**Introduction**

Computational devices have certainly become ubiquitous. And with ubiquity comes familiarity: we are accustomed to the hum of computer technology, and the beeps, trills, and LEDs that wink in our offices and homes. But computational artifacts have also become quite personally meaningful in the lives of their owners and users – especially those in the developed world, where computer use, for many, is frequent and has a long history. These meanings are far removed from the office and productivity tasks that brought the technology into existence, and instead people might be apt to understand their personal technologies as partners and build long and intense relationships with them. But what is the flavor of these relationships? How and why do these bonds form, and what characteristics do they have? Are these relationships with computers and other physical technologies closer to relationships that people have with other household objects (for example, a beloved car), or do they resemble relationships that people have with living beings including pets, or even other people?

Our interest in delving deeper into how and to what extent technology has become intimate grew from an article in the New York Times, from the August 24th, 2006 edition. The article, provocatively titled “Laptop Slides into Bed in Love Triangle” claims that some folks are comfortable enough with their laptop computers that they take them into their bedrooms and right into their beds (Hafner, 2006). The article touches on issues of work-life balance, which might explain the need to so radically intermix work and domestic life, but there is also some social commentary about wives who resent their husband’s computers, and find the presence of a laptop computer in the bedroom an intrusion. The author interviews individuals who work in the bed while their partner sleeps, and partners who work together in the bed, each on their own respective laptop. Though the bedroom is often the site of romantic and physical intimacy, this is not necessarily the type of relationship that is suggested between the laptop users and their machines. Instead, the intimacy here seems rooted more in a sense of comfort, appreciation, or maybe security with technology. Though some users may experience something that might be, on some level, construed as romantic love towards a piece of technology they are particularly close to, we want to be much more inclusive in our definition of intimacy toward technology.

We have noticed other trends which motivate our interest in this topic. We have seen in our workplace at Georgia Tech the fanaticism among owners of Apple computers, who name their machines and in casual conversation talk about their “love” for their machines. Apple Computer actively cultivates a brand-image that is centered on infatuation with the computer and other products, literally putting a (cartoon) face on a machine. Many folks have internalized this image – we feel that Apple computer users achieve a closeness with computers that is not rivaled even by other up-market technology brands. Finally, a more radical motivator is the rise of teledildonics and the use of physical technologies in sexual situations, both as a technical practice and as a social phenomenon worthy of academic study.
Using computers and technological artifacts in sexual practices may be a harbinger of a shift that sees technology becoming viewed not as cold and unfeeling office tools, but as intimate objects.

Our planned investigation will explore these myriad conceptions of technology, of intimacy and love, and of people’s practices. We want to find ways to understand people’s practices of being intimate with their computers, cell phones and other high-tech gear. We will rely on prompting participants to tell stories of their intimate interactions in home tours, to reflect on their relationships via cultural probes, and we plan to crawl the web for publicly (or semi-publicly) articulated narratives of intimacy with computers. On the other hand, we do not foresee much use for observational work, since we fear that nothing will keep you from kissing your computer goodnight than an odd man standing with a clipboard in the corner of your bedroom. The methods we use to analyze the situations, as well the metrics for success, are shifted by our focus on personal relationships, often in the home. In factory or office setting, the goal of the total human-computer system is to create value, so it is natural to focus an analyst’s and system builder’s time on finding ways to improve the efficiency of a sub-system, or to get more productivity out of a particular group of workers. In the home, these conceptions of work, value, and productivity often do not apply (or at least seem to be much less helpful). Instead, new metrics must be found, and new methods must be developed to access and understand the nature of life in the home.

The goal of this investigation is to understand more deeply the social value and perhaps “intimate” value that people have with their technology. We seek to understand why people begin to feel intimate with their machines, how they reflect on this intimacy, how it is exhibited for others to see, and what it means to them. We will investigate the role intimacy plays in the production and consumption cycle. We want to understand how patterns of consumption may encourage intimacy, and how advertising and brand image reinforce an intimate view of technology products. We may also begin to develop a set of implications for system design and manufacturing that acknowledge intimacy. We know that the materials used and the form factors designed for today’s computers are different from the more office-focused machines of the 1970s and 80s. We will investigate whether this, along with the increased miniaturization and mobile of computational artifacts is at the core of the growing senses of intimacy, or is merely incidental.

Related Work
For many years now, historians and sociologists have been examining the changing networks of relationships in the home as they accommodate new technologies. Among some of the seminal works that provide insight into how the roles of individuals in the home changes as a result of the negotiation of the forms, uses, and meanings of technology between technology producers and consumers in the home are Cowan (1985) and Strasser (2000). These authors trace how seemingly “unintimate” technologies (washing machines, modern factory equipment, etc.) entering the home eventually caused the redefinition of some of the most intimate relationships in the home – what it means to be a wife and mother. There is also a wide breadth of work on how office technologies – such as the telephone and the computer – have moved into the intimate space of the home. Haddon, for example, describes how
the roles and places of the home telephone are negotiated and renegotiated within families. As it migrated from the office to the home, the phone became a mediating device for close personal relationships, but also a source of conflict between family members (Haddon, 1994). Laptops, too, can become a source of tension between partners in the bedroom (Hafner, 2006). While the works listed here provide rich descriptions of how technology affects intimate relationships and roles in the home, we hope to build on them to also describe how intimate relationships may be formed to the technology itself.

The “sciences of intimacy” – inter-personal psychology and human development – provide another lens with which to examine intimate relationships to technology. These sciences have long studied intimacy empirically, and can provide models of the formation of intimate relationships (e.g. Hazan & Shaver, 1987; Reis & Shaver, 1988). If humans can be shown to mindlessly respond to computers as social actors (Nass, 2000), it might also be the case that they can also treat them as partners in a semi-conscious relationship. This set of works may also help us further crystallize what it is we mean, and don’t mean, when we talk about intimacy and intimate relationships. As part of their work on romantic love, Hazan and Shaver develop or make use of a large number of scales of love and attachment which serve to define and situate these notions in the realm of everyday human experience (1987). Of course, no quantitative, empirical studies of intimacy and other complicated aspects of the human condition emerge with clear-cut results. In the course of our research, one goal of ours is to question the limits of such approaches, and use qualitative methods to get at rich aspects of intimacy that they may miss. As a framework for delving into the various kinds of intimacy, we follow Dalsgaard, et al., who have synthesized a set of issues in strong-tie intimacy (2006). The criteria that we find most interesting to our work on intimacy toward technology artifacts are those of reciprocity (does a computer reciprocate your feelings?), physical intimacy, emotional intimacy, and issues of trust and commitment. Finally, we also find encouragement in the work of psychologist James Averill, who describes the social construction of emotions, including romantic love (1985). This work provides a starting basis from which to examine how intimacy with technology may be fostered through marketing and advertising and through socio-cultural pressures.

Intimacy has also been explored in HCI design and ubiquitous computing. At the “Intimate (Ubiquitous) Computing” workshop held at UbiComp 2003, participants came together to stake out a research agenda in ubiquitous computing as it relates to intimacy (Bell et al., 2003). The workshop organizers listed three manifestations of intimacy in computing. They write, “1. intimacy as cognitive and emotional closeness with technology, where the technology (typically unidirectionally) may be aware of, and responsive to, our intentions, actions and feelings... 2. intimacy as physical closeness with technology, both on the body and/or within the body. 3. intimacy through technology: technology that can express of our intentions, actions and feelings toward others” (Bell et al., 2003, p. 2, emphasis in original). Under this analysis framework, most designs for intimate technology focus on intimacy through technology (Dodge, 1997; Goodman, 2003; Kaye 2006). The sense of intimacy as possibly directed toward technology objects is not directly touched on in the workshop proposal, however. The Bed (Dodge, 1997), though, is one system that indirectly begins to explore this possibility. It provides its user a warm,
squeezable, responsive pillow to its user – a computational artifact ripe for the development of feelings of security and comfort.

**Methodology**

Our proposal is to study the potentially wide constellation of emotional attachments that people have toward their technology. We understand that not everyone may have strong feelings toward their technology artifacts, and that people who do have these strong feelings may not have them toward multiple items, but only to a cherished single product (or even a product that they no longer have). We plan to explore the senses of intimacy that include trust, commitment, reciprocity, expressivity, and emotional and physical aspects. The range of emotions that we may find spans the sensual, the “warm-n-fuzzy”, the secure, the comforting, and perhaps even romantic feelings. We further plan to trace the growth and changes of these feelings over time, as intimacy is a process that may take months and years (Hazan & Shaver, 1987). In the course of our study, we will certainly learn a lot about people and their emotions, but we may also be able to glean lessons about the products themselves, as well as how they’re produced, marketed, and consumed. We propose to explore what characteristics of a technology product promote feelings of intimacy. We understand that these characteristics are also not incidental or accidental. Instead they are part of a larger production and marketing chain, so we plan to take extra care to understand how brand-image and product-image factor into these feelings of intimacy.

Studying whether, and how, and to what degree, people form complex emotional attachments to their technological artifacts is difficult. First, this is a study of emotion and emotional attachment, something which many common HCI methods do not measure. Second, this topic is quite personal, and because study participants may be uncomfortable (or simply not used to) talking about emotions that they have for an inanimate object, they may be less than forthcoming. Third, the usual problems of qualitative research apply, and, we suspect that the inquiry itself may encourage changes in participants thoughts, perceptions, self-reflection, and behavior.

Our overarching approach for our investigation is to create a polyphony of voices, each providing an independent interpretation on the subjects of our study. Each part of our planned evaluation will contribute its independent voice to the total evaluation, and measure or record from one facet of the larger problem. This polyphony of voices will hopefully converge on a coherent narrative of the phenomenon of intimacy toward technology. Our planned explorations will include a home tour and a series of semi-structured interviews with a set of volunteer participants. In our home tours, we will specifically ask participants to show us their technology artifacts, and to tell stories of their interactions with the artifacts. We will ask questions about when participants might bring a product into private spaces such as a bedroom or bathroom. And we plan to probe participant’s reported narratives for changes in their intimacy levels with particular products or classes of products. As we interview participants we will use Isbister et al.’s Sensual Evaluation Instrument (SEI) to help us get to a deeper and perhaps richer set of the internal emotional states of the participants. We plan to use open coding to form categories and higher-level structure from our interview and home-tour data.
A second set of polyphonic voices will come from the use of Gaver et al.’s Cultural Probes to survey a larger population (but different from the first set) of volunteer participants. We will create cultural probe materials and tasks that attempt to bring novel perspectives on people’s uses and appropriations of technology. We will specifically build on the tropes from advertising and media (TV, film, and novels) about the love of technological objects and beings and hope that this will elicit interesting responses. We plan to pilot these probes to see if they provide interesting stories, but we understand that the interpretations and narratives that cultural probes produce are not perfectly analyzable or rationalizable. However, their use lies in the way that they give access to the minds of volunteers in a way unencumbered by structure and forethought. They may give us greater confidence in our prior home study work, because some of the same themes may be produced by participants.

A final set of polyphonic voices will come from an assay of blog posts and other end-user-produced web content. We feel that these forums are places where people feel free to discuss and present certain aspects of their personal lives, including their emotions for others. We have a hunch that people often use this channel as a way to broadcast their feelings and get emotional support. We have already done a very preliminary study of blogs and of photographs posted on Flickr.com and have found quite a few interesting posts and photos where people are shown in various states of love with their machines (mostly laptop computers and cellular phones). We plan to do a statistical survey of this data after we mine the web for it. We plan to use statistical techniques to determine whether people think about their love for a technology artifact like they think about their love for a pet or another person, or if they think about that love more like the love we have for a new pair of shoes, or other non-interactive object. We feel like this final polyphonic voice will add some weight to our claims if it turns out that people really do form intimate bonds with their technology gear.

Our chief aim as we analyze our data is to provide a rich and coherent account of how people become intimate with their technology gear. Our perspective privileges richness over perfect coherence. We feel that while different participant’s feelings of intimacy may be related, there is not a need to, nor a true possibility of, creating a universal framework about their emotions and their behaviors toward intimate objects. Our goal instead is to see if our polyphonic interpretations and polyphonic voices converge in a way that supports some conclusions to be drawn. We plan to build a database of emotional responses to technology that is very broad (thousands of entries), and then see if the trends we see in this dataset are bolstered by the open-coding of a very deep but small set of interviews and home tours. We will also use our “data” from our cultural probes to

Discussion
We hope that our proposed study would be useful to both traditional HCI and Industrial Design researchers and practitioners, as well as contribute to emerging work going on near the fringes of these disciplines. In particular, we hope that our work will inspire members of the HCI and ID communities working on designing computational artifacts and services for the home, and those researching ubiquitous computing. At the same time, this research could generate a range of data and analysis that would be interesting to researchers exploring alternative resources for design, reflective HCI practice, and the intersection of art, design, and HCI.
Evaluation of computational artifacts in the home is a long-standing and established aspect of HCI study, but most such evaluations focus on issues of usability. With the emergence of the fields of affective and experience-centered design, new work also explores how users react to interaction with artifacts on an emotional level. However, we are unaware of any work that explicitly looks at issues of intimacy between a user or group of users, and technology in the home. Designers of such artifacts do have a vocabulary (often a visual one) that includes concepts such as sensuality, security, and others that fit into our understanding of intimacy. However, this vocabulary is rarely made explicit, and is usually only acquired with experience. While we acknowledge the value of experience and inspiration in design, we hope that through our project we would be able to start towards the construction of a linguistic vocabulary that could help designers discuss intimate aspects of computational artifacts. Also, as human-computer interaction researchers, we would also be interested in intimacy “below the skin” – how modes of interaction (e.g. haptic, audio, etc.) and styles of interaction (i.e. how the device presents its interactivity) affect users’ perceptions of intimacy with devices. These findings would serve as a resource for designers who might choose to consider how aspects of intimacy might play into their designs (Norman, 2005). We do not suggest that using our results designers would simply be able to “build” intimacy into their artifacts, but that highlighting certain aspects of how intimacy is encountered by users in artifacts would serve as an open-ended guide and possible inspiration for their designs.

With this work, we also want to attract the attention of ubiquitous computing researchers. From wearable computers, to the next generation of intelligent (and provocative) bathroom fixtures (Mann, 2003), ubiquitous computing invariably enters the intimate spaces around an individual and in her home. Thus, ubiquitous computing artifacts should be designed with intimacy in mind – the human-to-human intimacy they may intrude on, and also the intimacy that might develop from years of wear, care, and extensive use. The first steps towards examining intimacy in this context have been taken – for example the Workshop on Privacy in Context at UbiComp 2005 – which sought to get participants to examine a user’s personal comfort while in a ubicomp-augmented environment. We hope to enrich this work by contributing to an understanding of how users may come to feel welcome, safe, and comfortable (in an emotional sense) in technologically-enhanced environments. Furthermore, by looking at how users currently understand and form relationships to portable devices we may also be able to contribute to an understanding of how aspects of intimacy may cause users to choose to wear or not wear, carry or not carry future devices.

We expect that the data and analysis from our research will contribute to emerging trends in HCI, especially work looking alternative resources for design, work at the intersection of design, art and HCI, and to reflective HCI practice. Examining intimate relationships with technology allows us to exercise new methods of inquiry into human experience. By extending from methods such as cultural probes (Gaver, 1999), we can test their limits to providing rich and nuanced understandings of complicated topics at the intersection of the human experience and technology. The results from these and other approaches we have proposed might provide inspiration for design interventions. Possible results from a study of users’ intimate relationships with technology would be a ripe site for inspiration for reflective HCI practitioners (Sengers, 2005). Any attempt at seriously examining users’ intimate relationships with
their technologies questions dominant paradigms in HCI (which do not consider this type of relationship), and the findings could be knowingly manipulated (e.g. exaggerated or invert) through design interventions to cause reflection on relationships between users and technology by other practitioners, or by users themselves. Such reflection may be especially useful for ubicomp researchers, some of whom recognize ubicomp’s proximity to issues of intimacy (Bell, 2003). Yet most researchers in the field are still strongly rooted in functionalist, computational traditions, where human-centered approaches might be more appropriate (cf. Dourish, 2004).

Conclusion
In this paper, we propose a line of research to examine users’ intimate relationships with technological artifacts. We argue that this is a novel approach to understanding the relationship between people and technology – one that differs from related approaches to understanding how people can be intimate through technology, or how technology can seem intimately connected to our needs (Bell et al., 2003). Instead we seek to find the ways in which we all are intimate toward our technology gear. By attempting to analyze and understanding these relationships, we hope to be able to contribute to the understanding of the social and personal value of technology, and of the motivations for consumption. These results may also be used by designers and marketers of technological artifacts looking to understand how these artifacts may be used and understood by users though their form (including construction materials), interactive potential, and social context. This line of research may also contribute to HCI researchers and practitioners looking to form alternative understandings of the relationships between humans and technology, and explore the design spaces around them.

As a final note, we would like to express a word of reservation about this research. Not only is intimacy challenging to define and to study (as we hope to have illustrated in this proposal), but intimacy is also challenging to find. Intimate relationships between humans are elusive and rare – no one has an intimate relationship with every person they interact with, and some people do not have any intimate relationships at all. Similarly, it would be strange to expect to immediately find many examples of users’ intimate relationships to technology. It is more likely that many users have none, and some may have one or two devices towards which they feel some form of intimacy. At the same time, it is important to consider that at this time many users have been carrying, using, and worrying over personal technology (like laptops and cell phones) many hours a day, nearly every day, for over 10 years. If, indeed, intimacy is an attachment process (cite) then we may now start seeing these relationships emerge. Our goal with this proposal is to start to document, analyze, and design for these relationships.

References
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