

## Enchanted Artifacts: Social Productivity and Identity in Virtual Material Ecologies

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### ABSTRACT

Virtual worlds such as *Second Life* and *World of Warcraft* offer some of the most immersive, interactive possibilities for learning, simulation, and digital design in use today. While it is clear that they support complex collaborations and productivity, often in highly engaging ways, less well understood are the mechanisms that create conditions favorable to these outcomes. Theories of material ecology offer one approach to improving our understanding of the ways that virtual worlds support these forms of collaboration and productivity. This paper presents two case studies, which consider two particular *Second Life* ecologies: its public sandboxes (used for developing content with its authoring tools) and the most private spaces of a private role-playing community. This paper offers an application of and a contribution to material ecology theory. The application is to use material ecology theory to understand non-casual productivity and advanced social behavior specifically in *Second Life*. The theoretical contribution is twofold: to clarify the relationship between a given material ecology and its type or kind; and to propose that technologists extend material ecology theory by incorporating material culture theory.

**Keywords:** artifacts, material ecology, ecological interaction, sandboxes, homes, domesticity, virtual worlds, *Second Life*, identity

### INTRODUCTION

Virtual worlds, such as *Second Life* and *World of Warcraft*, have seen extraordinary success as entertainment platforms. Beyond entertainment, they also offer some of the most immersive, interactive possibilities for learning, simulation, and digital design in use today. With their humanoid avatars, complex animations, and perceptually realistic simulated 3D environments, virtual worlds offer plenty of opportunity for collaboration, coordination, and other forms of social productivity. Given the benefits of these shared, immersive spaces as platforms, interaction designers concerned with social, pervasive, and ambient

forms of computing stand to benefit from a deeper understanding of how virtual worlds support and encourage both productivity and enriching experiences.

Numerous factors contribute to this potential for productivity and experience, one of which is the significance of virtual artifacts: the things, items, furnishings that populate the virtual spaces in which avatars act. Indeed, artifacts mediate avatar activity in virtual worlds. While artifacts can be merely instrumental, such as a chair that an avatar sits on, their deeper value lies in the ways that these artifacts collectively constitute a *meaningful* world (as opposed to a merely well-decorated one). Artifacts themselves act and mediate experiences (Verbeek, 2005). Theories of material culture and ecology offer a productive approach to researching the role of artifacts and materials ecologies in supporting the sociability, productivity, and experiential qualities that are characteristic of virtual worlds.

Perhaps the characteristic that makes *Second Life* stand out among virtual worlds is its unique combination of mainstream success and the fact that its contents are user-created. In *Second Life*, unlike most other popular virtual worlds, 3D immersive content creation is a major user activity. Obviously, much of the content created in *Second Life* includes virtual artifacts, and these artifacts, like nearly all human-made artifacts, wind up as participants in material ecologies. This paper explores the contexts of content creation and content use in *Second Life*. Specifically, using an ethnographic approach, I explore *Second Life* sandboxes and the private homes of members of a *Second Life*-based role-playing community. Sandboxes are public areas set aside for (mostly beginner) users to create *Second Life* content. The role-playing community is a private and closed community, engaging in a long-term simulation of a series of science fiction novels, with dark erotic themes.

In these two studies, I focus on the roles of artifacts as constituents of larger wholes, specifically material ecologies and material cultures, which respectively represent two similar yet distinct theorizations of artifacts in spaces. Though the two environments included in the study differ, their respective users share a key commonality: they devote extensive time and effort in the construction of content-appropriate material ecologies *prior to* interacting with each other and being productive in the virtual spaces. These material ecologies thus should not be seen as mere containers for in-world activity, as if they were secondary or incidental to it. Rather, I will argue that virtual material ecologies are intimately bound up and even *constitutive* of human interaction, productivity, and pleasure in *Second Life*.

## THEORIES OF MATERIAL ECOLOGY AND MATERIAL CULTURE

*Artifacts* are material things we encounter and use. They are ubiquitous in our lives and are integral part of our daily experience. They also participate in much larger wholes, including spaces, ecologies, and human activity. Artifacts become meaningful to us when they comfort us, discipline us, help us conceptualize and understand abstract ideas, forge and confirm social roles and relationships, and reveal the passage of time in our lives. Put another way, artifacts are important less in their objective existence than they are in the many ways that they are *meaningful* to us. Artifacts also have histories, whose meanings evolve over time, intertwined with our memories and life cycles. They thus have a considerable power over us; they compete for our attention, help engender emotional connections that bridge us with our lived environment, and mediate our relationships with friends, family, loved ones, strangers, and even enemies.

The role of artifacts as constituents of larger dynamic wholes has been theorized in different ways. One conceptualization is that of a *material ecology*, which emphasizes the extent to which an artifact participates in a system of artifacts. This structural approach considers ways that the relationships among artifacts determine their meaning in the system or ecology. Another conceptualization is that of a *material culture* (e.g. Woodward, 2007), which emphasizes the role of artifacts in human meaning and activity. This anthropological approach is hermeneutic, stressing ways that artifacts are implicated in human understanding and meaningful activity. Common to both theorizations is an understanding that artifacts are constituents of larger, dynamic wholes. What distinguishes them is the relational/structural versus hermeneutic approaches to that understanding.

In technology-oriented disciplines, the study of artifacts has tended to take a more ecological approach, yet strands of both approaches are visible (Mitcham, 1994; Nardi & O'Day, 1999; Verbeek, 2005; Krippendorff, 2006; Turkle, 2007). The following is a quick summary of important works on material ecology in technology studies to date.

Arguing against the Cartesian notion that artifacts are passive objects, Mitcham (1994) writes that artifacts have consequences and even exert agency over human thinking and behavior, that "collections of artifacts influence individual decision and social behaviors" (p. 182). For example, the purchase and use of iPods and mobile phones incur subsequent consumption of additional accessories, and have spawned a new business model of music that has threatened the music industry and even led to international anti-trust lawsuits. The study of material ecology thus encourages designers and technologists alike to consider the reverberations of their constructed artifacts, from their immediate meanings to their users and beyond to their social, economic, environmental, and cultural impacts.

Klaus Krippendorff, writing from the standpoint of design, emphasizes the need to move beyond the individual artifact and to study how artifacts relate to each other, influence each other, and how such interactions affect people who use and own these artifacts. Krippendorff defines *an ecology of artifacts* as "the net effect of what many stakeholders do locally" (Krippendorff, 2006, p. 198). Krippendorff's definition emphasizes action/doing rather than things, which underscores again that material ecologies are not merely containers in which activity occurs. Artifacts within the same ecosystem have complex interactions with each other: Artifacts can be cooperative, competitive, and/or independent from one another. He coins the term *ecological meanings* to describe these possible interactions among a network of artifacts (Krippendorff, 2006, p. 198). Krippendorff's notion of "ecology of artifact" thus provides us with an interpretive lens to see how, within the same network, artifacts join organisms as fellow actors, creating meaning through different types of interaction.

Nardi & O'Day, in their exploration of the relationships between human activities and information technologies, define an *information ecology* as "a system of people, practices, values, and technologies in a particular local environment" (Nardi & O'Day, 1999). Within each information ecology, Nardi and O'Day see many diverse components and relationships. Since the focus of an information ecology centers on human activities, especially how these activities are shaped and mediated by people's relationships with the

tools they use and the practices they develop, an information ecology approach allows us to tease out how different agents interact with each other and how they adapt in order to coexist.

Forlizzi (2008), relying on social ecology theory, constructs a *product ecology framework* that describes how social behaviors are evoked through the dynamic interactions among people, products, and environments. When we interact with an artifact, we are interacting with the diverse characteristics and features of the said artifact on the one hand, and the complex (human) social interactions on the other. Forlizzi's framework is consistent with the others summarized here in deemphasizing the centrality of rational human agency, offering instead a model centered on interaction, in which humans and artifacts equally are both agents and objects of change.

Summarizing these theoretical statements, we can see that a *material ecology* is a complex system (Cilliers, 1998; Monge & Contractor, 2003) and has the following qualities:

- A material ecology is *local*, pertaining to a particular time and a particular place.
- The collection of artifacts within a material ecology is diverse, and the relationships among the artifacts are dynamic; that is, due to mutual relationships and feedback loops, simple changes may have complex and unpredictable consequences.
- The ecology itself evolves as the artifacts interact with each other (e.g. cooperate or compete, etc.). The introduction of a new artifact changes the nature of the ecology.
- It grows and fades according to people's active engagement.
- It mediates people's activities and influences people's understandings and actions.

This paper offers an application of and a contribution to material ecology theory. The application is to use material ecology theory to understand non-casual productivity and advanced social behavior specifically in virtual worlds, in this case, *Second Life*. The theoretical contribution is twofold. First, I propose that in researching material ecologies, which by definition are local and particular, that we introduce an analytic category of the *type* or *genre* of material ecology. Second, I propose that technologists should extend current strategies for researching technology-mediated material ecologies by incorporating a material culture perspective, which is better suited to accounting for the roles artifacts play in constituting human perception, subjectivity, identity, social engagement, and intersubjective understanding.

## MATERIAL ECOLOGIES IN SECOND LIFE SANDBOXES

Content creation in *Second Life* takes place on virtual land. This land has multiple significances. Diegetically, that is, within the fictional universe of *Second Life*, it is obviously a representation of the ground on which avatars go about their business. Non-diegetically, it is also a metaphor for server space. If content creation requires land, and land converts to real-life server space, and server space has real-life costs, then *Second Life* has a chicken-and-egg problem. The only ones willing and able to buy land are those who can develop on it, but the skills needed for development can only be acquired on land. In short, Linden Labs, makers of *Second Life*, needed a mechanism to enable prospective content creators to learn content creation tools and practices without having to make a significant financial investment first. Their solution was the virtual sandbox, an allotment of land set aside for the public to create whatever content they wanted on it. To make the resource continuously available, once a day all of the content on the sandbox is deleted (copies are stored in users' inventory and can be re-instantiated in the world at a later time, whether in a sandbox or in a purchased plot of land). Not surprisingly, most of the users in sandboxes are relatively new to content creation or socially connected to someone who is, and their orientation is often as much toward learning the tools as it is toward actual content creation.

To understand the material ecologies of virtual sandboxes, a colleague and I conducted virtual ethnographic fieldwork (Turtle, 1995; Hine, 2000; Mann & Stewart, 2000; Miller & Slater, 2000) in *Second Life* sandboxes. We observed design practices in publically accessible sandboxes during the study period, spending 3–4 hours per day. During the observation, we collected and subsequently analyzed chat logs and hundreds of screenshots from the design activities. We also conducted unstructured interviews with a sample of the users. All told, 17 sessions were observed, recorded, and analyzed over a period of five weeks in 2007.

In trying to understand *Second Life* sandboxes as material ecologies, we could only observe particular instances. That is, there is an important difference between the sandbox as a type of space and a given sandbox on a given day. Because material ecologies are always local and particular – the precondition of their materiality – one cannot ever directly observe a *type* of ecology. The relationship is akin to that of literary genre: one can read this or that science fiction novel, but one cannot read the genre itself. To understand a literary genre, one must read many novels that fit in that genre. Accordingly, to understand a type of material ecology, such as the



sandbox, it is necessary to study many instances of a sandbox and from them infer the characteristics of the type.

Considering a material ecology based on its type is useful because it helps researchers generalize from a given material ecology toward principles for design. But just what is a “type” of material ecology? Here again the analogy to a literary genre is useful. Literary theorists reject the notion that a literary genre is primarily about classification, i.e. that a given novel is an example of science fiction, adventure, or romance. Rather, a genre is “a *tendency* that, in combination with other autonomous generic elements or tendencies, is active to a greater or lesser degree within a literary text that is itself understood as a completely structured totality” (Freedman, 2000, p. 20). In other words, rather than a work fitting in a genre, instead generic tendencies coexist within a work, with one such tendency dominant. The work itself is seen as a complex whole in its own right. In this way, a mystery novel can contain elements of horror and adventure and yet still be a mystery novel. In a similar way, I believe that a given material ecology can have several internal generic tendencies, and that one of them can rise to a dominant position and be said to be its “type”. In this first case study, I consider an example of this, whereby numerous ecologies within *Second Life*, which feature tendencies from IRC (internet relay chat), science fiction themes, MMOGs (massively multi-player online games), and multimedia authoring tools, can all be said to be “sandboxes” because each is marked with the dominant tendencies of this type of ecology. In this section, I will articulate this type’s primary features.

In what follows, I focus on the artifacts that people created and used in the design activities in *Second Life* sandboxes. From this I derive three categories of user-constructed productivity contexts that typify the *Second Life* sandbox. The three categories are as follows:

- **Diegetic spatial contexts:** Sandbox productivity occurs in spatio-physical contexts, starting with the virtual land itself, but extending to other structures, such as houses, that provide visual/physical environments that support and sustain content creation.
- **Social contexts:** Sandbox productivity is not a solitary activity in a separate client, but rather an activity that takes place in public spaces, in-world, in real-time, such that anyone can come and observe, interact, and even sabotage them. Designers are rarely alone in sandboxes.
- **Non-diegetic tools and production contexts:** The sandbox is also a technical production environment, host to *Second Life*’s 3D authoring

toolset. The toolset itself is non-diegetic (i.e. avatars in their fictional universe wouldn’t “see” the 3D authoring toolset). Additionally, users supplement *Second Life*’s built-in tools with non-diegetic content-authoring tools of their own creation.

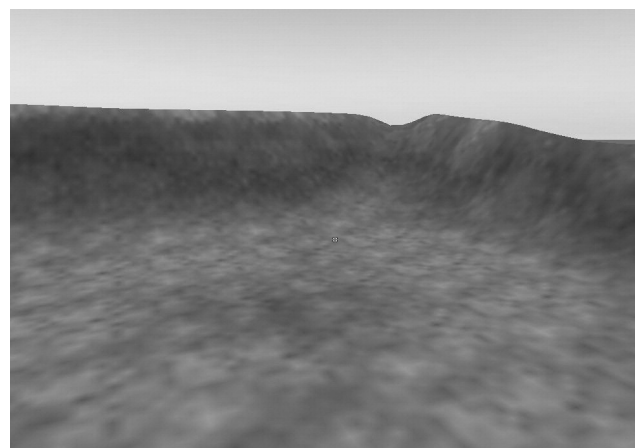
In the following sections, I consider each of these contexts in turn.

### Diegetic spatial contexts

When first presented, land is typically presented as a more or less featureless, flat field (Figure 1) bounded by hills. As the virtual world equivalent of a blank page, this land seems to lack any material ecology. Designing in such a vacuum is difficult; most of us are not used to perceiving artifacts abstract of context, and even if professional 3D modelers are able to do so in Maya and 3D Studio Max, it defeats a purpose of a virtual world to ask its users to create 3D content in a vacuum. Context provides scale, implied functional meaning (e.g. a tire in a front yard has a different function than a tire on a car), visual and thematic coherence (or dissonance, etc.), and so on.

To cope with the featureless plain of the *Second Life* sandbox, many of the designers we observed constructed contexts appropriate to their situations to ensure the right physical scale and authentic environmental semantics. For example, one of the sandbox avatars we observed is an aspiring virtual kitchenware designer. Rather than creating dishtowel racks and kitchen tables in the middle of the field, she first created a virtual house, complete with tall trees, a shaded garden and an enclosed shed, which provide a sense of context, scale, and visual coherence for her work (Figure 2). She instantiated this home setting not with the intention of selling the house (or copies of it), but rather to create for herself an environment that supports the design of virtual household features

Figure 1. *Second Life* public sandboxes are situated in flat, featureless landscapes.



and appliances. In another example, designers of animations constructed a bath set, including a fully decorated bathroom, in advance in order to support the design of intimate two-person bathing animations. (Animations are designed in an external program, typically Poser, so this set was needed for testing and tweaking this animation.) This practice demonstrates that sandbox designers regard their development space, however transient, not merely as physical coordinates in 3D virtual environment but as a meaningful space, an appropriate sociocultural construct, along the lines of those described in Harrison & Dourish (1996) and Wright et al. (2005).

### Social contexts

"Land" converted into a meaningful place or context is the diegetic space in which design occurs, but designers also work in the non-diegetic *Second Life* content authoring environment. The authoring environment in *Second Life* includes a simple primitive-based 3D modeling environment, in which users create models out of simple shapes, such as cubes, cones, and spheres, which they can then position, scale, and distort (Figure 3); a scripting language (Linden Scripting Language, or LSL); and the capacity to import external media assets, including 2D bitmap graphics, or textures, to map onto 3D models, and 3D character poses and animations.

Significantly, the authoring environment is not separate from the rest of the virtual world. This makes *Second Life* a social authoring environment, where a group of people can literally develop and modify builds simultaneously and in the same space, and in fact such collaboration is quite common. When working together, it is commonplace for collaborators to define their roles during building, with for example one person specializing in 3D modeling, another in 2D texture design (usually done

Figure 2. A kitchen appliance designer sets up a house prior to working on appliances.

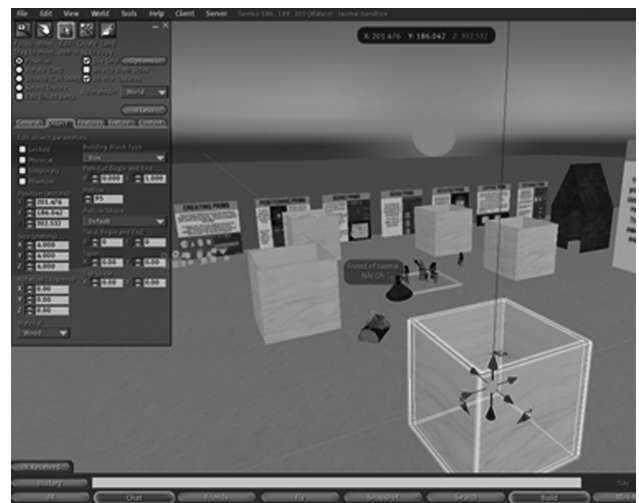


Figure 3. Second Life's 3D modeling tools including manipulating primitive shapes in real-time and in public space.

in Photoshop and uploaded into *Second Life*), while a third specializes in scripting. In this way, all three can work on the design at the same time, asking for or offering feedback and critique throughout the process.

Sandbox visitors do more than coordinate. One common activity is teaching and learning, not surprising given that sandboxes are oriented towards new users and neophyte content creators. Spatiotemporal characteristics of the space not only facilitate certain design practices, but they also shape teaching and learning practices. Because content is deleted daily, and because it is used simultaneously by many people who usually do not know each other, space and time are compacted to small lots in the sandbox for small units of time – usually no more than a couple of hours. The rules of the sandbox not only lead to these kinds of material arrangements, but they also effectively encourage a certain kind of learning practice. Teaching and learning do not follow lengthy, coherent, and comprehensive curricula, but rather are ad hoc, highly contextual, and just-in-time. In such a space, it could hardly be otherwise. It is also highly participatory, as the following chat excerpt shows:

Cyrix: "Shall I build it with you or just watch?"

Pallor: "Build with it will be easier ...

because you will remember the steps better."

Specialized abilities, such as effective compositing, scripting, texturing, and tacit knowledge (e.g. best practices and strategies) are acquired just-in-time, in situ, and often in conjunction with design breakdowns. This activity is accompanied by a simple but widely held pedagogical theory, articulated in a basic form in the preceding quote, of learning by doing. Fortunately, because sandboxes

are typically filled with a narrowly focused type of user – emerging *Second Life* designers – users are often successful at obtaining help by simply asking nearby strangers, as seen in an excerpted dialog between two designers below, where Kevin<sup>1</sup> starts a conversation with a stranger (Ellen), inquiring about rotating a built object in *Second Life*.

[13:11] Kevin: are you a scriptor?

[13:11] Ellen: yup

[13:11] Kevin: aww cool, I'm searching for 1. do you know a little rotations?

[13:11] Ellen: a little

[13:12] Kevin: I'm trying to Rotate the foot of a build, maybe could have a look to the script?

[13:12] Kevin: i dunno how to rotate it

[13:12] Ellen: llSetRot()

[13:12] Kevin: yes i know but

[13:12] Kevin: i wrote all, but seems not in the right order

[13:12] Kevin: or something wrong

[13:12] Ellen: ahh, sure then

Kevin is not seeking serious instruction or mentoring; he really appears to be looking for a relevant code snippet that he can adapt for his own purposes. The reusable, shareable, easily appropriated code snippet is itself an artifact of the sandbox's material ecology, though it certain

finds its place elsewhere in *Second Life* as well. The speed of the interaction also lightens the burden on experts to become teachers.

*Second Life* is not just an authoring tool; as a game-like virtual world, it has strong genealogical ties with massively multiplayer online games, and that genealogy is also relevant to sandboxes. Playful behavior is rampant in sandboxes, even when users are ostensibly there for the "serious" business of design and learning *Second Life*'s authoring toolset. Play is more than a way of lightening up work; it is often constitutive of both design and learning, through emergent forms of creativity and even as an aid to the evaluation of design. Sometimes, playful behaviors get out of hand, resulting in grieving.<sup>2</sup> While grievers are a common nuisance in public sandboxes, they carry unexpected benefits as well: they can reveal unexpected technical capabilities enabled by the system, thus changing the meanings of artifacts and human relationships with them (usually for the worse, in the short term). The other potential benefit of grieving is that it often clarifies social norms, allowing avatars to bond and even become online communities (Dibbell, 1993). Consider the following example (see Figure 4), in which Bellum, a griefer, uses a weapon to threaten a group of designers (Steven, Druida, and Sarita), saying:

[11:25] Bellum: Step away from the Cube

[11:25] Steven: go the fuck away

[11:26] Druida: aalright asshole

Figure 4. Grieving in sandboxes has the unexpected benefits of enhancing group cohesion and familiarizing the avatar-designers with the use of the built artifacts.





[11:26] Druida: leave or be reported

[11:26] Steven: i already reported him

[11:26] Steven: don't worry

...

[11:26] Sarita: lol

[11:26] Steven: and i will again if he doesn't leave

[11:26] Steven: stupid greifer

...

[11:27] Druida: shooting is not allowed in these sandboxes

[11:27] Sarita: ok

...

[11:28] Steven: people like him are what made me stop playing for a while

[11:28] Steven: so many greifers it's ridiculous

[11:28] Sarita: yea i now whats you mean

The excerpt above illustrates how a group of sandbox designers react after a grieving incident. Immediately after the attack (i.e. [11:25] "Bellum: Step away from the Cube"), one of the sandbox designers (Steven) reports the incident to Linden Labs, while another designer (Druida) explains the sandbox rules to the newcomer (Sarita), creating a bond among the three and inculcating Sarita into the dominant cultural norms of *Second Life*. These norms include an awareness of what is acceptable in a sandbox, what constitutes grieving, and ways to deal with it, both diegetic (i.e. respond to threats and abuse in kind, here including both verbal abuse and guns from the designers) and non-diegetic ways (i.e. report the griefer to Linden Labs).

All of these types of social activity – coordination, teaching and learning, and grieving – constitute a social context that is well suited to the material ecology in which it is situated. All three are intimately connected to the spatio-physical context of the sandbox, for better or worse: coordination among diversely skilled designers is nonetheless *about* creating physical-visual content in the space; teaching and learning is connected to breakdowns that happen when designers are focused on designing particular things in the space; and grieving is a disruption equally physical and social. The social context is inseparable from the material context. Social interaction does not merely take place in a physical space, as a drink sits in a glass. Social interaction occurs with, through, in response to, and in order to change physical interaction.

### Non-diegetic tools and production contexts

Sandbox-based content creation is not, as I have shown, a matter of an individual professional designer working from a blank canvas to create original content. Instead, diegetic and social contexts shape the processes of creation and learning the skills required for that creation. A third type of context supports creativity in sandboxes, and it includes non-diegetic tools and production contexts. These are additions to *Second Life's* native toolset, which is effectively extensible because it is situated in a world that it has the means to modify. In other words, if the toolset has shortcomings, they can often be overcome by using the toolset to build new production features. These are non-diegetic, because they are not part of the fictional in-world life of the avatars. Paradoxically, they are in and of the world of *Second Life*, because they are created by its content creation tools and instantiated materially in-world.

Because *Second Life* 3D modeling is primarily about building complex shapes out of simple ones, called prims,<sup>3</sup> recognizable shapes (e.g. a car or a house) are actually collections of many carefully positioned prims. For this reason, grouping and positioning are extremely important. But the toolset has some limitations. One of these limitations is an inability to have nested groups; for example, if one models a chair, using legs which themselves are models out of several prims, users cannot group the prims that constitute the leg, and then assemble them into a chair, and then group the objects comprising the square (while maintaining each of the legs as a separate, nested group). This becomes a problem, especially for designers who have to tear down and set back up their designs frequently, as is universally the case of anyone working in a sandbox. Once prims are returned to inventory, all in-world positioning data is lost, and only one level of grouping is remembered, with the consequence that setting a complex object back up, such as a house with all of its contents, can take a significant amount of time.

Users introduced the "rezzer"<sup>4</sup> to address this problem. The rezzer, created primarily with *Second Life's* scripting language, helps designers overcome the grouping and positioning shortcomings just described (see, for example, YakPeople, 2007). The script enables the user to record in-world information about an artifact, including its size/scaling, position, grouping, and so on. Re-rezzing this complex artifact becomes automated, because all of the tedium of positioning is automated by the script. The rezzer can also be used to store multiple configurations of the same objects. For example, if one has the objects within a home positioned in a particular way – e.g. a fireplace against the far wall, carpet beneath a sofa near a

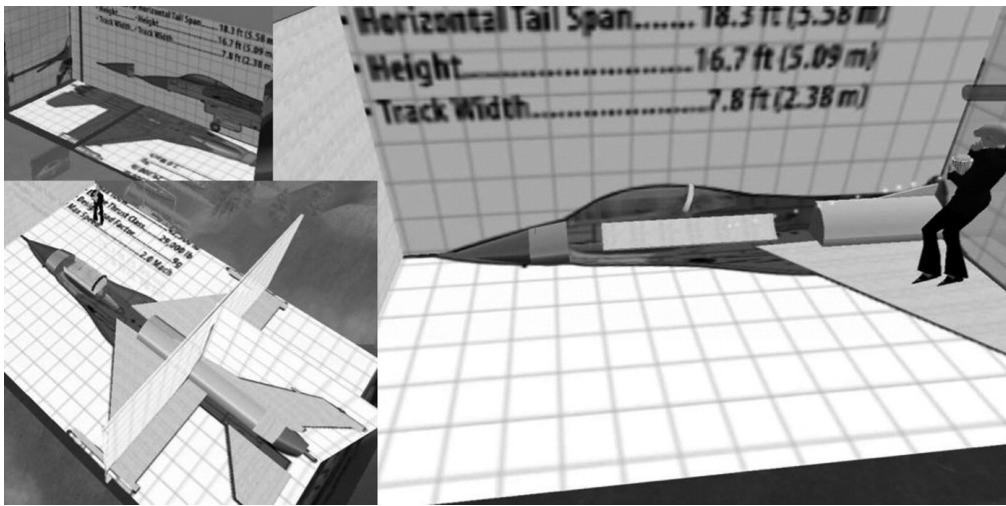


Figure 5. A 3D template (graph paper) is used to facilitate the creation of complex shapes, in this case, a fighter jet.

bookcase – one can record this information and rearrange the room, knowing that it is possible to return to that setup just by activating the rezzer. As a practical application, by way of example, machinima-makers (virtual filmmakers) can design sets at design time and spawn the sets quickly and efficiently at film production time. Thus, the rezzer is a significant non-diegetic production tool that has many applications, including overcoming one of the biggest problems of the sandbox – its impermanence.

The rezzer is a sophisticated example of a non-diegetic production tool, but there are much more simple examples as well. In real life, children often use thin, translucent paper to trace existing art when learning to draw. Using a similar approach, one user developed a 3D version of this practice to help design a fighter jet. To do so, he constructed a simple Cartesian grid out of three flat surfaces, each one textured as if it were a piece of graph paper and imprinted with a perspective of the aircraft (e.g. top-down, side, etc.) (Figure 5). Physical dimensions of the aircraft were also printed on these sheets, presumably because *Second Life* enables both visual and numeric scaling of objects. Using this “3D graph paper”, the user makes it considerably easier to construct an accurate scale model of the fighter jet.

The rezzer, the 3D graph paper, and other non-diegetic production support tools, like all artifacts in a material ecology, are implicated in activity and performance. They are part of the physical, social, and tool-enabled interactions that constitute design practices. These practices do not exist first and then are implemented in-world; they emerge from the world.

These three contexts of production – diegetic, social, and non-diegetic production – make visible several characteristics of the virtual sandbox

as an environment that shapes design practice. The temporary nature of sandboxes means design activities in these spaces are necessarily episodic: One seldom sees the same avatars across sessions, and the social activity is mostly ad-hoc and spontaneously structured. Within these constraints the three primary activities of sandboxes occur: design, learning, and play. Yet, as discussed above, these three activities tend to unfold in very particular ways: episodic, locally yet intensely contextual, just-in-time, playful, and largely emergent/unplanned. Intuitively, this collection of characteristics might not seem to support the learning needed to empower users to develop competence with a toolset as complex and unfamiliar (to the average person who is not already a new media professional) as *Second Life's* 3D modeling tools. Be that as it may, it does work, thanks to a series of contextually appropriate techniques developed emergently by the masses of users who have used *Second Life* and its sandboxes across the years. In general, design, learning, and play can be structured and unfold in many possible ways. That they unfold in similar ways in sandboxes, in spite of the fact that there are different people with different design and different learning needs, lends evidence to the idea that a material ecology, though local and unique, can be externally shaped by the type of ecology dominant within it. Thus, while any given sandbox on a given day may reveal the tendencies of the sandbox with greater or lesser strength, inasmuch as something is an instance of this *type* of ecology, it is susceptible to the formative influences of its type.

## MATERIAL CULTURE IN VIRTUAL DOMESTIC SPACES

In the previous section, I argued that the *Second Life* sandbox is a type of ecology that shapes or conditions the day-to-day material ecologies that are created within it. *Second Life* sandboxes are of interest because they are the locus of relatively



serious social learning and production practices in a virtual world. Another locus of non-casual social interaction in *Second Life* is its role-playing communities. Typically situated on private islands well off the beaten path, role-play communities enable users to take on persistent personas and establish long-term relationships with each other in thematically coherent contexts, from Harry Potter simulations to virtual steampunk dystopias.

A major category of role-play communities is the Goreans, communities that simulate the fantasy world of Gor. Gor refers to a series of cult fantasy novels written by John Norman, which takes place in a Greco-Roman-inspired society, where most women are owned by men. The exotic locale and sexual bondage gives the series a theme of dark and violent erotic fantasy. Gorean simulations have been popular in IRC and MUDs (multi-user dungeon) since the 1990s (Gracen, 2000), so by the time they arrived in *Second Life* they were already fairly mature as a type of virtual community, with a known history (both diegetically in the fictional world of Gor and non-diegetically, as a longstanding virtual community); a well-established series of practices, rituals, and symbolism; and documentation on their lifestyle.

The case study is based on a seven-month ethnographic work of "Ithaca", one of the many Gorean communities in *Second Life*. Ithaca is closed to the public, and entrance into its community involves a lengthy and ritualized process emphasizing education in the Gorean ways of life. Ithaca places special focus on the training and education of *kajirae* (i.e. slaves/submissives). Role-playing a slave involves literacy not only with the fictional world of Gor, but more importantly with the rights and responsibilities of being owned, the rituals of intimate interaction and role-play, and the cultivation of appropriate attitudes.

In this study, a colleague and I explored participants' experiences with the virtual space and the Gorean culture to understand how participant-created environments enable the cultivation of a sophisticated subculture, and how such personal and cultural experiences are made meaningful and powerful through settings, events, and artifacts created and used by the community members. The pre-study included extensive work with its leadership to manage the impact of our presence and gain consent as well as observation of over a dozen virtual classroom-based sessions on the training of slaves (which doubled as a requirement for entrance in the community for prospective role-players). At the conclusion of the pre-study, we designed a study of domestic homes within Ithaca, which included home visits involving dozens of hours of observation and 11 two- to three-hour

semi-structured interviews.<sup>5</sup> This paper considers the material ecology of Ithaca, with a special focus on virtual domestic arrangements. As with the sandboxes, a given virtual home in a role-playing community is understood to have a material ecology, and yet this particular material ecology exhibits tendencies of types of ecologies that inform it, in this case, the broader Gorean subculture, contemporary American middle-class homes, *Second Life* property ownership practices, and so forth. But whereas in the *Second Life* case study I focused on how the sandbox, as a type of ecology, created certain tendencies within the specific material ecologies of the sandboxes, in this section I use a material *culture* approach to reveal and explore relationships between artifacts and their significance for the role-players that live in them.

### **Intimate spaces and the cultural construction of Gorean domesticity**

As material culture (Belk, 1988; Lubar & Kingery, 1993; Miller, 1998; Attfield, 2000) and humanist geography theory (Tuan, 2001) argues, and as the sandbox example discussed earlier shows, place serves to contextualize actions, forging specific meaning in relation to the surrounding sociocultural environment. Ithaca is no exception, though its size and role-play depth gives it many different kinds of place, each with its own attendant activities and meanings. The virtual home is one of these, and it is replete with meaning, symbolism, and individual aesthetics. Residents of Ithaca spend a lot of time in and energy on their domestic spaces. The majority of private homes we observed and conducted interviews within are considered by members to be their favorite place within *Second Life*. Ithaca community members' homes are located within Ithaca's cluster of islands, which is largely blanketed by a rough desert terrain, ranging from elaborate castles to modest houses. Most of the members either own their own homes or share private living spaces with their role-played partners.

As in real life, private residences take on special meanings for their residents, who clearly see them as more than a place to hang out. As the following quotes show, these virtual private spaces are intimately bound up with users' notions of their selves:

Aye, I did a great deal of shopping ... This was the one I chose. It is My home.

[My virtual private home] allows me to escape from Ithaca and also my RL [real life]. This is where I can be me.

The first quote is typical in claiming that the home is an expression of the self. Ithacans invest a lot of energy in their private homes – usually some combination of shopping and designing/building –

and the result is a sense of “home” – its origin may be external, but its resident has appropriated it; claiming it as her/his *own*. The second quote takes this further, suggesting that the virtual home is a refuge. Interestingly, the virtual home is a refuge not merely from the trials and tribulations of real life, but even those of virtual life in Ithaca! This claim reveals that virtual worlds do not represent blanket escapism from the real world. It also underscores the extent to which a virtual domestic space not only expresses, or represents, the subjectivity of the avatar, but also is a nurturing sanctuary where the avatar-self is actualized (“I can be me”).

In creating the spaces in which they live, people collect and dispose of artifacts and, in the process, construct an “ecology of artifacts” meaningful only to them (Krippendorff, 2006, p. 194). The interior of a home is one place where this phenomenon is visible. Our research suggested that in Ithaca the collective meaning of these artifacts is not merely “home”; it can also be understood as a portal through which one’s individual experiences, interests, and hopes can be accessed, and also a social sphere through which one affirms solidarity with a group. Through our artifacts, we organize our experiences, construct our identities, and, in the words of Csikszentmihalyi & Rochberg-Halton (1981), “stabilize our sense of who we are” (p. 21). Thus, whereas Krippendorff develops the notion of ecology of artifacts mainly to explore how personally assembled networks of artifacts work together and become collectively meaningful, Csikszentmihalyi & Rochberg-Halton’s notion of artifacts further propose that these networks are implicated in the emergence and maintenance of our identity itself. Their notion is anticipated by a concept dating back to Bachelard’s *L’imagination des matières*, which proposes that “certain personality traits were found to correspond to concrete elements in a kind of psychoanalysis of the material world” (Flitterman-Lewis, 1996).

In the following sections, I explore how networks of domestic virtual artifacts are not only meaningful for Ithaca residents, but also constitutive of their identity and experience, by considering artifacts from the following perspectives:

- **Artifacts as sites of (sub)culture:** In addition to being things with some sort of objective external existence, artifacts are understood intersubjectively by members of a culture or subculture. In Ithaca, this ranges from a combination of the distinctive Greco-Roman-S&M visual language of Gor to more mainstream cultural languages, such as the languages of interior design that constitute the everyday Western notion of the “home”.

- **Artifacts as markers of identity:** Practices of identity are, of course, drawn from a broader cultural repertoire of such practices, but any given individual makes choices from that repertoire to construct her or his own particular expression of it. These practices are typically accompanied by and enacted via interaction with artifacts. In this way, artifacts become proxies of identity.
- **Artifacts as tokens of intimacy:** Artifacts are also tokens of intimate personal relationships between two people; the wedding ring is a common example. Other tokens are secret and/or only shared by the two involved. Often, intimate artifacts have both public and private dimensions, and negotiating among these is one way to practice being in a relationship.

### Artifacts as sites of (sub)culture

Residents of Ithaca live in an ecology that can be understood as a series of concentric rings, each one split into public and private halves. At the highest level is a person’s world, split into external reality (public – shared by all humans) and *Second Life* (private – shared only by *Second Life* users). Within *Second Life* there is likewise a split between a public half – e.g. the main continents – and a private half, e.g. closed communities such as Ithaca. Ithaca itself, as described, is divided into public spaces (e.g. market, classroom, meeting spaces) and private (i.e. domestic) spaces. Finally, and perhaps not surprisingly, domestic settings are themselves divided into public sitting/entertaining rooms and private areas (such as the bedroom). I begin on the public side of the private home.

In the Ithacan homes we visited, the Greco-Roman inspired Gorean style was the most pervasive decorative scheme. At least one of the rooms in these homes is Gorean themed, if not all. It is furnished with highly ornate carpets, sumptuous couches with rich upholstery, period-appropriate wall art, drinking and eating vessels, candelabras, and torches, among others. Collectively, these artifacts replicate Gor’s visual language at the scale of a domestic interior. In addition, unique Gorean cultural artifacts such as the bazi tea service, *kaissa* (i.e. the Gorean version of a chess set), and bathtubs with strigil (i.e. a metal tool used in the ancient world to scrape dirt and sweat from the body) are prominently displayed in public areas of members’ homes. One sees, for example, the conspicuous display of common Gorean artifacts such as the “sleen knife” and “homestones”, which not only signify Gor, but also position residents within particular social castes in Gorean society.<sup>6</sup>

We asked residents why, in their private homes, they felt a need to maintain one or more rooms in the Gorean aesthetic of their community. A typical response was that they do so to make “other Gorean visitors feel more at home”. This response is

interesting for a few reasons. First, it is a reminder that even a private space has a public face. And second, and related, is that entertaining others in a role-playing community requires that the front be maintained. These artifacts have a reciprocal relationship with Gorean culture: they are only meaningful within it, but they also signify it. These kinds of local feedback loops suggest that Gorean artifacts are more than decorations; they are participants in complex systems.

Analyzing the relationship between fashion and identity, Barnard (1996) observes that one is not first a skinhead and then shaves his head and puts on all the gear; only by shaving one's head and getting the gear does one *become* a skinhead. In a similar way, *Second Life* Goreans are not Goreans when they are in blue jeans in a virtual fashion mall; they are made Goreans by their interaction within Gorean interiors in Gorean cities, speaking in Gor's unique chat dialect (more on that below), and wearing Gorean accessories. Thus, even private spaces must incorporate intersubjectively agreed upon cultural signs in their interiors; these private interiors cannot be arbitrarily individually expressive, because doing so would threaten their owner's Gorean identity by replacing it with one or more different cultural identities.

### Artifacts as markers of identity

Although all domestic settings that we saw in Ithaca had at least one Gorean room, many of these homes had one or more non-Gorean rooms. These included, for example, Asian-inspired, medieval, and futuristic science fiction themes (Figure 6). We asked people to tell us about their non-Gorean interior designs. One participant describes why much of her home displays an Asian-inspired visual style.

We admired the simplicity [of Asian aesthetics]. Also my daughter is half Chinese and she has a home somewhat similar and it's very comfortable. Sampson [the speaker's real-life husband] spent a lot of time in Southeast Asia as well.

This resident's statement reveals her desire to design a place that is intimately comfortable based on real-life values and family relationships. Another participant explains why he chose a Sci-Fi look for his private residence:

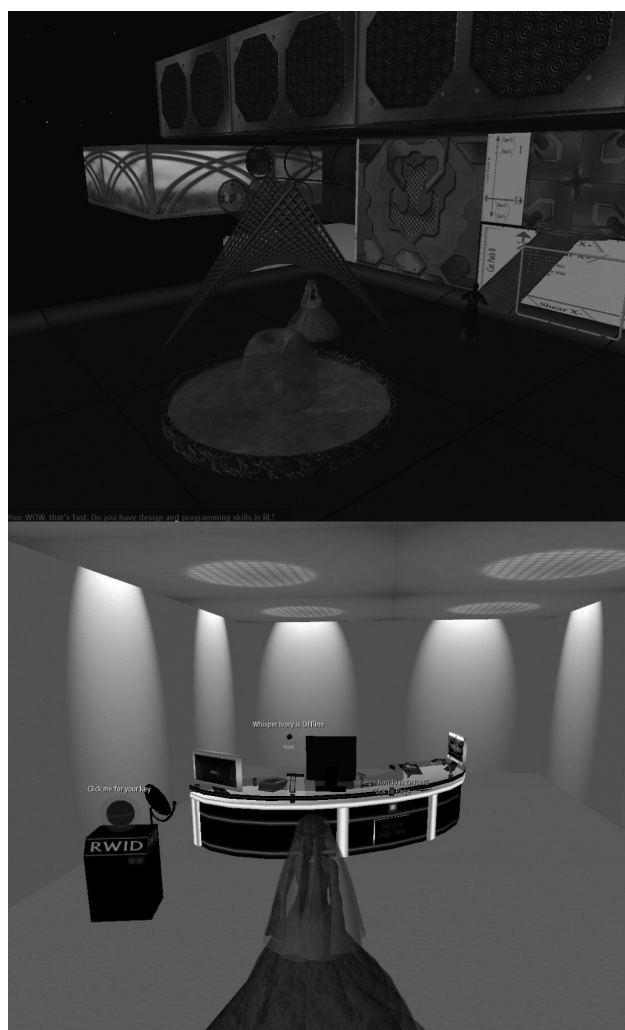
... this one [the house] is further up, and more geared towards a sci-fi look. A little something to satisfy my inner geek.

In both of these examples, the real and the virtual converge, resulting in a material culture that borrows from the (public) cultural vocabularies of real life to enable the (private) expression of real-life personal preferences, tastes, and values. As

several other researchers have also argued (Miller, 2001; Blom, 2004; Pearce 2006a ,b), artifacts are expressions of identity and community.

These examples obviously show that the boundary between real life and participation in a *Second Life* role-playing community is fluid; more importantly, it also implies that role-played virtual identity itself is inseparable from real-life identity. Csikszentmihalyi & Rochberg-Halton suggest how this happens: because artifacts reveal and represent the self in the procession of time, they become "foci of involvement in the present, mementos and souvenirs of the past, and signposts to future goals" (1981, p. 23). Though the subject exists in different spaces – i.e. real life and Ithaca – her past experiences and future hopes cross-pollinate; one does not enter *Second Life* as a blank slate, and neither do *Second Life* experiences disappear upon logging off. This shared history across worlds means that artifacts bearing special meaning in one world may also appear and bear similar meanings in the other world – because one subject is resident of both. The role-played identity is thus not simply

Figure 6. Artifacts help comprise symbolic ecology that evokes a personally crafted aesthetic value.





a fictional character projected into Ithaca's public drama; it is a subjectivity that is a hybrid of multiple worlds (Bardzell & Bardzell, 2008). Artifacts and their ecologies are expressive of their residents' hybridized subjectivity.

### Artifacts as tokens of intimacy

We have argued that material cultures are constructed out of artifacts that reciprocally signify the cultures that give them meaning, and then I added to this argument to claim that artifacts also signify the hybridized identities of their avatar-users. In this section, I explore the ways artifacts also signify human relationships. Avatars in virtual worlds form relationships to one another among artifacts, not merely interacting with each other, but also crafting a 3D immersive material ecology in which their relationships are enacted. In our interviews a few members described deeply personal relationships with virtual artifacts. Tangible artifacts such as jewelry and other love-tokens exchanged between partners are precious because of their projection of deeply personal emotional connections, rather than their general aesthetic qualities. These artifacts are *ensouled* (Nelson & Stolterman, 2003) and are often characterized as the most precious things possessed by the Ithacans we interviewed.

Often, these items are given as gifts, and though the gifts are virtual, they are extremely important to users. As anthropologists such as Mauss have shown to be true of all human societies, gift-giving creates an intimate relationship – a reciprocal connection that demonstrates solidarity between the giver and the recipient (Douglas, 2000). Intimate relationships in a society predicated on sexual slavery, where that slavery is virtual and role-played – and therefore circumscribed by a wide variety of technical, gameplay, and social rules – shape the meaning of gifts, as the following quote reveals:

[My favorite object is] my collar because i am His, and only His, it is the symbol of O/our D/s relationship and all that means to U/us.<sup>7</sup>

The relationship between dominants and submissives in this kind of relationship is reciprocal, albeit in non-traditional ways; both partners have rights and responsibilities, and this relationship is explicitly rule-bound. But the power differentials, in combination with practices of one-sided polygamy (i.e. a free partner can have multiple slave partners, but slaves can only have one owner), create interesting dynamics. For example, whereas in traditional Western heterosexual relationships both partners wear wedding bands signifying marital status, in Gor only submissives are so marked as taken. One of these markers is the collar. The collar signifies several public states of affairs: that these two are officially together; that their relationship

is one of dominance and submission; and that she is the submissive. If that is what the collar means to the Gorean public, it is just a small part of what it means *for her*. For her, the collar signifies their "relationship and all that means"; in other words, her collar signifies not just facts, but it also signifies the two of them. Ironically, (to her) the collar signifies *him*, so even if she wears it, he, too, is bound by it. Gorean D/s reciprocity operates in strange ways.

The submissive (non-submissively) asserts her relationship with him in other ways, such as the unusual but highly codified capitalization scheme used in the quote, which is written in a standard Gorean chat dialect. Her capitalization conventions are normalized, so that the dominant partner is always capitalized (e.g. "His") while the submissive partner is always lower case (e.g. "i"). When plural pronouns mix dominants and submissives, *both* capitalization conventions are used with the dominant always preceding the submissive (e.g. "O/our"). In this way, through the appearance of self-effacement, the submissive enacts self-assertion; if he has collared her literally, she has reciprocally collared him through capitalization. In a virtual world, where chat is the primary mechanism of communication, textual conventions such as capitalization become a part of the material ecology, because it is perceptually present in *Second Life's* space, visible to all nearby, and floating among the chairs, carpets, and torches of the Gorean interior.

The experience of intimacy is not something that simply exists (e.g. as an internal psychological condition) that is passively referred to with signifiers such as collars. Rather, putting these signifiers – collars and capitalization alike – materially into the world *constitutes* the experience of intimacy. As Barnard's skinhead can only be a skinhead with the right gear, so a Gorean submissive needs a material ecology to *be* her lover's slave, and she likewise needs to *experience* her particular form of intimacy.

We have shown that artifacts signify simultaneously on multiple levels and to different participants. Even the smallest and most private material ecologies, such as individual private residences, are symbolically dense, polyvalent, and multidirectional. Far more than the expression of an individual's taste, the material ecologies of domestic spaces both represent and enact the meanings of Ithaca's Gorean subculture. They inject players' most personal real-life memories, values, and affections into their avatars and their avatars' social arenas. They also constitute a language through which intimate interaction takes place – privately and

publicly. A material ecology is far more than a network of artifacts; it is a complex system of communication, experience, and identity.

### ECOLOGICAL INTERACTION IN SECOND LIFE

The Cartesian view of the world separates subjects and objects. As Lakoff & Johnson (1999) argue, this perspective underscores both traditional Western science *and* everyday common sense. Because of this one-two punch of our most common epistemological commitments, it can be hard for us to see the ways in which our environments profoundly shape not just our actions but who we are, because we are conditioned to see environments and artifacts as external and passive. As we technologists move into our technology-rich artificial world, we do so as both residents and designers. Theories, such as those of material ecology and material culture, have the potential to help us understand the deeper personal and cultural implications of interaction, specifically how both humans and artifacts participate in complex systems of meaning.

The point of view advocated here takes a position that material ecologies are not mere containers in which we, as independent rational beings, make decisions and act. Rather, they are immersive and complex communication systems through which we act and are constituted. These two case studies in *Second Life* exemplify the theory. The sandbox example showed that people neither author content nor learn to author content without those processes being shaped and made possible through diverse material contexts – the diegetic space, the social context, and the production context. The role-play community offered evidence that people become subjects through their interactions in material spaces, in the real world, in *Second Life*, in their communities, and in their private virtual homes.

More generally, all of these processes take place in a virtual world that grounds social interaction in concrete, familiar, and perceptual reality, characteristics that Dourish (2001) claims characterize embodied computing. This concrete everyday perceptual reality is not merely “out there”, seen from the perspective of the embodied subject (i.e. the avatar and accompanying camera), though that much is true as far as it goes. Additionally, that perceptual reality is filled with meaning. It is at this point that material culture theory has the potential to amplify a material ecology approach, by situating material ecologies more firmly in relation to human subjectivity. Each artifact in a material ecology not only relates dynamically to other artifacts, but it also signifies whole cultures and subcultures, the past and future, virtual and real-life subjectivities, tastes and

relationships, conventional and subversive values. These meanings are neither static nor universal, and negotiation through them constitutes the subject, who receives, resists, emphasizes, associates, shares, denies, transgresses, and/or represses them.

The notion that we can pin down these meanings – so that there is a seamless, shared, and transparent understanding between designer, system, and user or as proposed as a goal of semiotic engineering in de Souza (2005) – may not only be unachievable as a goal but may also be the wrong goal. Clearly this critique has its own place and limits; obviously, an interaction designer creating an interface to set an alarm clock presumably can benefit from designing around a cognitive model of the user. But as computing becomes more culturally embedded, designers and researchers will need to understand how interaction with technology does not so much affect us, as if we were separate from these interactions, as it does constitute us.

### NOTES

1. All avatar and community names throughout the paper have been anonymized.
2. Griefing is a term used in online spaces that describe the act of aggravating and harassing other users.
3. Prims are the simple elements out of which the *Second Life* 3D modeling toolset enables designers to work; they include cubes, cylinders, cones, pyramids, and so on. Designers can position, resize, twist, texture, and deform these shapes.
4. “To rez” in *Second Life* is a colloquial term for instantiating something materially by dragging it out of inventory and placing it somewhere in the world.
5. The completed result of the main study is published in Bardzell & Odom (2008).
6. Sleen knives are given to the huntresses in the Gorean society, while homestones are important for the Free class. Both objects are thus important in symbolizing the resident’s Gorean social class.
7. “D/s” is an abbreviation of dominance and submission.

### ACKNOWLEDGEMENTS

The authors wish to thank their colleagues at the IBM Almaden Research Center focused on the Rehearsal Studio and other virtual world interests. They also thank their clients who have provided them with thought-provoking and challenging problems that enable them to do research and development in this fascinating domain of virtual worlds. Their appreciation goes out to the participants of the Productive Play workshop at

UC Irvine, particularly the organizers Celia Pearce, Bonnie Nardi, and Jason Ellis, for their rich thoughts, discussion, and lively debate. Particular thanks are offered to Ben Shaw for his repeated engagement with and review of this piece.

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ISSN 1749-3463 print/ ISSN 1749-3471

DOI: 10.1080/17493460903020141

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