scientific, and technological changes within their societies. Millions of people encounter these speculative works each year, and portrayals of the future do not flit through their minds unabsorbed. These encounters can lead to problematic understandings of what is known to be and what is possible in the future given these knowns. They can also allow for deeper understandings of complex social ramifications in the development and use of new technologies. We see how rigid theory may miss the lived experiences of those who are historically unimportant, non-valuable, marginal. The inclusion of science fiction in social science courses can both increase student understandings about the implications and complexities of the topics covered within the curriculum, and offer instructors a view of how these topics are being conveyed to broad audiences who do not typically engage with scientific, medical, or technological discussions beyond popular media. As Haraway says, "Science fact and speculative fabulation need each other, and both need speculative feminism" (2016, 3). Today's students are part of a body of future creators, artists, and great thinkers, disseminating knowledge out into the world. By using science fiction as a functional part of education, we open doors for better communication between academia and the wider population.

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