International Journal of Gender, Science and Technology
http://genderandset.open.ac.uk

A Techno-Passion that is Not One: Rethinking Marginality, Exclusion, and Difference

Linda Vigdor

University of Illinois at Urbana-Champaign, U.S.

ABSTRACT
Contemporary portrayals of the gender-computing relationship are limited in their perceptions and constructs. Dependent on overly generalized subjects (girls and women not much interested in computing) and a singular and all-consuming notion of what constitutes a passion for technology, girls and women are cast as uninterested bystanders or moral critics of computing. To varying degrees, girls' and women's disinterest is explained as an outcome of their techno-passion gap. Highlighting three women digital artists' technology stories, I develop an alternative story that plays out in the marginal spaces of artists' practices, performances, and reflective marginality. I begin with a broad and brief overview of three common gender-technology stories and elucidate some of their limitations. My focus turns to a mainstreamed educational and popular narrative that 'girls and women just aren't that into computing'. I argue for an alternate story that finds value in marginality and a web of ambivalent passions and ethical commitments that drive an artist's interests in technology.

KEYWORDS

Difference; gender & technology; computing; marginality; performance; situated practice; technological agency; techno-passion; expert-user

A Techno-Passion that is Not One: Rethinking Marginality, Exclusion, and Difference

INTRODUCTION

Thirty years of quantitative thinking about women's underrepresentation in computing drives national and international educational and policy initiatives in the US, UNESCO, and the European Union. Beginning in the early 1980s, the popular imagination in the US began to coalesce around a gender-technology story, concerned that women were missing some capabilities central to working effectively with computers (e.g. Hawkins, 1985; Sanders, 2005). This later shifted to the concern that 'girls/women just aren't that into computing'. Two examples illustrate this thinking:

> There is a subset of boys and men who burn with a passion for computers and computing. Through the intensity of their interest, they both mark the field as male and enshrine in its culture their preference for single-minded intensity and focus on technology.
> (Margolis & Fisher, 2002; p.4)

> Girls are not computer-phobic; they are 'computer reticent'...They express a 'we can, but I don't want to' philosophy.
> (American Association of University Women [AAUW], 2000; p.7)

Both statements depend on a conventionally gendered subject and a casual use of the word passion. Too often it is assumed that (a) it does not matter which women's technology stories become reference points and (b) that a loosely located or defined concept of passion is explanatory. In fact, both the subjects studied and what passion points to does matter in how we construct gender-technology stories.

How we construe the gender-computing relationship depends on the perspectives we draw from. Ensconced in imaginaries, it is easy to forget that there are a number of gender-technology stories in circulation, with at least three popular across the US and EU. A primarily 'academic' story—grounded in techno-science, cultural, and feminist science studies—has historically been concerned with how technologies are themselves gendering or how techno-cultures are constructed or co-constructed through dominant epistemologies that largely promote men's orientations to the world. In a second story, STEM education and popular press accounts have us watching statistics on the number of girls and women who enroll in computing courses, play computer games, or persist in computing careers. A third story revolves around exemplary women who have made major contributions to computing (e.g. Ada Lovelace and Grace Hopper in the sciences). The second story, despite its flaws (see Vigdor, 2010), contributes most to the popular, dominant social imaginary of gender and computing.[1] The third story is of course significant, but relying on the extraordinary to think about more everyday experience is not that useful in making sense of diverse, situated practices. While all these stories have helped us appreciate the gender challenges and opportunities

that come with technological progress, the constructions and demarcations grounding each have become limitations.

The three women artists' stories highlighted in this paper may be extraordinary in their own right; each reveals accomplishments not to be dismissed. However, if we approach each as in part *unextraordinary*, they resonate differently. That is, stories not singled out for their extraordinariness with technology, but for the everyday ways women artists work with and think about digital technologies, suggest that techno-passions attenuate in significant ways. These artists' techno-passions are negotiated within a web of perceptions and intentions that intersect with an individual artist's interests, ethics, and experiences of marginality. As do other passions, techno-passions ebb and flow within circumstances. Extraordinary yet everyday, they reflect negotiations across ambivalence, rationality, and a host of passions for both computing and art.

Popular gender-technology stories take passion for granted when the focus is put on women's reticence and men's overindulgence, relying on *a priori* psychological traits (e.g., AAUW, 2000; Brunner, Bennett, & Honey, 1999; Turkle, 1988). How easy it would be to argue that this passion/reticence binary was merely a product of conceptually separating reason and affect, where reason and logic have been the masculine domain and affect, the feminine. However, looking more closely, in gender-computing stories boys and men are the passionate agents and girls and women, the voice of reason and ethics. In essence, gendering computing has depended on the reductivist interplay of passion, reason, and ethics, yet their intersection is far murkier than acknowledged.

Contemporary work on affect suggests a necessary rethinking of passion; no longer seen as dichotomous, cognition and affect are instead intertwined and co-mediating (e.g., Damasio, 2005; Massumi, 2002; Naranch, 2007). Susan James (1997) argues that twentieth century philosophy misconstrued seventeenth century philosophers by placing understanding reason and passion in opposition, placing ethics on the side of reason. Following this twentieth century limitation, gender-technology research has constructed three incommensurable notions. In one corner, computer geeks and hackers are characterized by their extensive logical reasoning capacities; their fascination with machine logic keeps them safe from seemingly illogical and unprogrammable human emotions. In another corner, boys and men are characterized as driven by a passion that blinds them to the moral ambiguities wrought by technology. In a third corner, girls and women claim a greater moral-ethical compass with regard to technology because they remain dispassionate. Examples of this thinking are found across the gender and technology literature in education and psychology (e.g., AAUW, 2000; Brunner, Bennett, & Honey, 1999; Cohoon & Aspray, 2006; Collis, 1985; Kay, 1992; Margolis & Fisher, 2002; Turkle, 1988). The often-cited AAUW report (2000) states girls' position as follows:

> In girls' efforts to find a perspective from which to talk about gender differences, they often position themselves as morally or socially more evolved than boys who, they tell us, enjoy "taking things apart" and

interacting with "machines." (p.8)

The conundrum is that when it comes to thinking ethically about computing women, conventionally the emotional and less-rational gender, are more grounded. Male rationality, as characterized, serves their programming skills, but their interest is tied to a singularly focused passion for the computer.

An assumption framing much of Western thought has been that "rational people are able to control and advance the processes of their own thought, whereas passionate people are responsive to, and constrained by, the partial ideas they derive from experience…rational people are agents, whereas passionate people are not" (James, 1998, p.1367). James asks whether rational judgments carry a distinctly moral authority. If they do not, she suggests, there is little ground to the notion that "we are subject to an ethical requirement to use reason to control our passions" (p.1370). When girls' or women's dispassion for computing becomes the grounds for a claim to a higher techno-ethical compass, the underlying rationale is that men's passions negate ethical thinking. How shall we reconcile the various oppositions put in play?

Gilligan's (1993) feminine ethic-of-care pervades US based STEM gender-technology research to portray girls' and women's emotional connection to others and to society; thus they avoid 'intimacy' with computers (e.g. Turkle, 1988). In contrast, portrayals of boys and men veer between their high degree of logical reasoning and their driving passions for a logical machine, without addressing the apparent conflict in these two orientations. Rather than pitting reason against passion, insufficiently explained through gender, it might be useful to think in terms of "one passion…used to overcome another...[or] by appealing to interests" (James, 1998, p.1380). Positioning attenuated interests and ambiguity as mediators of reason and the passions, James opens a path out of the recursive loop of the passion-reason binary by recognizing a "murky intersection of reason, passion, and ethics" to distinguish between "passions and interests…calm and uncalm passions" that better elucidate the relationship between virtue and emotion (p.1391).

James (1997) wants to bring a more complex view of the passions back to philosophy, to contribute to the contemporary project of re-integrating mind and body, affect and reason. Most relevant to the contemporary gender-technology problem is that "different accounts of the passions yield different analyses of decision-making and indecision, and also draw attention to a largely neglected analysis of the place of desires among the antecedents of action" (p.17). In short, dichotomous or pre-determining passions become the problem, narrowly framing gender-computing stories. Inferences about passion rely on broadly assumed dichotomies: male-female; mind-body; reason-emotion; and, ethics-technocentrism. Instead of using passion as causal marker, gender-technology research might better view passions as what "infuses what we know about who we are (or contesting what 'we' has been) and what we desire (or should desire)" (Naranch, 2007, section 1). Connecting theoretical expositions of passion to women artists' reflections on their motivations and challenges in working with advanced computing technologies suggests that passions mediate thinking about technology,

but that these passions are not singular—they are multivalent and ambivalent. Ambivalent passions allow these artists to creatively navigate their pragmatic, ethical, and creative interactions with technology.

Antonio Damasio's (1994, 2005) neurobiological investigations similarly present a strong case that emotions and reason, as well as body and mind, are highly intertwined. Central to his model of neurobiological mechanisms is that the body and feelings provide the valuations and biases that allow reasoning to proceed and be effective. In his model, mind "arise[s] out of an organism rather than out of a disembodied brain" (p.229). Reality, as well as our sense and experience of the world, is constructed through the interactions between bodily representations and constructions made of this reality in our brains.

BACKGROUND: TWO GENDER-TECHNOLOGY 'GRAND NARRATIVES'

Just as gender is now understood to be mediated by intersections of race, class, geography, (dis)ability, and so on, gendered techno-passions must also be seen as multivalent, not bound to a norm constructed around a much lauded, scorned, or feared masculine computing culture. However, evidence for this multidimensionality tends to get lost within the imaginaries of circulated gender-technology stories. In effect, mainstream US and European lenses have depended on or constructed at least two 'grand narratives' to describe the gender and technology relationship. One focuses around the insufficient representation of girls and women in computing or STEM fields and the second, on the social construction of gender and technology. Both depend on essentializing and determinist thinking and miss that a frustrating experience can be the provocation to embrace marginality. Also limiting is a highly essentialized and determinist concept of passion.

Underrepresentation and Disengagement

Since emerging in the early 1980s, research on gender underrepresentation in computing has been driven by reductivist concepts of women/gender and technological determinism, framed by the good intentions of liberal feminism. Three recent literature reviews lay out this landscape—Barker & Aspray, 2006; Sanders, 2005; and, Singh, Allen, Scheckler, & Darlington, 2007—thus my description is brief. A guiding light has been Gilligan's *In a Different Voice: Psychological Theory and Women's Development* (1993), which argued that girls' and women's moral compass is driven by a feminine ethic-of-care that is different, not deficient, from boys' and men's concept of justice.

The narrative links computational wizardry and techno-passion with present and future opportunity. Sherrie Turkle's essay *Computational Reticence: Why Women Fear the Intimate Machine* (1988) became an often-cited resource, arguing that boys' and men's passions for computing helped them avoid the messiness of the social world, whereas girls intentionally kept their distance because they saw machine intimacy as foolish and anti-social. Another seminal essay was Camp's *The Incredible Shrinking Pipeline* (1997), which highlighted an increasingly declining participation as girls and women move through computing's educational and career pipeline. Women's dispassion for computing became central as an explanation (e.g., AAUW, 2000; Margolis & Fisher, 2002). That is, as women's deficits in STEM fields

were abandoned as explanations, a lack of passion for computers became the popular argument. Yet, how passion has been conceptualized in these narratives remains highly gendered, determining, naïve, or simplistic.

Socially Constructed Gender and Technologies

Social constructivist models have taken a different tack in explaining women's marginality to computer culture. Although there is some overlap with underrepresentation concerns, social construction advocates focus on technologically mediated patriarchal power or socially constructed gender norms. Gender roles and relations have been described as constructed in and through the configurations of specific technologies, and enforced or reified in everyday interactions (e.g., Cockburn & Ormrod, 1993; Balsamo, 1995; Faulkner, 2000; Clegg, 2001).

Liberal feminists tended to view technology in a positive light, as the means of breaking free of patriarchal control. Conversely, radical and ecologically driven feminists argued that liberation required keeping technology—always a tool of patriarchy—out of women's lives (Mies, cited in Wajcman, 2004). Feminist re-evaluations of the 1990s coalesced around cyberfeminism and Donna Haraway's cyborg (1991a). Among the most radical of cyberfeminists, Sadie Plant (1998) argued that digital technologies are much more suited to women's ways of being and thinking, thus making men superfluous in a digital era. Technology, now out of control, was a boon to feminism because it meant men were no longer in control. Haraway (1991a) situated technology *in* culture rather than independent of society; her cyborg blurred human-machine boundaries, subverting gender oppositions.

Judy Wajcman's technofeminism opened-up constructivist thinking by suggesting that both gender and technology co-construct; the locus of power is not solely or even primarily within technology. She emphasized a newly empowered feminist technological agency that coalesces around an abstract conception of democratic solidarity. A more equitable and gender friendly technology climate will emerge as men recognize that they should cede exclusive control of the work environment and technology; passion takes a backstage to power.

POST HUMANIST AND NEW MATERIALIST INTERVENTIONS

Haraway's (1991b, 1997) work on the intersection of technoscience and knowledge intervened in a number of essentialisms: male-female, human-machine, and culture-science, arguing that a misguided understanding of scientific objectivity taints perceptions of valued knowledge. Targeting an Enlightenment legacy that privileged a disembodied, 'god-trick' view of scientific objectivity, Haraway's influence was to redirect the lens, making culture, vision, and experience integral to scientific knowing (Haraway, 1991b, 1997). Other feminist scholars extend her vision and find value in ontological, biological sex differences (e.g. Alcoff, 2006a; Braidotti, 2003; Wilson, 1998). To summarize these scholars' highly complex arguments, biology and ontology are harnessed as a source of women's power, a far different position than earlier notions that saw female biology as the source of women's oppression.

Insufficiencies of long-standing mind-body and reason-affect oppositions drive new feminist thinking about the dynamic interplay of nature-culture and technology-society intersections, through posthumanist, new materialist, and feminist technoscience analytics (e.g., Alaimo & Heckman, 2008; Barad, 2007, and Colebrook, 2009). Briefly, posthumanism describes a shift away from thinking about humans as singular agents with the resources to control nature. Instead, a multiplicity of agents contributes to the dynamism of nature intertwined with culture (e.g., Grosz, 2005; Hayles, 1999). New materialist scholars argue that material-affective dimensions also play a large role in how the nature-culture dynamic unfolds. They emphasize a shift from "ethical principles to ethical practices" and from rules to "embodied, situated actions" (Alaimo & Heckman, 2008; p.7; also, Coole & Frost, 2010; Hird, 2004). The dissatisfaction is with thinking about nature, culture, and the body as products wholly of discourse or as independently functioning entities rather than dynamic engagements.

New developments in affect theory have been influential, as has neurobiological research (e.g. Braidotti, 2002, 2003, 2006; Damasio, 2005; Connolly, 2002; Massumi, 2002). Braidotti suggests that in a posthumanist worldview, liberalism's sex-gender opposition is no longer useful. Instead, we must acknowledge transversal connections between multiple kinds of subjects and subjectivities. Damasio's neurobiologically oriented argument posits that the mind is embodied, that "it is as if we are possessed by a passion for reason, a drive that originates in the brain core, permeates other levels of the nervous system, and emerges as either feelings or nonconscious biases to guide decision making" (p.245). Emotions target what is worthy of logical analysis.

Drawing from both posthumanist and new materialist thinking, contemporary feminist technoscience scholars view technology quite expansively to connect ontologically "the human, nonhuman, technological, and natural as agents that jointly construct the parameters of our common world" (Alaimo & Hekman, 2008, p. 5), moving beyond dichotomous thinking that drive both modernist and postmodern epistemologies (Alaimo & Heckman; Barad, 2007; Colebrook, 2009; Connolly, 2002; Grosz, 2005; Haraway, 1997). A dynamic enterprise manifests "a deconstruction of the material/discursive dichotomy that retains both elements without privileging either…to more productively account for the agency, semiotic force, and dynamics of bodies and natures" (Alaimo & Heckman, 2008, p.6).

Women's techno-passion gap plays out in contrast to men's singularly focused techno-passion. This passion binary negates possibilities for recognizing the potentialities to be found in local, situated practices, marginalized actors, and ambivalent passions. Yet, a multi-faceted techno-passion is evident in women digital artists' reflections on their creative, technological practices. Rather than suggesting a cohesive identity, this paper focuses attention on individually circumscribed passions for computing. Artists' stories portray a network of creative passions framed around individual frustrations, agencies, values, and ambivalent passions. Each artist shares her tempered passion for technology, where ambivalent passions reflect the artist's situated, aesthetic practices and personal ideals. Although the overall gender-technology project retains its political aims,

alternative analytic strategies are proposed that recognize the potential of ambivalent techno-passions as a source of creative practice and motivation.

A RATIONALE FOR AN ALTERNATIVE STORY

To date, gender-technology stories have sustained two assumptions. First, women's marginal status in computing is a political, structural barrier that must be overcome and second, that a sub-par techno-passion is constant and readily observed. That is, a singular and obsessive techno-passion is used to generalize a male, all encompassing love of all things technological. One extreme example of this thinking was manifest in Turkle's (1988) notion of girls' computer reticence as a rejection of boys' intimacy with the computer, built from a stereotype of the computer hacker who fears the complexities of social relationships.

I argue an alternative: techno-passions are built from extraordinary and everyday, frustrating and passionate, technology interactions and beliefs. Moreover, multi-dimensional passions and an embraced marginality can become the basis of an individual's technological agency. Patricia Hill Collins (1986) explains the agency afforded by an awareness of one's marginality. Focused on Black feminists' creative re-analyses of race, class, and gender, Collins argues that Black feminist thought has been fueled, at least in part, by these intellectuals' recognition of their "outsider-within status" (p.S15): "'For a time…marginality can be a most stimulating, albeit often a painful, experience. For some, it is debilitating…for others, it is an excitement to creativity'" (p.S15).

Popular gender-technology stories take men's practices to be the gold standard, women's to be lacking, and artistically oriented practices to be largely of little import. For example, in a 2008 New York Times article, Justine Cassell dismissed women's inroads in Web design and computer graphics, suggesting that these "are not traditional computer science" and therefore "not much of a victory…The pay is considerably less than in software engineering and the work has less influence on how computers are used" (Stross, 2008, par. 10). Cassell's dismissal reflects some common biases. Most prominent are cultural beliefs that place pure techno-science at the top—within Western culture and academe, the arts have been a distant cousin to the more objective disciplines. Cassell's prejudice values the designer's/expert's contributions to technological innovation over those of users'/consumers', not recognizing that these so-called outsiders contribute in equally significant ways. Users reshape a technology through needs that emerge in local practices and effectively decide where, when, and how a technology will enter the culture (e.g., Oudshoorn & Pinch, 2005; Law & Singleton, 2000; Suchman, 1999). Thus, a problem to overcome is a tendency to group pure technoscience, an ontological and singular passion for computing, and a higher technological agency on one side, and women, a more applied technoscience, dispassion for computing, and a lesser technological agency on the opposite side.

Recently posited connections across the passions and reason, culture and nature, suggest ways to sidestep the trap of quantifying representations that ignore the qualitative significance of marginalized agents, their practices, and ambivalent passions (e.g., Butler, 1990, 2004). Drawing from Derrida (1978), difference is

turned on its head; more than an *other* to *a* masculine norm, difference becomes the means of locating other viable perspectives and ambivalent engagements.

Artists' stories provide a lens onto their reflective marginalization, illuminating how they negotiate their technological, ethical, and artistic agencies, values, and passions. This reading does not negate observations that women's technological interests are often driven by a sense of ethical responsibility. Yet, within conventional gender-technology stories, passion for computing has become the antithesis of women's ethics driven, utilitarian interest. The dominant gender-technology imaginary condenses women, their values, and deficit passions to suggest that these steer women away from computing. The three artists interviewed tell a different story, connecting technological passion with a responsibility to become masterful, creative collaborators with their technologies.

NORMS AND DEFICIT PASSIONS

Women's technological passions commonly are portrayed as fragile or deficient. This 'lack' becomes a feminine techno-passion gap: "More boys than girls experience an early passionate attachment to computers, whereas for most girls attachment is muted and is 'one interest among many'" (Margolis & Fisher, 2000, p.16). Taken for granted is a male-female binary that broadly 'genderalizes' passion, where boys' passions for their computers stand in stark contrast to girls' passions for social relationships (e.g. AAUW, 2000; Cohoon & Aspray, 2006), making it seem that passion has two poles rather than degrees. Framed through a psychological reductivism, a feminized technological dispassion became the antidote to boys' and men's misguided intimacies (rhetorical or metaphorical) with the computer (Turkle, 1988).

Reliant on a romanticized and naïve passion that demands a singular devotion to its object, popular gender-technology stories construct a similarly romantic subject—the geek. The computer is his object, mirroring the romanticized artistic genius of the 19th century. Girls and women, in contrast, are said to 'naturally' reserve their passions for people; girls and women's passions more reflect those of 1950's family sitcoms.

> Women like that computing will allow them to do things that have meaningful human social impact. To save lives, help people, to make a contribution - contextual concerns. For boys, the appeal is doing cool things without external interference (physics, life...). 'You get to do cool things and play around with it and it's fun'.
> (Margolis & Fisher, 2002, p.54)

More expansive views of women and technology are emerging. Janet Abbate (2010) notes that most gender-technology narratives emphasize negative experiences; as a correction, she focuses attention on the surprising positives that women have experienced in computing. Thomas Misa (2010) highlights the exemplary women who have been passionate about their computing pursuits and who have been honored for their work (e.g. Fran Allen and Barbara Liskov who each won the prestigious Turing Award from the Association for Computing Machinery, in 2006

and 2008, respectively). Despite these examples, the dominant discourse continues to emphasize women's dispassions for computing.

Close examination of women artists' stories puts the gaze onto a passion that is not one, to paraphrase Irigaray (1977,1985). A less naïve, de-romanticized, and more ambivalent notion of passion makes it possible to see technological agencies and passions as having multiple, purposeful expressions. In the following stories, Ann, Denise, and Sue illuminate how their individual technological agencies are negotiated and performed within the contexts of each artist's self-interpreted marginalization and creative ethic, driven by a spectrum of passions.

MARGINALITY, DIFFÉRANCE[2], AND PERSISTENCE

Gender-technology researchers rarely look at women in the margins—where the margins are defined broadly as women who either do things differently, locate themselves in less traditional roles, or simply do not fit a transparent yet generalized norm. Artists hold this marginal social position and this otherness can be both imposed and embraced. As used by Collins (1986), reflective marginality becomes the basis for creative engagement. Similarly, intentional marginality—not unlike Butler's (1990, 2004) notion of alternative gender performances—is a useful lens for thinking about the fact that artists often self-depict or self-identify, to varying degrees, as thinking and working outside cultural or gendered norms. Uniqueness is a valuable asset for an artist (Sofia, 2002). Moreover, artists in general tend to be independently motivated, take on challenges as a matter of course, and work against stereotypes and expectations. The three artists interviewed describe their marginality in at least two dimensions. One is the marginal status afforded artists, both in society and within technoculture. Second is the marginalized position of women in computing, even when their skills and knowledge are equal to or supersede men's.

Gender-technology stories have always been about difference and—on the surface—it *appears* that these stories have been theoretically sensitive in articulating differences by shifting over the years from a focus on biological sex to social constructions of gender (more recently adding to the mix race, class, ethnicity, and disability). Yet, difference tends to denote a stable, clearly marked category of otherness. Mainstreamed gender-technology stories rarely access scholarship that thinks through an intersection of ontology, dynamism and situated knowledges (e.g., Alcoff, 2006b; Braidotti, 2003; Grosz, 2005; Haraway, 1991b, 1997; Irigaray, 1985). Derrida's (1978) work has been central in these endeavors to respect the local nature of difference.

According to Drucilla Cornell (1999), Derrida's understanding of différance is that of "a 'general economy' [that] can only be demonstrated within the particular context" (p.140). Context challenges thinking about "the male and the female as unshakable biological entities" that can be used to systematize a universal category of difference (p.140).[3] The problem of thinking in terms of easily classifiable gender difference is that such differences end up as generalizations of women's experiences and identities, without regard to individual women (or men).

Also relevant is Butler's argument that gender can unfold through performances (1990, 2004), especially as marginality is either embraced or resisted. She opens an alternative lens for interpreting how women express their technological identities and spectra of passions. Intentional performances embrace difference and become claims for a kind of personal or socio-cultural agency. Self-embraced or performed marginality gains intensity to the degree that there is passion involved, although it may be hard to pin down the character of this passion at any given moment. Women digital artists perform at least two marginal roles: the artist in a technocratic society and the female computer geek.[4]

PRACTICES AND PASSIONS IN THE MARGINS

Marginalized individuals or subgroups only have value in popular gender-technology stories to the degree that they illuminate the workings of oppression and inequity experienced by a broad group. Ambivalent or moderated passions appear to offer little value. On the one hand, dispassion explains those who have little interest in a value-free technoculture. On the other, women are accorded a higher-order techno-ethic through a psychologically gendered ethic-of-care. Similarly, reductivist renderings of users-creators and gendered computing interests largely ignore the ways that both users and creators contribute to techno-scientific innovations (e.g., Law, 2000; Latour, 1979, 2005; Oldenziel, 2001; Suchman, 1999). Situated practices illuminate individual engagements and individualized, multivalent passions.

I use situated practices to characterize how individuals engage with their worlds and to describe an interplay of individual practices as they reify, challenge, or re-envision conventional practices of a social group. Lisa Given (2008) refers to the practices of artists as "often reflective, reflexive, recursive, and responsive acts of living inquiry" (p.26). Situated practice also draws upon Haraway's conception of situated knowledges, challenging the privileged status of abstracted, disembodied scientific objectivity to highlight the centrality of locally experienced perspectives. Central to a more representative objectivity are situated knowledge practices that in turn recognize science as a value-laden, social-historical practice (e.g. Latour & Woolgar, 1979; Stengers, 2000). Situated perspectives and practices are fundamental to how we see the world. Following those who see art and science as equally interpretive of our world, the situated practices of artists are one type of objective engagement (e.g., Colebrook, 2010; Ede, 2005; Scott, 2006).

Women artists' situated, technological practices provide an alternative lens that is useful to the feminist project of building better and more encompassing theory. It is not just that artists are wrongly classified as mere users of technology. Their art, to the degree that it departs from conventions of representation, tends to be viewed as obtuse, or worse, superfluous to the real work of technological innovation. Conversely, the more a scientist's work produces new theoretical knowledge, the more likely is 'he' to be thought a genius. Moreover, genius carries the romanticized notion of a single-minded creative passion. The computer geek fits this romantic tradition. Focusing some light on women digital artists shows that passion is more nuanced and that ambivalent passion is what keeps the artist working and learning new technologies, pushing creative boundaries, driven by her own aesthetic ethic.

The three women artists' personal journeys with technology discussed in the following pages may be studied as both performances of self-reflection and as windows into an individual's evolving technological agency through her ambivalent techno-passions.

Artist's situated practices blur some of the distinctions commonly made between creating and using technologies. On the one hand, artists create with the computer, thus hold a user role. Sometimes they also program, create, or reinvent software tools. However, even if they do not actively design or program (the role commonly accorded 'computer experts'), they do interpret, constitute, and make visible the cultural value (negative or positive) of both individual technologies and techno-culture. Moreover, high-end computer graphics tools are quite complex and require a specialized user. Programmers might have been the early creators and users of 2D and 3D software, but the fields did not blossom until artists got access and contributed aesthetic and creative expertise. Artists might be 'users' of technology, yet this framing does not do justice to their technological prowess and creativity or to their cultural contributions.

MARGINALIZED SUBJECTS IN THE LIMELIGHT

The three artists discussed in this paper combine both traditional and digital media; their situated practices illuminate both creative engagements with technology and a necessary cultural processing of technological innovation. This processing is as constitutive of new technology as is the invention itself—a technology would have little meaning if not taken up by society. Artists are reflective, constitutive interpreters of technoculture, even if they often sit outside the mainstream of this culture.

I have noted how passion is theorized to effectively disrupt long-standing binaries of reason-affect that have framed a host of male *versus* female, mind *versus* body, and reason *versus* affect constructions, as scholars such as James (1998) suggest that passion itself is multi-dimensional and draws from ethical, aesthetic, political, social, and self-other interests. In addition, I have suggested an alternative valuation of women's marginalized status within computer culture, where an outsider position becomes a source of motivation and creative energy. To illustrate these interactions, I draw on interviews conducted with women digital artists, all graduate students in the arts at a major US research university.

The artists were selected from a pool of available students enrolled in the Master of Fine Arts (MFA) program in digital arts or architecture, or the doctoral music program. Their selection was random, not in the experimental sense, but rather, as three artists among many who enroll in graduate digital arts or technology infused music programs. While extraordinary in their own right, the artists were not selected or interviewed based on any extraordinariness, other than for being both women and interested in technology. The interviews were conceived as a counter to an earlier study focused on technobiographies of preservice teachers, also enrolled at the large Midwestern university (Ching & Vigdor, 2005). So many STEM gender-technology stories have been told through the lens of students and teachers whose primary connection to technology is through K-12 schooling or teacher education

programs. This author saw an opportunity, suspecting that artists on the same campus, but in a different location, would tell a substantively different set of stories. My argument is not so much with the findings of any given study, but with the presumptions surrounding the subjects or objects that form the basis of a broadly painted story of a highly gendered techno-passion gap.

The interviews focused around questions such as how each evolved as an artist and the role technology played in their professional development or artistic vision. They shared views of technology-facilitated art and described their artistic processes in working with technology. Also shared were their frustrations, challenges, and joys in learning or working with advanced technologies and the significance of being in control of a technology to serve artistic intentions.

The ensuing interpretation is not meant to be evaluative but rather, an attempt to situate each story within a larger social-cultural story (Alvesson & Sköldberg, 2000; Flyvbjerg, 2001) and to discern meaning in practices (Foucault, 1991). The background is a mainstream gender-technology story that, while driven by gender as a marker of significant difference, overly depends on ill-defined, reductive concepts of passion and otherness.

SITUATED STORIES AND MULTI-FACETED PASSIONS

Ann's technological work has two distinct foci. On the one hand she is an accomplished computer programmer of artificial intelligence and on the other hand, she employs computer graphics to render and display her architectural designs. Denise's primary arts practice is focused on creating large-scale installations. These installations bring together digital media that she creates, traditional media (e.g. paint), and performance. She navigates between exploring cutting-edge technologies such as 3D animation and situating these in real-time environments and performances. Sue is a composer who integrates traditional and digital painting with her electronic music compositions. To varying degrees, each artist crosses commonly articulated boundaries of computer expert-user and hard-core technoculture contrasted with the oft-portrayed soft culture of computer art. Sofia (2003) suggests that an over emphasis on the new has distorted our valuation of both technology and new media driven art and that "technological developments in this century have proceeded faster than our coming to grips with their implications, and artists still have a lot to do in helping culture "digest" and work through earlier technologies" (p.507). As they create their art, these artists help to create technology and technoculture.

Ann: Two Performances of Technological Agency

Before returning to graduate school, Ann worked professionally as a computer programmer, but her first encounter with computing would have suggested a different outcome.

> It was 1986, and I was scared right out. I remember the first day I came in and showed up. I didn't know anything about computers. All the guys...there's a lot of macho posturing that's so big in computer science you know. I can play now because I'm in my 30's—what do I

> care. But then, I was completely intimidated…And I ended up, I ended up dropping the course, because I was so intimidated I thought I couldn't keep up.

At the time, she was a 24-year-old student and her experience mirrors what is commonly portrayed in the gender-technology literature (AAUW, 2000; Camp, 1997; Margolis & Fisher, 2002), where perceived marginality prompted her to drop computing. However, Ann relates this story from her current position as a 36-year-old graduate architecture student; in the intervening years, she earned her master's degree in computer science. She interrupted her architecture studies to get her computer science degree and continues to work part time doing artificial intelligence (AI) programming while completing her MA in architecture. She tells two different technology stories that on the surface appear nearly oppositional. On closer inspection, we see her perform two versions of her technological agency and passions, each situated in a specific persona. Her different technology stories highlight two different perceptions of what constitutes marginalization, agency, and passionate engagement in the fields of architecture and computer science.

When Ann talked about her second foray into a computer class, the narrative was substantively different:

> When I took the course again, ten years later, older and wiser, I was one of the top students in the class, so it wasn't a matter of me not being able to do it, it was a matter of me [earlier] being completely intimidated by the macho culture of the whole thing.

By retaking the course and staking out a position in what she had once experienced as a hostile computer culture, Ann reveals some of her steps in her quest to claim her technological agency. First is that she re-entered computer science. This was an intentional act that challenges the existing story that suggests that once women leave computing, they leave for good (Gurër, & Camp, 2002; Margolis & Fisher, 2002). In signing up for the course again, Ann had to face her initial marginality and negative experience. She remained cognizant of her marginal status, but it was redirected as a source of strength.

An attenuated passion for computing bolstered Ann's achievements in computer programming. However, a techno-passion is far less evident when Ann talks about computing from her perspective as an architect. Not only does her relationship to technology shift, the way she talks about technology changes:

> I thought that the technology would force me to behave a certain way and you know, encourage me to do Platonic solids - or you know, WHATEVER WAS EASIEST to do with the machine and I wouldn't be able to you know be as, as free as I can with regular analog media. You know I recently went over to the dark side.

Separating her experiences, in one moment Ann protects her architect identity by keeping technology from the center of her creative process. Her fear was that the

technology would wrest control and that the computer would hold (or be seen to hold) the agency. In a later moment, talking through her computer scientist persona, she reveals a different technological agency and passion:

> The last thing I did at the research lab before I left was a project to do a distributed computing space… so it was in a lisp-like language and…the whole structure of the language was really—it had a beauty to it. And the idea—it was very aesthetically pleasing—the idea of creating these programs and, you know, you could write simple recursive code to do something incredibly complex. It's like the beauty of a machine, you know. And it really, it really was seductive. The idea of just being able to use words to create these machines of enormous power. I mean that was, that was really neat. Still is neat. I still enjoy it.

In this statement, Ann's aesthetic merges with her programmer identity, where her appreciation for the technology itself is quite strong, reflected in her confident agency, competency, and passion. When she talks about technology through her architect identity, her agency and her passions take on a different tenor; voiced instead are a distinct dispassion, framed through concerns about technology taking control of the art-making process. On the surface, it appears that Ann is telling contradictory stories about her technological and her artistic agency and passions.

In her AI work, Ann describes herself as able to create the 'mind' of the machine, yet as an architect she portrays herself at the mercy of computers having an independent mind or aesthetic. Expressed are two different versions of her relationship with technology, suggesting variations on a scale of technological agency and passion. That is, Ann splits her own identity-agency as well as the computer's. She performs an identity of a savvy computer scientist in one location, and of a technology resistant artist-architect in another. As the architect, she guards her creative agency to keep it independent of technology. Being open about her technological proficiency in her architecture work would mean sharing creative and aesthetic agency with technology, thus diminishing her own unique and human abilities. Her skill and fondness for computers presents no challenge to her professional identity as an AI programmer, even as she portrays herself as somewhat marginal in the culture. In fact, Ann reveals that in the AI lab she consciously performed to appear to fit:

> I mean even at the lab I could—I had to watch myself. I had to adopt a sort of pose I had the feeling sometimes that, you know, oh yeah, no problem…because that's just how it is. And that's how guys, that's how these computer guys at least talk to each other.

Her initial experience was of extreme marginalization from the masculinized world of technology. As the years pass, she builds both technological agency and acceptance in the culture through a passion that is not black and white. Her marginality serves as one motivation to develop her technological talents. However, an uncomplicated techno-passion is evident only when she speaks through her

computer science persona. A different passion and technological agency characterizes her architect's voice. Mediating her agencies are differently oriented passions—one for the beauty of computer code and the other, for the sensuous materiality of drawing on paper. As an architect, it is not that she does not retain her technological agency because the underlying skills and knowledge do not disappear. Instead, techno-passion takes on a different color as she performs her idealized identity of an architect-artist who is passionate, creative, and productive; she diverts any creative agency away from the computer.

Denise: Moving Beyond Perceived Limitations

Denise is a 39-year-old MFA student who uses advanced digital media in her installation-based sculpture. She began her art career as a sculptor using analogue media to create large works or site-specific installations. Over the years, she has experimented with different computer technologies both in her art-making and in various jobs. She currently combines advanced technologies, analogue media, and performance in her art making. Her eclectic past includes a degree in teaching English as a second language and a graduate assistantship working with digital media. She shares that she talked her way into the assistantship despite not knowing much about computing or the software programs the employer assumed she knew:

> But then I—oh, heard something about multimedia and it sounded sort of interesting to me. So I got an assistantship, without any experience.…And I wasn't any good at it, well, because I had no experience.…I think if I had known programming better and stuff like that I could have been…I was kind of a freaker probably for about nine months on it.

Denise exhibits both hubris and fear as she modulates her techno-passions and agency, depending on the point she is arguing. Emphasizing that she landed the position, she also admits to nine months of stress. She shares her internal trepidations—ones that we generally do not hear men express—but she is very clear about not showing these fears or self-perceived limitations to her co-workers. A mix of ambivalence, frustration, and a passion for challenges characterizes Denise's experience of learning and working with computers. Despite frustrations, she tells of forging ahead learning rather advanced computer technologies such as 3D computer animation:

> I had been doing some 3D animation…for fun, [during] my…linguistics degree. It had nothing to do with it. I was just taking a class in the architecture department.…I might go back and do some 3D, I'm not very good at it. But I'm not particularly too hyped up on technology, I mean it's just another tool.

Denise's passion comes off as reserved and critical as she expresses disdain of "technology for technology's sake". That is, she criticizes what she sees as a misplaced passion for technology that often lacks concern for what a technology facilitates, which in her view is not very good art. In the following excerpt, she

works into the conversation her negative assessment of most technology-based art, criticized for being about the technology only, yielding art with little meaning:

> I don't like a lot of the art. Like I don't like a lot of the art that's made in the CAVE.[5] I think it's hideous.…I think it's more a means to an end, maybe of exploring another space …yeh, I think it's just another medium.

She says similarly disparaging things about techno-culture:

> I can be really geeky about it but I try real hard not to go that…not to be identified as such. Whereas other people wear it as a badge of honor…I think there's a hubris that results from excessive belief in technology.

Her statements suggest that what keeps her techno-passions charged are the challenges and new possibilities—aesthetic or practical—a technology presents. There is an evident tension between her interests in what technology allows her to do, her dislike of technology's high status, and her drive to prove to herself (and to others) that she can master advanced technologies. Her story unfolds in the space between distance and desire; similarly, her techno-passion has multiple nodes:

> I probably try real hard not to think about technology. I'm sure it really does sound condescending, but there's so much artwork out there that's so much more about what a particular technology can do as opposed to a lot of that stuff is really contentless—or is a very pretty picture image. I still think the world, that people in the art world, get impressed by things that maybe they shouldn't be.

Denise both constitutes and negotiates her technological agency by arguing that a zealous passion for technology is not a reflection of artistic or technological worth, creativity, or even, of passion. Instead, in criticizing techno-centric art she is staking a claim for art and artists who resist the temptations of technology for its own sake. She embraces ambivalence when she expresses a dislike of technological culture and, at the same time, elaborates on her technological accomplishments. Much of the interview reflects a tension in how Denise positions herself in relation to technology—creatively independent of it and yet, passionate about the challenges it offers. Her technological agency is more than just learning how to use the computer:

> I mean it doesn't start with the technology—that's just something out there. I don't ascribe some sort of magical [quality]—I mean my intuition's my intuition whether I'm using technology or not.…The more tools, or the more media you have out there, maybe the broader your vision—not broader, but maybe the more specific your vision could be.

Resentful of the encroachment of technology into the domain of art creation, Denise nonetheless passionately pursues new technologies to serve her creative ends, yet

resists giving any artistic or aesthetic agency over to technology. Despite reservations and frustrations, Denise displays a great deal of independence and persistence as she goes about playing with and learning the new tools. Much of her experimentation, learning, and frustration take place in private:

> I usually get a book and do a bunch of tutorials…figuring it out myself…I mean, I just go home and figure it out…For some of the programming stuff…I'm good at piecing together things [code]…Most of it is I just figure it out from looking at the web and doing tutorials.

In a broad sense, Denise's technological passions reflect a mix of public performances of confidence that are bolstered by her private learning. The latter allow her to work through insecurities and knowledge gaps in her own space. Thus, both her technological agency and her conflicted passions for technology play out in a protected space. However, she also wants public recognition for her hard won knowledge and accomplishments. She describes in the following her frustrations in trying to get this recognition from her male co-workers:

> If you know about art stuff and technology stuff, that's never as good as knowing about the programming or server stuff. Like server guys who you know think they're just way better than you are, that they are way smarter and that you don't know the time of day.

Denise's stories, as do Ann's, suggest how an artist's technological agency develops through series of struggles and situated public performances of a hard won agency. However, they both exhibit a passion for the challenge of mastering a technology; challenge becomes the motivation to continue. Denise gives some indication of how these challenges are themselves creatively motivating:

> I would say definitely…that technology is a really big challenge…and so that's interesting to me, to use it in my work.…I guess paint could be a challenge too, just not a challenge I'm interested in at the moment.

Learning the technology has been a significant hurdle, but this is what keeps her interested. Her passions are about fun that is synonymous with challenge rather than play, which she interprets as fluff. Denise is careful about admitting to having fun in her work:

> When you start saying that something is play, then it becomes devalued—culturally devalued….I don't think play is only located within making artwork, but I do think that there is play—there's an element of serious play in making artwork.…so many people have that real inconceived notion—about "oh, you're making art, well, you must be having fun".

Beyond situating her art-making as serious work, and her creativity independent of the technologies employed, Denise also takes issue with technology and a geek culture that are given more status than are art or artists. Mediated passion and a

somewhat masked agency are her means for criticizing the general cultural fascination with technology that she sees overtaking the artist and art. In the next section, I introduce Sue, who describes her concern over the relationship between art, the artist, and her tools and technological practices. Her passions target the ethical intersection of art and technology.

Sue: Negotiating the Primacy of Art Over Technology

Sue is a 33-year-old composer who uses multiple art forms and media in her work: analogue and digital music in concert with paintings rendered either digitally or with traditional media. These multi-media works come together as she takes on multiple roles of painter, composer, director, and/or performer. All of her art training has been in America rather than in her native Korea where she was a chemist. After attaining professional stature in Korea in one field, she was restricted from switching to another field because of her age and economic realities. She came to the US to study and change careers. From this 'marginal' position, Sue has a great deal to say about the value or quality of technology-based art:

> I've experienced a lot of works just showing off technology and not having any substantial quality of art.…I believe there is a great distinction between two different kinds of approaches and I of course really want to go for more substantial art forms.

Sue puts her emphasis on her belief that the artist must remain in control of her/his technology. Maintaining 'proper' balance will lead to art with more substance: "I don't think technology itself can be art. The technology to me—is very much like assisting gear". Aesthetic control is the responsibility of the artist and should not be acquiesced to technology.

Acknowledging an instrumental aspect to using technology, Sue complicates this use because for her, using complex technology is a serious responsibility. She talks about this as a point of tension when she describes the frustration of trying to keep up with technology and at the same time, wanting to keep the art more important than its technological means of production:

> If you stay in the technology field long enough, you realize there are a lot of frustrating parts about it especially…upgrading software and then it's not compatible between [platforms]. And you have to actually be always aware of what you are doing. So it takes a lot of time to catch up to things. But it's actually one sided as I said—it has nothing to do with the actual substantial art form so…you have to kind of develop a different you know, ear or eyes to keep working on that part, along with your artistic creative work.

In her view, two outcomes are likely in technology-driven arts practices—the technology can take center stage or a technology can effectively be harnessed to support the artist's vision. Sue's passion is to continually work to understand her technology and to master any technology she uses well enough so that she remains

the creative driver; her technological agency and ethical-aesthetic passions intersect.

Sue believes technical knowledge should not carry more weight or power than does the integrity of the artistic concept. She positions art on a higher plane than she does technology or a technocentric approach to art making, but this does not mean she has a lesser technological agency or passion. In the following, Sue describes two different ways that she works with technology:

> There are algorithmic approaches that you have to actually design from scratch with programming. First, you design everything by yourself and then use it later sort of as assistant parts. I think I tend to do both. So for the first one, algorithmic composition, you have to start with the computer and you have to have imagination–what, how you are going to build those things. You have to be really tied up to the language itself. But the second part is really kind of parallel. You know, you have ideas going on and you test it out, and if it doesn't work, sort of let go. So yeah, I consider both sides, if that's ok.

Both ways of working with technology seem to be important. In the first, she immerses herself in the abstract language of the computer through programming. In the second, she critically examines 'results' in the context of the artwork, focused on what she wants the work to do or say, with the help of technology. These two processes merge in a dance of the artist's technological and aesthetic agencies and passions:

> Technology I think has its own language. It either, [it's] controlling us or we're controlling over—it is sort of like an interactive thing. We have to, I mean we have to speak with it. And nobody, no one—neither I think—I don't see it as hierarchical.

A mediated agency-passion relationship unfolds in the process of the artist using technology for its capabilities while manipulating it to her artistic vision. On the one hand, Sue sees this relationship as non-hierarchical, but on the other, the artist must remain aesthetically in control: "I think it's important for artists to think why they are using technology, and what it is for, you know. And pay attention to your original concept first".

In common with Ann and Denise, Sue argues that technology is not in itself art. "You are like a painter using a brush. You are using another tool to do something else." Although this artist as tool user resonates with the literature that characterizes women's interactions with computers as task driven, I want to argue that there is something else going on here. The computer means many things to an artist: tool, language, creative partner, and an object of ambivalent passions. This complex artist/technology relationship is highlighted in Lovejoy's description of the artist Zoe Belloff's work:

> [Belloff] states that her work deals with the relationship between imagination and the technology of the moving image both in terms of content and through rethinking the apparatus itself. She wishes to show that machines are not simply tools, ideologically neutral, but grow out of our deepest unconscious impulses. Just as we think through our machines, by the same token they structure the limits of our thoughts. (1989; p. 189)

Sue too negotiates this 'thought structuring' of technology as she tries to remain in control, but must do so within the constraints presented in a given software package. With the computer, the artist collaborates intimately with her tools and, in an abstract sense, with the toolmaker. Creating *with* software is a collaborative engagement between the artist and the 'mind' of the computer program as well as its creator. Sue's conception of technological agency and passion adds a dimension of ethical responsibility: An artist who really knows how to use a technology will produce art with more artistic integrity:

> You develop aesthetics from [the perspective embedded in a] certain technology or a certain environment and instead of [the artist] having something interesting [to say of their own] and trying to reach out, she is sort of stuck in the idea that you can only do [certain] things [she gestures with hands, to indicate a limitation] with this software. So I think it's individual responsibility to kind of reach out and work it out.

Insisting that the artist has a responsibility to learn enough to get beyond any aesthetic limitations embedded in a given technology, Sue says that these limitations are a result of only using a technology in a superficial, off-the-shelf, way. Inferred is that a degree of passion is needed to push beyond superficiality, but this passion must be appropriately directed.

Sue's belief is clear: Artists who do not master their software or hardware can only produce art that is merely the product of a technocentric aesthetic-ethic that can be traced to the technology itself. Finally, although Sue talks at length about her sophisticated use of complex technologies, she laughs as she admits at the end of our interview "although I'm using [it] a lot, still I don't really like it. I like nature… yeah, it's weird". She shares with Denise and Ann a highly qualified passion for technology. For these artists, a burning passion for technology is not a requirement for holding or claiming a sophisticated technological agency. Instead, each exhibits ambivalent passions for computing that drive them to become technologically fluent and define their own version of an artistically informed technological agency.

CONCLUSION: LOCATING TECHNOLOGICAL & TRANSFORMATIVE AGENCY

These three artists' stories have a common theme. All dismiss practices that value technology simply because it represents novelty but notably, none of these women alludes to the care-ethic or computer reticence that mainstream gender-technology research depends upon for its rationale. Nor do they personify the disenfranchisement or socio-political orientations emphasized across much of the

gender-technology literature. Also not evident are concerns over a co-construction of gender and technology, yet there arguably is a co-construction of artistic and technological identities and aesthetics. The question remains open as to whether these are gendered—a question that has ramifications for how we locate women's creativity and positions in the arts. The topic is important, but far too complex to address here.

The three artists discussed illuminate practices wherein the artist, in a dance of aesthetics and ambivalent techno-passions, exerts intentional efforts to embrace the challenges and opportunities of creative computing technologies and techno-culture. Each artist articulates her own specific version of holding artistic agency above and distinct from the computer, framed by a multivalent techno-passion. None of the artists claims her art is better because of technology. However, all do suggest that technology offers them exciting yet enormously challenging new possibilities within which to create. Denise states, "I'm pretty happy with [my] use of technology. I mean, it seems purposeful, it's not using technology for technology's sake". For these artists, using technology is not purely instrumental. Each engages with technology to expand aesthetic practices, shaping a technology to serve her vision. The challenge is to grow as an artist and the art is, in part, a performance of the artist's technological agency, driven by mediated passions.

Conventional discourses of computing culture depend on a teleology of gender norms. Similarly, these norms infuse ideas of what technological agency and passion look like. Being passionate about computing has meant that one holds an unwavering devotion to the computer and its capabilities, often leaving the social world to other, less technologically enthralled humans. Ann's programmer identity falls within this norm—when performing this role she models many 'geeky' attributes. All three *artists*, however, actively try to distance themselves from any inferences that technology is in control of their art or creativity. Rather than gushing over what technology can do, the artists admit their reservations and are forthright in asserting both their technological and aesthetic agency and passions, more so as artists than as technologists. This stance, however, should not mask their impressive accomplishments with—and passions for—technology. Rather than focusing on their deficit passions we might more productively focus on two parallel agencies, both sustained by a spectrum of passions. All three artists describe the challenges that technology presents but also describe how their arts practices are negotiations for the primacy of art over technology, driven by passions for both.

Wendy Faulkner (2000) has said that, "For individual women, the effect of the felt ambivalence about technology is often either immobilising or polarising" (p.15). These artists' stories bring into view that technology and praxis are intertwined and that ambivalence may become a point of departure, not an end-point. These three women artists overcome—to varying degrees—uncertainties about their abilities and place in a sometimes intimidating or simply overbearing technological culture. The artists' technological agencies emerge on multiple levels and reflect various passions mediated by situated practices and aesthetics. Technological agency and a passion for technology are not merely about taking on the challenge of learning to use or master computers. Rather, they evolve in the context of situated and

meaningful creative practices. Each artist expends far more energy in claiming a space for her creative agency rather than her technology skills; however, a high level of technological knowledge is an understood requirement and a responsibility taken seriously.

These artists' stories sit at the margins of a larger techno-culture and discourse. Gender-technology research and educational policy often promote a gendered and techno-scientific hierarchy, in part defined by an unwavering passion for computing. Computer scientists are at the top (e.g. Cassell, cited in Stross, 2008), and this structure promotes conventional and uncomplicated notions of technological agency and passion. In a world where many perspectives are needed to tackle our escalating problems, thinking in terms of a complex ecology of technological agencies and passions opens new possibilities.

Within mainstreamed versions of gender-technology research, women's outsider position in computing is not merely documented; it is also constructed. Women's outsider position depends on a cultural narrative where one form of technological agency and passion supersedes all others. The dominant view of techno-passion and agency has been built on a belief that a higher agency and sustained interest depends on a singularly 'passionate' relationship to computing. Ann, Denise, and Sue help illuminate alternative technological agencies that are not linked to an all-encompassing passion. Instead, a passion for computing is multi-dimensional and accommodates multiple professional or personal identities and passions.

Although each artist's story is unique, these three artists stories are not unique as a *kind* of story. They suggest the ways marginalized agents reveal a more complex (and positive) picture of women's technological agency and passions. These stories are examples of performed intersections of technological and artistic agency that evolve through significant yet everyday individual investments. As artists 'do technology' by performing privately and publicly the challenges of accessing, learning, and creating with technology, they create their own individualized technological agencies. Artists' stories suggest that we might let some air out of the masculinized imaginary of an all-encompassing passion-driven norm as the basis of entry to computing (or for sticking with it). Thinking in terms of ecologies of technological agencies and passions, enacted at the margins, opens many more doors. A strategic question remains regarding how to extend this lens to a broader gender-technology landscape, such that ambivalent techno-passions are embraced in mainstream practices and thinking, viewed as a position of strength and openness to possibilities, rather than a readily accessible explanation for a gender-computing gap.

ACKNOWLEDGEMENTS
I am greatly thankful to Samantha Frost, Thomas Schwandt, Paul Prior, Amelia Herb, and Harriet Hawkins for their insightful comments as the paper unfolded. Appreciation is also due the anonymous reviewers whose comments helped better tune my argument. While I hope I have closed most gaps, any that remain are on me, not my generous reviewers.

ENDNOTES

[1] Castell, S. de., & Bryson, M. (1998). 'Retooling Play:Dystopia, Dysphoria, and Difference' in J. Cassell & H. Jenkins (eds.), *From Barbie to Mortal Kombat: Gender and Computer Games,* Cambridge, MA: MIT Press; Phipps, A. (2006). 'I Can't do with Whinging Women!' *Feminism and the Habitus of 'Women in Science' Activists. Women's Studies International Forum 29*, 125-135; Abbiss, J. (2008) 'Rethinking the 'Problem' of Gender and IT schooling: Discourses in Literature', *Gender and Education*, 20(2), 153-165; and Corneliussen, H. G. (2009) 'Disrupting the Impression of Stability in the Gender-Technology Relation'. Paper presented at the *5th European Symposium on Gender & ICT*, University of Bremen, Germany.

[2] Derrida coined the word 'différance' to bring into one concept a number of competing ideas about difference and to include a range of "logical, ontological, and (transcendental) aesthetic values" (Wood & Bernasconi, 1988, p. x). Différance accommodates reading and interpretation as non-reductive, ongoing activity.

[3] Cornell's concern was MacKinnon's framing of a legal argument, which defined the terms of debate by focusing on a masculinized norm.

[4] The computer geek, until quite recently, was also a marginalized character, but this is a tangential story (see, for example, Turkle's *The Second Self*, 1984).

[5] A Cave Automatic Virtual Environment (CAVE) uses projectors and other digital technologies to create an immersive virtual reality environment.

REFERENCES

AAUW. (2000) *Tech Savvy: Educating Girls in the New Computer Age*. Washington, DC, American Association of University Women Educational Foundation. http://www.aauw.org/learn/research/all.cfm

Abbate, J. (2010) 'The Pleasure Paradox: Bridging the Gap Between Popular Images of Computing and Women's Historical Perspective', in T. J. Misa (ed.), *Gender Codes: Why Women are Leaving Computing* (pp. 213-228). Hoboken, NJ: John Wiley & Sons & IEEE Computer Society.

Alaimo, S. & Hekman, S. (2008) 'Introduction: Emerging Models of Materiality in Feminist Theory', in S. Alaimo & S. Hekman (eds.), *Material Feminisms*. Bloomington: Indiana University Press.

Alcoff, L. M. (2006a) 'The Metaphysics of Sex and Gender'. *Visible Identities: Race, Gender, and the Self* (pp. 151-176). Oxford, England: Oxford University Press.

Alcoff, L. M. (2006b) *Visible Identities: Race, Gender, and the Self*. Oxford, UK, Oxford University Press.

Alvesson, M. & Sköldberg, K. (2000) *Reflexive Methodology: New Visions for Qualitative Research*. Thousand Oaks, CA, Sage.

Balsamo, A. (1995) *Technologies of the Gendered Body: Reading Cyborg Women*. Durham, NC, Duke University Press.

Barad, K. (2007) *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham, NC, Duke University Press.

Barker, L. J. & Aspray, W. (2006) 'The State of Research on Girls and IT' in J. M. Cohoon & W. Aspray (eds.), *Women and Information Technology: Research on Underrepresentation* (pp. 3-54). Cambridge, MA: MIT Press.

Braidotti, R. (2002). *Difference, Diversity and Nomadic Subjectivity*. Retrieved from: http://digilander.libero.it/ilcircolo/rosilecture.htm. Last Accessed 10the March 2010.

Braidotti, R. (2003) 'Becoming Woman: Or Sexual Difference Revisited', *Theory, Culture & Society,* vol. 20, no. 3, pp. 43-64.

Braidotti, R. (2006) 'Posthuman, All Too Human: Towards a New Process Ontology', *Theory, Culture & Society,* vol. 23, no. 7-8, pp. 197-208.

Brunner, C., Bennett, D. & Honey, M. (1999) 'Girl Games and Technological Desire' in J. Cassell & H. Jenkins (eds.), *From Barbie to Mortal Kombat: Gender and Computer Games*. Cambridge, MA: MIT Press.

Butler, J. (1990) *Gender Trouble: Feminism and the Subversion of Identity*. New York, Routledge.

Butler, J. (2004) *Undoing Gender*. New York, Routledge.

Camp, T. (1997) 'The Incredible Shrinking Pipeline', *Communications of the ACM,* 40 (10), 103-110.

Ching, C. C. & Vigdor, L. (2005). *Technobiographies: Perspectives from Education and the Arts*. Paper presented at the American Educational Research Association, Montreal, Canada, April 13th – 15th.

Clegg, S. (2001) 'Theorising the Machine: Gender, Education and Computing', *Gender and Education,* 13 (3), 307–324.

Cockburn, C. & Ormrod, S. (1993). *Gender & Technology in the Making*. London, England: Sage.

Cohoon, J. M. & Aspray, W. (eds.) (2006). *Women and Information Technology: Research on Underrepresentation*. Cambridge, MA: MIT Press.

Colebrook, C. (2009). *Sexuality and the Politics of Vitalism*. Paper presented at the 7th European Feminist Research Conference: Gendered Cultures at the Crossroads of Imagination, Knowledge and Politics, University of Utrecht, Netherlands, June 4-7 2009.

Colebrook, C. (2010). *Deleuze and the Meaning of Life*. New York, NY: Continuum Studies

Collins, P. H. (1986) 'Learning from the Outsider Within: The Sociological Significance of Black Feminist Thought', *Social Problems, 33*(6), S-14—S32.

Collins, P. H. (1991) 'Learning from the Outsider Within: The Sociological Significance of Black Feminist Thought', in J. E. Hartman & E. Messer-Davidow (eds.), *(En)Gendering Knowledge: Feminists in Academe*. Chicago, IL: University of Chicago Press.

Collis, B. (1985) 'Psychosocial Implications of Sex Differences in Attitudes Toward Computers: Results of a Survey', *International Journal of Women's Studies,* 8(3), 207-213.

Coole, D. & Frost, S. (eds.) (2010) *New Materialisms: Ontology, Agency, & Politics*. Durham, NC Duke University Press.

Connolly, W. E. (2002) *Neuropolitics: Thinking, Culture, Speed*. Minneapolis: University of Minnesota Press.

Cornell, D. (1999) *Beyond Accommodation: Ethical Feminism, Deconstruction, and the Law*. Lantham, MD, Rowan & Littlefield.

Derrida, J. (1978) *Writing and Difference*. Chicago, University of Chicago Press.

Damasio, A. (2005) *Descartes' Error: Emotion, Reason, and the Human Brain*. London, England: Penguin Books.

Ede, S. (2005) *Art & Science*. New York, NY: I.B. Taurus.

Faulkner, W. (2000, June) 'The Technology Question in Feminism: A View From Feminist Technology Studies', *Women's Studies International Forum.*

Flyvbjerg, B. (2001) *Making Social Science Matter: Why Social Inquiry Fails and How It Can Succeed Again*, Cambridge, UK, Cambridge University Press.

Foucault, M. (1991) 'Politics and the Study of Discourse', in G. Burchell, C. Gordon & P. Miller (eds.), *The Foucault Effect: Studies in Governmentality*, Chicago, University of Chicago Press.

Gilligan, C. (1993) *In a Different Voice: Psychological Theory and Women's*

Development, Cambridge, Harvard University Press.

Grosz, E. (2005) *Time Travels: Feminism, Nature, Power*. Durham, NC: Duke University Press.

Given, L. M. (2008) 'A/R/Tography'. in L. M. Given (ed.), *The Sage Encyclopedia of Qualitative Methods* (Vol. 2). Thousand Oaks, CA: Sage.

Gurër, D. & Camp, T. (2002) 'An ACM-W Literature Review on Women in Computing', *SIGSCE Bulletin,* 34 (2), 121-127.

Haraway, D. J. (1991a) 'A Cyborg Manifesto'. *Simians, Cyborgs, and Women: The Reinvention of Nature* (pp. 149-181). New York, NY: Routledge.

Haraway, D. J. (1991b) 'Situated Knowledges: The Science Question in Feminism And The Privilege Of Partial Perspective'. *Simians, Cyborgs, and Women: The Reinvention of Nature* (pp. 183-201). New York, NY: Routledge.

Haraway, D. J. (1997) *Modest_Witness@Second_Millennium.FemaleMan*© *_Meets _OncoMouse*™, New York, Routledge.

Hawkins, J. (1985) 'Computers and Girls: Rethinking the Issues', *Sex Roles,* 13 (3/4).

Hayles, N. K. (1999) *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago, IL: University of Chicago Press.

Hird, M. J. (2004) 'Feminist Matters: New Materialist Considerations of Sexual Difference', *Feminist Theory,* 5 (2), 223-232.

Irigaray, L. (1977) *This Sex Which Is Not One* (C. Porter, 1985, Trans.). Ithaca, NY: Cornell University.

James, S. (1997) *Passion and Action: The Emotions in Seventeenth-Century Philosophy*. New York, NY: Oxford University.

James, S. (1998) 'Reason, the Passions, and the Good Life' in D. Garber & M. Ayers (eds.), *The Cambridge History of Seventeenth-Century Philosophy* (Vol. 2, pp. 1358-1396). New York, NY: Cambridge University Press.

Kay, R. H. (1992) 'Understanding Gender Differences in Computer Attitudes, Aptitude and Use: An Invitation To Build Theory', *Journal of Research on Computing in Education,* 25 (2), 159-171.

Latour, B. & Woolgar, S. (1979) *Laboratory Life: The Social Construction of Scientific Facts*, Thousand Oaks, CA, Sage.

Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*, Oxford, UK, Oxford University Press.

Law, J. & Singleton, V. (2000) 'Performing Technology's Stories', *Technology and Culture,* 41, 765-775.

Lovejoy, M. (1989) *Postmodern Currents: Art and Artists in the Age of Electronic Media*, Ann Arbor, UMI Research Press.

Margolis, J. & Fisher, A. (2002) *Unlocking the Clubhouse: Women in Computing*, Cambridge, MA, MIT Press.

Massumi, B. (2002) The Autonomy of Affect, *Parables For The Virtual: Movement, Affect, Sensation*. Durham, NC: Duke University Press.

Misa, T. J. (2010) 'Gender Codes: Defining the Problem' in T. J. Misa (ed.), *Gender Codes: Why Women are Leaving Computing* (pp. 3-24). Hoboken, NJ: John Wiley & Sons & IEEE Computer Society.

Naranch, L. E. (2007) The Reason-Passion Nexus that Liberalism Needs. [Book review]. Cheryl Hall. The Trouble with Passion: Political Theory Beyond the Reign of Reason. New York: Routledge, 2005. *Theory and Event,* 10(3).

Oldenziel, R. (2001) 'Man the Maker, Woman the Consumer: The Consumption Junction Revisited', in A. N. H. Creager, E. Lunbeck & L. Schiebinger (eds.), *Feminism in Twentieth Century Science, Technology, and Medicine*, Chicago, University of Chicago Press.

Oudshoorn, N. & Pinch, T. (eds.) (2005). *How Users Matter: The Co-Construction of Users and Technology*. Cambridge, MA: MIT Press.

Plant, S. (1998) *Zeros and ones: Digital Women and the New Technoculture*. London, England: Forth Estate.

Sanders, J. (2005) Gender and Technology in Education [A Research Review]. Retrieved from: www.josanders.com. Last accessed: 9th March 2011.

Scott, J. (ed.) (2006) *Artists-in-Labs: Processes of Inquiry*. Wien, Austria: SpringerWienNewYork.

Singh, K., Allen, K. R., Scheckler, R. & Darlington, L. (2007) 'Women in Computer-Related Majors: A Critical Synthesis of Research and Theory from 1994-2005', *Review of Educational Research,* 77 (4), 500-533.

Sofia, Z. (2002) 'Women Artists and Their Relations to Technologies', in N. Yelland & A. Rubin (eds.), *Ghosts in the Machine: Women's Voices in Research with Technology*, New York, Peter Lang.

Sofia, Z. (2003) 'Contested Zones: Futurity and Technological Art' in J. Malloy (ed.) *Women, Art, and Technology*. Cambridge, MA: MIT Press.

Stengers, I. (2000) *The Invention of Modern Science.* (D. W. Smith, Trans. Vol. 19). Minneapolis, MN: University of Minnesota Press.

Stross, R. (2008, November 11) 'What Has Driven Women Out of Computer Science?', *New York Times,* p. 4.

Suchman, L. (1999) 'Working Relations of Technology Production and Use', in D. Mackenzie & J. Wajcman (eds.), *The Social Shaping of Technology* (Second ed.), Buckingham, UK, Open University Press.

Turkle, S. (1988) 'Computational Reticence: Why Women Fear the Intimate Machine', in C. Kramarae (ed.) *Technology and Women's Voices: Keeping in Touch*, New York, Routledge and Kegan Paul.

Vigdor, L. (2010) *An Intersectional Reading of Gender & Technology.* PhD Dissertation, University of Illinois at Urbana-Champaign, Champaign. Retrieved from http://hdl.handle.net/2142/17049. Last accessed: 9th March 2011.

Wajcman, J. (2004) *TechnoFeminism*. Malden, MA: Polity Press.

Wilson, E. A. (1998) *Neural Geographies: Feminism and the Microstructure of Cognition*, New York, Routledge.

Wood, D., & Bernasconi, R. (eds.) (1988). *Derrida and Différance*. Evanston, IL: Northwestern University Press.