## THE CONSTRUCTION OF CYBORG BODIES:

### FACT, FANTASY AND THE CYBORG CONTINUUM

by

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#### ABSTRACT

This thesis explores the construction of cyborg bodies and the connections between cyborgs in science fiction and in the real world. Using the concept of the cyborg continuum to represent a range of technologies which integrate the artificial and the organic, this thesis contributes to a grounded liberatory feminist cyborg discourse that empowers us in relation to our increasingly technologized bodies, and that also promotes responsible social change. This research focuses on the connections between people who have artificial joints, their quality of life and daily experiences (i.e. total hip or knee replacements), and the artificially-intelligent cyborgs of science fiction. Common issues arising in both fact and fiction include power, control, and identity. Science fiction can be valuable in extrapolating these issues for the benefit of those who integrate increasingly more artificial parts into their bodies and the bodies of others. While the research participants in this thesis had no such crisis of identity or question of their humanity as the fictitious cyborgs faced, there are different reasons for creating cyborgs. Artificial joints are used to alleviate pain and improve mobility, whereas artificially-intelligent cyborgs are constructed to serve their creators. The connection is in the degree to which people can control what happens to their bodies and the argument that identification as "human" may derive from the

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recognition and respect for the range of possibilities and lived experience of others, which in turn, promotes social change.

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## DEDICATION

To my parents, Helle and Peter Fry

## INTRODUCTION

When I met Donna Haraway at a conference in Calgary, Alberta on September 19, 1997, I told her that her work had inspired me to write my Gender Studies MA thesis in the field of feminist cyborg theory.<sup>1</sup> She responded with great surprise and said "Oh, is there such a theory?" Yet her 1985 essay, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century,"<sup>2</sup> prompted my initial theoretical work in this area, together with my enduring love of science fiction, and the resulting realization that feminist political theory and science fiction could be integrated into academic work. In my research, I found that cyborgs are currently popular in certain academic circles and that the field is growing in text, at conferences, and on-line. While there has been some exploration of artificial body parts in cyborg theory, I decided to focus on the physical bodies that integrate artificial and organic parts and began to explore aspects of the construction of cyborg bodies in both fact and fiction.

Feminist cyborg theory has, typically, been preoccupied by the abstract postmodern possibility of cyborgs as liberatory symbols.<sup>3</sup> I

<sup>&</sup>lt;sup>1</sup> Feminism is a complex term with a wide variety of definitions, relationships, meanings, and applications. In this thesis, feminism is defined as "challenging the prevailing power structures and assumptions of androcentrism in science and society." (Shulamit Reinharz, *Feminist Methods in Social Research* (New York: Oxford University Press, 1992), 242)

<sup>&</sup>lt;sup>2</sup> Reprinted in Donna Haraway, *Simians, Cyborgs and Women: The Reinvention of Nature* (New York: Routledge, 1991), 149-181.

<sup>&</sup>lt;sup>3</sup> See Donna Haraway, *Primate Visions: Gender, Race and Nature in the World of Modern Science* (New York: Routledge, 1989); Haraway 1991; Donna Haraway,

propose a feminist cyborg theory that is grounded in people's actual experiences and benefits from the possibilities presented in science fiction. I am not trying to further theory for the sake of theory, but offer a version that can be used towards real social change, the kind that may intersect with the medical establishment, feminist theory, activism and research, and cultural studies. I do not mean to suggest that science fiction leads directly to real social change but that it can be used as an important tool in the pursuit of social change. Using the theoretical device of the cyborg continuum, my research investigates the integration of artificial parts into women's and men's organic bodies. I argue that integrating technology into our bodies is a positive reaction to the physical limitations imposed by biological part failures and physiological facts. I seek to contribute a grounded liberatory feminist cyborg discourse that empowers western people in relation to our increasingly technologized bodies, and that also promotes responsible social change.4

Modest\_Witness@Second\_Millenium. FemaleMan@\_Meets\_OncoMouse™: Feminism and Technoscience (New York: Routledge, 1997); Anne Balsamo, Technologies of the Gendered Body: Reading Cyborg Women (Durham: Duke University Press, 1996); and Susan Bordo, "'Material Girl': The Effacements of Postmodern Culture," in *The Female Body: Figures, Styles, Speculations.* ed. Laurence Goldstein (Ann Arbor: University of Michigan Press, 1993). <sup>4</sup> I do not mean to suggest a universal category of Women, which mistakenly essentializes all women regardless of class, race, ability, ethnicity or age. There is an enormous variety of issues that affect different groups of women in terms of health and quality-of-life. Securing power and control of our bodies is an on-going struggle for most women and I think that cyborg discourse represents a commonality or bridge, which may be the basis for contextual or temporary alliances between and among women.

The connections between organic and artificial body parts occur in many different combinations. Therefore in Chapter I of this thesis, I will provide several definitions of key terms that are both complex and are used in many different ways. I then look at the theoretical origins of cyborg bodies in feminist theory, from Donna Haraway to Teresa Ebert. This provides a basis for the subsequent chapters on artificial parts currently in use and on cyborgs in science fiction. In Chapter II, I will focus on total joint replacements: their form and development, surgical procedures, and the remaining physiological challenges. In Chapter III, I will explore the issue of power and control in relation to artificial body parts based on the interviews I have conducted with orthopedic surgeons, the medical care system, and other health professionals, and with people who have received hip or knee replacements, all of whom have varying opinions about where the power and control lie, as well as the gender implications of total joint replacement surgery. Where and how power is distributed is an important question in terms of both the future integration of artificial and organic body parts and gender. In Chapter IV, I will analyze the narratives in Marge Piercy's He, She and It (1991) and Amy Thomson's Virtual Girl (1993) to find: a) the location of power and control, and b) the identity implications for artificially intelligent cyborgs in terms of their humanity. In Chapter V, I will integrate and analyze the various elements that connect people with total hip and

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knee replacements with the cyborgs in the science fiction. These elements are connected with feminist cyborg discourse and the future direction of cyborg bodies, both in theory and in practice.

My research focuses in part on the connections between fact and fiction because all too often, fact is privileged over fiction and the insights of fiction are ignored in a social science context. Science fiction, in particular, investigates a wide variety of issues, concerns, scenarios, consequences, and situations which broaden the scope of imagined possibilities and enrich the discourse of cyborg bodies. In real life, the reasons for building cyborg bodies vary, but I have no doubt that the current medical trend is towards increasingly more artificial intervention into our bodies, and science fiction is a valuable tool for evaluating the physical, emotional, and psychological challenges, consequences, and implications of this trend. **CHAPTER I: CONSTRUCTING CYBORG BODIES** 

Like any important technology, a cyborg is simultaneously a myth and a tool, a representation and an instrument, a frozen moment and a motor of social and imaginative reality. A cyborg exists when two kinds of boundaries are simultaneously problematic: 1) that between animals (or other organisms) and humans, and 2) that between self-controlled, self-governing machines and organisms, especially humans.<sup>1</sup>

#### DEFINITIONS

There is no single definition of a **cyborg**. In 1960, Manfred Clynes coined the term 'cyborg' from 'cybernetic organism' to refer to "an artificially extended homeostatic control system functioning unconsciously," or more simply, to a self-regulating human-machine system.<sup>2</sup> The primary definition of a cyborg used in this thesis is "a person whose physiological functioning is aided by, or dependent on, a mechanical or electronic device."<sup>3</sup> Cyborgs can be seen as interconnected and interdependent networks that are made of assorted parts from many different places. Cyborgs can consist of seemingly endless combinations of organic and artificial parts. As such, they transgress traditional boundaries, and as such, like other feminist

<sup>&</sup>lt;sup>1</sup> Haraway, Simians, Cyborgs and Women, 138-39.

<sup>&</sup>lt;sup>2</sup> Anne Hudson Jones, "The Cyborg (R)evolution in Science Fiction," in *The Mechanical God: Machines in Science Fiction*. ed. Thomas P. Dunn and Aldiss Erlich (Westport: Greenwood Press, 1982), 203.

<sup>&</sup>lt;sup>3</sup> P.K. Jamison, "Contradictory Spaces: Pleasure and the Seduction of the Cyborg Discourse," *The Arachnet Electronic Journal on Virtual Culture* 2:1, 1994 [journal on-line]; available from

http://lydia.bradley.edu/las/soc/syl/391/papers/contra\_spaces.html; Internet; accessec 27 January 1996.

projects, they are conceived to deconstruct and demystify patriarchal or ruling relations.<sup>4</sup>

The field of **cybernetics** was founded by Norbert Weiner in the late 1940s. Cybernetics is the control and communication in the animal and the machine. It introduces the revolutionary notion of feedback control.<sup>5</sup> The implications, in engineering for example, were immediately obvious: "if all the variables are tightly coupled, and if you can truly manipulate one of them in all its freedoms, then you can indirectly control all of them."<sup>6</sup> In effect, cybernetics plays on the holistic nature of systems, the system of observing systems.<sup>7</sup> What happened to this developing field of cybernetics? According to Kevin Kelly,

[B]y the late 1970s, cybernetics had died of dry rot. Most of the work in cybernetics was at the level of...armchair attempts to weave a coherent big picture together. Real researchers were bumping their heads in frustration in AI labs, or working in obscure institutes in Russia, where cybernetics did continue as a branch of mathematics. I don't believe a single formal textbook on cybernetics was ever written in English.<sup>378</sup>

In this thesis, I will use the concept of the **cyborg continuum**, which consists of all of the possible cyborg combinations that replace, assist, enhance, augment and improve organic bodies through

<sup>&</sup>lt;sup>4</sup> Dorothy E. Smith, *The Everyday World As Problematic: A Feminist Sociology* (Toronto: University of Toronto Press, 1987).

 <sup>&</sup>lt;sup>5</sup> Kevin Kelly, Out of Control: The New Biology of Machines, Social Systems and the Economic World (New York: Addison-Wesley Publishing Company, 1994), 119.
 <sup>6</sup> Ibid., 120.

<sup>&</sup>lt;sup>7</sup> Ibid., 453.

mechanical and artificial interventions and implantations.<sup>9</sup> At one end of this continuum would be cyborgs with generally visible and removable parts, such as hearing aids, eyeglasses, mobility aids, and artificial limbs. Further along the continuum would be less visible cyborgs with less removable devices, such as implants and replacements (for instance, breast implants, joint replacements, and pacemakers). Assisted reproductive technologies, such as in-vitro fertilization and artificial insemination, and genetic engineering occupy other points along the cyborg continuum. Other cyborgs are as yet imaginary and fall within the domain of science fiction, such as those with artificial intelligence and cyborgs who are most familiar to us through television, films and novels. The most recognizable cyborg bodies are the Terminator (living tissue over a metal skeleton),<sup>10</sup> the Borg (mechanical enhancements onto an organic host for the purpose of assimilation into the Borg collective).<sup>11</sup> and the Six Million Dollar Man (replacing injured parts with super-strong bionic parts).<sup>12</sup>

<sup>&</sup>lt;sup>8</sup> Ibid., 454.

<sup>&</sup>lt;sup>9</sup> See Appendix 1 for a visual representation of the cyborg continuum and for examples of joint manufacturer's advertisements for total hip and knee replacement systems.

<sup>&</sup>lt;sup>10</sup> The Terminator, James Cameron, dir., (Los Angeles: Thorn EMI, 1984).

<sup>&</sup>lt;sup>11</sup> Star Trek: The Next Generation, Gene Roddenberry, executive prod., (Los Angeles: Paramount Pictures, 1987-1994).

<sup>&</sup>lt;sup>12</sup> This 1973 entry of the cyborg into popular culture was based on the book *Cyborg* by Marten Caidin. It was inspired by a US Air Force pilot who was in a plane crash, as well as the US cybernetics program (1970-1972), which was based on modifying humans (volunteers) to be superior in strength and speed. This was an unconfirmed cyborg program which experimented with crude bionics. (from "Brave New Body," *Future Fantastic: hosted by Gillian Anderson*, The Discovery Channel, 1996). There was also a spin-off show called "The Bionic Woman." The popular

Distinctions must be made between the integration of a dynamic steady-state machine/human entity (i.e. The Terminator), in contrast to the mechanical impetus of life (i.e. ARTs). This distinction between cyborg bodies and cyborg technologies is important because it indicates different points along the cyborg continuum. Examples of cyborg technologies include test-tube babies, life-support systems, organ retrieval units, and replacement surgery.<sup>13</sup> Test-tube babies are the product of cyborg technologies because they are produced by the manipulation of organic parts by artificial means. The organic and artificial are integrated differently but still blended to produce an organic human body.

In order to operate within a cyborg discourse, it is necessary to define 'discourse,' because it is, in itself, a problematic and complex term. **Discourse** is used "to signify the system of relations between parties engaged in communicative activity and...is meant to signal the inescapable political contexts in which we speak and work."<sup>14</sup> In other words, 'discourse' is an active communications system with

conceptualization of the cyborg is of a hyper-masculine muscle-bound villain (the exception being the Six Million Dollar Man). The machine and human elements are often at war both within the body and in relation to the rest of the world. Cyborgs have seldom occupied the role of the hero, although that has changed more recently with Arnold Schwarzenegger's role in *Terminator 2: Judgment Day* (1991) and Jean-Claude Van Damme's role in *Universal Soldier* (1992).

 <sup>&</sup>lt;sup>13</sup> Kathleen Woodward, "From Virtual Cyborgs to Biological Time Bombs: Technocriticism and the Material Body," in *Culture on the Brink: Ideologies of Technology*. ed. Gretchen Bender and Timothy Druckrey (Seattle: Bay Press, 1994), 54.

<sup>&</sup>lt;sup>14</sup> Patty Lather, *Getting Smart: Feminist Research and Pedagogy with/in the Postmodern* (New York: Routledge, 1991), vii.

rules, conventions, and signs that are laden with political meanings. Discourse is more than language because it is a specific set of signs that refer to a particular set of relations.

**Cyborg discourse** is the politicized active system designed to communicate the particular system of cyborgs. It is the discourse of hybridity, power and control, interventions and implantations, medical, legal and ethical implications, and relations of production. These relations are created through power dynamics, emerging technologies, and control mechanisms. Cyborg discourse is specialized and therefore applies to particular people. In this thesis, I am using cyborg discourse to connect the medical discourse of total hip and knee replacements with artificially intelligent cyborgs in science fiction.

One powerful connection between cyborgs in fact and fiction is with regard to power and control. **Power** is complex and dynamic. Max Weber defines power as "the probability that an individual or group will be able to carry out its will even against resistance."<sup>15</sup> Power is also defined as ideological practice, as having agency without reference or actual existence.<sup>16</sup>

<sup>&</sup>lt;sup>15</sup> Sandra Kirby and Kate McKenna, *Experience, Research, Social Change: Methods from the Margins* (Toronto: Garamond Press, 1989), 34.

<sup>&</sup>lt;sup>16</sup> Michel Foucault, *Power/Knowledge: Selected Interviews and Other Writings* 1972-1977, ed. Colin Gordon, trans. Colin Gordon, Leo Marshall, John Mepham, and Kate Soper (New York: Pantheon Books, 1972).

Dorothy Smith conceptualizes power, more useful for this thesis,

as

...arising as people's actual activities are coordinated to give the multiplied effects of cooperation...Its capacity to coordinate consciousness and to displace individuated experience arises, of course, as people participate actively in the socially organized practices accomplishing an objectified knowledge.<sup>17</sup>

In other words, power is the set of contextualized effects that develop from actual social activity which then transcend or graduate to the collective, never losing sight of the individual experience.

Power dynamics in the construction of cyborg bodies can be further clarified using the concept of ruling relations. **Ruling relations**, Dorothy Smith's concept, are "a complex of organizational practices, including government, law, business and financial management, professional organization, and educational institutions as well as the discourses in texts that interpenetrate the multiple sites of power." Ruling relations envisage "power, organization, direction and regulation as more pervasively structured than can be expressed in traditional concepts provided by the discourses of power."<sup>18</sup> "A mode of ruling has become dominant that involves a continual transcription of the local and particular actualities of our lives into abstracted and generalized forms."<sup>19</sup> Ruling relations are texts which are woven with

<sup>18</sup> Smith, The Everyday World As Problematic, 3.

<sup>19</sup> Ibid., 3.

<sup>&</sup>lt;sup>17</sup> Dorothy E. Smith, *The Conceptual Practices of Power: A Feminist Sociology of Knowledge* (Toronto: University of Toronto Press, 1990), 70.

power, gender, economic, technological, and social aspects that impact us in our daily existence. She argues that the world is constructed in texts (on paper or computer) that are capitalist and patriarchal. Although she does not mention or specifically include oral traditions and histories, the pervasive nature of 'relations of ruling' applies in orally-based cultures as well. Examples of ruling relations include "text-mediated discourse, professional management, formal organization, management, administration, bureaucracy, the state, at all levels and so forth."<sup>20</sup>

**Technology** is a nebulous and complex term.<sup>21</sup> Corlann Gee Bush argues that

[t]echnology has everything to do with who benefits and who suffers, whose opportunities increase and whose decrease, who creates and who accommodates. If women are to transform...technology, we must develop ways to assess the equity implications of technological development and develop strategies for changing social relationships as well as mechanical techniques. To do this, we must have a definition of technology that will allow us to focus on such questions of equity.<sup>22</sup>

Martin Heidigger tends to rely on the Greek root of technology and its various associations that bring-forth knowledge, challenge and reveal truth, and unlock and store energy. The danger is, according to Martin Heidigger, in the constantly escalating nature of technology to the

<sup>&</sup>lt;sup>20</sup> Heidi Gottfried, *Feminism and Social Change: Bridging Theory and* Practice (Chicago: University of Illinois Press, 1996), 47.

<sup>&</sup>lt;sup>21</sup> Frederick Ferré, *Philosophy of Technology* (Athens: University of Georgia Press, 1988), 26.

detriment of human control.<sup>23</sup> Sally M. Gearhart focuses on technology as a product of human animals and defines it as "the conscious and systematic manipulation of one's environment for the purpose of reducing one's dependence on environmental factors for survival."<sup>24</sup> Clearly, the relationships and applications of technology are crucial to understanding what technology is. Some feminists view technology "as an interdependent variable"<sup>25</sup> that interconnects with content, methodology, social context, determinism, and the nature of technology.<sup>26</sup> Corlann Gee Bush argues that the context of technology is crucial, whether the technology in question is operating in a design or developmental, user, environmental, or cultural context.<sup>27</sup>

Ursula Franklin defines technology as "the totality of the operational knowledge, the practices, procedures and devices used to accomplish certain tasks in society,"<sup>28</sup> while techniques are the "collection of means for achieving something [or] preventing

<sup>&</sup>lt;sup>22</sup> Corlann Gee Bush, "Women and the Assessment of Technology: to Think, to Be; to Unthink, to Free," in *Machina Ex Dea: Feminist Perspectives on Technology*, ed. Joan Rothschild (New York: Pergamon Press, 1983), 163.

<sup>&</sup>lt;sup>23</sup> Martin Heidigger, *The Question of Technology, and Other Essays*, trans. and introduction by William Lovitt (New York: Harper and Row, Publishers, 1977), 13-16.

<sup>&</sup>lt;sup>24</sup> Sally M. Gearhart, "An End to Technology: A Modest Proposal," in *Machina Ex Dea*, 171.

<sup>&</sup>lt;sup>25</sup> Joan Rothschild, "Introduction: Why Machina Ex Dea?," in *Machina Ex Dea*, xxiv.

<sup>&</sup>lt;sup>26</sup> Ibid., xxv.

<sup>&</sup>lt;sup>27</sup> Bush, Machina Ex Dea, 157.

<sup>&</sup>lt;sup>28</sup> Ursula Franklin, *The Real World of Technology* (Concord: House of Anansi Press Ltd., 1990), 3.

something else from happening."<sup>29</sup> She argues that technology has its own values and standards: efficiency, speed and reproducibility. In fact, Ursula Franklin explicitly sets out the difference between what she sees as "the technological order" and the "women's world." She ascribes characteristics such efficiency, predictability. as scheduleability, specificity, non-randomness, non-contextual, nonreferential, interchangeability of actors, plannability, and dependability on hierarchy to the "technological order." In supposed opposition, is the "women's world," which has flexibility, integratability, unpredictability, continuity, improvisability, spontaneity, randomness, diversity, contextual, experiential.<sup>30</sup> Using this system of categorization as an accurate guide for distinguishing between the technological and the female world is misleading, increasingly unrealistic, and does not offer any possibility for change. Ursula Franklin's evaluation is evidence of previous feminist reaction to an older type of Western technology, a stance that I argue is increasingly untenable as biological and engineered systems look increasingly alike. This reality does not facilitate absolutes in distinguishing between the two systems outlined by Ursula Franklin. Anne-Jorunn Berg argues that feminists have regarded technology as a finished and

<sup>&</sup>lt;sup>29</sup> Franklin, The Real World, 3.

<sup>&</sup>lt;sup>30</sup> Ibid., 6.

non-negotiable product.<sup>31</sup> Therefore, the tendency has been to study the harmful social impacts of new technologies on gender relations or on women.<sup>32</sup> She wants to shift the focus from a producer's immutable commodity to a user's point-of-view. She is not contesting that technology is basically male-produced for capitalist and patriarchal interests, but she wants to map a way out of feminism's predominant pessimism by looking at technology's flexibility. For her, users of technology do not merely adopt technology but help to shape and construct it, through capitalist interactions (i.e. consumerism), and incorporate it into our daily lives by negotiating technological applications. "By substituting an emphasis on cultural integration of technologies for one on utilitarian values, and by substituting a view of technology as in process for one in which it is seen as non-negotiable, we can overcome...the pessimism that pervades feminist technology studies."<sup>33</sup> She stresses women's relationship with technology as an inter-relationship of process, relation and negotiation. "The argument that women's relationship to technology is a contradictory one, combined with the realization that technology is itself a social construct, opens up fresh possibility for feminist scholarship and

<sup>&</sup>lt;sup>31</sup> Anne-Jorunn Berg, "Technological Flexibility: Bringing gender into technology (or was it the other way around?)," in *Bringing Technology Home: Gender and Technology in a Changing Europe*, eds. Cynthia Cockburn and Ruza Fürst (Philadelphia: Open University Press, 1994), 95.

 <sup>&</sup>lt;sup>32</sup> For an excellent review of feminist literature on gender and technology, see Judy Wajcman, *Feminism Confronts Technology* (Cambridge: Polity Press, 1991).
 <sup>33</sup> Berg, *Technological Flexibility*, 108.

action.<sup>334</sup> Both Judy Wajcman and Anne-Jorunn Berg are appropriating technology for feminist applications because we cannot always be reacting to the fallacy of a monolithic, imposed-from-above agenda. A pro-active approach, while cautious and well-informed, can lead to social change and transformation.

Once technology is seen as a process instead of an alreadymade 'thing', the user of technology is no longer its passive recipient but can come into view as an important actor in its shaping. Intentions baked into technology may restrict the flexibility of a given artifact, but they cannot altogether determine its use or meaning. Intentions can enable or inhibit actions or the range of possible actions...But the user negotiates these structures in different ways through human agency and creativity, and the outcome can be a subversion of intentions.<sup>35</sup>

In this thesis, my focus is on the applications of particular technologies from a user-standpoint. I agree that technology is a combination of socially-constructed 'things' and social process which is shaped but not determined by intentions and applications. It is important to recognize, however, the capitalist character of technology because it is connected to economy, capitalism, and labour. Capitalist technology is "designed not simply according to engineering priorities but in keeping with social values," which are driven by market demands and profit, and not human needs.<sup>36</sup> As capitalist technology is not immune to individual and market manipulations and pressures, I argue that

<sup>&</sup>lt;sup>34</sup> Wajcman, Feminism Confronts Technology, x.

<sup>&</sup>lt;sup>35</sup> Berg, Technological Flexibility, 96.

<sup>&</sup>lt;sup>36</sup> Teresa L. Ebert, Ludic Feminism And After: Postmodernism, Desire, and Labor in Late Capitalism (Ann Arbor: The University of Michigan Press, 1996), 107.

while we should never forget the capitalist and patriarchal origins and intent of technology connected to the relations of production, it would be a mistake to treat technology as determined, essential, monolithic, or immutable. Our goal is actual social change and emancipation, a ,call "for a balance of nature; an end to social domination, whether of sex, race, or class; the breakdown of hierarchies; and a society based on principles of equity--values that feminists seek to implement for technological scholarship and technology itself."<sup>37</sup> I believe that feminist cyborg discourse can offer a particular perspective on these things.

In the late twentieth century, the development of synthetic complex systems and emerging technologies has been increasingly modeled on biological systems. Kevin Kelly believes that biology will always prevail:

...the flavour of the next epoch is neo-biological rather than bionic, because although it may start symmetrically, biology always wins in any blending of organic and machine. Biology always wins because the organic is not a sacred stance. It is not a holy status that living entities inherit by some mystical means. Biology is an inevitability -- almost a mathematical certainty -that all complexity will drift towards. It is an omega point. In the slow mingling of the made and the born, the organic is a dominant trait, while the mechanic is recessive. In the end, bio-logic always wins.<sup>38</sup>

<sup>&</sup>lt;sup>37</sup> Rothschild, Machina Ex Dea, 150.

<sup>&</sup>lt;sup>38</sup> Kelly, Out of Control, 183.

The inevitability of biology is an interesting argument, in response perhaps to those who are significantly more cautious, if not suspicious, of the evolving trend towards life-like machines, engineered life, and cyborgs.

In this thesis, I will use Kevin Kelly's definition of **life** as having patterns in space and time, ability to self-reproduce, information storage of its self-representation (genes), metabolism to keep a persisting pattern, functional interactions, the interdependence of parts, or the ability to die, stability under perturbations, and the ability to evolve.<sup>39</sup> Computer viruses are the first example of emergent artificial life by this definition of life. Thus, according to Kevin Kelly, life "is a verb, not a noun."<sup>40</sup>

But what is **human**? According to the Oxford English Dictionary, 'human' denotes certain forms, characteristics and qualities, all of which are decidedly vague. One definition of 'human' is "[o]f, belonging to, or characteristic of mankind [sic], distinguished from animals by superior mental development, power of articulate speech, and upright posture."<sup>41</sup> Another useful definition regards 'human' as "belonging or relative to humans, relating or characteristic of activities, relationships, etc., which are observable in mankind [sic], as distinguished from a) the lower animals; b) machinery or the

<sup>&</sup>lt;sup>39</sup> Ibid., 346.

<sup>40</sup> Ibid., 347.

mechanical element; c) mere objects or events."<sup>42</sup> In a discussion of the humanity of cyborgs, the question of their own humanity may not be problematic to those who have total hip or knee replacement systems. They have no crisis of identity over their humanity and the issue is never raised for them. By contrast, the cyborgs in Marge Piercy's *He, She and It* and Amy Thomson's *Virtual Girl* struggle for recognition of their humanity, individuality and identity, which is often in conflict with their creators' agendas.

#### THEORETICAL DEBTS

Donna Haraway argues that science and science fiction have conceptualized the cyborg as a product of Western traditions of humanism and enlightenment ideals.<sup>43</sup> The figure of the cyborg becomes the hope after the apocalypse, foretold by the innocent origin, the fall out of Nature and then rising from the ashes of the apocalypse like the Phoenix.<sup>44</sup> The apocalypse is destructive but also cleansing and renewing, much like a rebirth after decadence and decay. Humans may not be equipped to survive the apocalypse without some improvements to our bodies in the harsh new surroundings. Cyborgs

<sup>&</sup>lt;sup>41</sup> The Oxford English Dictionary (1989), 2d. ed., s.v. "Human."

<sup>42</sup> Ibid.

<sup>&</sup>lt;sup>43</sup> Haraway, Simians, Cyborgs and Women.

<sup>&</sup>lt;sup>44</sup> This origin story has roots in the Book of Genesis (New Testament), with the creation of Adam and Eve in the Garden of Eden. Their Fall from Grace and expulsion from the Garden occurred because they ate the forbidden fruit of knowledge, which destroyed their innocence. The apocalypse includes the events that lead up to the ultimate battle between God and the Devil (Book of Revelations, New Testament). Donna Haraway does not cite specific biblical sources but makes

replacing Adam and Eve in a post-apocalyptic can be seen as environment, for the survival and continuation of the human species in an altered form. In other words, the development of cyborgs is closely linked to saving the human race from (self)destruction. Cyborgs will protect us from external threats and even from a self-induced apocalypse. In situating cyborgs as the hope for the future, Donna Haraway points out the irony of the cyborg's position. Even as they are intended to 'save' us and secure our future by their ability to adapt to the post-apocalyptic environment, cyborgs also embody the many contradictions that are firmly established in us, their creators. Cyborgs unintentionally undermine their creators' intentions by blurring traditional boundaries and transgressing humanist dualisms, on which our post-industrial society is based. As seen in terms of western binary oppositions, cyborgs are both human and machine, organic and artificial, self and other, whereas our western Aristotelian philosophy clings to either/or boundaries. Can cyborgs transcend the humanist Judeo-Christian legacy? Can the creation escape the limitations of the creator if cyborgs "are still undeniably the dream-children of a positivist, rationalist American technology built by middle-class men

frequent reference to the apocalypse (for example: Haraway, Simians, Cyborgs and Women, 151 and 175).

of the previous two centuries."<sup>45</sup> Who are these cyborgs? I argue that we are cyborgs, 'they' are 'us,' and that we (re)create ourselves.

Given the humanist legacy of cyborgs, Donna Haraway argues that "[c]yborg writing is about the power to survive, not...on the basis of original innocence, but on the basis of seizing the tools to mark the world that marked them as other."46 She plays with notions of 'truth' and 'fiction,' constructing politics and truth as fiction, arguing "for pleasure in the confusion of [established] boundaries and for responsibility in their construction.<sup>347</sup> For her, cyborg theory disrupts the humanist quest for origins, as no longer applicable or relevant, and she intends the cyborg to interrupt, undermine and obliterate the conceptual prison of salvation history. If 'humanism' was the conceptual lens through which cyborgs have traditionally been framed, then, according to Mary Catherine Harper, "Haraway's cyborg is a self-declared deconstructor of humanism." <sup>48</sup> What does the cyborg look like without the conceptual framework of humanism? Scott Bukatman points out that for cyborgs, the integration of the organic

<sup>&</sup>lt;sup>45</sup> N. Katherine Hayles, "The Life Cycle of Cyborgs: Writing the Posthuman," *Science Fiction Studies* 22:67 (1995): 405.

<sup>&</sup>lt;sup>46</sup> Haraway, Simians, Cyborgs and Women, 175.

<sup>47</sup> Ibid., 150.

<sup>&</sup>lt;sup>48</sup> Mary Catherine Harper, "Incurably Alien Other: A Case for Feminist Cyborg Writers," *Science Fiction Studies* 22: 67 (1991): 403-4.

and the artificial is permanent and irreversible. "There is no going back. That's a game for those who still have flesh."<sup>49</sup>

I must point out that Donna Haraway, Scott Bukatman, and many science fiction writers, are firmly focused on cyborg bodies of the faraway future and not on people with total joint replacements. There - will be a considerable period of time required for research and development, during which many experiments and attempts at integrating artificial and organic body parts will fail. The replaced parts will likely fail because it is experimental surgery, always in process, and therefore it is just a matter of time for artificial parts to fail, break down, or wear out (which is dependent on many variables, including type of materials, sterilization, surgical technique and condition of the patient). These failures will motivate renewed efforts and undetermined time will pass before the cyborgs the creators envision might exist. I argue that while we are not even close to their vision, it is certainly imaginable, and my research suggests that we are moving in that direction.

In an intellectual game, Donna Haraway re-reads and re-interprets technology to spin a cyborg myth that transcends a pessimistic view of technology. The problem, according to Teresa Ebert, is that Donna Haraway does not ground her cyborg theory in historical materiality.

<sup>&</sup>lt;sup>49</sup> Scott Bukatman, "Postcards From the Posthuman Solar System," *Science Fiction Studies* 18:55 (1991): 346.

What are Donna Haraway's goals then? What is her purpose? Teresa Ebert argues that Donna Haraway's aim is "semiotic freedom," which is a diversion from effecting actual social change. By replacing the economic with the technocultural and the sociocultural, Donna Haraway severs technology from the relations of production that produces it. Technology becomes the abstracted ground of all other social, cultural and economic realities.<sup>50</sup> Donna Haraway "embraces" the postindustrial society, which replaces capital and labour (industrial society) with information and knowledge (postindustrial society).<sup>51</sup> She seeks to displace revolution with reform and transformation with subversion.<sup>52</sup> Donna Haraway's reform comes from coalition, which is based "on a mutual understanding of a postmodern identity of otherness, difference and specificity.<sup>53</sup> But when cyborgs inhabit 'us' and 'them' in the same space, does not her concept of coalition through otherness simply *perpetuate* the binary opposition of 'us' and 'them'? 'Self' and 'other' are connected, they are the same through the relations of production. On the basis of self-interest, which is the product of the academic class privilege, 'self' and 'other' are maintained, and there is no social change that emerges from theory

- <sup>52</sup> Ebert, Ludic Feminism, 108.
- <sup>53</sup> Ibid., 109.

<sup>&</sup>lt;sup>50</sup> Ebert, Ludic Feminism, 107.

<sup>&</sup>lt;sup>51</sup> See neoconservative Daniel Bell, *The Coming of Postindustrial Society* (New York: Basic Books, 1973), a rejection of Marxism and dismissal of capital and labour as defining characteristics.

which cannot connect with lived experiences.<sup>54</sup> Coalition should be based on the shared commitment to end exploitation and to effect social change.

Is Haraway describing new realities for us? Certainly she describes some important changes in the social and cultural relations of contemporary society, but whether there are, as she claims, "fundamental transformations in the structure of the world" (1991, 165) is highly debatable. What is at stake is whether these changes constitute fundamental transformations in the structure of capitalism. By subsuming the economic to the technological and then arguing for extensive social changes stemming from technology, Haraway misreads diverse social and cultural--that is, superstructural--developments as basic changes in the relations of production and the exploitation of labour...<sup>55</sup>

Teresa Ebert criticizes Donna Haraway for speaking of economy in terms of superstructure and adjectives, and that "her richly detailed descriptions do more to obscure than to explain the existing economic realities of women."<sup>56</sup> Donna Haraway's cyborg politics, her origin story of 'salvation,' must be only abstracted theoretical mythology if it cannot take into account the economic realities of women (such as poverty) and seek social change in a grounded version of feminist cyborg theory.

What if 'salvation' is replaced by other goals, such as immortality, longevity, quality of life issues, short-term physical or health improvements, or aesthetics? If we reject the cyborg as the means of

- 54 Ibid., 119.
- 55 Ibid., 110.
- <sup>56</sup> Ibid., 116.

our salvation, what other interpretation can we give to the increasingly pervasive trend of technological interventions into our bodies? New technology and its various applications seem to influence our daily lives at an accelerated rate. Biology appears increasingly connected to engineering as the boundaries between human and machine blur and the dichotomy of human/machine breaks down as the differences between the two are increasingly minute. As worn-out or damaged body parts are replaced with metal and plastic, the body consists of parts that will decompose organically and parts whose decomposition will likely take centuries. In the future, our bodies will become hybrids with metal and flesh, polyethylene surrounded by blood.

#### METHODOLOGY

In my research, I used a feminist multi-method approach, a combination of interviews and content analysis. Such an approach means a commitment to understanding critical, contextual, and complex issues in women's lives. Multiple methods involve asking questions, treating truth as a process, and remaining flexible and adaptable. "This approach is humble since 'findings' are housed in the project's specific features, rather than claimed as disembodied truth."<sup>57</sup> The results of a multi-methods approach to research illuminate previously unexamined or misunderstood experiences, based on a new, rich and different interpretation of the data.

Feminists choose multiple methods for technical reasons, similar to mainstream researchers, and for particular feminist concerns that reflect intellectual, emotional, and political commitments. Feminist descriptions of multimethod research express the commitment to thoroughness, the desire to be open-ended, and to take risks. Multiple methods enable feminist researchers to link past and present, "data gathering" and action, and individual behavior with social frameworks.<sup>58</sup>

The issues arising from this approach are all related to power and control, which are at the core of both emerging technologies (i.e. total joint replacements) and building complete cyborg bodies (i.e. in science fiction).

Since defining cyborg bodies as those who are hybrids of organic and artificial components, I have chosen to look at a particular group of people who have undergone surgery for total hip or knee replacements. My research participants do not regard themselves as cyborgs, the issue was not included or brought up in the interviews, and most of them had never heard of the concept of cyborgs. One of my main goals was to discover how they felt about having artificial body parts. Prior to the interviews, all of the participants signed a consent form that guarantees their anonymity and right to confidentiality. Therefore, I am using a code to designate the source of information secured through the interviews. The code refers to the research participants as follows: P1 to P7 designates those participants who underwent either total hip or knee replacement surgery. S1 to S4

<sup>&</sup>lt;sup>57</sup> Reinharz, Feminist Methods, 212.

refers to the four surgeons that I interviewed, and H1 to H4 applies to the other four health professionals who participated in my research.

Shulamit Reinharz suggests that the researcher and her research process should be visible in both the interview and in the final analysis. Interviewing methods are more closely linked to the lives and issues concerning living, tangible women and men than content analysis. They involve more action and practice than content analysis which is based primarily on written texts. Theory must be grounded in practice in order to identify patterns, issues, and problems to effect change.<sup>59</sup> Social change may be facilitated by a feminist research approach, which may be defined as a way to produce "knowledge through ... interactive relationships ... [where] the everyday life experience and feelings of participants are a major source of knowledge."60 Interviews can be seen as collaborative ventures, a means of collecting data directly from people by asking them questions about their experiences. Content analysis entails the examination of cultural documents but little meaning can be derived, outside of an academic context, if the subsequent analysis cannot contribute to change in the world at large.<sup>61</sup>

<sup>&</sup>lt;sup>58</sup> Ibid., 197.

<sup>&</sup>lt;sup>59</sup> For grounded theory in qualitative methods research, see Barney G. Glaser and Anselm Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research* (Chicago: Aldine Press, 1967). The application of grounded theory for feminist research is well-articulated in Kirby and McKenna, *Experience*, 1989. <sup>60</sup> Reinharz, *Feminist Methods*, 182.

<sup>61</sup> Ibid., 197.

In Chapter IV, I utilize content analysis to examine the issues within the narratives of He, She and It and Virtual Girl in the construction of cyborg bodies. According to Shulamit Reinharz, there is no terminological consensus for content analysis. One general definition is the study of "a set of objects [or events by] interpreting the themes contained in them."62 These themes include analyzing the plot, the concepts of identity, power and control in the text in relation to cyborg bodies, and the discourse employed in the construction of cyborg bodies. It is an approach that studies underlying themes and stereotypes and "addresses questions of theory, such as identifying the processes through which gender is constructed."63 In this thesis, I use content analysis to explore the themes of identity, power, and control. Content analysis is both interdisciplinary and transdisciplinary, but it needs to be grounded in other methods, as well as in theory and in practice, in order to effect change (direct or delayed), which is the goal of feminist research.

<sup>&</sup>lt;sup>62</sup> Ibid., 146.
<sup>63</sup> Ibid., 160.
# CHAPTER II: ARTIFICIAL PARTS: SOME ASSEMBLY REQUIRED

#### METHODOLOGY OF HIP AND KNEE REPLACEMENTS

I don't know that we're ever going to end up with a total bionic person who has everything, everything replaced, but I think generally, for patients comfort, that we may be seeing more and more of it, as people get older and are staying mobile into their 80s and 90s, we will see more of this kind of surgery.<sup>1</sup>

I chose total hip and knee replacements as the focus for my exploration of issues in the construction of cyborg bodies because replacement surgery lends itself to a gendered analysis, although the evaluation of breast implants and assisted reproductive technologies [ART] may seem to be more obvious points of the cyborg continuum for a feminist analysis. There is already an abundance of information, such as testimonies and recorded experiences, in the fields of breast implants and ART, but there are few recorded experiences of people who have joint replacements.<sup>2</sup> Living and working in Prince George, a relatively small northern city, it was easier to find interview participants of both genders who have had hip and knee replacements, than women with breast implants. Moreover, the variety of interviews I was able to conduct allowed me to do a gendered analysis.

<sup>&</sup>lt;sup>1</sup> Interview with H2, 17 April 1997.

<sup>&</sup>lt;sup>2</sup> For more information on breast implants, see Susan M. Love (with Karen Lindsey), Dr. Susan Love's Breast Book, 2d. ed. (New York: Addison-Wesley Publishing Company, 1995); Barbara Nettles-Carlson, "Problems of the Breast," in Women's Health Care: A Comprehensive Handbook, ed. Catherine Ingram Fogel and Nancy Fugate Woods (London: SAGE Publications, 1995); and Fabienne Darling-Wolf, "Mixed Messages: how the media went wrong on the breast implant story," Herizons 10:3 (Summer 1996), 15-17. For more information on ARTs, see "Proceed with Care: Final Report of the Royal Commission on New Reproductive Technologies -Volumes I and II" (Ottawa: Minister of Government Services Canada, 1993).

I have chosen to look at degenerative and congenital reasons for surgery in order to narrow my focus to a specific group of research participants. I conducted semi-structured, open-ended interviews based on the principles outlined by Shulamit Reinharz, in <u>Feminist</u> <u>Methods in Social Research</u> (1992). For her, meaning emerges through interaction, and one of the main ideas is to uncover "previously neglected or misunderstood worlds of experience."<sup>3</sup> With the predominance of medical discourses, it is important for people's voices to be heard with regard to their health and well-being, in this case, around the integration of artificial body parts.

## JOINT REPLACEMENTS

They tell you that it is experimental surgery, and they don't really know how long you're going to have a good hip for, so it's a bit of a gamble when you go in there, but if you want to be able to walk, of course, then really there's not a lot of choices open to you ... Oh well, it's human experimentation, in the first place, right? ... I mean we haven't got beyond that. Seven years ago, I was told, we've been doing these for twentyfive years, but we still don't have enough longitudinal studies and enough information to tell you what you're going to be like, you're young, you're obviously going to have more of these, but we can't tell you how many, and we can't tell you how long ... I was told then, we hope fifteen to twenty years, but we don't know. Well, in my case, it was 7 years, I didn't expect it to loosen up but OK, and that's the way it goes. If this one lasts longer that the last one, I'll be really pleased, but again you don't know,

<sup>&</sup>lt;sup>3</sup> Reinharz, Feminist Methods, 45.

it's an unknown quantity ... You carry on with life and when it happens, it happens, so there's a bit of uncertainty in that respect, but given, I don't think I would've been upright and walking since 1989 if I hadn't have had a joint replacement.<sup>4</sup>

In order to understand the reasons for total joint replacement surgery, an elementary grasp of joint physiology is essential. "Joints are articulations where bones are joined to one another, or where two surfaces of bones come together. Joints help hold the bones firmly together while permitting movement between them. Joints may be classified by the type of material between the bones and by their degree of movement."<sup>5</sup> Joint replacement surgery is performed to alleviate pain, improve mobility, correct deformity.<sup>6</sup> Total joint replacement is indicated in people with painful and disabling arthritis in a joint that isn't responsive to nonsurgical treatment, such as exercise and/or medication.<sup>7</sup> The reasons may be due to degenerative disease, sports injuries, and congenital conditions to which everyone is vulnerable. People live with a great deal of pain prior to going in for total joint replacement surgery, mostly because of a huge demand for such surgery, which creates long waiting lists. One surgeon said: "...we have a tremendous waiting list, of patients that need this surgery, that

<sup>&</sup>lt;sup>4</sup> Interview with P2, 18 March 1997.

<sup>&</sup>lt;sup>5</sup> Leona Mourad, Orthopedic Disorders (St. Louis: Mosby-Year Book, Inc., 1991), 14.

<sup>&</sup>lt;sup>6</sup> Robert E. Tooms and James W. Harkess, "Arthroplasty: Introduction and Overview," in *Campbell's Operative Orthopaedics*, 8th ed., ed. A.H. Crenshaw (St. Louis: Mosby-Year Book Inc., 1992), 372.

<sup>&</sup>lt;sup>7</sup> Tooms and Harkess, Arthroplasty: Introduction, 372.

would benefit from it but we can't, we get one day a week in the operating room, which at times has been cut down less that that because of our budget this year, and beds are being closed and that sort of thing...<sup>78</sup> A health professional commented that "[u]sually they're on quite a long waiting list prior to their surgery, so they've had decreased strength and decreased range of motion and decreased mobility as a result of their problem prior to the surgery.<sup>99</sup> This situation occurs in large cities as well as in smaller places and regional hospitals (i.e. Prince George Regional Hospital), but the waiting periods tend to be longer outside of the large urban areas.

There are 127 kinds of arthritis currently known, causing pain and stiffness in and around the joints. Most types affect both women and men, a few affect mostly men and one affects mostly women -- synovitis, the inflammation of the joint membrane, commonly resulting in rheumatoid arthritis. Another common kind of arthritis, that affects both genders is osteoarthritis or cartilage degeneration, where the cartilage facing the joints breaks down with age and the bone ends may come into contact with each other causing pain.<sup>10</sup> Rheumatoid arthritis and osteoarthritis are the most common causes of

<sup>&</sup>lt;sup>8</sup> Interview with S4, 15 April 1997.

<sup>&</sup>lt;sup>9</sup> Interview with H3, 26 May 1997.

<sup>&</sup>lt;sup>10</sup> James F. Fries, Arthritis: A Comprehensive Guide to Understanding Your Arthritis, 3d. ed. (New York: Addison-Wesley Publishing Company, 1990), 9-11.

total joint replacement surgery, and were the causes of the joint replacement surgery experienced by the participants in my research.

## TOTAL HIP REPLACEMENTS

The hip joint is a ball and socket type of joint which provides free movement in all directions. The ball is the top of the thigh bone and it fits into the socket of the pelvic bone. Both of these bone ends are normally covered by cartilage which ensures smooth and painless motion.



## -Total Hip Replacement Owner's Manual, 4

The hip was the first joint to be "replaced". The first documented efforts to relieve pain through the introduction of artificial materials into a hip was in 1912 with the use of gold foil. Results were unpredictable and residual stiffness and pain were the primary causes of failure. In 1923, 'molded arthroplasty' was attempted using glass.<sup>11</sup> While all the implanted glass molds "broke within a few months, the initial results were encouraging and prompted a search for more durable materials."<sup>12</sup> Some of the materials tested included pyrex, celluloid and Bakelite, but these were all discarded due to fragility or severe foreign body reaction. The development of Vitallium in 1937 marked the first sufficiently durable material for hip implants. Basic designs for hip replacement systems were debated and tested and discarded from 1940 to 1960.

The modern era of total joint replacement arthroplasty began in the 1960s with the development by Sir John Charnley of a total hip replacement arthroplasty consisting of a stemmed stainless steel replacement for the femoral head articulating with a high density polyethylene acetabular implant, both components being securely fixed to the underlying bone by polymethylmethacrylate cement.<sup>13</sup>

This is the now-classic design for hip replacement systems, the building block for further research to find even more durable materials, and more effective ways of sterilizing materials, and mixing the acrylic cement. The goals of research include the search for "optimal implant design, new materials with better wear and biomechanical bone compatibility properties, optimal fixation techniques, improved

<sup>&</sup>lt;sup>11</sup> Arthroplasty is defined as "the construction of an artificial joint." *The Oxford English Dictionary* (1989), 2d ed., s.v. "Arthroplasty."

<sup>&</sup>lt;sup>12</sup> James W. Harkess, "Arthroplasty of Hip," in *Campbell's Operative Orthopaedics*, 8th ed., ed. A.H. Crenshaw (St. Louis: Mosby-Year Book, 1992), 442.

<sup>&</sup>lt;sup>13</sup> Tooms and Harkess, Arthroplasty: Introduction, 371.

instrumentation, and ease of revision."<sup>14</sup> The four major causes of hip replacement failure are infection (for many reasons, including polyethylene particulate wear-debris), joint dislocation, loosening of the acetabular cup and femoral stem, and failure of the femoral stem. "Loosening has emerged as the major long-term problem."<sup>15</sup> Sir John Charnley began with stainless steel metal and Teflon components, which have been replaced by stronger alloys such as titaniumaluminum-vanadium and the popular cobalt-chromium. Teflon was abandoned because of poor wear characteristics.<sup>16</sup> Cobalt-chrome, on the other hand, is favoured because of its higher elasticity which may decrease the stress placed upon the hip joint.<sup>17</sup> Hip replacement designers are experimenting with platinum and diamond components.<sup>18</sup> There are current tests of "ceramic (aluminum oxide) femoral heads [with] with polyethylene acetabular components...because this material has excellent frictional and wear" initial results.<sup>19</sup> In the words of one of the orthopedic surgeons that I interviewed:

...the plastic lining of the hip socket and in the knee are made of high density polyethylene, and there have been some problems with how that plastic is produced and how it is sterilized. Sometimes that plastic can, end up with a sort of lamination effect from the way it is sterilized and that, the outer layer of it can actually break down and peel away ... With certain methods of preparing

<sup>&</sup>lt;sup>14</sup> Ibid., 372.

<sup>&</sup>lt;sup>15</sup> Harkess, Arthroplasty of Hip, 445.

<sup>&</sup>lt;sup>16</sup> Ibid., 453.

<sup>&</sup>lt;sup>17</sup> Ibid., 461.

<sup>&</sup>lt;sup>18</sup> Toronto Star. April 11, 1996: A4.

<sup>&</sup>lt;sup>19</sup> Tooms and Harkess, Arthroplasty: Introduction, 372.

it. So, what the companies are doing now are trying to come up with ways of preparing this plastic so that is will not break down. It's the fine particles, the wear particles that are generated from the everyday use of the joint ... [The wear particles are a concern] in that they seem to contribute to the loosening of the prosthesis, the body engulfs these microscopic particles of plastic or metal in cells that at the same time release some enzymes that dissolve some bone, and eventually loosen the prosthesis, so having less wear debris is one factor that is being worked on. Cement is improving, the type of metal used to make these prosthesis is improving, the way that the porous coating is bonded to the main metal part of the component needed for the femoral component or the acetabular component, or the femoral hip component if you're doing a completely uncemented hip. There has been some loosening of the interface between the porous coating and the main metal stem, and that's been a concern. Ceramic heads for the femoral components are a newer thing that are felt to generate less wear debris, again, it's a wear concept that we're working on, then there are loosening and fracturing of the cement around the femoral component of a hip replacement, and now, there's sort of a third generation way of preparing and inserting the cement. We mix it under a vacuum, we put it in a closed container with a hose going out to a suction system so that air is missing from the mixing chamber ... And so air bubbles don't form within the cement. The cement is then also centrifuged, we don't do that here, but the cement can be, we mix it under a vacuum but we don't centrifuge it, centrifuge means you put it in a container and you put it in a big spinner that then by gravity, causes the air bubbles to come out of it ... And then the third thing is by pressurizing the cement, as you are putting it into the femoral canal. We put a plug down at the bottom so the cement doesn't just keep going down and down ... So that we have something to push it against and that forces the cement out into the pores of the bone ... And it helps to anchor it better.<sup>20</sup>

<sup>&</sup>lt;sup>20</sup> Interview with S4, 15 April 1997.

Ultra-high molecular weight polyethylene was developed in 1971 for acetabular components as the removable liners on the articulating metal surface. Metal-on-metal was tried and rejected because of generations of metallic debris, which caused infection, pain and disability.<sup>21</sup> However, it is currently undergoing research again and given the improvement in materials and technique, metal-on-metal may prove a viable option. The future may include custom-made components, although current costs make that option prohibitive and therefore unlikely. As one of the orthopedic surgeons explained:

Well, I see probably change to different materials, such as ceramic and metal-on-metal, as our techniques get better and as we work with less problems. A long way in the future are things like custom-made components for each person. On x-ray, you'd determine the person's modulous elasticity of their bones and make a component out of carbon fiber that bends the way their bone does. That way you wouldn't get the modulous mismatches that we get now that can cause pain, that cause fractures and things like that. Companies are looking into that but it's probably far down the road, too expensive. And the other side of it is probably medical treatment for osteoarthritis, in which case we stop doing total hip replacements all together.<sup>22</sup>

Orthopedic surgeons have three surgical options for implanting total hip replacements: cemented, cementless, and hybrids. The cemented option means that both the femoral and acetabular components are cemented. Cementless surgery has both the femoral

<sup>&</sup>lt;sup>21</sup> Harkess, Arthroplasty of Hip, 467.

<sup>&</sup>lt;sup>22</sup> Interview with S3, 25 March 1997.

stem and acetabular cup with porous surfaces for bone to grow through in order to fix the components in place. Hybrid hip replacements cement the femoral stem and use a porous acetabular component.<sup>23</sup> The hybrid hip system seems to be the most popular model among orthopedic surgeons that I interviewed. I asked them which hip and knee systems they are currently using. The following is representative of what they said:

We are presently using the Wright medical technology ... for knees and we are trying a Zimmer hip system ... we are trialling the Zimmer hip. We have trialled the Wright hip, the De Pue hip and, also I think we're going to be looking at the Johnson & Johnson [hip], so we're still in the process of deciding what is the most beneficial system for us to use and it doesn't just involve which one we think is technically the best, it involves which company is able to give us the best support ... In terms of supplying the equipment we need, on a timely basis, and other factors such as if we have a certain hip system, then we also will have access to a new knee arthroplasty system or other instruments. They make a package deal ... To be quite honest, I think most of the top manufacturers' products are just as good as each other's.<sup>24</sup>

Total hip replacement is most often performed because of degenerative joint disease from osteoarthritis.<sup>25</sup> It is the most common orthopedic surgery, performed over 150,000 times per year in the United States.<sup>26</sup> In Canada, there were 25,878 total hip replacement

<sup>&</sup>lt;sup>23</sup> Harkess, Arthroplasty of Hip 463.

<sup>&</sup>lt;sup>24</sup> Interview with S4, 15 April 1997.

<sup>&</sup>lt;sup>25</sup> Leona A. Mourad and Millie M. Droste, *The Nursing Process in the Care of Adults with Orthopedic Conditions*, 3d. ed. (Albany: Delmar Publishing Inc., 1993), 377.

<sup>&</sup>lt;sup>26</sup> Trudy Sandler Goldstein, *Geriatric Orthopaedics: Rehabilitative Management of Common Problems* (Gaithersburg: Aspen Publishers Inc., 1991), 29.

surgeries performed between April 1988 and March 1990.<sup>27</sup> More recently, in 1992-1993, hip arthroplasty was done in 14,615 women and 8,023 men.<sup>28</sup>

## TOTAL KNEE REPLACEMENTS

The knee joint is a complex hinge joint that relies on strong muscles and ligaments for support and stability. It may bend and straighten but the side ligaments prevent any unwanted sideways movements. The weight-bearing areas are located between the femur, the tibia and the patella. The knee is not actually totally replaced as worn cartilage surfaces are the only parts that need to be replaced. Perhaps it might be better named a 're-surfacing knee replacement.'<sup>29</sup>

One surgeon commented:

...we sometimes don't even replace the knee cap,... [it] has been the weak link in the chain for knee replacement [systems], and if you don't need to replace it, they seem to have a longer lifetime when [you don't replace the knee cap] ... but if the knee cap is severely worn then it has to be replaced and you have to take your chances with that.<sup>30</sup>

Total knee replacement is performed mainly in response to pain due to osteoarthritis and rheumatoid arthritis.

<sup>&</sup>lt;sup>27</sup> Information obtained by a phone call to Statistics Canada on May 20, 1997 (1-800-263-1136).

<sup>&</sup>lt;sup>28</sup> Ibid.

<sup>&</sup>lt;sup>29</sup> Arthritis Society, The (BC & Yukon Division), *Your Knee Replacement Owner's Manual* (Vancouver: The Physiotherapy Department, Vancouver General Hospital, The Division of Reconstructive Surgery of the Department of Orthopaedics at the Vancouver General Hospital and the University of British Columbia, Revised January 1989), 2-3.

<sup>&</sup>lt;sup>30</sup> Interview with S4, 15 April 1997.

The knee prostheses consist of an upper metal femoral component, a lower metal and polyethylene tibial component, and a polyethylene button which is attached to the back of the patella to provide smooth movement among the knee parts. These parts are usually cemented together with polymethylmethacrylate. Cementless components "have a textured metal surface into which bone can grow to form a bonemetal locking bond."<sup>31</sup>



-Your Knee Replacement Owner's Manual, 2

I was thinking of a knuckle joint and the plastic that they stick right in, you know? ... But this looks like, the bottom, like the bottom of your leg comes up, you know, ... it was absolutely cut out square ... They used chisels and hammers and everything else to do it, to cut it absolutely square, there was a pad on each side. One squeezed around my [femoral] ball on the top ... And another one under my knee cap, when they put it back on.<sup>32</sup>

<sup>&</sup>lt;sup>31</sup> Arthritis Society, Your Knee Replacement Owner's Manual, 3.

<sup>&</sup>lt;sup>32</sup> Interview with P5, 25 March 1997.

Partial knee arthroplasty, using materials such as skin, muscle, fat and even a pig's bladder, was documented as early as 1861.<sup>33</sup> None of these efforts was highly successful. Different ideas continued to be tested in the 1920s and 1930s, but breakthroughs in knee prostheses were much slower to develop than in hips. The challenges included the replacement of both the tibial and femoral joint surfaces, to provide stability and to restore limb alignment.<sup>34</sup> Nineteen seventy-one was the beginning of the modern era of total knee arthroplasty, based on "the low-friction concept originated by Sir John Charnley for total hip arthroplasty and consisted of steel surfaces articulating with highdensity polyethylene surfaces, all components being cemented in bone by polymethylmethacrylate."<sup>35</sup> One participant recalled:

They have trays, oh I'm guessing they were about as big as a cookie sheet, maybe they were bigger, I was kinda woozy, but anyway, they had all these trays, it was just like a parts shop. They have, mine has three different, replacement parts, artificial, but they have a whole tray of knee caps and a whole tray for the top [part], anyway and these are all different shapes and sizes, you see. So, when they get the bone all ready, then they go and find the right part that fits your leg ... I found that very interesting, like it isn't just one size, it's just like buy and choose, you get one to fit your own, your own body, and I found that interesting, I thought gee, this is like going into a shop with all these spare parts sitting around [laughing]. Yeah, I liked that.<sup>36</sup>

<sup>&</sup>lt;sup>33</sup> The use of these materials is attributed to Verneuil in France (Robert E. Tooms,
"Arthroplasty of Ankle and Knee," in *Campbell's Operative Orthopaedics*, 8th ed., ed. A.H. Crenshaw (St. Louis: Mosby-Year Book, Inc., 1992), 390).

<sup>&</sup>lt;sup>34</sup> Ibid.

<sup>&</sup>lt;sup>35</sup> Ibid., 391.

<sup>&</sup>lt;sup>36</sup> Interview with P4, 24 March 1997.

With more knowledge of the biomechanics of the knee, different designs were tested and "the result of all these efforts has been a success rate in total knee arthroplasty that equals or exceeds that in total hip replacements."<sup>37</sup> Design criteria for knee replacement systems were initially elusive but "[i]t appears desirable to design components that allow a normal or nearly normal range of motion...[meaning] flexion and extension, adduction and abduction. and rotation."38 The knees are made of cobalt chrome. But I think the shapes have stayed pretty well the same. We haven't changed much there, I think the biggest advancements were in the cementing techniques."<sup>39</sup> In terms of materials for knee systems, a high-strength metal alloy such as cobalt-chromium is preferred to titanium alloys due to wear result comparisons for weight-bearing surfaces. Early studies "indicate that prosthetic wear may be much greater in knees than in hips. This could be expected for several reasons, including the fact that the knee is a much more complex joint biomechanically and is subject to a greater variety of stress-producing forces.<sup>40</sup>

The discourse of hip and knee replacements is full of medical terminology and medical models of ethics, appropriate care, and therapy. Medical language is not easily accessible and lack of

<sup>&</sup>lt;sup>37</sup> Tooms, Arthroplasty of Ankle and Knee, 391.

<sup>&</sup>lt;sup>38</sup> Ibid., 393.

<sup>&</sup>lt;sup>39</sup> Interview with S1, 14 March 1997.

<sup>&</sup>lt;sup>40</sup> Tooms, Arthroplasty of Ankle and Knee, 430.

understanding obscures and mystifies body functions and processes. It reinforces and perpetuates the idea that we are not experts of our own bodies. The medical discourse of inorganic parts is one part of cyborg discourse, one connection among many that make up our bodies. Cyborg bodies, therefore, are made up of partial connections to everything else such as other bodies, the environment, technology, power relations, and control mechanisms. Nothing is separate and complete. One can keep adding on in any direction, limited only by one's imagination and creativity. Practical considerations or constraints in the real world do include time, space, the availability and cost of resources, and the ability to function in the real world. New emerging technologies affecting hip and knee replacements are influenced by these same constraints. For example, ceramic acetabular heads have been possible for the past twenty years but were only just approved by the Canadian government because of the substantial and prohibitive costs involved.<sup>41</sup> There is only so much room inside the joint, only so much new hardware can be added. Research and development cost time and money which may limit access to design improvements, thereby excluding many people from the benefits of new technologies in the field of prosthetics.<sup>42</sup>

<sup>&</sup>lt;sup>41</sup> Personal communication with H1, 19 July 1997.

#### INTERFACE: PHYSIOLOGICAL CHALLENGES

No objects, spaces or bodies are sacred in themselves; any [biotic] component can be interfaced with any other if the proper standard, the proper code, can be constructed for processing signals in a common language.<sup>43</sup>

Perhaps my most serious concern with these technologies is the issue of safety. The medical establishment admits to a limited understanding of how our bodies work, function, heal, combat infection and disease, etc. Our collective medical knowledge has never been as detailed or complete as it is now and yet we still have a long way to go. There is great concern about the long-term effects of having metal and plastic parts implanted in our bodies. Ideally, organic and artificial parts would work in a harmonious balance, neither one harming the other. Research continues to seek the ideal artificial parts that our bodies will not reject. For now, we can only hope that the benefits achieved now are enough to improve the quality of life for the people who choose them.

In our Western, technological society, the view that compatibility problems will be solved in the integration of artificial parts into organic bodies is part of a myth of machine perfection.<sup>44</sup> Yet a cursory

 <sup>&</sup>lt;sup>42</sup> See Appendix I for examples of hip and knee replacement systems. These advertisements are from *The Journal of Bone and Joint Surgery*, 1996-1997.
 <sup>43</sup> Haraway, *Simians, Cyborgs and Women*, 163.

<sup>&</sup>lt;sup>44</sup> The myth of machine perfection is a classic science fiction theme (Jones, *The Cyborg (R)Evolution*, 207) that is also associated to various historical contexts in real life (Sandy Stone, "Split Subjects, Not Atoms; or How I Fell in Love with My Prosthesis," in *The Cyborg Handbook*, ed. Chris Gray Hable (New York: Routledge, 1995), 393-406.).

glance at the increasing complexity of computer technology surely should signal what issues creators of cyborg bodies face. Interfacing is a huge problem. Where are we now, in terms of interfacing the organic and the artificial? In the February 1997 issue, WIRED magazine published the views of four "experts" regarding the future of bionics. They were William Durfee, Associate Professor in Mechanical Engineering at the University of Minnesota, Donald R. Humphrey, Professor in Physiology and Neurology at the Emory University School of Medicine, William M. Jenkins, PhD, Vice President for Development at Scientific Learning Principles Corporation, and Gerald E. Loeb, MD, Professor and Director of the Bio-Medical Engineering Unit at Queens University and Chief Scientist at Advanced Bionics Corporation. These experts predicted a time-frame for the development of artificial vision, bionic limbs, hi-fi cochlear implants (high-fidelity implants for the ear) and bionic persons:

	Artificial Vision	Bionic Limbs	Hi-Fi Cochlear Implants	Bionic Person
W. Durfee	2040	2020	2030	unlikely
D. Humphrey	2020	2005	now	2050
W. Jenkins	Unlikely	2016	now	unlikely
G. Loeb	2050	2010	1998	unlikely

The 'bottom line' of these expert predictions averages out to the development of artificial vision around 2040, bionic limbs in 2013, and hi-fi cochlear implants in 2005. The development of bionic , persons was deemed unlikely by these experts. While a cyborg may be theoretically possible, Donald R. Humphrey says:

[t]he major problem lies in overcoming tissue-material interfaces. And that's a biggie. Not only do artificial tendons and ligaments have to be connected to real ones, artificial muscles don't yet approach the size and power of human tissues. Our understanding of motor skills and the brain's sensory and perceptual abilities has really just begun ... Since the 1970s, companies have developed "myoelectric" limbs that are actuated by electric signals transmitted from underlying muscles to the surface of the skin. The next step is to interface motor nerves with sensors in the artificial limbs -- enabling a prosthesis to respond to brain signals.<sup>45</sup>

This quote illustrates the basic challenges facing researchers today, showing us just how far we have come while clearly leaving few illusions about how far we have to go, if the goal is to solve the interface and physiological obstacles to integrating organic and artificial parts.<sup>46</sup>

## POWER AND CONTROL OF BODIES

The key issues in feminist discourse are power and control, which we can extend to the medical discourse of total joint replacements. Although Donna Haraway argues that feminist cyborg theory is about

<sup>&</sup>lt;sup>45</sup> David Pescovitz, "The Future of Bionics," WIRED, February 1997, 84.

<sup>&</sup>lt;sup>46</sup> For an excellent overview and update on the development of artificial body parts, including ears, eyes, limbs, organs and tissues, see "The Real Bionic Man" on The

the power to survive, Teresa Ebert reminds us that power and control must be grounded in historical and economic reality.<sup>47</sup> Who has the power? Who has control? Whom do you trust with your life? Who has power and control in terms of constructing cyborg bodies? The fundamental questions are: 1) How is power distributed? (i.e.: among the surgeons, patients, other health professionals and the medical care system, and 2) How is the distribution of power evolving? What is changing? What are the projections for the future? Feminist perspectives about the control of women's bodies provide a context in which I consider power and control in my research. Historically,

Western metaphysical thought has bound Woman to the destiny of biology through her capacity to give birth. Particularly since the emergence of modern materialist science, Woman has been aligned with nature, irrationality, and the body, in contrast to Man, the bastion of culture and reason. Woman is symbolized by her body, Man is symbolized by his mind. With the Cartesian ascent of rationality came a denigration of the body, alongside a masculinist assault on nature and a scientific repugnance towards things feminine. Thus, it is possible to interpret the modern scientific scrutiny of women's bodies as a manifestation of a philosophical tradition concerned with establishing again and again, the superiority of Man.<sup>48</sup>

In this historical and social context, Nancy Scheper-Hughes and Margaret Lock present a framework for three bodies: 1) bodies viewed as phenomenally experienced, lived individual bodies/selves; 2) social

Learning Channel, 1996; and "Brave New Body," Future Fantastic: hosted by Gillian Anderson, The Discovery Channel, 1996.

<sup>47</sup> Haraway, Simians, Cyborgs and Women, 175: Ebert, Ludic Feminism, 116.

bodies, what anthropologists term a natural symbol for thinking about relationships among nature, society and culture; and 3) bodies politic, artifacts (and...inscriptions) of social and political control.<sup>49</sup> All three of these aspects are inscribed on women's biological, social, and political bodies. As Simone de Beauvoir said, "[o]ne isn't born a woman, one becomes a woman."50 In this climate of the social construction of women's bodies, Ruth Hubbard argues that "[w]e need to get information directly from women and not rely on so-called experts, who are often male and whose knowledge tends to be based on the experience of 'patients'--that is, of women with problems."51 Therefore, in order for women to regain control and power of our bodies, we need to adopt an experientially-based knowledge which is located contextually and responsibly in all of the complexity of our bodies.

Dorothy Smith offers us two interrelated concepts useful for women's empowerment: relations of ruling, and women as expertknowers of our own bodies.<sup>52</sup> The concept of ruling relations is useful for my research because it sets a framework in which women and

<sup>&</sup>lt;sup>48</sup> Jacqueline Urla and Jennifer Terry, "Introduction: Mapping Embodied Deviance," in *Deviant Bodies*, eds. Jennifer Terry and Jacqueline Urla (Bloomington: Indiana University Press, 1995), 12-13.

<sup>&</sup>lt;sup>49</sup> Nancy Scheper-Hughes and Margaret Lock, "The Mindful Body: A Prolegomenon to Future Work in Medical Anthropology," *Medical Anthropology Quarterly New Series* 6 (1987): 41

<sup>&</sup>lt;sup>50</sup> Simone de Beauvoir, *The Second Sex* (New York: Knopf, 1953).

cyborgs have been imagined, constructed, and managed. The 'relations of ruling' explain where the power lies, who controls the access and funding, and who is the focus of trust (that is who is perceived as authority). One strategy for undermining the ruling relations in order to empower women is the concept of women as expert-knowers of our own bodies. Thus, the "knower's experience of the world is taken as an ineluctable ground of any knowledge of [our bodies] we may have...<sup>353</sup> In other words, if we begin from what we know about our bodies, then women will have partial power and control of our bodies. Esther Rome argues that in talking with other women about our bodies and learning the biological facts, we arrive at a new respect for the beings we are. We equip ourselves with information of use to us in our daily lives and become active participants in our own health and medical care.<sup>54</sup>

It is important for women to gather information and knowledge about our bodies in order to make informed decisions regarding prevention, treatment and maintenance. "We want to reclaim the knowledge and skills that the medical establishment has

<sup>&</sup>lt;sup>51</sup> Ruth Hubbard, *The Politics of Women's Biology* (New Brunswick: Rutgers University Press, 1990), 127. Also see Emily Martin, *The Woman in the Body* (Boston: Beacon Press, 1987).

<sup>&</sup>lt;sup>52</sup> Smith, The Everyday World As Problematic, 3.

<sup>&</sup>lt;sup>53</sup> Smith, *The Conceptual Practices of Power*, 54. For more on women as expertknowers of our bodies, see Virginia Olesen, "Feminisms and Models of Qualitative Research," in *Handbook of Qualitative Research*, eds. Norman K. Denzin and Yvonna S. Lincoln (Thousand Oaks: Sage Publications, 1994), 158-169.

inappropriately taken over ... We still believe that we, as women, are the best experts on ourselves.<sup>355</sup> Because cyborg discourse is about hybrid power, I argue that everyone who has had joint replacement surgery has a degree of expertise gained from accumulated knowledge and experiences.

In the West during the last century, the state, hospitals, and doctors/surgeons have had a monopoly on diagnosing and treating people's health problems. But as information has been distributed and available to a greater number of people, we are starting to take responsibility for our own health and quality-of-life. Power is not monolithic or exclusive to the medical establishment. We can educate ourselves about the reasons for surgery, surgical procedures, potential problems both during and after surgery, and recovery and therapy. Power lies in the ability and responsibility to make decisions, distribute resources, and control access and funding. When I asked the research participants about power, they thought that power lay in the hands of the surgeons, the hospital, and the provincial government. They largely trusted the medical opinions they received, and followed the medical advice given the doctors, surgeons, and by

<sup>&</sup>lt;sup>54</sup> Esther Rome, "Anatomy and Physiology of Sexuality and Reproduction," in *The New Our Bodies, Ourselves*, eds. The Boston Women's Health Book Collective (New York: Simon & Schuster Inc., 1992), 241.

<sup>&</sup>lt;sup>55</sup> Hilary Salk et. al., "The Politics of Women and Medical Care," in *The New Our Bodies, Ourselves*, eds. The Boston Women's Health Book Collective (New York: Simon & Schuster Inc., 1992), 653.

physiotherapists. Most of them believed that they made well-informed choices to have the surgery in consultation with their orthopedic surgeons and received adequate information prior to their surgery. The people who participated in my research were not powerless, passive, or helpless. They were all agents, to varying degrees, who made decisions that contributed to the outcome of their surgical procedures. They did not perceive their own power but it could be argued that they were the most powerful agents in terms of their own surgeries because they retained the right to consent to the surgical procedures. However, they were not the only agents to have an impact on the outcome, the other included their family doctors, orthopedic surgeons, nurses, and physiotherapists. The orthopedic nurse, the x-ray technologist, and the two physiotherapists I interviewed were clear that while they have particular roles to play, which are essential to support both the patient and the orthopedic surgeon, their power is restricted to specific tasks for a limited amount of time. It is also a matter of perceptions of power. Many of the people that I interviewed did not frame their experience within a conception of power dynamics, although it was implicit that the orthopedic surgeons were seen as having preponderantly more power, which is linked to the amount of money each group of health professional is paid. The amount of control wielded by the surgeons is related to a structure of economics, where financial gain may be a motivating factor for the perceptions of the surgeons' power.

The surgeons would appear to wield considerably more power, since they have the most training, and are clearly paid the most money for their services than other health professionals. In doing the surgical procedures, the orthopedic surgeons are the ones in charge of the operating room and the direction of its personnel. When I talked to the orthopedic surgeons, I found their concern striking that they are not able perform surgeries for everyone who needs to have them done. The reason for this problem is restricted hospital budgets for orthopedic surgery (and other kinds of surgeries) which limit how many surgeries can be performed per week, month, and year. The hospital budgets are dependent on the provincial government's funding allocation plan.<sup>56</sup> Clearly, each of these groups of people has a certain degree of power in sometimes different contexts, with many interconnected levels between the patient's situation and the state's allocations to the health care system.

<sup>&</sup>lt;sup>56</sup> The current provincial government was occasionally mentioned in the interviews as the principle culprit for health system problems, particularly at the local hospital.

## CHAPTER III: INTERVIEWING 'CYBORGS': PEOPLE WITH TOTAL HIP OR KNEE REPLACEMENTS

I conducted fifteen interviews in order to understand the impact of integrating artificial body parts on the quality of people's lives as well as their daily lives. Of those fifteen interviews, I interviewed seven people who had undergone total hip or knee replacement surgery (41-78 years of age), four orthopedic surgeons, one orthopedic nurse, one x-ray technologist, and two physiotherapists.<sup>1</sup> Four of the seven who had the surgery were women, three were men; four of the seven had total hip replacement surgery (three women, one man) and three of the seven had total knee replacement surgery (one woman, two men). The surgeries took place at Vancouver Hospital, St. Paul's Hospital (Vancouver), Jubilee Hospital (Victoria) and Prince George Regional Hospital, and the surgeries were performed between 1989 and 1997. All of the orthopedic surgeons I interviewed for this project were men, while the other health professionals were women. All but one of the participants are members of the mainstream white Canadian culture and they all reside in Prince George.

## INTRODUCING THE PARTICIPANTS

P1 had one hip replaced, followed by a period of recovery, and then the other hip replaced to correct the congenital condition (which had led to rheumatoid arthritis). P2 developed osteoarthritis in her 30s which led to a total hip replacement that lasted for 7 years. She

<sup>&</sup>lt;sup>1</sup> See Appendix II for sample consent form and letter of introduction given to each research participant.

recently underwent revision hip surgery that replaced the acetabular component (wear debris was the cause of component failure in the first one). P3 has had both of his hips replaced, due to osteoarthritis. The first hip replacement still gives him pain (reduced) and he may need a revision at some point, but the second one works very well. P4 has had both of her knees replaced in the past 3 years because of osteoarthritis. Her recovery was rather long for the first one, but the second one is recovering more quickly. P5 has a long history in the operating room, with a replaced heart valve, both knees and a shoulder. He is satisfied with his knee replacements but guite dissatisfied with his shoulder replacement. He also suffers from osteoarthritis. P6 has had his right knee replaced fairly recently because of osteoarthritis and is recovering fairly quickly. P7 has recently had her right hip replaced due to osteoarthritis and is recovering. Of the four orthopedic surgeons, two were originally trained as mechanical engineers and they argued that orthopedic surgery was the natural field of surgery for someone trained as an engineer. One of them stressed that "orthopedic surgery allows me to deal more with it [the body] as a machine, to do with the mechanics of the body than any other aspect of medicine."2 Both orthopedic surgeons viewed their engineering training as an asset which benefited their joint replacement patients. One surgeon said,

<sup>&</sup>lt;sup>2</sup> Interview with S4, 15 April 1997.

...when you are doing joint replacements, you have to have an understanding of the different forces involved, you know, because that will tell you, or the way you insert the joint into the bone, the angle and the position, if you put it in the wrong way, then the forces will act a different way upon it therefore will cause it to become loose quicker. So, what you want to do is put it in such a way that the minimum amount of load is on the joint and therefore it will tend to last a long, long time.<sup>3</sup>

#### INDICATORS FOR HIP AND KNEE REPLACEMENT SURGERY

By looking at several indicators present in the interviews, we can glean critical information regarding how people have and do integrate the experience and reality of having artificial body parts. This information provides clues, at a fairly basic level, that will connect to similar issues in science fiction (in Chapter IV and V). These indicators, which apply mainly to the interviews conducted with people who have undergone total joint replacement surgery include: 1) reasons for having the joint replacement surgery, 2) education received before the surgery, 3) the experience of surgery, 4) post-operative recovery, experiences, problems, and quality of life, 5) their feelings about having artificial body parts, and 6) speculations and predictions about artificial body parts. The indicators for the orthopedic surgeons and the other health professionals include engineering the body, their concerns, issues, and problems in the field, and speculations and predictions.

<sup>&</sup>lt;sup>3</sup> Interview with S1, 15 April 1997.

The reasons for having surgery were straightforward for all of the research participants. The six participants who had osteoarthritis had been living with increasing pain for several years prior to the total joint replacement surgery. When non-surgical options were not effective and the joint was clearly deteriorating, surgery was considered. One of the participants was born with a congenital hip condition which was not diagnosed in time, that is soon after birth. She was diagnosed as a toddler and was later told that she couldn't have total hip replacement surgery until she was 50 years old. So she lived with increasing pain from her early 20s on and developed rheumatoid arthritis. Finally, with advanced technology, she was able to undergo total hip replacement surgery at the age of 41. But the last couple of years leading up to the surgery were terribly difficult in terms of pain management and lack of mobility. She recalled,

I'd been seeing the orthopedic surgeon off and on for years and ... they explained to me what my situation was and ... basically I lived with pain and not being able to walk [for a couple of years]. Before I had my first surgery, I couldn't be on my feet for more than five minutes and I was in total pain and I couldn't walk, I couldn't do dishes, I couldn't do housework, I couldn't shop ... at work it was hard because I couldn't sit very long I couldn't walk a block ... so, it really restricted me and like I said, I was diagnosed, I had rheumatoid arthritis so I wasn't just in pain in those [hip] joints, it was all over ...<sup>4</sup>

The gender aspect of this account is evident in the list of daily activities that gave her so much difficulty prior to the total hip replacement surgery. The three male participants did not mention any restrictions they had in terms of doing dishes, housework or shopping. Instead, they mentioned interaction with their grandchildren (P3 and P5) and outdoor activities (P6) as daily activities that they were unable or able with great difficulty to do prior to surgery. The other female participants made it clear that there was a point when surgery was indicated,

Yes, [my family doctor] recommended me to a surgeon because they don't like to do these things, the result <u>has</u> to be better than what you have, especially if you're not, I mean, they do it in all age groups now, it's not just the elderly but particularly for somebody young who expects to be active, the pain has to be bad enough so that what you end up with is worth it.<sup>5</sup>

Another participant said that the pain "would just be on-going and it would just get worse and worse, and it was really, really limiting my lifestyle. It was something that just had to be done."<sup>6</sup>

Once surgery was indicated and the appointment was made, people received varying degrees of educational material. "They gave me a pile of papers, diagrams and instructions and things you know, and all about it, and diagrams of the joints."<sup>7</sup> One participant admitted that while the procedures were explained to her, she didn't really understand or have a clear idea what was going to happen to her on the

<sup>&</sup>lt;sup>4</sup> Interview with P1, 14 March 1997.

<sup>&</sup>lt;sup>5</sup> Interview with P2, 18 March 1997.

<sup>&</sup>lt;sup>6</sup> Interview with P7, 28 March 1997.

<sup>&</sup>lt;sup>7</sup> Interview with P6, 28 March 1997.

operating table, and she seemed comfortable with that situation.<sup>8</sup> Another participant, a health professional, had an excellent grasp of what she was about to go through,

Well, I'm one of these patients that if I'm going to make an informed choice, then I want to know the answers, and I probably drive the doctors crazy because I come in with pieces of paper, full of questions and I don't leave until the questions are answered, and if I haven't got my questions answered and they don't have enough time, then I'll go back and see the person another time and I did that with the surgeon the first time and he got really used to, just lay back in his chair, put his hands behind his head, "OK, give me questions, have I answered all the questions", he was really nice about it, but in fact, doctors prefer patients to be informed, they like them to ask questions, so they encourage you to do so ... And every individual has a different need to know ... And my way of coping with what's happening to me, is to get my questions answered so that I can understand what's happening to me ... That might not be another person's need to know.<sup>9</sup>

For the rest of the participants, the need to know fell somewhere between those expressed by the last two participants. For example, P6 had been through his wife's two total knee replacements so he had a realistic and knowledgeable basis for his own total knee replacement surgery. There seems to be an increasing emphasis on educating the patient on both surgical procedures and recovery from surgery. This situation may not originate in the desire to empower patients as much as trying to decrease costs to an overburdened health care system. However, patient education gives back partial control of health to the

<sup>&</sup>lt;sup>8</sup> Interview with P4, 24 March 1997.

<sup>&</sup>lt;sup>9</sup> Interview with P2, 18 March 1997.

patients and re-distributes responsibility as the medical establishment is streamlined.

The experience of surgery varies from no memory (due to the anesthetic), through remembering certain things, to full consciousness of the event,

And I was asleep, but I woke up 2 or 3 times. I heard them, I talked to the anesthesiologist during the surgery, we were mentioning something about a blacksmith's shop, but I didn't relate it to myself.<sup>10</sup>

A lot of people thought it was disgusting that I was awake in the OR [Operating Room], and you could hear what they were doing. It didn't bother me. You could also feel the slamming and the banging, you know, and moving around on the table ... The force of what they were doing.<sup>11</sup>

Whether they were unconscious, semi-conscious or conscious during surgery, most of the participant's surgeries were successful. However, in P6's case, his other leg was paralyzed immediately after surgery but the paralysis wore off, just as hiccups set in for a couple days. He had just recovered from the hiccups when he was sent back to the OR for prostate surgery. He has not experienced further complications. P3 has two replaced hips and in the first replacement there was some pain, which has not occurred in the second one. At the time of our discussion, the pain was getting worse in the first replacement and he is facing the possibility of revision surgery, or another invasive

<sup>&</sup>lt;sup>10</sup> Interview with P7, 28 March 1997.

<sup>&</sup>lt;sup>11</sup> Interview with P2, 18 March 1997.

surgical procedure to fix and/or replace the total joint replacement system that has malfunctioned. Revision surgery may be indicated when debilitating pain re-occurs in the joint, and it is something that orthopedic surgeons are concerned about: "[M] biggest concern is whether it [the hip replacement] will last long enough. Or it will have to be done again, which is risky...And it's just more difficult and the bone quality isn't as good."<sup>12</sup>

The critical recovery process follows the surgery. For P1. "[r]ecovery was excellent. The nurses in the hospital and my family and friends couldn't believe how fast I was up on my feet again ... my therapists were also amazed at how fast I recovered." Most of the research participants told similar stories. They were motivated to recover quickly. Now that the terrible pain was gone (they all scoffed at the residual surgical pain, as they felt that it was nothing compared to what they'd been living with for years), they were eager to resume activities that had been out of their reach prior to the replacement surgery. They recognized that there were limitations for someone with a total joint replacement, but they were now able to walk, garden, hike (moderately), shop, and work. One participant told me that she found her motivation for a quick recovery when she returned home from the hospital,

<sup>&</sup>lt;sup>12</sup> Interview with S2, 24 March 1997.

... so I went in and came home to a husband who really doesn't know [laughing] how to do anything on his own and you can really recover quickly [laughing]. Well ... he tried very hard but [laughing] he'd never cooked or anything before, but he did learn how to do some things, ... Never did a load of laundry in his life [laughing] ...

He's getting quite good at it now.<sup>13</sup>

Similarly, the other participants found their own sources of motivation, although it was mostly enough that the pain was gone and normal activity was now possible.

Of the seven people who participated in my research, one person has already had hip revision surgery, and another is facing the possibility of one. The hip revision surgery was necessary because the research participant was incapacitated with pain--the acetabular component had become loose. It was loosened because "the gamma radiation which they use to sterilize the prostheses before they insert them, has a less than advantageous effect on the plastic liner of the acetabular [component]."<sup>14</sup>

Apparently it allows the plastic to break down sooner than expected over time, they degrade and as the little chips of plastic come off, being the normal wear and tear of the hip, you get pain because of the little bits floating around in there and over the last year, they've done a lot of research apparently into this, if you take these little bits of plastic that have been radiated and put them under a microscope, you can see the degradation of the plastic. So, for that reason, he doesn't want to do those kind of prostheses anymore until they change their method of sterilization.<sup>15</sup>

<sup>&</sup>lt;sup>13</sup> Interview with P7, 28 March 1997.

<sup>&</sup>lt;sup>14</sup> Interview with P2, 18 March 1997.

<sup>&</sup>lt;sup>15</sup> Interview with P2, 18 March 1997.

Another participant has a similar problem with his hip replacement,

Without going inside, and, the thing that the doctor has cautioned me twice and he's concerned about it is, if they re-do it ... there's a 20% chance of infection, and that's quite a serious problem ... He said they have to, you know, take the old [cemented] spike out of your femur and clean all the old cement out and sometimes to get that out, they have to split the femur length-wise and so it's, it's not easy an operation as the original.<sup>16</sup>

Clearly, joint replacement surgery is experimental and further research

is needed to minimize the risks involved with successive surgeries.

## QUALITY OF LIFE

The most striking and unanimous indicator concerns quality of life. All fifteen research participants agreed that experimental or not, risky or not, total hip and knee replacement surgery made a tremendous improvement to their quality of life. I asked the seven people who received total hip or knee replacements how their artificial joints had affected their quality of life,

P1: It means I have a life again [laughs]. Seriously, ... my life really changed, I went out and did things ... and I came back to work, people commented, before they could only see the pain on my face, and there was quite a difference especially after the second one. It's made a big difference in my life. I can get out and do things again. I was very restricted before ... Now I can do a lot more, you know, a lot more housework, I can walk and walk ... And work is easier.

<sup>&</sup>lt;sup>16</sup> Interview with P3, 20 March 1997.
P2: Well, it's like night and day ... Because you don't have hip pain anymore. You can resume the normal activities that a hip patient's allowed to do.

P3: I'm standing up much straighter than I was, everybody comments on it, they say "You're standing straight!" ... I walked like this [hunches over] ... So, and even with the way the right [hip] is, I don't have the constant pain.

P4: Oh, excellent. Like before the surgery, I could hardly go shopping ... and no pain right after the surgery...That was the first thing I noticed. Hey, it doesn't hurt anymore ... So yes, my quality of life is excellent now.

P5: OK, knee surgeries, pretty well no problem. For instance, we go out to the golf club to play bridge ... but by the time ... I get up, I can't move for a minute, for some reason, maybe it's dry in the joint or something, I don't know ... It's an artificial things in there ... But it'll hurt like a son of a gun, and then slowly gets straightened up and then you'll be all right, see ... you'll be OK ... but other than that, it's been wonderful. I'm back to now where I even went hunting for a couple of days there, for a few hours, you know, hiked. Which for ten years I couldn't ... My kids, my grandkids said "Oh Grampa! You've grown 6 inches!" [laughing]

P6: It did away with the pain, so now, walking is my main exercise, and, I haven't built any recently but I used to build my own kayaks, just cruising kayaks for the lake and last year, I got out 4 or 5 times. The first time out, I had great difficulty getting in and I couldn't go far because my leg was so painful ... This summer I should be able to go back to normal.

P7: It takes a little while [laughing]. But you never ever have that pain again ... The one that makes you feel sick to your stomach when you stand up. And you know, there is some pain from your surgery and that sort of thing, but that's getting better everyday, you know, a lot of things that I was doing before. You noticed I'm walking with a cane now, I started yesterday ... So, that's fairly quickly, for 6 weeks. Total joint replacement surgery clearly improved their quality of life, even those who had complications or difficulties afterwards believe that the surgery is highly beneficial and preferable compared to their quality of life prior to the surgery.

If total joint replacement can offer tremendous benefit and relief for arthritic pain now, then future research and development in this field may exceed expectation someday. When I asked the medical professionals how they saw the future of increasingly more artificial body parts, their answers ranged from looking ahead to replacing other joints to replacing a much larger proportion of body parts. For example, the newest joint replacement system is for the shoulder, and research continues towards building a workable ankle replacement system and metacarpal joints of the hand.<sup>17</sup> However, one of the physiotherapists said,

...I'm not sure what else might be ... done. But I'm sure they'll find a way. But I think they've got to be careful that there's a reason that they're doing this, not just, you know, that the patient really wants to do it, cause it's a lot of hard work for them afterwards ... It's not an instant fix. So, they need to think about why they're doing it and what their goals are.<sup>18</sup>

The physiotherapist is warning us that while it may be possible to replace other joints and body parts, it may not be advisable if it endangers the patient's ability to recover from the surgery, regardless

<sup>&</sup>lt;sup>17</sup> Interview with H1, 2 April 1997. (and) Interview with H3, 26 May 1997.

<sup>&</sup>lt;sup>18</sup> Interview with H3, 26 May 1997.

of other reasons why surgery might not be advisable, such as for moral or ethical reasons.

## INTEGRATING ARTIFICIAL BODY PARTS

With regard to total hip and knee replacements, however, the people that I interviewed did not have mixed feelings about having artificial body parts, because the artificial parts were a vast improvement over what they had before. One participant was amused, "my grandchildren were quite impressed, I'm bionic, bionic lady ... It never occurs to me that I have metal or anything, you know, in my body, you don't relate it to yourself."<sup>19</sup> Another one said "It's no bother at all. If I stop to think about it, and I feel my knee, well I mean, there's flesh there and it feels...But the knee itself, there's just no pain so, you just do everything as normal really. Just remember there's a little restriction here and there, but I hope to overcome."<sup>20</sup> I encountered further positive testimony for the integration of artificial joint systems into the research participants' bodies,

No problem, it helps. I recommend it to anybody. This operation I'm recommend to anybody. It helped the pain and ... There's such an improvement. It's the most wonderful thing I've ever had done. A friend of mine, he's now 80 ... and he had his knee replaced about 5 years ago and it was just wonderful for him. And when I was in the

<sup>&</sup>lt;sup>19</sup> Interview with P7, 28 March 1997.

<sup>&</sup>lt;sup>20</sup> Interview with P6, 28 March 1997.

hospital, there was a lady in there who was 90 years old that got her hip replaced and she was a real ball of fire, 'I gotta get out of this place,' she said, 'And do my exercise,' she was a little wee thing, you know, to give a person another chance like that is just wonderful.<sup>21</sup>

The main point seems to be having that "chance" without the crippling arthritic pain these people suffered from prior to their joint replacement surgery. The prospect of surgery is always frightening but the benefits outweigh other concerns. One participant compared her artificial hip parts with breast implants,

It doesn't bother me in the slightest [laughing]. They're not like breast implants because, I don't foresee that the metal and plastic components that I've got will react with my body tissue in the same way that breast implant patients' do, I mean that's really scary to think that you can get autoimmune diseases and that whole host of complications that the makers of those things tend not to believe are the cause of the problems, which I think they probably are, but, no, it doesn't bother me at all. I'm bionic, I think.<sup>22</sup>

The people who participated in my thesis research shared their experiences of having artificial parts inserted into their bodies for the specific and usually urgent purpose of alleviating pain and enabling mobility. Any complications resulting from the integration of artificial parts into their bodies were less significant than the benefits they experienced from the joint replacement surgery. Some of them expressed humour at the thought that they were 'bionic,' and overall, their attitude was positive. Similarly, in the science fiction of Marge

<sup>&</sup>lt;sup>21</sup> Interview with P3, 20 March 1997.

<sup>&</sup>lt;sup>22</sup> Interview with P2, 18 March 1997.

Piercy and Amy Thomson, certain characters (Shira, Malkah, Gadi and Azul) take various artificial augmentations for granted. They believe that the integration of artificial body parts is normal and necessary for comfort, survival, and/or aesthetics. In contrast, other characters (Yod and Maggie) are feared, reviled and outlawed because they are artificially intelligent cyborgs, built secretly from different parts from a wide variety of places. Any positive feelings about the nature of their existence is overshadowed by the necessary concealment of their true origins to ensure their own survival. Additionally, the artificially intelligent cyborgs, unlike people with hip or knee replacements, have a crisis of identity regarding the issue of their humanity. Identification as a human being is an important issue for the cyborgs in science fiction but not even raised by the participants in my research, which indicates an interesting difference in experiences accumulated along the cyborg continuum.

**CHAPTER IV: CYBORG BODIES IN SCIENCE FICTION** 

While there are differences between fact and fiction, the cyborg continuum can represent a wide variety of projects that integrate the artificial with the organic. The desire to improve quality of life, through the addition of particular parts or the total emulation of human bodies by artificial means, is an expression of the diversity made possible by the continuum. Whether writing a science fiction novel or building a hip or knee, we undertake both activities to seek redress for perceived inadequacies, unfulfilled potential, and physical and/or biological limitations. The cyborgs in science fiction seem to bear little resemblance to people who have artificial hips and knees. After all, the imagination of science fiction writers is not necessarily fettered by actual physical and technological limitations. However, the cyborgs in science fiction can point to potential problems, complex issues, and possible consequences that may arise or occur if the current medical trend of successfully replacing increasingly more organic parts with artificial parts continues. In science fiction novels, the integration of the organic and artificial occurs on a variety of levels. I have chosen Marge Piercy's He, She and It and Amy Thomson's Virtual Girl because both novels are set in the future where advanced technology leads to the creation of artificial intelligence (AI), which in turn produces covenants and laws against the creation of artificial intelligence beyond the confines of computers and the prohibition of AI cyborgs in human form. In an environment of strict regulation, the

creators of cyborgs pursue their illegal activities in the face of heavy penalties, and therefore their motivations for building cyborgs must be considerable. In this chapter, I look at the plots of He, She and It and Virtual Girl thematically, exploring the concepts of power and identity. I argue that power and identity are the key issues that connect these novels to the other points along the cyborg continuum, and to the research participants I interviewed for this thesis, in terms of quality of Both Marge Piercy and Amy Thomson have life issues. metaphorically converted the subtle and underlying social rules which govern our control of our bodies into explicit and strict regulations which limit the existence of self-aware machines. The connection between cyborgs in science fiction and people with total joint replacements is the parallel between the social restrictions on artificially-intelligent beings and current restrictions on our control of our bodies.

# NARRATIVE CONTEXTS AND SUMMARIES

#### HE, SHE AND IT

Science fiction depends heavily upon the creation of an imaginary world that is often quite different from the world in which we live. The setting of those imaginary worlds is a crucial part of science fiction novels in relation to the construction of cyborg bodies. They supply the postapocalyptic conditions which posit cyborgs as a necessary means of human survival. For example, *He, She and It* is set in "the middle of the 21st century [where] [e]nvironmental disasters have ravaged the planet's resources, and the world has been divided into corporate enclaves," or multis, free towns, the Black Zone and the Glop.<sup>1</sup> Yakamura-Stichen (Y-S) is one of about 10 global corporate enclaves that controls resources and provides both environmental protection and closed hierarchical culture. The free towns sprang up outside of the multis, along the shore of the poisonous ocean where the multis considered it too dangerous to function. Free towns like Tikva survive on the margins by contracting out to the multis. Their on-line services for high-quality security software at the Base are the foundation of their economic independence from the multi enclaves.<sup>2</sup> The Black Zone is nuclear ground zero for a "large chunk of the Middle East [that is represented] on maps as a uniform black, for it [is] uninhabitable and interdicted to all. A pestilent radioactive desert."3 The Glop is a large area of the North American continent that "stretches fourteen hundred kilometers to the south and two hundred to the west."<sup>4</sup> Most of the population lives in the Glop, which may be called a "densely inhabited slum" characterized by danger, violence, gangs, drugs, chaos, and poverty.<sup>5</sup> Marge Piercy's characterization of

<sup>5</sup> Ibid., 30.

<sup>&</sup>lt;sup>1</sup> Marge Piercy, He, She and It (New York: Ace Books, 1991), back cover.

<sup>&</sup>lt;sup>2</sup> M. Keith Booker, "Woman on the Edge of a Genre: The Feminist Dystopias of Marge Piercy," *Science-Fiction Studies* 21:3 (1994), 345.

<sup>&</sup>lt;sup>3</sup> Piercy, 11.

<sup>&</sup>lt;sup>4</sup> Ibid., 298.

the Glop parallels the modern urban ghetto and sets the stage for the plot of *He, She and It.* 

The plot is centred on the relationship between Shira Shipman, a lightly-augmented human being who has been excluded from the dominant culture (Y-S), and Yod, an entirely-augmented cyborg. In 2059, Shira lives and works in Y-S with her son Ari and husband Josh. With the dissolution of her marriage, the custody of Ari is awarded to Josh by Y-S, much to Shira's anguish. She then returns to her childhood home in the free town of Tikva, on Massachusetts Bay, to live with her grandmother Malkah who raised her, and to accept a position working for Avram, the local inventor/scientist. Her job is to socialize Avram's latest creation, a cyborg named Yod. Cyborgs with human intelligence and form are illegal, and as a result, a corporate covenant was instituted by the multis that ordered artificial intelligence confined to the Net<sup>6</sup> and Bases. The penalty for breaking the covenant "is immediate blacklisting and death."<sup>7</sup> Avram is contravening this covenant by pursuing his life's work -- building cyborgs. His previous attempts failed as these cyborgs became violent because they could not handle the information overload experienced at the moment of their "birth" or consciousness, and they had to be destroyed. Yod is

<sup>&</sup>lt;sup>6</sup> The Net is a public utility, rather like a global public library, which contains all of "the mutual information of the world" and is accessible to multis, towns and individuals (Piercy, *He, She and It, 55*). A similar concept is utilized in *Virtual Girl.* <sup>7</sup> Ibid., 49.

Avram's latest and greatest achievement. Avram sees his cyborgs as easily replaceable and not as individuals. They are objects which fulfill their programming, and they are not identified as "persons."

The issue of Yod's identity is problematized when Yod is socialized by Avram, Malkah, Shira, and Gadi (Avram's biological son and Shira's ex-lover) and then introduced to the rest of the community as Avram's cousin and new assistant. The secret nature of Yod is similar to the hidden nature of joint replacements: no one knows Yod is a cyborg or that someone has a hip or knee replacement unless they are told so. The fact that Yod faces destruction while people with joint replacements do not, despite a similarity in condition which varies by degree, reveals the different conditions that can evolve for those who occupy different points along the cyborg continuum. The citizens of Tikva have treated him as a member of the community, until they find out that Yod is a cyborg. This leads to a passionate debate by the town council as they evaluate Yod for citizenship: Yod the person versus Yod the machine. Before their decision is rendered, however, Y-S offers peace in return for Yod. As Avram's weapon to defend and protect Tikva, Yod is ordered to self-destruct at the meeting with Y-S and when he does, he takes most of the Y-S senior executives and Avram with him. Yod obeys his creator and asserts his individuality based on his accumulated lived experience in his final act. In his farewell message to Shira, Yod writes:

I have died and taken with me, Avram, my creator, and his lab, all the records of his experiment. I want there to be no more weapons like me. A weapon should not be conscious, ... have the capacity to suffer for what it

does, to regret, to feel guilt. A weapon should not form strong attachments. I die knowing I destroy the capacity to replicate me. I don't understand why anyone would want to be a soldier, a weapon, but at least people sometimes have a choice to obey or refuse. I had none.<sup>8</sup>

## VIRTUAL GIRL

The landscape for Virtual Girl is similar to that of He, She and It, but not nearly as well-defined, discussed, or illuminating. Also set in a future America, Amy Thomson creates a world which has been buffeted by natural disasters and the continued destruction of the environment, which has altered various urban areas (i.e. Los Angeles does not exist anymore and Seattle has expanded to include a vast geographical area known as "Seattle-Tacoma.") The plot is set in predominantly urban environments, places where it is easy to get lost, hide, and keep illegal secrets. The future in Virtual Girl is somewhat bleak but certainly more recognizable than the future in He, She and It, as Amy Thomson focuses on the not-so-distant future when the idea of building artificially-intelligent cyborgs will become a reality. In the context of cyborg theory, the focus is on the actual possibility of building cyborg bodies to thrive in relation to our increasingly technologized bodies. Amy Thomson explores the impact of cyborg bodies on definitions of humanity, the value of lived experience, and the location of power and control. She looks at the intersections and partial connections made with and among cyborg bodies and the social change they effect by the formation of various relationships within the social fabric.

The plot begins with Arnold, the creator, accessing his creation, Maggie, in virtual reality. Arnold has created Maggie as an artificial intelligence in the computer first, and he is about to transfer her into a body that he has built for her out of mechanical and synthetic biological parts, which is powered by a rechargeable battery pack. "Finding parts and supplies ... was simply a matter of patrolling the trash bins and surplus stores of the high-tech industries."<sup>9</sup> He took a great deal of pride in his creation of Maggie:

He spent the summer and early autumn scrounging parts from dumpsters and industry surplus yards. Maggie's eyes were a particular point of pride. He had found them in a dumpster behind an optical prosthetics factory. It had been surprisingly simple to adapt their leads to a computer interface instead of a biological one. Only Maggie's skin and hair had needed custom orders.<sup>10</sup>

Maggie's eyes were originally intended for a human and were adapted to fit a cyborg which is an ironic comment by the author on the idea of using machine parts for humans. Arnold transfers Maggie into her

<sup>&</sup>lt;sup>8</sup> Ibid., 415.

<sup>&</sup>lt;sup>9</sup> Amy Thomson, Virtual Girl (New York: Ace Books, 1993), 5.

<sup>&</sup>lt;sup>10</sup> Ibid., 6.

physical body and then spends several weeks teaching Maggie "to become like a human" and the complex world of human interaction.<sup>11</sup> Concepts such as access and quality are important in this context as well as in the context of my research participants' experiences because they form the basis of value for cyborg bodies. Value is based on the longevity, durability, and optimum functioning of replaced and implanted body parts.

When Arnold feels that Maggie is ready to experience the world, he takes her out of doors, where she is overwhelmed and suffers major data overload. Forced to re-build her memory functions, she creates new pathways and directories which form her core personality and reorganize her internal processing patterns that resemble a tree. "There was an almost organic organization to it, like some incredibly advanced cellular automata."12 The next time Maggie ventures outdoors, her programming is sufficient to enable her to function "like a human." As Kevin Kelly argues, biology is an inevitability and machines are evolving towards emulation of nature and biological systems.<sup>13</sup> As stated earlier in this thesis, one of the orthopedic surgeons mentioned the ideal situation would be having organic rather than artificial replacement parts, affirming the hierarchy of the organic as supreme. This situation would be ideal because it would eliminate

<sup>&</sup>lt;sup>11</sup> Ibid., 19.

<sup>12</sup> Ibid., 31.

the current physiological interface challenges that surgeons face in terms of bodies rejecting implants made of plastic and metal.

Arnold and Maggie are separated by a traumatic incident that results in partial amnesia for Maggie. She eventually encounters another self-aware machine, names him Turing, and he helps her recover and reintegrate her missing memories.<sup>14</sup> Meanwhile, Maggie meets Azul, a young cyberdancer/sex-trade worker who has undergone illegal augmentation, an artificial skullcap, that produces visual images when he dances. He considers his artificial parts as an essential part of his artistic expression, but he is also disenfranchised by his integration of illegal "cyborg" technology into his body. Thus, the dialectical relation between the machine who emulates humanity and a human who uses the advantages of machine augmentation is revealed.

Arnold and Maggie are re-united and he is delighted to see her because he is lobbying to repeal or soften the AI laws. He plans to use her to accomplish his goals now that he has her again. "First, he would copy her program, and then he would bring her body up to the standard of his other robot bodies. She deserved that much, at least, for her faithfulness. With proper maintenance, her upgraded body could last at least fifty years without needing repair. In fact, the

<sup>&</sup>lt;sup>13</sup> Kelly, Out of Control, 183.

<sup>&</sup>lt;sup>14</sup> 'Turing' refers to Alan Turing, a British mathematician who is credited with the 'Turing test,' a hypothetical test given to artificially-intelligent machines. If they pass as human, they have passed the Turing test. See Kelly, *Out of Control*, 459.

servant might well outlast the master, Arnold thought wryly.<sup>"15</sup> He makes several improvements to her new body, including "better knee and hip joints." That way, she will "need much less maintenance them and be even stronger.<sup>"16</sup> When Maggie's body is finished, Maggie and Turing transfer her from the computer back into her body. Then they transfer Turing into a male body that is also in Arnold's lab and they leave the building together. At the end of the narrative, they leave a robot shell program for Arnold as a peace-offering and set up their own prosthetics business, "mostly as a cover for the [cyborgs] they were building to house some of the more adventurous AIs ... who wanted to leave the Net for the real world."<sup>17</sup>

# POWER AND CONTROL

It is interesting that both Arnold and Avram work alone and on the margins with their life's work, building cyborg bodies. According to Marge Piercy and Amy Thomson, the creators of AI cyborgs are amateurs operating outside of the mainstream power system, in an environment where the superstructure is the enemy. In contrast, with joint replacement therapy, it is the dominant system that is developing and researching the increasing integration and replacement of artificial body parts in our bodies in real life. In other words, the medical establishment is moving slowly towards more and better replacements

<sup>&</sup>lt;sup>15</sup> Thomson, 212.

<sup>&</sup>lt;sup>16</sup> Ibid., 221.

for parts of our bodies. My research participants welcome these innovations because emerging technologies in this field continue to improve their quality of life. The cyborgs in these two novels are created without research teams, as non-collaborative research projects. For people who integrate artificial parts into their bodies now, they are agents and collaborators in terms of the decisions made to undergo the surgical procedures. While the orthopedic surgeons may focus on the problem instead of the whole patient, the participants in my thesis research were not powerless or passive in the decision-making process about what would be done to their bodies.

The motivations of the creators of cyborgs, then, are important elements in the construction of cyborg bodies in science fiction. The creators of hip and knee replacements are motivated by both profit and the challenges of improving upon their earlier work. There is demand from the orthopedic surgeons (and more abstractly from people who need these hip and knee replacements in order to function) for better products to implant into their patients' bodies, and so replacement part manufacturers invest in further research and development towards the "ideal" replacement parts. For the fictional creators of cyborg bodies, there is the contrast of the fear of cyborgs by the general population with the humorous reaction of the people whom I interviewed to the integration of artificial body parts. The story of the AIs is rather like a

<sup>&</sup>lt;sup>17</sup> Ibid., 247.

fairy tale told in both novels as if to a child (Yod and Maggie), demonstrating the paternalistic attitudes of the creators. In Maggie's case, however, her creator sets himself up as both owner, father, and potential/thwarted lover. Arnold is on the run from his wealthy father, who is always trying to find him and destroy his illegal cyborg experiments. He is determined that no one will harm his Maggie, who is his protector, his companion, and his possession. Arnold's work stems from his hatred and resentment of his father's power and control yet Arnold has complete power and control over Maggie because he programmed her that way. He programmed her to be sweet, kind, and nice but he also created a sub-personality security program which is activated by dangerous situations. This security program is accessible only by Arnold and Maggie finds it very disturbing and does not like it because it is separate from her, the "other" part of her that she has no control over. In Virtual Girl, Maggie is completely subject to Arnold's will and directives until she is separated from Arnold and learns to survive without him. The power structures that are being represented in this novel are clearly gendered, looking at a female machine being who is subordinate to a male human being, and reflecting typical relations of ruling in the real world. Similarly, since all of the orthopedic surgeons that I interviewed were men, the impact of their relationships to power and artificial body parts is marked by the gendered construction of their profession. In other words, the context of orthopedic surgery has been constructed by a male medical model of power. Therefore, the attitudes and relationships the orthopedic surgeons have with artificial body parts is marked by issues of power, control, and value.

The power structures in He, She and It and Virtual Girl are defined differently and thus produce two distinct results. The broader structure of power in He, She and It was very segregated, regulated, and controlled for all groups in society, where Yod was unique and completely reliant on human allies. In the less constrictive, though perhaps more chaotic, environment of power relations in Virtual Girl, Maggie was able to duplicate the process of her creation, appropriating the role of creator, to form a community of artificially intelligent cyborgs like herself. With the intent of maintaining power over their creations, both Avram and Arnold built control mechanisms into Yod and Maggie and while Maggie was able to reprogram and thereby eliminate Arnold's ability to control her, Yod was not. Arnold built Maggie for purely selfish reasons, he wanted a perfect companion and protector who would always be loyal and trustworthy. Avram was slightly more altruistic in creating Yod to protect the community from the multis, but he was no less demanding of his creation in denying Yod free will and citizen status. The most striking difference between He, She and It and Virtual Girl, of course, is the fate of Yod and Maggie. Yod dies because he is unable to choose life and Maggie

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lives because she is able to free herself from the confines and directives of her creator. The connections between Yod's and Maggie's fates and my research participants involve the power to choose what happens to their bodies, the degree of control wielded by the creator/orthopedic surgeon in terms of procedures and directives, and the distinction made between the rights and humanity of the fictional cyborgs versus the cyborgs with hip or knee replacements.

Maggie's emerging agency and independence from Arnold is evident when he tries to stop her from leaving him. She says: " I'm leaving, Arnold. I don't want to belong to you. I don't want to belong to anyone. I'm not just a thing that you can play with. I'm real, Arnold. I have real thoughts and ideas. I don't want to be copied into a million other bodies and then turned into a slave."<sup>18</sup> Arnold then recites her override code and she tells him: "I'm sorry, Arnold, your override code won't work anymore. I've reprogrammed myself. I'm free now. I've taken my backups, too. I may not be human, but I am a person. I won't be made into a slave ... I have to belong to myself."19 Maggie has learned to believe that she is a person based on her lived experience and social interactions, rather than resigning her identity as equivalent to her derivation or origin. In this way, Maggie evolves beyond her programming and away from Donna Haraway's cyborgs

<sup>18</sup> Ibid., 217. <sup>19</sup> Ibid. who are tied to western humanist origins in salvation history. Maggie also <u>embodies</u> Donna Haraway's vision of the cyborg who disrupts, interrupts, and undermines her own ties and origins in pursuit of recognized humanity, respect, power, and partial connections between herself and the world.

For Marge Piercy, power relations are much more complex and insidious. Yod's experience is the result of being born an adult, instead of accumulating knowledge over many years from infancy to adulthood. Yod refers to Avram as "Father" but he does not regard Avram as such. Although their relationship "is one of unequal power, which is like a father-son relationship in minority, ... but not nearly as complicated or compelling. He manufactured me. He chose to make me exist -- but not as me as an individual, not who I am, only some of what I can do... He's more my judge than my father..."<sup>20</sup> Avram does have the power of life and death over Yod because he built a selfdestruct code into Yod that is only accessible by Avram. Avram's goal in building Yod is to not only emulate humanity but to improve on the original design and blueprint as well. The telos, for both cyborgs in fact and in fiction, is the integration of human and machine that can function as human. The motivations for building "humanlike" cyborgs, like Yod, are to serve particular purposes and agendas,

<sup>&</sup>lt;sup>20</sup> Piercy, 120.

while regaining physical human functions are motivated by concerns for improving quality of life.

### IDENTITY AND HUMANITY

In both He, She and It and Virtual Girl, one of the central themes is the human identity of the artificially intelligent cyborgs, Yod and Maggie. While the participants in my thesis research did not have their identity as human beings challenged through the integration of joint replacements, the issue of their humanity may arise as increasingly more body parts are replaced in our bodies. At some point, human identity and gender may not be easily ascertained, obvious, or visible. Is Yod an "it" or a "he?" and is Maggie an "it" or a "she?" Yod starts out as an "it," despite being anatomically male, when introduced to humans, but gradually evolves into a "he" as he develops relationships with others. At first, Shira thinks that Avram is anthropomorphizing the cyborg and that "human form did not make a human creature."<sup>21</sup> She makes the transition from "it" to "he" after getting to know Yod and being struck by the strength of his feelings and personality.

The title thus resonates with multiple associations to themes and motifs within the novel: parent-child stances and issues of legitimacy linked to a discussion

<sup>&</sup>lt;sup>21</sup> Ibid., 71.

of biological reproduction and the cultural production of meaning, the construction of gender, male-female relationships, and individual or collective relations to fundamental and intricate matters of ethics and politics.<sup>22</sup>

Gendered identity is apparent in both the science fiction and the interviews conducted for this thesis. Although Yod is positioned as a disenfranchised and indentured male servant, Marge Piercy places less emphasis on his gender and focuses on the question of his human identity. However, in Virtual Girl, Maggie's gender is produced to please and satisfy only Arnold. He thought that a female artificially intelligent cyborg would be easier to control. While gender is shown to be both largely irrelevant and part of control mechanisms in the science fiction, the people who have total hip or knee replacements did not express concern over gender identity. The activities that they were unable to engage in prior to their orthopedic surgery were the primary gender markers. In the interviews, the male participants listed activities such as hunting, kayaking, walking, hiking and playing with their grandchildren.<sup>23</sup> Some of the female participants' activities included walking, shopping, hiking, doing housework.<sup>24</sup> The people who participated in my research did not view their total joint replacement surgeries from the perspective of gender since joint failure is not a gender-specific medical problem that impacted on their identity as

<sup>&</sup>lt;sup>22</sup> Kerstin Shands, *The Repair of the World: The Novels of Marge Piercy* (Westport: Greenwood Press, 1994), 141-42.

<sup>&</sup>lt;sup>23</sup> From interviews: P3, P5, P6.

human beings or "persons." The connections between identity and gender in relation to our bodies are associated with the shared experiences of personhood both for the people that I interviewed and the people created in the novels.

In *He, She and* It, there is a focus on making human-type machines because Marge Piercy explores the issues faced by a different kind of "person." When Shira asks Yod if he is alive, he replies:

I'm conscious of my existence. I think, I plan, I feel, I react, I consume nutrients and extract energy from them. I grow mentally, if not physically, but does the inability to become obese make me less alive? I feel the desire for companionship. If I can't reproduce, neither can many humans.<sup>25</sup>

Yod's argument shows Shira that he is more similar to her than she had initially thought, just as people with replacement parts are similar to non-augmented (or differently-augmented) people. Her empathy for him is based on a shared experience of exclusion, although Yod is excluded by his very nature as a machine intelligence. She then asks him if he remembers his equivalent to birth and Yod tells her of the moment of consciousness, when he experienced intense sensory overload. He says:

Everything assaulted me. Sound, sight, touch, all my sensors giving me huge amounts of data and all of it seeming equally important, equally loud. I was battered almost to senselessness ... I experienced vast random streams of information forcing their way into my con-

<sup>&</sup>lt;sup>24</sup> From interviews: P1, P2, P4, P7.

<sup>&</sup>lt;sup>25</sup> Piercy, 93.

sciousness. I was flooded with internal readouts, ... distances from me to other objects, chemical analyses, reports on the temperature of various parts of my skin and of the atmosphere, definitions of words, calculated trajectories, trigonometric functions, algorithms, precise time, world and local history, forty languages ... For a long time I could not sort out what was important from what was trivial in the storm of details assaulting me. In a sense I was born knowing far too much to understand anything.<sup>26</sup>

Yod's memories of his 'birth,' or awakening of consciousness, are the result of experiencing an overwhelming amount of information all at once. Information overload is a reality for all of us in the real world, although cyborgs may be better equipped to filter it since cyborgs like Maggie can effectively re-program their central processors to organize and filter too much information. My research participants awake from a surgical anesthetic to a new physical reality (i.e. relief from the serious arthritic pain and the possibility of regaining mobility). Obviously the difference is that my research participants chose to undergo total joint replacement surgery whereas Yod was not consulted at all. The participants did not have a crisis of identity or self because they did not perceive that the joint replacement made any fundamental difference in their perspectives of themselves. The fundamental difference was the absence of pain and the increased mobility, which were not framed in terms of paradigm shifts or a change in the way they felt about their bodies. Their feelings

<sup>26</sup> Ibid., 119-120.

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regarding their 'bionic' bodies were characterized by humour and relief. In contrast, the case of Marge Piercy's character, Yod, gives rise to further contemplation over the unique combination of nature and nurture that shapes and develops individuals. Thus,

Yod remains a platonic blueprint of himself, inhumanly smooth, regular, embodying the idea of himself, an idea that is infinitely duplicable. Or is it? Even though the 'genetic' setup would be identical, [Marge] Piercy indicates that the cultural programming affected by Avram, Malkah, and Shira, as well as Gadi, and their interactions and tensions have made a difference in Yod's development. While genes/chips constitute a given, perhaps predictable point of departure, the journey of a person or a machine is subsequently shaped by the surrounding environment in unforeseeable ways.<sup>27</sup>

In other words, the development of the individual is unique, whether it is a machine or human being. Similarly, my research participants showed a lack of regard for the artificial parts that had been implanted into their bodies. The difference between an artificial or a natural hip failing was not distinguished, both components were "human" and the participants were no less human because of the replacement of various parts because it is the accumulation of experience that counts. Malkah concludes that making Yod was a mistake and says that it is "better to make people into partial machines than to create machines that feel and yet are still controlled like cleaning robots. The creation of a conscious being as any kind of tool -- is a disaster."<sup>28</sup> The problem is

<sup>&</sup>lt;sup>27</sup> Shands, 150.

<sup>&</sup>lt;sup>28</sup> Piercy, 412.

creating another being for the purpose of servitude, which privileges the organic over the mechanical. Nili argues that once "society has begun to fiddle around with people, there's no turning back."<sup>29</sup>

Malkah approaches Yod and asked him to forgive her for her part in his formation, reflecting on the "overweening ambition and pride [that] are involved in our creating of conscious life we plan to use and control, when we cannot even fully use our own minds and we blunder and thrash about vainly in our own lives."<sup>30</sup> She feels guilt because her

...programming made him more useful ... and far closer to the human than any of Avram's unsuccessful cyborgs, but it also made him vulnerable to desires and aspirations that had nothing to do with his central programming or his function. I gave him the flexibility that enabled him to overcome his fundamental commandment to protect and defend Avram, as well as the town. What Avram and I did was deeply wrong. Robots are fine and useful, machine intelligence carrying out specific tasks, but an artificial person created as a tool is a painful contradiction.<sup>31</sup>

She decides that as "it is wrong to give birth to a child believing that child will fulfill your own inner aspirations, will have a particular talent or career, [and it is] equally wrong to create a being subject to your will and control ... In the myth of Pygmalion, we assume that she would love her sculptor, but [George Bernard] Shaw knew better."<sup>32</sup> The destruction of Avram's lab is the attempt to prevent or obliterate

29 Ibid.

30 Ibid., 393-94.

<sup>&</sup>lt;sup>31</sup> Ibid., 418.

<sup>32</sup> Ibid.

the possibility of building another cyborg like Yod. Marge Piercy validates the improvements and augmentations to human bodies for aesthetic and practical reasons but concludes that the extreme (i.e. Yod) is a mistake. By contrast, the orthopedic surgeons that I interviewed looked to the future to produce better (and many more) replacement parts, surgical techniques, and treatment conditions that lead to replacement surgery. They were not thinking in terms of creating artificially-intelligent cyborgs, but the possibility of increasing integration of artificial body parts did not perturb them either. Their attitudes are based on the common understanding of a medical model of progress, the pursuit of complete medical knowledge to cure every ailment, trauma, and disease. While the orthopedic surgeons want to develop the best materials and techniques for replacement surgery, Avram wants to develop the perfect weapon to defend his community. The surgeons want to improve people's bodies, fixing their bodies in order to improve function. Avram wants to improve the body of his weapon to meet specific criteria, in order for "it" to function optimally. Both strive for progress towards an ideal, meaning further research, studies, and tests, and neither seems particularly prepared for the philosophical challenges addressed primarily in the science fiction around issues of human identity, gender, and power. Another example of a cyborg creator who does not consider these philosophical challenges is Arnold in Virtual Girl.

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Arnold creates Maggie in an anatomically-correct female body and the most important aspects of her programming were designed for pleasing Arnold, so Maggie is always referred to as "she," but he explicitly treats her as an "it." Her self-realization of her personhood occurs while they are separated, which means that Maggie's development as a person came as an unpleasant surprise to Arnold. His pride in her reflected his pride in his genius, his creation, and his possession.

Marge Piercy uses Yod's experience of being alive and his periodic self-reflections on the difference between being alive and being human to introduce a parallel narrative in the form of a story that Malkah tells to Yod. Her story is relevant as another historical cyborg story and cautionary tale of what the reactions and consequences of constructing artificial life might be. She tells a story that is interwoven with Yod's and Shira's narrative, set in sixteenth-century Prague where Chief Rabbi Judah Loew (the Maharal) creates a golem from clay by mystical means for the purpose of protecting the Jewish ghetto from their Christian persecutors. According to Gershom Scholem, the "golem is a creature, particularly a human being, made of an artificial way by virtue of a magic act, through the use of holy names."<sup>33</sup> With specific reference to the golem story in He, She and It, Jenny Wolmark compares Joseph the golem to Yod the cyborg:

<sup>&</sup>lt;sup>33</sup> Gershom Scholem, Kabbalah (Jerusalem: Keter Publishing House Jerusalem Ltd., 1974.

It/he is named Joseph, he thinks and feels, but he is not human and when the danger to the Jews has passed, his maker returns him to clay. The mythical nature of the golem is used to suggest that the contradiction at the heart of Yod's existence--that he is a person but not a 'human person'--is ultimately insurmountable, and this enables [Marge] Piercy to relocate the question of identity within the metaphor of the human as cyborg, rather than the cyborg as human.<sup>34</sup>

The construction of the golem in He, She and It and his fate are connected to Victor Frankenstein's creature in the way that they are both connected to Yod. All three cyborgs suffer at the hands of their creators' agendas and all three are destroyed by their tragic circumstances. They all asked similar cosmological questions about their identity, purpose, and humanity. How did we come into existence, how do we fit into a universal scheme, what is the relation between us and our creator, how does our creator feel about us, what do we need from our creator, is our creator gendered and what are the gender implications?<sup>35</sup> The meaning of life and the answers to these questions are familiar but elusive. I have learned that context and perspective are vitally important when attempting to hypothesize answers to cosmological and philosophical questions. They take on different meanings when asked by an artificially intelligent cyborg who was created by us, contrasted with people who have artificial body parts, who do not ask these questions when they integrate

<sup>&</sup>lt;sup>34</sup> Jenny Wolmark, Aliens and Others: Science Fiction, Feminism and Postmodernism (Iowa City: University of Iowa Press, 1994), 132.

artificial parts into their bodies and do not question their humanity because of them.

## QUALITY OF LIFE

The quality of life experienced by AI cyborgs is different from the experiences of the people with artificial joints only because of the power and identity issues that both separate and connect them together on the cyborg continuum. When Yod compares himself to Frankenstein's monster, he is disturbed by the similarities, which is an affirmation of the cyborg continuum. Shira attempts to reassure him that they are all unnatural now. She says,

I have retinal implants, ... a plug set into my skull to interface with a computer ... I read time by a corneal implant. Malkah has a subcutaneous unit that monitors and corrects blood pressure, and half her teeth are regrown. Her eyes have been rebuilt twice. Avram has an artificial heart and Gadi has a kidney... We can't go un-aided into what we haven't yet destroyed of 'nature.' Without a wrap, without sec skins and filters, we'd perish. We're all cyborgs, Yod. You're just a purer form of what we're all tending toward.<sup>36</sup>

Gadi's attitudes towards this kind of augmentation are similar to the people that I interviewed who have artificial joint system in their bodies. When Shira asks him how many operations he has had, he replies that he's had just "the kind of cosmetic nonsense people have always endured for beauty... What's the difference between getting the medicine man to drill a hole for a nose ring and getting my cheekbones

<sup>35</sup> Ibid., 150.

sharpened or my shoulders built? But I'm flesh and blood."37 Gadi clearly does not think that his human identity is compromised by the augmentative surgery he has elected to have performed on his body. Similarly, my research participants agree with having artificial interventions, implantations, and alterations into their bodies because it greatly improves their quality of life. The quality of their lives is so markedly improved and other than various restrictions on their physical activities after having the joint replacement surgery, they did not have any qualms about their surgical experiences or about potential future surgeries. There are two other modified human characters in Marge Piercy's novel: Riva and Nili. Riva is Shira's estranged mother and an information pirate who finds hidden knowledge and liberates it.<sup>38</sup> She "is constantly on the run, assuming various disguises and making herself into an unsentimental and finely honed instrument for the cause that needs her."<sup>39</sup> Nili is a highly-augmented warrior-scout from the Black Zone, where a community of women live below the radioactive desert. She explains her lifestyle to Shira:

I can walk in the raw without protection, ... tolerate levels of bombardment that would kill you . We live in the hills -- inside them, that is. We are a joint community of the descendants of Israeli and Palestinian women, who survived. We each keep our religion, observe each other's holidays and fast

<sup>&</sup>lt;sup>36</sup> Piercy, 150.

<sup>&</sup>lt;sup>37</sup> Ibid., 210.

<sup>&</sup>lt;sup>38</sup> Ibid., 78.

<sup>&</sup>lt;sup>39</sup> Shands, 146.

days. We have no men. We clone and engineer genes, [and after] birth we undergo additional alteration. We have created ourselves to endure, to survive, to hold our land. Soon, we will begin rebuilding [Jerusalem].<sup>40</sup>

Both Riva and Nili alter their bodies to facilitate their work and in order to survive. Like the non-fictional cyborgs, Riva and Nili integrate artificial body parts for practical reasons. Neither Riva nor Nili has difficulty accepting Yod as a fellow soldier in the endless fight against the multis, seeing him as another link in the plan to make the world a better place. The main difference between Yod and all of the augmented humans seems to be one of degree. For example, when Shira reflects on the internal differences between her body and Yod's, she says: "I was making love ... with something built of crystals, chips, neural nets, heuristic programs, lab-grown biologicals. [I] could not cook up disgust. After all, [my] own interior was hardly aesthetically pleasing. Were biochips more off-putting than intestines?"<sup>41</sup> She asks Yod if he finds her biological body disgusting: "But does it ever bother you I'm so messy and biological, that I'm an animal? I bleed, I sweat, I get tired. Sometimes I feel embarrassed before you since you're so much neater. Don't I seem rather gross to you, always putting stuff in or letting it out?"42 The people I interviewed did not generally reflect

<sup>41</sup> Ibid., 180.

<sup>&</sup>lt;sup>40</sup> Piercy, 98. According to the world history in *He, She and It*, in the last Two Week War, a zealot set off a nuclear device that blew up Jerusalem. The postnuclear environment is a radioactive wasteland.

<sup>42</sup> Ibid., 240.

on the actual artificial parts in their bodies, as long as the parts were working. Their feelings ranged from bemusement to disinterest because the arthritic pain and later its lack were the main point, the means to the end. One point to be made, though, is that their artificial parts are also less visible than Yod's or Maggie's. In this context, it is perhaps understandable why my research participants did not view themselves differently after their joint replacement surgery because few of us really have a sense of what the inside of our hip or knee actually looks like. So the surgery replaced a part of their bodies that they had never looked at with another part that they will never see.

Both novels discussed above explore the concept of the cyborg as essentially human, where the origin of the components is not what makes us human. Life experience and the ability to make decisions define us as human beings. The people who participated in my research did not feel that having artificial parts made them any less human, just as the cyborgs in the novels make a strong plea for the recognition of their own humanity. The difference between these two groups of 'cyborgs' lies in the laws that can be made to affect the lives of people based on their derivation or origin. The freedom to control what happens to our bodies may be restricted by society's reaction to the integration of artificial and organic body parts, and only the recognition and respect for the lived experience of others will promote social change. I am not denying that there are qualitative differences between my research participants and the cyborgs in the novels with respect to physical body parts. Instead, I argue that those qualitative differences represent a continuum of power and control of distinct bodies both in science fiction and the world in which we live. **CHAPTER V: CONNECTIONS AND CONCLUSIONS**
The answer to Donna Haraway's question is that there is indeed a field of feminist cyborg theory. In this thesis, feminist cyborg theory interconnects medical discourse, feminist theory, feminist social science methodology, and science fiction. The cyborg continuum connects people who are integrating increasingly more artificial parts into their bodies and the construction of cyborgs in science fiction. Those connections are made through many different pathways in the context of feminist cyborg discourse, which is focused on social change. When connections are grounded in the experience of people whose bodies integrate organic and artificial parts, then the implications and insights available from more abstract and fictitious sources become relevant in terms of the future direction of building cyborg bodies.

This research explored reasons for integrating organic and artificial body parts, and how issues of power, control, and identity were affected by that integration. Replacement surgery, while still experimental and constantly improving, made a tremendous difference to the participants' quality of life, and it was unanimously hailed as worthwhile and necessary. Regardless of various problems that arose post-operatively, the research participants were satisfied with their choice to undergo the surgical procedure. None of my participants had negative or even mixed feelings about having artificial body parts, and most were amused at the idea of being "bionic." For them, the benefits clearly outweigh any pain or complication experienced as a result of hip and knee replacement surgery. Their perspectives were based on their own experiences and sometimes on the experiences of other people, communicated through hospital, family, and friends' stories. The health professionals and the orthopedic surgeons had a broad perspective that comes with numerous interactions with people who require joint replacement surgery. Their perspectives were specific to their particular discipline and role in terms of prevention, treatment, maintenance, and care of total hip and knee replacement patients. The people with total hip or knee replacements and the medical professionals shared the view that the integration of technology into our bodies is a positive reaction to the limitations imposed on us by the physical world that we live in, making people's lives less painful and more enjoyable.

There is a note of caution from some of the health professionals who participated in my research, as well as from some feminists, with regard to embracing the integration of artificial body parts wholeheartedly.<sup>1</sup> However, when asked whether she had any concerns about artificial body parts, one health professional replied:

<sup>&</sup>lt;sup>1</sup> For example, see Ursula Franklin, *Will Women Change Technology or Will Technology Change Women?* (Ottawa: CRIAW Paper No. 9, 1985): and Ursula Franklin, *The Real World of Technology* (Concord: House of Anansi Press Ltd., 1990)

No, I'm a totally brainwashed medical person in the way that I think medical parts are OK. And I also watch science fiction ... and I think probably it'll take us into the future, until we learn to make our own body parts better... I'm certainly not for having a farm where we grow spare parts, you know. And the reproductive technology, if we're not careful, women can become a walking spare parts depot. Very easily. And that should be avoided I think,... You notice how quick the men were to legislate against cloning? Because sperm was not required? Isn't that funny?<sup>2</sup> hum....

She saw the connections between medical parts and science fiction, but emphasized the importance of women's awareness, understanding, and knowledge of medical parts discourse and where it might lead if women do not pay strict attention to the directions taken by emerging technologies. Her argument for continuing surgical procedures that replaced organic with artificial body parts was based on the experience of seeing what a difference the surgery made to people's quality of life.

I think that women and men, women especially, should do everything they can to improve the quality of their life,... feminists [who] take a stand on reproductive technology and on prostheses and how we are interfering with our bodies ... it is only theoretical until you actually have a pain that can be stopped by surgery... When you get in that position, you stop being a theorist ... because there's no sense having a quality of life degraded. Medicine is here, theoretically, to serve us ... And if you don't <u>make</u> it serve us, then it's going to go and do something else.<sup>3</sup>

<sup>&</sup>lt;sup>2</sup> Interview with H1, 2 April 1997.

<sup>&</sup>lt;sup>3</sup> Ibid.

Her words of warning echo those of Ruth Hubbard who cautions that while technology may "be useful and responsive to people's needs ... [it] offers no protection against prejudices [researchers] share with their society."<sup>4</sup>

The question is how to integrate technology into our bodies with understanding, safety, and expertise without placing blind trust in the medical establishment, the legal system or the government bureaucracies. Is it possible? I argue that it is. In the context of the cyborg continuum where all points along the continuum are partially connected, cyborgs serve as a conceptual tool for transgressing the borders that prevent "us" from knowing and identifying with "them." The medical professional becomes the patient/client and learns about pain and discomfort, while the patient/client is credited with a certain level of expertise about her/his own body. Instead of being separated wholes, each is partially connected to all other bodies.

Thus, feminist cyborg discourse can help to deconstruct and demystify the medical monopoly of bodily "truth," displace and undermine the concept of "expert," and seek to de-demonize and frame technological applications in positive and empowering ways for women. The implications of this reconceptualization may be staggering since it challenges the seemingly fundamental relationships

<sup>&</sup>lt;sup>4</sup> Ruth Hubbard, The Politics of Women's Biology, 211.

and discourses we have and use with and for our bodies.<sup>5</sup> There will be resistance to this challenge because the unknown is always feared, and suspicion of potential abuse may be a valuable ally which prevents actual abuse. However, there is nothing that is essentially, inherently, or necessarily wrong about medical and surgical technological interventions into our bodies per se. Understanding the technology is the first step to partial control, limited power and then perhaps a sense or degree of trust both in ourselves and in those who embody the medical branches of knowledge. Judy Wajcman argues that "women's relationship to technology is a contradictory one, combined with the realization that technology is itself a social construct, opens up fresh possibilities for feminist scholarship and action."<sup>6</sup>

Feminist cyborg discourse can benefit people with total hip and knee replacements because it encourages people to know as much as possible, and it promotes the belief that people can know and contribute to what is happening to and inside their bodies. As patients become agents and actors who collaborate with health professionals, feminist cyborg discourse encourages a broader perspective that encapsulates the politics, power relations, and risk involved in total joint replacement surgery. Familiarity with the integration of artificial and organic body parts in fiction is empowering to these same

<sup>&</sup>lt;sup>5</sup> Feminist discourse of women's bodies was addressed in this thesis from pp. 40-44.

<sup>&</sup>lt;sup>6</sup> Wajcman, x.

people because it provides a sense of where this technology could go, setting up different scenarios, decisions, and consequences for constructing cyborg bodies. Some of my research participants did find increased knowledge of their own bodies empowering, while others did not understand and were uncertain how the issues might be framed so that they would understand what was being done to their bodies. Increasing integration of artificial and organic parts also leads to a future where human identity becomes an issue, as it does in the science fiction novels studied in this thesis. Kerstin Shands asks:

Where exactly "is the borderline between human and nonhuman, when humans at this futuristic point in time already are so artificial, with surgical implants and alterations in body and visage, and when non-organic objects talk back at people? Further, as regards questions of life and death, of creation and destruction, what 'rights' do humans have? Is it ever right or justifiable to kill another human? Do human beings have the right, usually the prerogative of God, to decide which causes should be prioritized?<sup>7</sup>

In *He, She and It* and *Virtual Girl*, the cyborgs decide their own fate outside of their creator's directives. Yod chooses death for the greater good and Maggie chooses life for her own good. Are Yod and Maggie 'human' in the same way that the other characters are human? Perhaps not in the same sense but in a way, they 'become' human as they integrate human values into their daily lives and in their perceptions of their quality of life. Similarly, the people that I interviewed for my

7 Shands, 141.

thesis research integrated their total joint replacement into their daily lives and into their perceptions of the improvement in their quality of life. The key difference between cyborgs in fiction and in real life is the perception of their humanity as a consequence of the nature of their physical bodies.

In the science fiction novels explored in this thesis, the reasons for and reactions to the integration of artificial and organic body parts are different and yet related to the discourse of joint replacements. People built cyborgs in He, She and It and Virtual Girl for specific purposes and to meet particular needs, such as protection and companionship. In these novels, people are still augmented (Nili, Gadi, Azul) and repaired (Malkah) to function in the world, whether socially, culturally, or physically. The reactions to Yod and Maggie, however, are based in fear of difference, the unknown, and in prejudice, thus leading to overt struggles for identity, power, and control. Nobody questions the humanity of Nili, Gadi or Azul, although their augmentations may be as illegal as Yod and Maggie, because their actual creation was "natural." Building Yod and Maggie, artificially intelligent beings, is disturbing to people who do not see the connections between a retinal implant; artificial joints and limbs; and a combination of artificial intelligence, "lab-grown biologicals," wires, and silicone chips. The difference is by degree and to what degree people's attitudes and reactions change depending on the level of integration of artificial and organic parts.

Feminist cyborg discourse offers a possible solution to resolve the fear and prejudice encountered by the cyborgs in science fiction, and to prevent it in real life.

Cyborg imagery can help express two crucial arguments ... first, the production of universal, totalizing theory is a major mistake that misses most of reality, probably always, but certainly now; and second, taking responsibility for the social relations of science and technology means refusing an anti-science metaphysics, a demonology of technology, and so means embracing the skillful task of reconstructing the boundaries of daily life, in partial connection with others, in communication with all of our parts ... Cyborg imagery can suggest a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves ... It means both building and destroying machines, identities, categories, relationships, space stories. Though both are bound in the spiral dance, I would rather be a cyborg than a goddess.<sup>8</sup>

This cyborg, then, can be seen as a liberatory figure, whose discourse can be empowering for us because it encourages strategic and political awareness of the limited utility of binary oppositions, showing us that the social construction of "us" cannot operate without "them" for the future of humanity. A multi-methods research approach leads to a new grounded cyborg discourse by blending actual and daily experience of those who live as cyborgs with the imagination of those who engage in

<sup>&</sup>lt;sup>8</sup> Haraway, Simians, Cyborgs, and Women, 181.

cyborg discourse.<sup>9</sup> The affirmative power of science fiction is an important factor in the development of cyborg discourse for a variety of reasons. Cyborg discourse means partial power and control for people who have gained a degree of expertise from their knowledge and experience of their own bodies. Rather than relying on 'experts,' I agree with both Ruth Hubbard when she recommend getting information directly from the source, and Dorothy Smith who argues that if we begin with what we know, we gain partial power and While still remembering that bodies are inscribed control.<sup>10</sup> biologically, socially, and politically, cyborg discourse demystifies and deconstructs how influence and social ideologies affect everything, including power relations, the illusion of control and the abuse of trust by those in authority.<sup>11</sup> Instead of centralized hierarchical authority, cyborg discourse transforms authority into something diffused and wide-spread. Hybridity and partial connections lead to adaptability, flexibility, community, survival, and freedom. In today's world, it can also lead to prejudice, exclusion, and restrictions to freedom.

Jenny Wolmark concludes that cyborg texts, "despite their contradictions and ambiguities, do contain a critique of the masculine hegemony of cybernetic systems which examines their impact on

<sup>&</sup>lt;sup>9</sup> Those who engage in cyborg discourse are primarily privileged academics such as Donna Haraway and Anne Balsamo and science fiction writers such as Marge Piercy, Amy Thomson, Octavia Butler, Ursula Le Guin and Anne McCaffery.
<sup>10</sup> Hubbard, *The Politics of Women's Biology*, 127: Smith, *The Conceptual Practices of Power*, 54.

gender and identity, and asks whether those systems are capable of sustaining other sets of relations and meanings.<sup>12</sup> I argue that a wide variety of relations and meaning are possible along the cyborg continuum which have an impact on gender, identity, power, and control.

From my thesis, it is evident that feminist cyborg discourse can be a valuable tool towards integrating replacement discourse, political awareness, and imaginative creativity, contributing to a concept of social change which re-distributes power and control, and promotes awareness, understanding, and knowledge. A cyborg discourse opens up the possibilities for adaptation and co-optation of technology and technological applications for feminist purposes and causes. It may also produce a powerful tool for women to name, describe, and, perhaps, control what happens to our bodies in the future. Cyborg discourse is both a personal and collective shift in paradigms to balance power and maintain control. It relies on shifting attitudes and perceptions of our relationships with our bodies and the interventions we choose to make in terms of integrating artificial parts into our bodies safely and knowingly. I argue that feminist cyborg discourse sheds light on an avenue for social change, both theoretically and in a way that can affect women's daily lives. It affects our relationship

<sup>&</sup>lt;sup>11</sup> Scheper-Hughes and Lock, The Mindful Body, 41.

<sup>&</sup>lt;sup>12</sup> Wolmark, 138.

with the medical establishment and the increasing intervention and implantation of artificial parts into our bodies, our experiences, and our lives.

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### APPENDIX I

### VISUAL REPRESENTATIONS OF THE CYBORG CONTINUUM AND ADVERTISEMENTS FOR TOTAL HIP AND TOTAL KNEE REPLACEMENT SYSTEMS (FROM THE JOURNAL OF BONE AND JOINT SURGERY, 1996-1997)

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### APPENDIX II

### SAMPLE CONSENT FORM AND LETTER OF INTRODUCTION

### CONSENT FORM TO PARTICIPATE IN RESEARCH

This is to state that I agree to participate in an interview for research with people who have undergone hip or knee replacement surgery.

- --I understand that the purpose of the research is to study the effects and impacts of hip and knee replacement surgery on quality of life.
- --I understand that the interviews will last about an hour and will be recorded on tape.
- --I understand that I am free to withdraw my consent to discuss my experiences and to withdraw my participation at any time.
- --I understand that data from this study may be used by Jenny Fry in her thesis, presentations and publications.
- --I understand that my confidentiality and anonymity are guaranteed, unless I indicate otherwise.

I HAVE CAREFULLY STUDIED AND UNDERSTAND THIS AGREEMENT, AND THEREFORE I FREELY CONSENT AND AGREE TO PARTICIPATE IN THE RESEARCH.

### NAME:

(please print)

SIGNATURE:

**RESEARCHER**:

DATE:

### LETTER OF INTRODUCTION

#### To Whom It May Concern:

I am a graduate student at UNBC and I am looking for people in the community who would participate in my research about the impact of hip and knee replacement surgeries on their quality-of-life. This research is important because there is very little information about the improvements of people's quality-of-life after having undergone this kind of surgery. I would like to know more about people's concerns about the quality of care they received, why people chose surgery, their recovery experiences and when they were able to resume normal functions. I think it is important that your voices and concerns are addressed.

I hope you will agree to grant me about an hour of your time in the near future. The interviews will be taped and kept confidential. If you wish, your identity will be concealed and protected. Your participation is always voluntary and may be withdrawn at any time.

If you are interested in talking to me about your surgery, please call me or leave a message at 250-563-4588 to set up an interview at your earliest convenience.

Thank you,

Jenny Fry Graduate Student in Gender Studies University of Northern British Columbia email: fryj@unbc.edu