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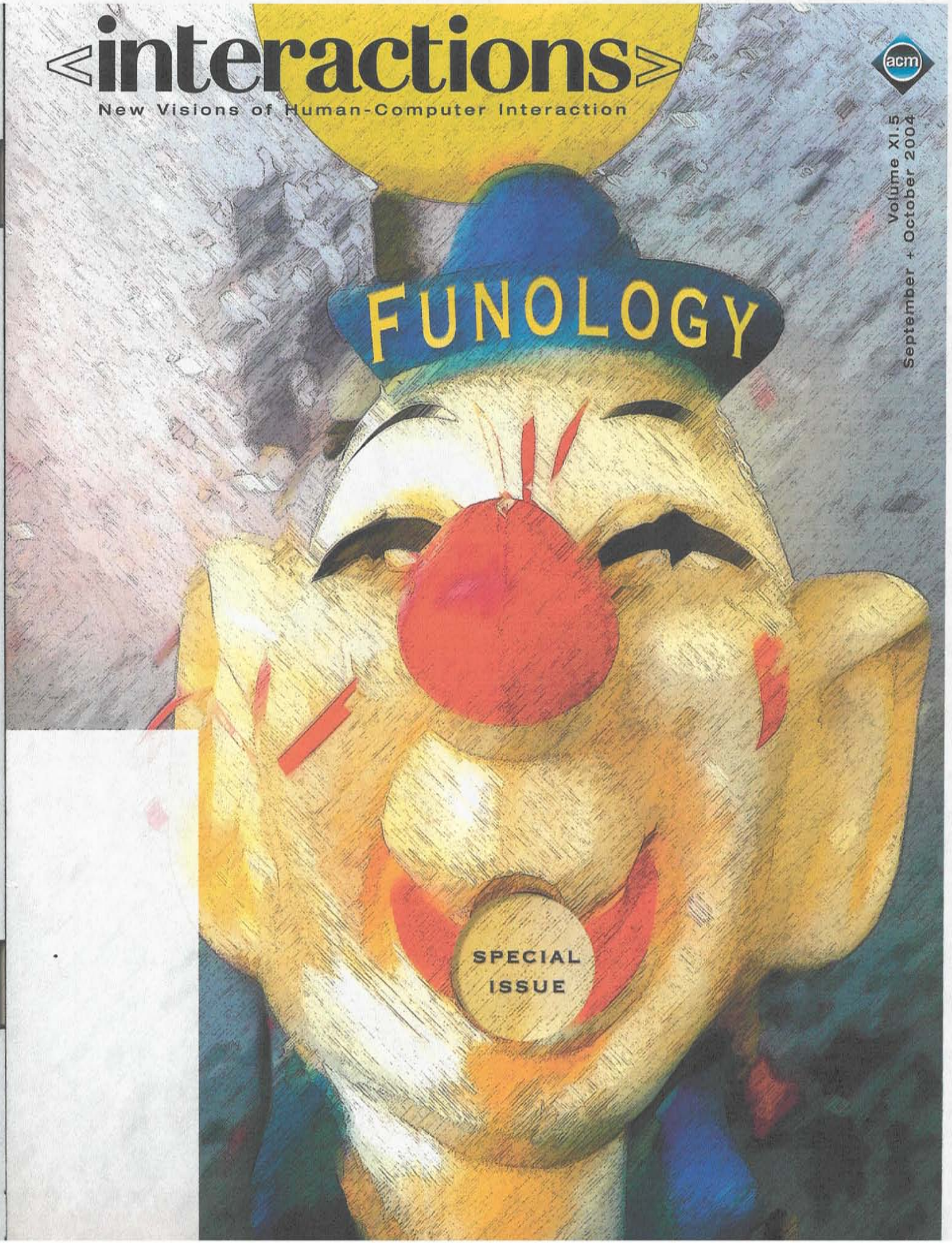
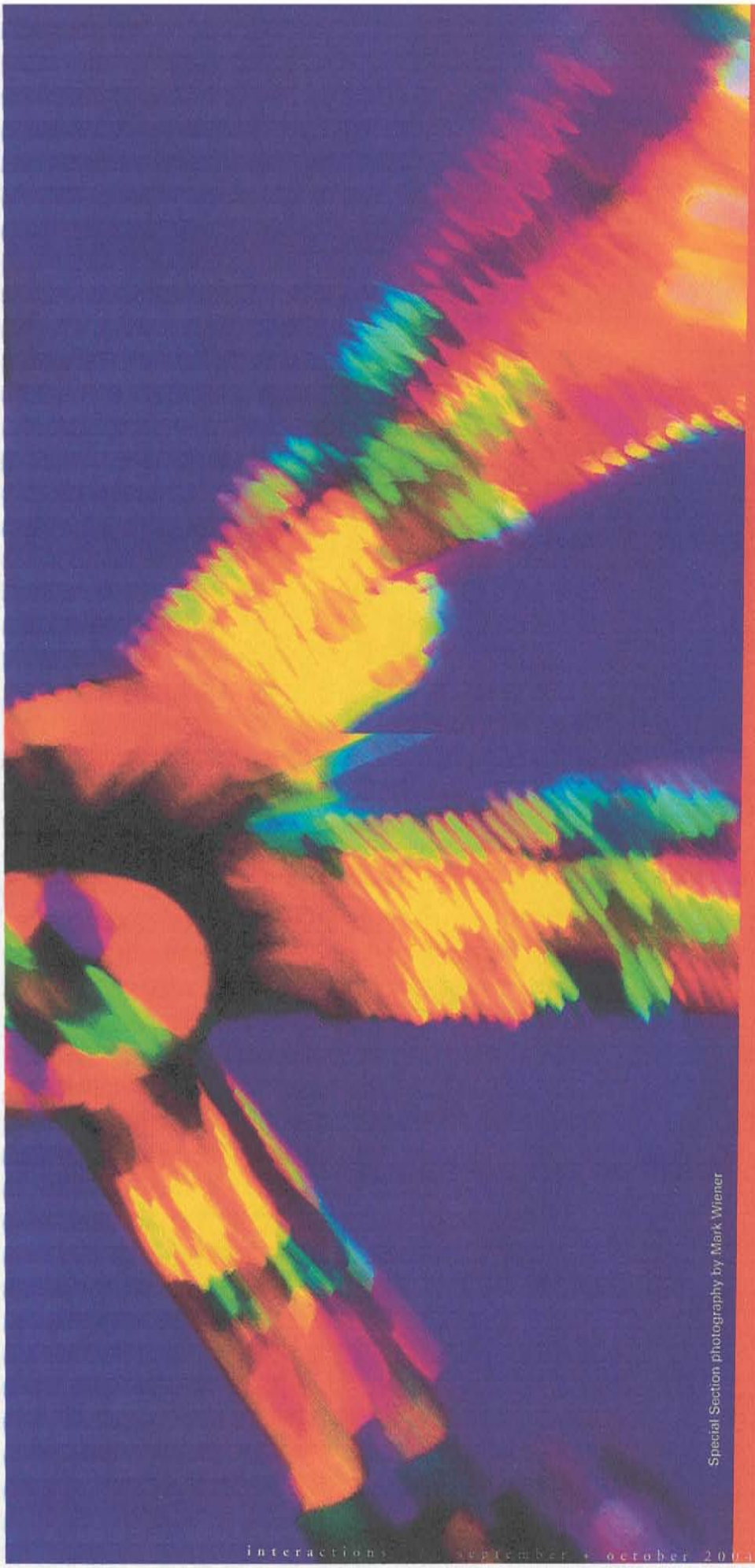
New Visions of Human-Computer Interaction

Volume XI.5
September + October 2004



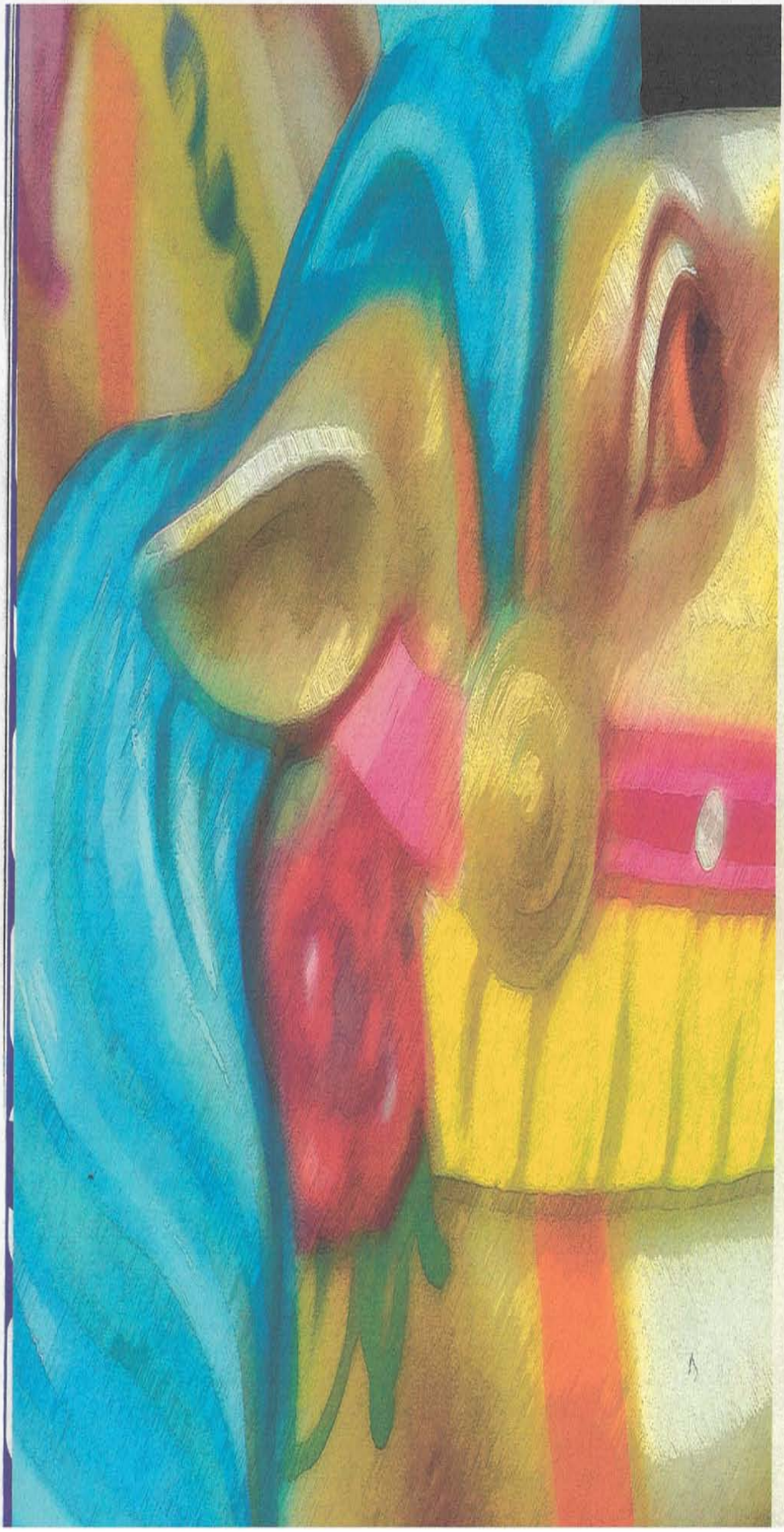


Special Section photography by Mark Wiener

More Funology

Information and communication technology has become a pervasive part of our personal and private lives. In recent years the field of human-computer interaction (HCI) has greatly broadened its scope to reflect this shift. Practitioners and researchers are now as likely to be concerned with how enjoyable a new technology is as how usable and useful it might be. New directions in the field encompass not just what technologies can do but how users can creatively adapt them to their needs. Emotional responses to design are being explored as systematically and rigorously as ease of use or ease of learning were in the earliest days of the field. The subject of computers and fun has moved from the sidelines of research towards center stage. It is the beginning of "funology"—the science of enjoyable technology. Fun and enjoyment are as important in the home and leisure context as productivity and efficiency in the work context. But the boundaries between work and play are increasingly being called into question and blurred. Many would now agree with Noel Coward, that work is much more fun than fun. This special issue of *interactions* brings together well-known HCI figures and also some members of the next generation of researchers working in this new field. For more information on much of the work here and also other contributions please refer to the book entitled *Funology: From Usability to Enjoyment*.

—Mark Blythe, Marc Hassenzahl, and Peter Wright



Beyond Fun

By John M. Carroll
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One of the most interesting threads of development in human-computer interaction through the past 25 years is the field's conception of "usability." Initially, this term was taken as synonymous with "easy" or "simple." As understanding of people's experiences with technologies has developed, the concept of usability was enriched with ideas from human development to include such notions as "cognitively stimulating," "consistent with prior knowledge," and "transparently useful in the work at hand." During the 1990s, as collaboration became a major problem area for human-computer interaction, and as organizational issues became better understood, usability was further elaborated to incorporate notions like awareness of and access to other people in the performance of a work task, and support for existing workplace roles and practices.

So what about fun?

Fun is an important and obvious example of how the concept of usability has developed. In circumstances where human-computer interaction is discretionary, and especially where it involves sustained user activity, ease and simplicity are just not enough. People must want to use a system, and must continue wanting to use the system. Part of achieving this is making the system fun to use.

Incorporating fun into considerations of usability, and of user behavior and experience, makes human-computer interaction far richer from the standpoint of psychology and design. The interaction of cognition and affect is fundamental to the complexity of social behavior and everyday experience. Things are fun

when they attract, capture, and hold our attention by provoking new or unusual perceptions, arousing emotions in contexts that typically arouse none, or arousing emotions not typically aroused in a given context. Things are fun when they surprise us; when they don't feel like they look, when they don't sound like they feel. Things are fun when they present challenges or puzzles to us as we try to make sense and construct interpretations, when they transparently suggest what can be done, provide guidance in the doing, and then instantaneous and adequate feedback and task closure.

Understanding how to evoke fun through design is involved. Just as a design is not *ipso facto* easier when its functions, displays, and command gestures are minimized, a design does not evoke fun merely because it incorporates color and animation, sound and music, or graphical fantasy content. Distractions may surprise us, may briefly capture our attention, but they are ultimately annoying, not fun. The possibility of fun arises when we are both aroused and intrigued, and at the same time recognize an intention to communicate through a design. Thus, the frontier for research and design with respect to fun is the development of insights and techniques for the management and support of hedonic arousal and the interpretations and attributions entrained.

An interesting question is whether we should think of fun as a facet of usability, or as something separate from usability. The answer depends on the definition of usability, but that does not mean it is completely arbitrary. Moreover, as I elaborate below, the question will continue to arise as the concept of usability continues to develop.

I would urge that we construct a broader, more encompassing concept of "usability," one that incorporates "fun" and other significant aspects of the experience of human interaction with technology, rather than settling for the primitive caricature of usability as synonymous with simplicity and ease, and regarding fun (and other aspects of the user experience) as something beyond or aside of usability. I propose this redefinition for two reasons: First, I think the process of constructing a more comprehensive and integrated analysis of the user's experience is likely to lead to greater technical progress than merely itemizing a variety of mutually inconsistent and incomplete facets of the user's experience. Second, articulating the roles and interactions among a variety of important components of the user's experience is itself likely to elicit a deeper and more significant consideration of each individual component (as I think it already has in the case of ease and fun).

Fun is not the culmination for usability.

As the use of computers expands into leisure activity, family interaction, and civic life, our understanding of usability may broaden further to encompass qualities like eudaimonic well-being [11], collective efficacy [2], cultural identity [5], and social capital [9]. Perhaps the most significant consequence of human-computer interaction is larger-scale and/or longer-term than those investigated so far.

In human-computer interaction, health and well-being are usually thought of with respect to workplace ergonomics—problems of physical posture and manipulation that can be long-term, and psychological stressors that are generally short-term. Technology clearly can have broader effects than this. People who report being happy when engaged in social interaction, report being bored and unhappy when watching television [7]. Television viewing is linked to reduced physical activity, and poorer physical and mental health [1, 12]. These are issues of usability-in-the-large. Indeed, concerns about impacts of Internet computing on health and well-being have already received much attention [6].

People's beliefs about their own specific capabilities exert powerful influences on learning and performance outcomes [2]. Perceptions of high self-efficacy for an activity domain cause individuals to set more challenging goals, to work harder on difficult aspects of tasks, to master new competencies, and to achieve more. Similarly, group members' beliefs about *collective* efficacy predict group performance. Collective efficacy is a function of interrelated personal efficacy beliefs, including both members' appraisals of personal capability for functions performed within the group (for example, the belief that there is someone you can turn to for advice about handling problems with your family) and members' appraisals of the group's capability (for example, the belief that one's community can improve the quality of public schools without help from the state government.) The tools people use, such as computers and software, can affect their perceptions of both self-efficacy and collective efficacy, and thereby enhance or impair future learning and performance.

Although it can seem like the world has been thoroughly homogenized, we are still clearly not all members of the same culture. Age, gender, ethnicity, race, nationality, residence, first language, education, occupation, family status, disabilities, and special needs—all entail folkways, mores, and concerns. Cultural identity contributes to the creativity of the self and to the diversity of society, but it is a complex social construction that must be accommodated, encouraged, and celebrated. It is under assault throughout the world by mass production of all sorts, including one-size-fits-all software and user interfaces. Although the risks of poor usability with respect to cultural identity are becoming better understood, it is still not well-understood how to manage the design of human-computer interactions to ensure preferred outcomes [8].

Social capital is a key concept in contemporary studies of the decline of civil society and the rise of utilitarian individualism [3]. The creation of social capital

involves the establishment and maintenance of social networks, shared goals and values, and social norms of reciprocity. Social capital is not a transient state, like satisfaction or frustration, or a discrete achievement, either present or absent; it is the social resources that it develops. It is not an individual state or achievement; it is a collective good benefiting everyone who lives in the community. Systems and applications that enhance social capital will have greater long-term usability for the members of the community; those that diminish the social capital of organizations are less usable.

These are just a few thoughts about possible future trajectories for the concept of usability. What I want to stress is my belief that there is a future trajectory, and that usability, like human-computer interaction, is continuously under construction.

Usability is the touchstone concept of human-computer interaction. As our understanding of the phenomena of human-computer interaction grows, the concept of usability has grown. One of the important areas in which this growth has already reached fruition, as evidenced by the work presented and referred to in this issue of *interactions*, is in the area of *affect*. In 1987, John Thomas and I wrote "we continue to see, without humor, the prospect of a decade of research analysis of usability possibly failing to provide the leverage it could on designing systems people will really want to use by ignoring what could be a very potent determinant of subjective judgments of usability—fun" [4]. I no longer worry about this.

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Interview with Patrick Jordan

By Mark Blythe

MB: For readers who aren't familiar with your work could you give an example of the four pleasures you talk about in Designing Pleasurable Products?

PJ: OK, here's a brief summary.

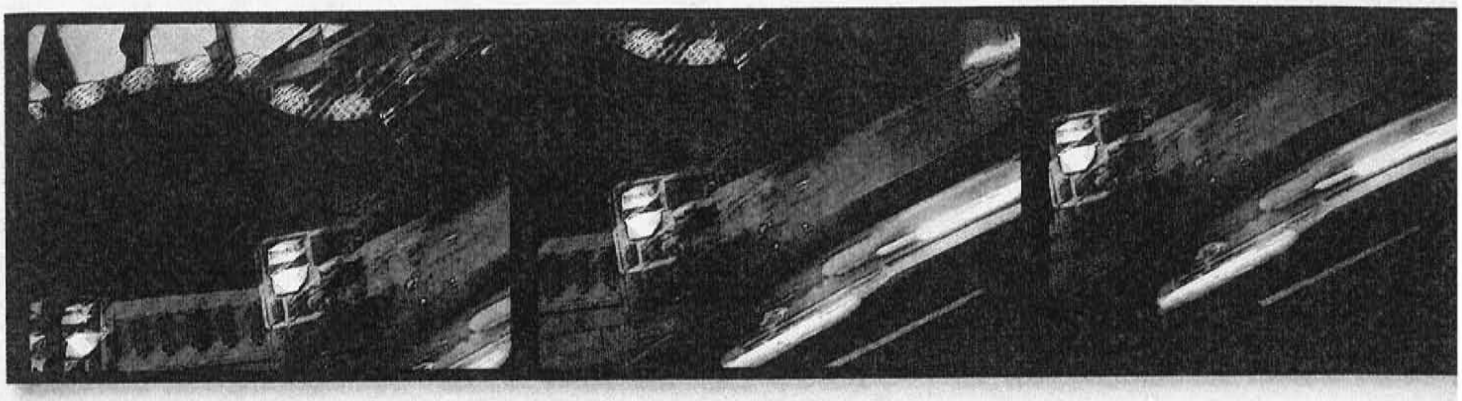
Physical pleasure is to do with the body and the senses. It includes things like feeling good physically and health wise, as well as sensual pleasures. Sensual pleasures include things like eating drinking, being comfortable, tactile things, etc. Anything associated with the five senses.

Social pleasure is to do with relationships. This includes relationships with family, friends, coworkers, loved ones and others that we know, but also more abstract relationships with society as a whole, such as how others see us, our status and those kinds of things.

Psychological pleasure is about what's going on in our minds emotionally and cognitively. Feeling good emotionally and doing things that interest and engage us would be examples of psychological pleasure. So would being creative or enjoying the creativity of others.

Ideological Pleasures. These are to do with our tastes and values. Our tastes are about things that we happen to like. Maybe we prefer red to blue for example—just matters of preference with no major philosophy about them. Our values are about our moral judgments. Maybe we believe it is right to care for the environment for example, or perhaps we hold religious or political beliefs. We feel better about ourselves when we act in line with our beliefs.

MB: There is a school of thought in the field of aesthetics that argues our responses are culturally- and context-specific, not timeless



or universal. Would you agree?

PJ: I think that it is likely that both nature and culture play a role in how we respond to things. For example there are certain shapes and colors that people from a wide variety of cultures seem to respond the same way to and these might tap into our human instincts. Lots of people are scared of images of snakes and spiders for example, but very few of us are frightened by pictures of cars or guns. However in today's society we are much more likely to be killed by a car or a gun than a snake or a spider. That might be an example of a natural aesthetic response—the aesthetics of snakes and spiders generate a stress reaction where the aesthetics of cars and guns don't.

On the other hand, some aesthetic reactions seem very culturally specific. Swastikas are offensive because they are associated with the Nazis for example. As a half-Brit/half-American I probably have an emotional response to the Union Flag and the Stars and Stripes which is different to how I would respond to other combinations of color and shape on a cloth background!

MB: Could you say something about how a design can be gendered as explicitly feminine or masculine, this may be quite an alien concept for some readers.

PJ: There are two broad issues here. One relates to ergonomics and the other to aesthetics. On the ergonomics side of things men and women differ, on average, on a number of physical and physiological measures. These would include things like height, reach, and strength. This might mean that if we were making something that was going to be used mainly by men it might be sensible if it were made to a different set of dimensions than if it were being used primarily by women and vice-versa.

There is also evidence from market research and sales data that suggests that men and women have, on average, different tastes in aesthetics. Again, whether these differences are natural or cultural or both would probably be a matter of debate among psychologists and other social scientists.

MB: Have your thoughts about designing pleasurable products changed at all?

PJ: At the moment I am interested in a field called "evolutionary design." The idea is that we can learn things about design from nature—like the thing I mentioned about the spiders and the gun earlier. I have always tended to focus more on the cultural elements of why we like things—I think this may be true of most people in our profession—so it is interesting to see this new branch of research emerging.

I still think that the basic principle of understanding people in depth is the key to designing things that are really wonderful and which people will really love. There are lots of different professions which have great ways of understanding people and we can learn new things from all of them.

MB: What are your favorite methods at the moment?

PJ: Recently I have been using a technique called the "method," which actors use to get inside the lives of the characters they are playing.

I originally started using this technique when I was a professor at Carnegie Mellon University. We were working on regional and national campaigns tackling anti-social behaviors such as racism and gun-violence. Because of the people we were trying to influence it wasn't practical or even safe to interview them.

I saw a show on TV about the actor Billy-Bob Thornton and how he had got into the mind of a really nasty character that he had to play and he talked about the "method" so I asked the drama department if they could help us. Ingrid Sonnichsen, a movie and theatre actor, taught me the basics of it. It worked really well and I am using it in a lot of my commercial work now.

MB: Why do you think the subject of design for pleasure has such a wide appeal?

PJ: I think that a lot of the general appeal is because it's about understanding people. Usually we can recognize ourselves or others that we know when we talk about motivation, lifestyle and why we like the things we do. I think that makes it fun to read about and apply. It's also very simple which helps, I think.

Technology as Experience

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User Experience

User experience is now becoming central to our understanding of the usability of technology. Today many interactive technology companies describe on their Web sites their commitment to experience-based design. There is also a trend in HCI communities to foreground experience-centered approaches to technology, a movement reflected in several recent articles offering theoretical statements about the sensual and emotional conditions of interaction with technology.

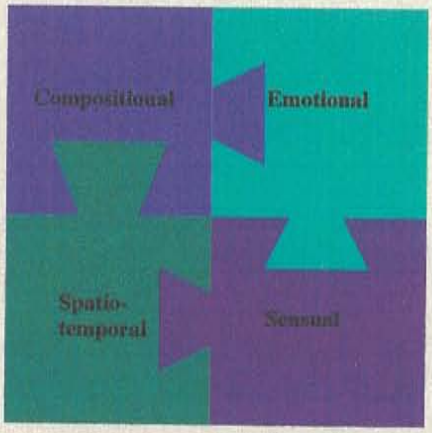
Thinking about Technology *as* Experience

In a recent study we presented a basis for thinking about and evaluating technology as experience. We show how technology can be seen in terms of experience with technological artifacts. This approach orients us toward the felt-life of technology-toward engagement, enchantment, irritation, and fulfillment. But we also recognize that the feeling-life does not begin and end with the immediate quality of an experience, rather it extends across space and time to the *sense* we make of experience in terms of our selves, our culture, and our lives. To make these concepts usable, we have developed a framework for analyzing experience with technology [2].

The Framework

Even though the framework is presented as a set of components, perhaps giving the impression of separable elements, each of these parts should be seen as intrinsically connected with each other, and, collectively constitutive of an integrated framework. The framework consists of four intertwined threads of experience and six sense-making processes.

The Four Threads of Experience



COMPOSITIONAL: *How do the elements of an experience fit together to form a coherent whole?*

This refers to the narrative structure, action possibility, plausibility, consequences and explanations of actions. When we ask questions like, "What is this all about?", "What will happen next?" and "How do I tackle this problem?" the composition of the experience is not clear to us.

SENSUAL: *What does the design and texture and the overall atmosphere make us feel?*

This orients us to the concrete, palpable, and visceral character of experience that is grasped pre-reflectively in the immediate sense of a situation; for example, the look and feel of a mobile phone and the sense of warmth in a social space.

EMOTIONAL: *What emotions color the experience for us?*

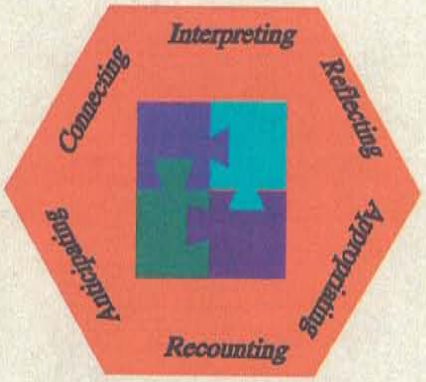
This refers to value judgments (e.g., frustration and satisfaction) that ascribe importance to other people and things with respect to our needs and desires. The emotional quality of an experience tends to summarize the experience for us; for example, as fun, exciting, or frustrating. This is how we tend to remember an experience.

SPATIO-TEMPORAL: *What effects do place and time have on our experience?*

This draws attention to the quality and sense of space-time that pervades experience. Time may speed up or slow down; pace may increase or decrease; spaces may open up or close down, affecting our willingness to linger or to re-visit such places.

The Six Sense-making Processes

People actively construct or make sense of experience—reflexively and recursively—in a way that seems to fold back into the experience itself. To reflect this in our framework we specify six inter-related, non-linear, sense-making processes.



ANTICIPATING: *We never come to technology unprejudiced.*

This refers to the expectations, possibilities, and ways of making sense that we associate with relevant prior experience; for example, the expectations we bring from a "bricks and mortar" shop to an e-commerce store run by the same company.

CONNECTING: *We make a judgment in an instant and without much thought.*

This refers to the immediate, pre-conceptual, and pre-linguistic sense of a situation encountered. This includes assess-

ment of place, such as a Web site being loud and the subsequent stressful feelings, or the sense of a social space being welcoming and the warm feelings that go with it.

INTERPRETING: *We work out what's going on and how we feel about it.*

This involves discerning the narrative structure, the agents and action possibilities, what has happened and what is likely to happen. For example, a design may excessively limit what we can do and leave us feeling trapped and frustrated.

REFLECTING: *We examine and evaluate what is happening in an interaction.*

As the experience unfolds we might reflect on why it was not possible to carry out a very similar action in two related applications or we might reflect with satisfaction on having solved a particularly difficult problem. We also reflect on the feelings of frustration or pleasure that are part of the experience.

APPROPRIATING: *We work out how a new experience fits with other experiences we have had and with our sense of self.*

This involves making an experience our own by relating it to our sense of self, our personal history, and our anticipated future. We may decide against buying over the Internet because we feel strongly about supporting local shops. Or we may modify the strength of our feelings about local shops because of the satisfaction of shopping on the Internet.

RECOUNTING: *We enjoy storytelling and make sense of experience in stories.*

This is a fundamentally dialogical process that involves telling others and ourselves about the experience. Recounting can change the meaning of an experience for us and it can open up new possibilities for experience. The importance of recounting in our culture is recognized in our attachment to "word-of-mouth."

In this short article, we have described the emergence of an orientation toward experience in HCI, suggested that conceptualizing technology as experience might provide appropriate foundations for this new orientation, and outlined the bones of a framework for working with technology as experience that is described more fully elsewhere. In doing so, we hope to have contributed to a turn that may in time provide a radical reconceptualization of technology as experience.

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Interview with Don Norman

By Mark Blythe and Mark Hassenzahl

MB: Most of our readers will be aware that your new book marks a change in direction for you. Why the turnaround? Are you hoping to inspire more designs like the Incredible Tea Juicer?

DN: The Incredible Tea Juicer? But of course!

I am trying to influence designers, so let me transform your question into asking what the "design field" knows and understands. Now, I put "design field" in quotation marks because it isn't quite clear what this phrase refers to. What I mean is an as-yet hypothetical discipline of research, theory, and practice that is concerned with design issues. This will encompass a wide range of existing fields. Thus, usability and HCI in general is one important facet, and perhaps the

most advanced of these areas. But usability and HCI (which are basically synonymous), is only one small piece. Indeed, the focus has been upon software, although usability experts in human factors and ergonomics have long focused upon hardware.

We also need to consider materials, aesthetics, manufacturability, serviceability, marketing issues, design for pleasure and fun, etc. There are also business considerations. There are many design communities: graphic design, industrial design, mechanical engineering, computer science and other related disciplines, but as yet, these are disparate, unrelated communities. I think it time for a single, cohesive design field that captures all of these aspects, from mechanical and electrical engineering, through art and graphics, through usability and pleasureabillity, through marketing, distribution, advertising, and documentation (which should be an integral part of the design process).

Areas such as fun and pleasure are now of more importance, yet they are poorly understood. The same with the emotional side of design. This is why I started studying emotion. Moreover, I thought I could show how usability, aesthetic appeal, and deeper, more cultural concerns, concerns about one's self image, and the issues addressed by much marketing and advertising could all be brought together under a common framework.

Long answer, but the questions gets at the heart of the philosophy that derives my work.

MB: When something doesn't work you can make a rule forbidding it, as your good friend so famously does for Web designers. Isn't it much more difficult to identify what makes a design engaging?

DN: There are many different aspects of design. In *Emotional Design*, I identify three different components: visceral, behavioral, and reflective. Behavioral Design is where we can develop good rules for designers, and this is where most of the scientific efforts within HCI and the usability community lie and, as you point out, where Jakob Nielsen has concentrated his efforts. Visceral design deals with appearance, and here, although there are no firm guidelines, there is a lot known from art, typography, and graphical design about what constitutes good design. Golden ratios, symmetry, appropriate use of colors—and color combinations. Visual balance, proper use of white space, etc. These are not quite a science, but there are certainly excellent guidelines.

Reflective design is something else. Now we are dealing with culture, with individual idiosyncrancies, and with learned behavior. Indeed, the best reflective designs are often very controversial—despised by some, loved by others. This is indeed where the skills and intuitions of the designers play critical roles.

Does expansion into these areas make design more difficult? Yes, but I wouldn't describe it that way. I would say it makes it more interesting, more challenging, much more exciting. After all, if we could reduce everything to simple rules, why would we want to work in that field? So hurrah for the difficulties. If a field isn't difficult, then I'm not interested in it.

MB: You argue that many of our responses are "pre-wired," that we have certain in-built aesthetic responses. But the play of fashion shows that some aesthetic responses are learned, what we wear this year and consider to be the height of cool will look absurd to us in twenty years' time.

DN: Hah! You aren't going to catch me in that trap!

I have been very careful to distinguish three different levels of processing: visceral, behavioral, and reflective.

Elsewhere, Andrew Ortony and I characterize the emotions at the visceral level as "perceptually driven," those at the behavioral level as "expectation driven," and those at the reflective level as

"intellectually driven." So the beautiful face, perhaps the enjoyment of a sunset, or a landscape marked by rolling hills, some open space and some trees, are all examples of visceral beauty. This is indeed beauty that is only skin deep.

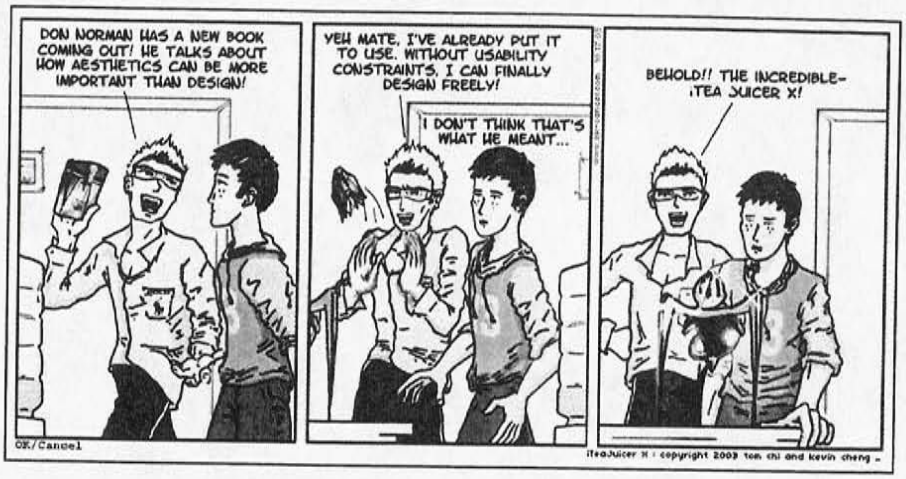
Behavioral beauty refers to the very positive feelings of turning a smooth knob or controlling some device where one always feels in control, where the device responds precisely as expected. This is a form of beauty seldom spoken of (because artists concentrate upon visual appearance), but inasmuch as much of the beauty of music is expectation driven, this is perhaps the home of much music appreciation.

The question asks about "judgments of taste" that might be historically and culturally contingent. This is reflective beauty. This is the home of fashion, for example. Thus, although all cultures prefer human bodies with certain proportions and symmetry, some cultures prefer fat, some thin. Still, within those who are fat or thin, all would agree upon which is the most attractive. So this judgment is a mix of visceral and reflective tendencies.

So, to answer your question, I believe that everyone agrees upon what makes for visceral beauty, but not for reflective beauty; here is where personal experience and history, cultural and national differences have a huge impact.

MB: You've said in other interviews that we know how to make products that work but we don't know how to make products that make us smile. But some computer manufacturers still seem to be coming up with products that make us want to throw them out of a window.

DN: Mac, Windows, Linux are too complex to be much fun. Moreover, they are a single system intended for everyone in the world, so they must always be seeking compromise. No single design or single system can possibly appeal to everyone. But it is the complexity that gets us down. Far too complex. Far too difficult to find stuff, to maintain the almost constant barrage of updates, not just of the



OS, but of the individual applications. I have to have a virus checker, a spam checker, filters on my e-mail. If I have 20 applications on my machine (and I do), and each requires upgrading twice a year, then I am upgrading almost every week. And in my experience, even simple upgrades can end up taking the whole day before you are finished.

So yes, both Apple and Microsoft have made truly excellent strides. But the overall computing experience is far too complex. That's why we end up wanting to throw them out of the window. When everything goes well, we often feel relieved. Relief? That's not a positive emotion.

You know where the excitement is, where the "invisible computer" really exists? It is the mobile phone. That is the platform for the future. On my mobile phone (a Palm Treo 600, in case you ask), I take photos, I send text messages, I read my e-mail, have my calendar (diary), address book, and notes. I have restaurant guides for the most important cities in the world, I can instantly tell you the weather for the next five days, or the currency conversion in five cities (and I can change cities in a minute or two), and so on. Oh yes, it is a music player as well.

Small screen? Sure, but always with me. Ubiquitous computing is here.

So far, the Treo 600 is a delight to use. But that will soon cease, as we pile more and more applications upon it, many ill-suited for the tiny screen and keyboard.

I have seen the future and it is the mobile platform. And it is déjà vu. Here we go again!

MB: You account for the prestige of certain items at the reflective level; does this take into account any of the work in semiotics by writers like Roland Bathes?

DN: Nope. Is my work related to semiotics? Yes, of course. Even in my *Design of Everyday Things*, the definition of "affordance" (or as I prefer, "perceivable affordance") is perhaps best interpreted as a semiotic concept, because an affordance can be interpreted as a signal. But I find that the style of thinking and writing from within Cognitive Science (which is where I reside) is so different from many of the European semioticians, that although I think I am in agreement with much of what they are saying, I can't understand them well enough to make any solid connection. We inhabit different cultures.

MB: Usability engineering has a strong tendency towards simplifying scientific models. Aesthetics, experience, and emotions add a new layer that will make business even more complicated. How will those issues translate into practice?

DN: The usability community has no clout, not in academia—where it is often a lowly-ranked discipline—nor in psychology, cognitive science, or computer

science, nor in industry, where it is rare to find a group that has any real say in products. (Microsoft and Nokia, by the way, are good, positive examples of companies in which usability groups actually do have impact.)

Why is this? Elsewhere, I have argued that because the field is analytical, capable of finding fault, but not capable of actual design. We need to become designers, not just analyzers. But the second reason is that we tend to be usability bigots, believing that usability is the most important part of a product. Product developers know better, so they ignore us.

We need to branch out beyond making something usable into making it more desirable. To making the products and services pleasurable. Just changing usability has little or no impact upon sales, and sales (and profits) is what drives business. So we'll be a lot more successful as a discipline—and have a lot more fun, besides—if we focus on those aspects of a product that improve the total customer experience, that improve sales, and that do indeed make a practical, business difference. Usability does matter, but only as a part of the entire complex of functions, features, appearance, pleasure, image, and, of course, cost.

MH: Do you think HCI academia will address emotions and experience more often in their research? Or will industry take the lead in developing the field?

DN: The answer already is yes, academics are taking more interest. Look at this special issue of *interactions*! And as you know, I just served as action editor for the journal HCI for a very nice paper by you, Marc Hassenzahl, called "The interplay of beauty, goodness and usability in interactive products" [1]. I thought your paper—and the spirited reviews—important enough that the editor (Tom Moran) agreed to make this into a discussion, where the reviewers of the paper provided commentary, and you got the final word. Beauty, goodness, and usability: three different concepts! We have tended to think that usability is everything and that beauty is quite independent. Tractinsky [4, 5], in a nice series of papers, argued that beauty really did matter—that it impacted usability (and Tractinsky was one of the reviewers and discussants). I built upon that work in my book. You disagreed: You suggested that beauty is separate from usability, but that both beauty and usability affect goodness—and it is goodness that we should be caring about. (But see Lindgaard & Dudek, 2003.) I think adding "goodness" to the story is a very valuable contribution.

MH: Usability engineering was hard to sell to industry. Will they pay extra cash for the upcoming new techniques, such as "enjoyment testing" and the "pluralistic emotional walkthrough"?

DN: I have no doubt that industry will buy into this notion with great joy. ("At last!" they are likely to say. Of course, now the fights will come with marketing and advertising who believe they already own this discipline.)

For example, although at the time of this writing, my book has only been out four months, it has already resulted in my being contacted by people in broadcasting, automobile interior design, retail selling, banking, and other industries that before only paid trivial attention. I've even been working for a candy maker. Yes, this will be an easier sell. But only if we actually deliver!

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Emotions Can Be Quite Ephemeral. We Cannot *Design* Them

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The "new" HCI stresses the importance of emotions. However, this emphasis might be misleading or at least not as valuable as hoped. Let me explain why.

Emotions are important. They are an essential part of our lives. We cannot function without them. There is a long tradition of accentuating the difference between "cognition and emotion," "the mind and the heart," "reason and passion." In the same vein, reformers of HCI often stress that the "old" HCI is, in essence, cognitive (i.e., focused on memory, tasks etc.) and that the future lies in emotions. But contemporary psychology understands emotion and cognition as integral parts of each other. Most complex emotions require cognitive processes. Consider satisfaction: It is the consequence of comparing an event's outcome with one's expectations [3]. This comparison process necessarily involves cognition, such as comparing outcome and expectation. In this sense, emotions need cognition, and research on the role of emotions in decision-making demonstrates that cognition needs emotions, too. People, who understand "emotional design," as putting passion, desire, and seduction above reason are misled. The

challenge for "emotional design" is to explore the interplay of cognition and emotion, rather than dismissing cognition entirely.

Often emotional design is understood as an explicit attempt to induce emotions through a particular product, just as marketing claims that products must touch the hearts of the customer. The most fundamental product-related emotions are attraction emotions (e.g., love, hate, liking, disliking). They are momentary and largely dependent on context. Indeed Ortony et al. conclude that "liking can be a quite ephemeral experience" [3]. Can we really design such an "ephemeral" experience? Things loved for one reason in a particular situation, can be hated for the same reason in another. As Wright and McCarthy note in this issue of *interactions*, it is not possible to design an experience, only to design *for* an experience. Designers can shape, but they cannot determine. They can create possibilities but they cannot create certainties. The same holds true for emotional experiences. Promising that a certain set of design recommendations—if put into action—will always result in a particular set of emotions, may be promising more than can be delivered.

What to do? Designing for needs rather than emotions

Positive emotions are important and making them happen is the "new" HCI's primary objective. But emotions happen in context. They are volatile and ephemeral, and products alone cannot guarantee an emotion. So what to do? How can we make a wide range of positive emotions (joy, satisfaction, pride) more likely? What are "designable" promoters of those emotions?

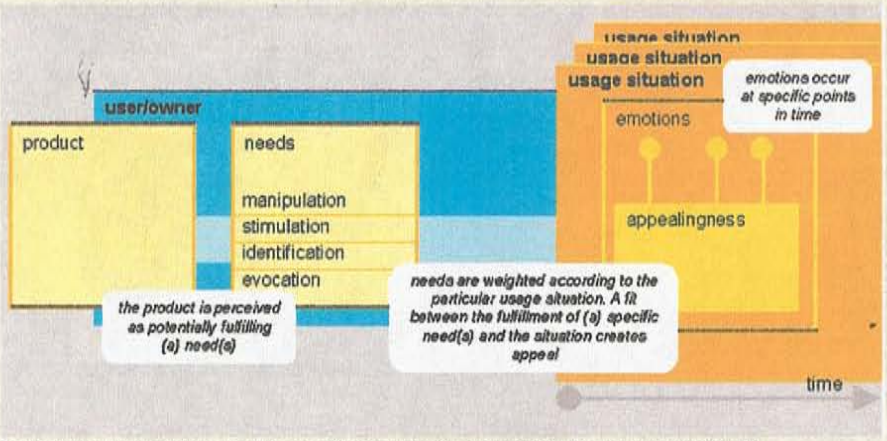
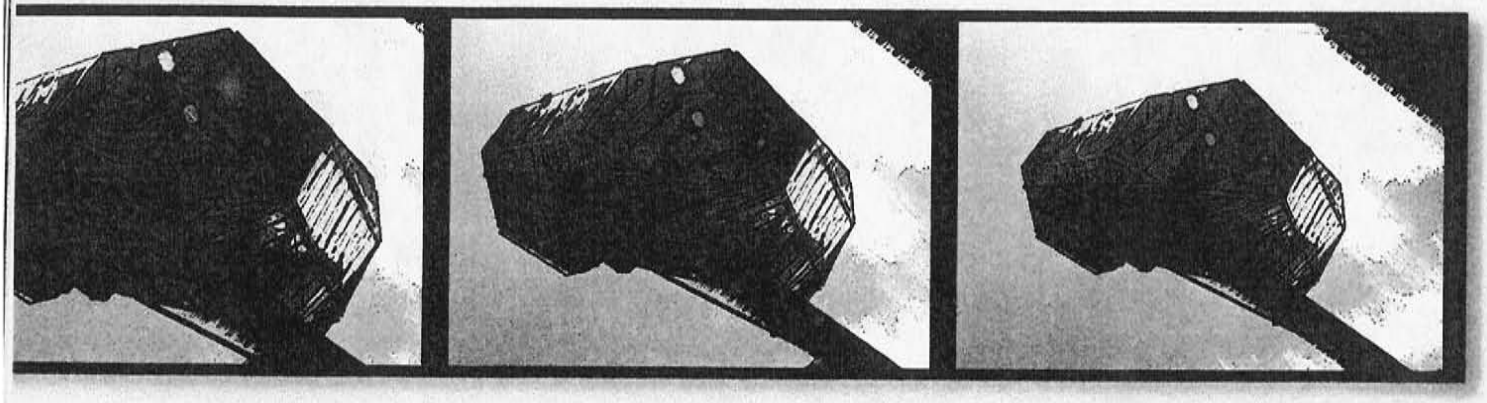


Figure 1: An abbreviated model of the relationship between product, user/owner, and situation [2]

My view is that people share a set of general needs, which may serve as a starting point, an anchor for design. I typically distinguish between needs for manipulation (goal-achievement), stimulation (personal growth, an increase of knowledge and skills), identification (self-expression, interaction with relevant others) and evocation (self-maintenance, memories). The definition of needs may vary from author to author [1], but, the message remains: situational fulfillment of needs promotes positive emotions. The more needs are embedded into a product, the wider the possible range of resulting emotions. A usable and useful product (i.e., high on perceived fulfillment of manipulation needs) may lead to satisfaction if a valued goal is achieved in a particular situation and at least a part of the success is attributed to the product. Pride may be the emotional result of using a presentable and classy product (i.e., high on identification) in a social situation. Joy (or "flow") may be the consequence of being excited and challenged by a product (i.e., high on stimulation) in a situation that allows for such a challenge. Whether fulfillment of a need is valued or not depends on the particular usage situation. A product designed for goal-achievement (manipulation), for example, may be appealing in a situation where important behavioral goals (e.g., getting text formatting right shortly before a deadline) are to be achieved. Identification, in turn, may become a source of appeal if the product is used in social situations (e.g. producing a stylish laptop on a train). Stimulation may become a source for appeal in situations where new solutions to problems must



be found. The different types of needs are stable, but their relevance and resulting emotions are fluid and fleeting. Figure 1 summarizes my view on the relationship between product, user/owner and situation.

Appeal, attraction, and emotions are inseparable from particular situations. Underlying needs are stable. A particular product can be perceived as usable, that is, good for manipulation, no matter what the situation. Nevertheless, whether usability is valued largely depends on the particularities of the situation. Potential fulfillment of needs promotes appeal and emotions. Accordingly, designers may focus on signaling fulfillment of needs rather than "designing for emotions."

To favor a more unified, integrative approach to human-computer relationships is a worthwhile endeavor. So far, this has been well received by the HCI community. But now, more theoretical, empirical, methodological and practical work is needed to transform the claim into working practice. Models like the one presented above and new approaches such as "inspiration engineering" are only just the beginning. I hope for much more.

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Designing for Fun: How Can We Design User Interfaces to Be More Fun?

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Designing for fun?

Fun-filled experiences are playful and liberating—they make you smile. They are a break from the ordinary and bring satisfying feelings of pleasure for body and mind.

Joyful sensations often come during physical activities such as entertainment, recreation, or sports—parties are fun, dancing is fun, skiing is fun. Fun is also tied to mental challenges such as solving problems, playing music, and discovering something new. In gentler forms it can also be about laughing at late-night comedy shows, listening to music performances, or watching movies. For me, fun is often social: attending parties, trading stories, or meeting compelling personalities.

All these examples could be called fun-in-doing. Another kind of fun is more tranquil and calm. It is about relaxing. It is not tied to action or goals, but to absence of action or goals. We all need some mixture of these two kinds of fun, but I'll focus on fun-in-doing rather than fun-in-not-doing.

These descriptions of fun-in-doing are meant to lay a foundation for readers to think about the ways in which technology can be designed to produce more fun for users. The topic of fun-in-doing goes back to early studies of games, such as the insight-filled work of Tom Malone on educational games [4]. He summarized the design heuristics for enjoyable interfaces with these criteria: challenge, curiosity, and fantasy (which he tied to emotion and metaphor). Malone described striving to attain goals in a context of uncertainty. This led him to see the importance of multi-layered interfaces that would allow users to choose the level of challenge.

Contemporary work on interfaces for children continues to emphasize these themes, even as applications have broadened from games to intrinsically motivating experiences. It is fun to browse NASA's pages for kids about space

exploration ("Games, activities, and a ton of fun for NASA kids!") and it is fun to find books in the International Children's Digital Library ("Explore the fun—read 324 books online"). Children are strong in their declaration that they expect to have fun using technology. Children often link the idea of fun to challenges, social interaction, and control over their world [2].

The topic of fun-in-doing and emotional reactions for adult users of interfaces has become hot. The interest stems from designers and researchers who are shifting their attention from desktop tools for serious professionals to new environments where discretionary users and non-professionals dominate. Lively topics include Web-based services such as shopping or banking, mobile devices such as cameras or cell phones, and consumer electronics such as music players or home entertainment centers.

For these new and highly competitive markets, I believe designers must address three almost equally important goals that contribute to fun-in-doing: (1) provide the right functions so that users can accomplish their goals, (2) offer usability plus reliability to prevent frustration from undermining the fun, and (3) engage users with fun-features.

How can we design interfaces to be more fun?

For the first goal, designers have only modest resources that discuss task-suitable functionality and processes to envision new user goals. While there are models of design spaces for input devices or menus, there are few higher level models of user goals that might guide designers to creating new services and applications. For example, what theory might guide designers to realize that digital cameras should come with cell phones so that users can send photos to friends and family members? What theory would suggest that peer-to-peer networking should be expanded to family photo sharing or corporate supply chain bidding?

Some insights come from promoters of the Contextual Inquiry method [1] and activity theory, who recognize the importance of generative theories that might help designers invent enjoyable services and fun-filled applications. The Activities and Relationship Table [8] tries to lay out the key human activities related to information technologies (collect, relate, create, donate) and a range of human relationships (working by yourself, families and friends, colleagues and neighbors, and citizens and markets). The relationships are organized by degree of shared knowledge, trust, and expectations of future encounters.

For the second set of goals (i.e., usability and reliability without frustration) designers have a stronger set of guidelines, principles, and theories. There are lengthy sets of guidelines with hundreds of do's and don'ts, as well as short lists such as the Eight Golden Rules (revised for the 4th Edition of *Designing the User Interface* [8]):

1. Strive for consistency.
2. Cater to universal usability.
3. Offer informative feedback.
4. Design dialogs to yield closure.
5. Prevent errors.
6. Permit easy reversal of actions.
7. Support internal locus of control.
8. Reduce short-term memory load.

These rules are far from complete and sometimes in conflict, but they have served as a useful starting point for design critiques. (Many other researchers have had fun building on these Eight Golden Rules and in criticizing them.)

For the third goal, designers are now beginning to develop theories of user engagement through fun-features: alluring metaphors, compelling content, attractive graphics, appealing animations, and satisfying sounds. When the functionality and usability have been accommodated in the design, it is time to add the extra touches and flourishes that delight and amuse users. These can be an appealing splash of color, an engaging animation, or a pleasing sound. A shimmering rainbow, a zooming movement, or a crescendo of trumpets can bring a smile to many users' faces. Getting these

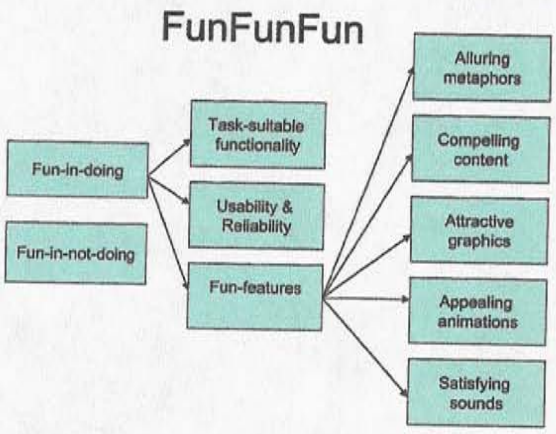

Figure 1: How can we design interfaces to be more fun? Plain Version.

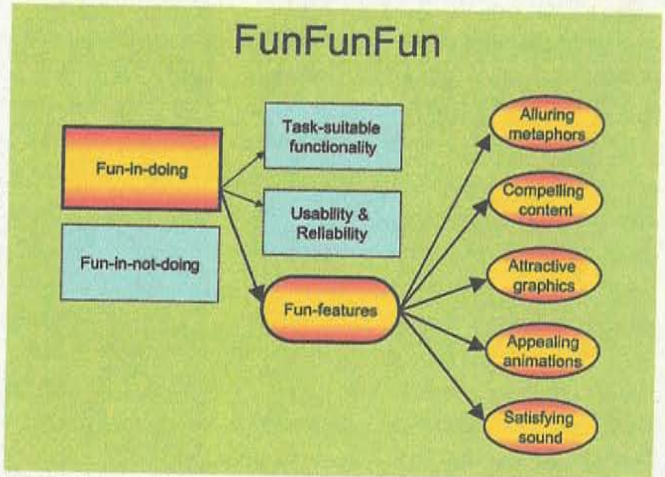

Figure 2: How can we design interfaces to be more fun? Fun Version.

right is difficult; too many designers go too far in using excessively bold colors, distracting animations, and annoying sounds.

Coming up with *alluring metaphors* is still an art for creative types, but we know that the desktop interface metaphor has been a success story for three decades. Other metaphors, such as shopping carts, painter's palettes, and notebooks have all helped make modern interfaces comprehensible and fun. Their direct manipulation style with drag-and-drop, click-to-select, or click-drag-release actions have become widely known and intuitive for users. When done well these techniques enable users to forget about the interface and concentrate on their tasks.

Compelling content such as first-rate writing, striking photos, and outstanding graphics are key elements in making interfaces more enjoyable to use. Of course, there are no automated metrics for writing quality (only readability), image impact, or graphic excellence. Quality has no metrics, but you know it when you see it. Satisfying every user is really tough, so success with some segment of the population is a reasonable goal.

Attractive graphics are important, but attempts to find predictive metrics of user preferences for aesthetic qualities are risky. This goal is once again in fashion: Useful guidelines are beginning to emerge from projects where user preference data is available for large numbers of Web pages [3]. We know that alignment and grouping is important for rapid performance [7] but do they also add to esthetic enjoyment? Balance and symmetry are classic notions for graphic design, but when do they also increase preference and improve performance [6]? Some color is helpful for highlighting and showing relationships, but when is the use of color seen as attractive?

Similarly, *appealing animations* enrich the possibilities for designers, but the research results are mixed. Animations are helpful in providing informative feedback about user actions, but they are an annoyance when they distract users from their tasks. They are often used to explain processes, such as crystal growth or algorithm execution, even though evidence that animations improve learning is shallow. Smooth transitions and zooming are enjoyable and helpful, preserving user comprehension, even though they slow users down. The direct manipulation principles of rapid, incremental, and reversible actions with immediate visibility of results, also increases satisfaction and performance. Animations that convey information such as the movement of files or progress in downloading are appreciated, but disruptive and distracting pop-up boxes and dancing icons are usually annoying.

Satisfying sounds are a vital addition for games, and helpful for alerting, such as a ringing phone. Sound design requires skill, but suitable sound effects give effective feedback and are well liked by users. However, users want control over the sound, especially the capacity to turn it off. The market in custom ring tones for cell phones is way beyond what can be justified by necessity—it must be fun to have your own ring tone.

Parting thoughts

User interfaces are taking their place in the world of fashion and style, which is great news. Just as dining out is more than getting a balanced diet and wearing clothes is more than staying warm, interfaces are becoming a personal statement. It's great that designers and researchers are turning attention to fun, as a separate design space, distinct from functionality, usability, and reliability. Did anyone notice that *fun* is part of *fun*ctionality?

Designers who accommodate differences among users by providing adequate user controls, will produce the most successful products. The controls will enable users to change color schemes, sound effects, and animation speed, or to dispense with these flourishes entirely. Productivity tool users have tasks to accomplish, so the fun aspects should not interfere with goal attainment.

Predictive models of fun-in-doing are an ambitious goal, but a useful step forward would be to develop prescriptive models of how to design more enjoyable graphical user interfaces for Web pages, desktops, and mobile devices. Designers need guidelines for graphical style issues such as symmetry, elegance, simplicity, and distinctiveness. They need principles for creating images with high impact and rules for dealing with familiarity, authoritativeness, and branding [5].

However, guidelines, models, and principles alone will never guarantee success. Designers have to develop their own style and then test, test, test, and test again. Excellence in design is a great facilitator of fun. Are you ready to have fun designing playful and liberating user interfaces?

ACKNOWLEDGEMENTS

Thanks to colleagues at Rochester Institute of Technology, University of Rochester, and University of Maryland for lively discussions of these issues. Thanks also to Ben Bederson, Allison Druin, Jennifer Preece, and the editors, for comments on draft versions.

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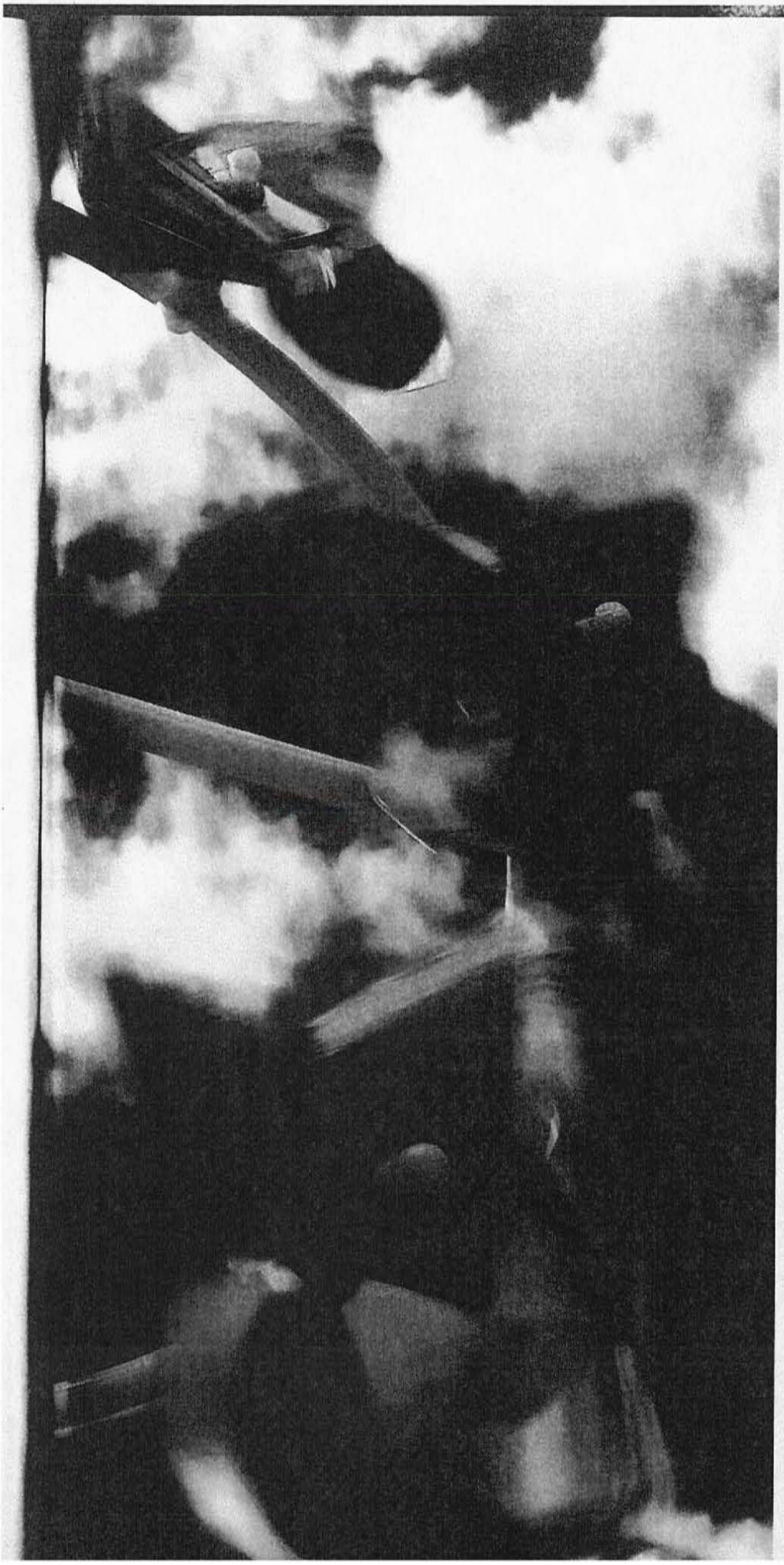

Pastiche Scenarios

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Maureen, are you tied up at the moment?

Not at all, Professor Dingbat, I was simply idling away a few minutes, putting Dr. Quintock's Cultural Studies slides online for the first years, sending out a reminder that no one has yet paid their ten pounds towards the examiner's dinner and trying to revive Professor Lapping's rubber plant.

Jolly good Maureen, you know about this "Net Neighbours" scheme don't you?

The one where you can do a bit of online shopping on behalf of an older person?

Yes, that's the one. I thought at first it wouldn't take very long but they've given me three to look after and some of them blather on for an absolute age. You wouldn't believe what I have to listen to, their neighbors' kids this and their bilious distress that. You've no idea how annoying it is—people blithering away about their problems while you're trying to get things done!

I think I can just about imagine it.

Well anyway, I've got this check through the post from one of my old dears—

"Old dears," Professor Dingbat? Dr. Quitntock's slides state very clearly that the term "old dears" is sexist, ageist, and offensive.

Ah, of course, where would we be without Dr. Quintock's unfailing guidance? Quite right Maureen, well one of my elderly ladies—

Dr Quintock's slides go on to note that the term "elderly" is also contested. Age is a social as well as a biological construct.

Well what am I supposed to call them? Chronologically challenged? Ha ha ha!

Professor Dingbat! That's just the kind of

reactionary humor that has made "politically correct" a term of abuse. Dr. Quintock says that "older people" is the phrase currently used by those of us who aren't quite so keen on being offensive.

Well it's a good thing that Dr. Quintock isn't here then isn't it? Now listen carefully, one of my coffin dodgers has sent me a check to cover the shopping I ordered for her. Make yourself useful and run along to the bank with it sometime this week will you, I haven't got time myself. Oh and here's a list of the ones who haven't paid yet, ring them up and remind them when you've got a spare moment or two.

(Pastiche Scenario from Taylor) [6]

The characterization of users in HCI scenarios has been severely criticized in recent years. Lene Nielsen has argued that they are very often little more than stereotypes, mere functionaries that illustrate the workings of the product being described [5]. Calling for more vivid characterization, she argues that it is not possible to predict the goals or actions of users without knowing anything about them. Alan Cooper has shown how the creation of personae can lead to design insight [2]. Djajadiningrat et al. found "extreme users" to be helpful in generating designs and Nielsen has argued that the techniques of film scriptwriting can enrich scenarios [3]. However, creating a vivid and non-stereotypical character each time a scenario becomes necessary in the design process is a bit of a tall order.

Pastiche allows the designer to very quickly evoke resonant contexts in which to place a new design or consider user needs. Pastiche is a form of writing that imitates and borrows from other works and styles. It appropriates characters, situations, and plot lines to place it in a new context. Pastiche scenarios then draw on existing narratives in order to create richer and more resonant descriptions of users and technologies. Because the cultural sources drawn upon are rich and resonant, possible interpretations of the scenarios are multiple. Character traits are not answered by product functionality because other authors have developed the characters with quite different aims in mind. This creates ambiguity which, as Gaver et al. note, can lead to new design challenges and insights [4].

Pastiche scenarios were initially developed in relation to the conceptual design of a piece of surveillance technology. This was a directly political subject which necessitated a detailed consideration of possible impacts on civil liberties and privacy. Pastiche scenarios, then, were made drawing on the Miss Marple detective stories (for an idealized utopian view of the crime prevention technology), a clockwork orange (for a dystopian view of how the technology might affect those it would be used against), and finally, and perhaps inevitably, Orwell's 1984. Although some of the characters in the resulting scenarios might be described as caricatures they were not stereotypes. The use of pastiche focused attention in a totally uncompromising way, on the very real dangers of the technology under consideration. These scenarios were concerned with conceptual design issues. However, the method also proved useful in the implementation stage of another project, the Net Neighbours scheme.

Net Neighbours is a scheme developed at the University of York with the local branch of the charity Age Concern. The scheme widens access to computer-based facilities like online shopping through volunteer telephone intermediaries. Plans are being made to extend the scheme so that university staff can do voluntary work from their offices by taking a little time to shop online on behalf of an older or disabled person. There are a number of possible methods for arranging the finances and at an early stage of the project a list of scenarios was prepared for discussion with Age Concern staff. Little discussion was generated perhaps because they were very dull to read. A number of pastiche scenarios were then prepared. The first was "A Christmas

Shopping Carol," which featured Scrooge as the older client reluctant to reimburse the volunteer and raised various issues, including trust and honesty on the part of both the volunteer and the client. The second was a set of scenarios based on Laurie Taylor's satirical newspaper column on the antics of academic staff at the fictional university of Poppleton. The scenario at the beginning of this article shows, through comic exaggeration, some of the difficulties university employees might encounter were they to take on too many clients and also some of the problems they would encounter if the accounts were not administered electronically. It also flags some of the issues around ageism that Age Concern is keen to address.

Although the scenario document was rather long the Age Concern representatives read them in their lunch break because they found them amusing. The rather dry subject of secure financial systems was enlivened by pastiche and a range of issues and design problems were raised around privacy, trust, honesty, complexity, reliability, and dependability which helped shape the final procedure.

There is an obvious objection to these kinds of scenarios: They do not address the typical user. This is an entirely valid criticism. The pastiche scenarios outlined above all addressed entirely atypical users in order to identify potential problems and abuses of the technological configurations described. Pastiche scenarios are not in any sense a scientific tool; rather they are resources to inspire or caution design. Similarly, the selection of the scenario has a profound influence (or bias) on the issues that are likely to be raised; selections must be based on the work the scenario is to do (as with the utopian or dystopian scenarios for the surveillance technology). One of the principle advantages of pastiche scenarios is that they are fun to make. They engage the designer and lead to fresh insight because the traits and quirks of the characters have nothing to do with the technology being imaginatively road tested. Pastiche scenarios are certainly not presented as an alternative to more traditional scenarios, rather they are suggested as a complementary and fun addition to the HCI toolkit.

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Cultural Probes and the Value of Uncertainty

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When reason is away, smiles will play.
— Paul Eluard and Benjamin Péret

Designing for pleasure demands a different approach from designing for utility. The latter can be done from outside a given situation, standing back to assess difficulties and seek solutions. The former, in contrast, is better done from within. To give pleasure to someone—to tell a funny joke, recount a moving story, dance a beautiful dance—it is best (or at least easiest) if you share with them some sense of humor, passion, and empathy.

Five years ago, Gaver, Dunne, and Pacenti published an article in *interactions* magazine, concerning "cultural Probes," a design-led approach to understanding users that stressed empathy and engagement [1]. Probes are collections of evocative tasks meant to elicit inspirational responses from people—not comprehensive information about them, but fragmentary clues about their lives and thoughts. We suggested the approach was valuable in inspiring design ideas for technologies that could enrich people's lives in new and pleasurable ways.

Since then, the approach has been adopted by several industrial and academic research and design groups around the world. This is heartening, of course, but also somewhat troubling. The problem is there has been a strong tendency to rationalize the Probes. People seem unsatisfied with the playful, subjective approach embodied by the original Probes, and so design theirs to ask specific questions and produce comprehensible results. They summarize the results, analyze them, even use them to produce requirements analyses.

Appropriating the Probes into a scientific process is often justified as "taking full advantage of the Probes' potential," as if, by not analyzing the results of our original Probes, we had let valuable information slip away. But this misses the point of the Probes. Sure, they suggested that research questions could be packaged as multiple, rich, and engaging tasks that people could engage with by choice and over time. Beyond this, however, the Probes embodied an approach to design that recognizes and embraces the notion that knowledge has limits. It's an approach that values uncertainty, play, exploration, and subjective interpretation

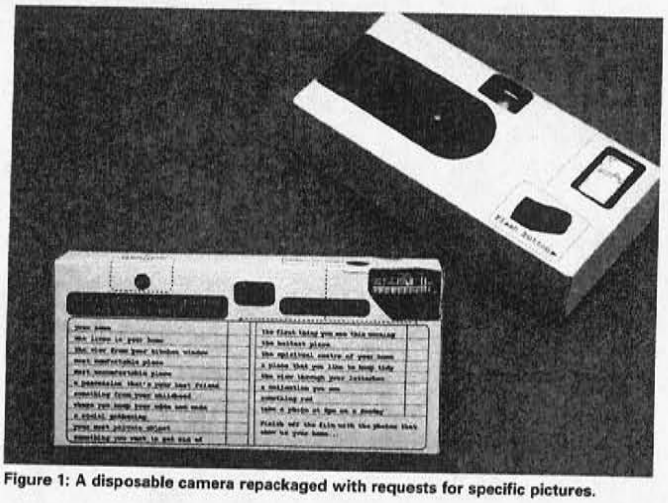

Figure 1: A disposable camera repackaged with requests for specific pictures.

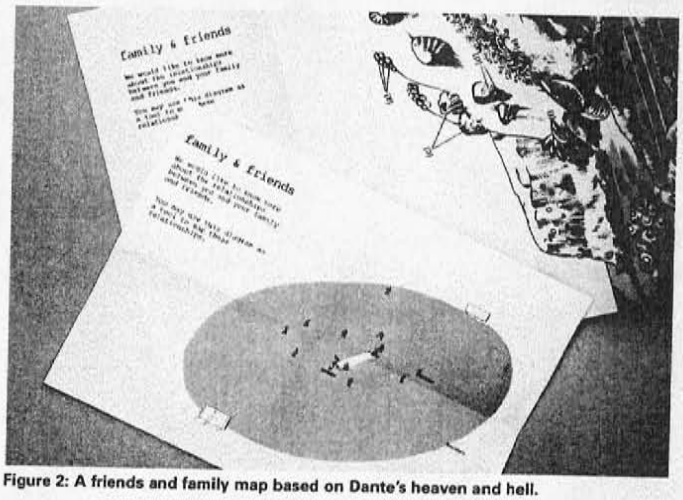

Figure 2: A friends and family map based on Dante's heaven and hell.

as ways of dealing with those limits.

> ***...it was through games, play, techniques of surprise and methodologies of the fantastic that [the Surrealists] subverted academic modes of enquiry, and undermined the complacent certainties of the reasonable and respectable.***
>
> *— Mel Gooding*

A recent example of our use of Probes provides an example of how we use this purposely uncontrolled and uncontrollable approach to help us understand design domains in new ways.

Over the last few years, we have been pursuing a project on new technologies for the home. At the outset, we realized that a great deal of research on domestic technologies reflects dubious stereotypes about how people live at home-that "home" equals "family," for instance, or that the activities of home revolve around consumption and recreation, domestic chores and paid employment. We decided to apply a Probes study to shake the preconceptions about home that seem to come with the domain.

For this study, we distributed domestic Probe packages to 20 volunteer households recruited through advertisements in popular London periodicals and signs posted on newsagents' windows. We made no attempt to control demographics, but our volunteers came from a wide range of circumstances: from ages 18 to 80, rich and poor, families, single people, and housemates; they represented a wide range of the home lives of people in today's society. Preliminary visits allowed us to introduce ourselves to the volunteers and give them Probe packages to complete over a month's time.

Confident from our success with the first Probes study, we designed more diverse and adventurous materials for this one. Space precludes a complete description here, but a few examples will give a feel for the approach we took.

As with many Probe or probe-inspired studies, we included a *disposable camera* with our packages, repackaged and labelled with requests for particular pictures (Figure 1). Many of ours were extremely open-ended or even absurd: "something you'd like to get rid of," "the spiritual centre of your home," and "something red." On the one hand, we found it interesting to see how people dealt with these problematic requests. On the other, accidental glimpses of the home's atmosphere were as informative to us as more purposeful presentations made by the volunteers. If nothing else, the requests provided a structuring technique that encouraged people to take pictures of their homes that they might not normally do.

We also included a *friends and family map*, adapted from a technique suggested by ethnographers in the project (Figure 2). Typically this requires that people come up with their own ways of diagramming their relationships, but we subverted the method by providing images (a cricket pitch; trees on a mountain slope; Dante's heaven and hell). This had the effect of encouraging volunteers to see their relations in new ways. Moreover, the visual frameworks we chose can be seen as somewhat sardonic comments on researchers' tendency to apply their own conceptual frameworks to the phenomena they observe.

One of our favourite items was the *Dream Recorder*, a cheap digital memo-taker that we repackaged with instructions to use upon awakening from a vivid dream (Figure 3). Pulling the tab that activated the device lit a LED indicating that there was 10 seconds to describe a dream to us. After that, the device simply shut down; volunteers had no chance to edit or even review what they had said, but could only choose to return the device. We weren't sure what to expect from this, but thought it might give us unexpected new insights into their lives. In fact, it gave us much more: The dreams we received were remarkably powerful and sometimes poignant, seeming to summarize people's lives and personalities in a few evocative words.

> ***"In my dream, the moon's reflection in a stream turned into my girl-***

friend's face. As I leaned forward to kiss her lips, I fell into the water and it was dark, green and very cold."

— S's dream.

None of these tasks (or any of the others we used) produced returns that were easy to interpret, much less analyze. How could you compare two photographs, even if you knew both were meant to show "the spiritual centre of the home?" It would be difficult to know for certain what the photographer had meant to highlight, and impossible to know its exact significance. Similarly, it is tricky to analyze friends' and family maps, knowing that they've been shaped and constrained by an arbitrary visual metaphor. How can you extract user requirements from dreams?

Our Probe results are impossible to analyze or even interpret clearly because they reflect too many layers of influence and constraint (see Figure 4). Of course, any user-testing involves a cycle of expression and interpretation. Researchers express their interest through questionnaires, experimental tasks, or the focus of their ethnographic observations; volunteers interpret researchers' motivations and interests and express themselves in response; and researchers interpret the results. But whereas most research techniques seek to minimize or disguise the subjectivity of this process through controlled procedures or the appearance of impersonality, the Probes purposely seek to embrace it.

When we finally receive the results it is clear that they are incomplete, unclear, and biased. We do not ask volunteers to explain their responses. Instead, we value the mysterious and elusive qualities of the uncommented returns themselves. Far from revealing an "objective" view on the situation, the Probes dramatize the difficulties of communicating with strangers.

'Tell me about yourself,' says a stranger at a party. You can recite your résumé, but what you really want to express, and what the stranger (assuming her interest is genuine) really wants to know, is what it is like to be you. You wish (assuming that your interest is genuine) that you could just open your mind and let her look in.

— Louis Menand

What is the point of deliberately confusing our volunteers and ourselves? Most fundamentally, it is to prevent ourselves from believing that we can look into their heads. By producing returns that reverberate with mutual influence, it is impossible to arrive at comfortable conclusions about our volunteers' lives or to stand back and regard them dispassionately. Instead, we are forced into a situation that calls for our own subjective interpretations. We have to see our volunteers in terms of our own experiences, understanding their responses empathetically, not intellectually.

Rather than producing lists of facts about our volunteers, the Probes encourage us to tell stories about them, much as we tell stories about the people we know in daily life. At first, these stories can reflect dismissive stereotypes ("she's a dumb media wannabe"). But stories are provisional. Our interpretations are constantly challenged: by the returns themselves, by the differing interpretations of colleagues, by our own changing perceptions. Over time, the stories that emerge from the Probes are rich and multilayered, integrating routines with aspirations, appearances with deeper truths. They give us a feel for people, mingling observable facts with emotional reactions.

The Probes simultaneously make the strange familiar and the familiar strange, creating a kind of intimate distance that can be a fruitful standpoint for new design ideas. They produce a dialectic between the volunteers and ourselves: On the one hand, the returns are inescapably the products of people different from us, constantly confronting us with other physical, conceptual, and emotional realities. On the other hand,

Figure 3: The *Dream Recorder*, a cheap digital memo-taker

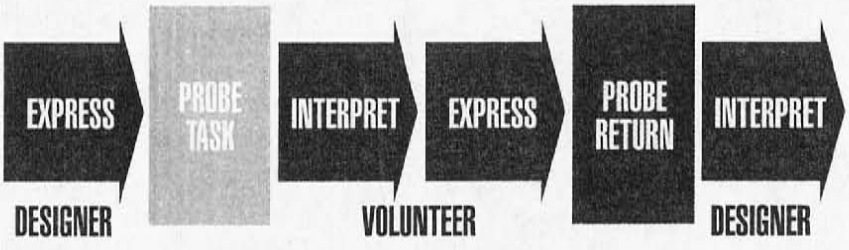

Figure 4: Probe results are the result of a multi-layered process of expression and interpretation.

the returns are layered with influence, ambiguity and indirection, demanding that we see the volunteers through ourselves to make any sense. This tension creates exactly the situation we believe is valuable for design, providing new perspectives that can constrain and open design ideas, while explicitly maintaining room for our own interests, understandings, and preferences.

Sometimes the trajectory from Probes to designs is relatively straightforward, and design ideas can clearly be traced back to Probe returns. For instance, a picture of Harry, one of the domestic Probe respondents, staring into his aquarium, was juxtaposed with a picture of a lonely straight-backed chair, the most uncomfortable place in his home. These led to a proposal that the chair might be turned into the command center for a telerobotic device that would give Harry a first-person view from inside the fish tank. In such cases, new proposals seem to emerge from the stories we tell about our volunteers as props are suggested by the stories of films or screenplays.

Most of the time the relationships between Probes and proposals are more complex and difficult to trace. Our design ideas are formed from a combination of conceptual interests, technological possibilities, imaginary scenarios and ideas for how to implement them. The Probes are one influence in all this. They create relationships with our volunteers that are a little like designing for friends: We know them well, but that doesn't mean we know exactly what we should make for them. Nonetheless, their familiarity serves as a reminder of the actualities for which we are designing, and allows us to imagine our proposed systems in real homes.

It would be a mistake to think that Probes make design easy, however. We freely admit that the responses they elicit are not necessarily accurate or comprehensive, and that they seldom give clear guidance to the design process. Nonetheless, the Probes have been an invaluable part of our design process, and without them we would not have produced the designs we have. Even if our designs are not dictated by Probe returns, referring to the returns often helps us explain the issues our designs address and the experiences they encourage. Moreover, after having produced prototype systems, the Probe returns have allowed us to predict with confidence which system our volunteers might prefer, just as we might predict which item in a shop our friends might like. The Probes give us a deep sense of familiarity and engagement with the people who might use our designs, and this nourishes our design process at every stage.

> ***"In searching out the truth, be ready for the unexpected, for it is difficult to find and puzzling when you find it."***
>
> ***— Heraclitus***

We began this article by saying that we worried about the tendency for researchers to appropriate the Probes into a "scientific" approach. This worry reflects some particular concerns about how the desire for control can dilute the particular appeal of the Probes:

- Asking unambiguous questions tends to give you what you already know, at least to the extent of reifying the ontology behind the questions. Posing open or absurd tasks, in contrast, ensures that the results will be surprising.
- Summarizing returns tends to produce an "average" picture that may not reflect any individual well, and that filters out the unusual items that can be most inspiring.
- Analyses are often used as mediating representations for raw data; they blunt the contact that designers can have with users through Probe returns.
- Seeking for justifiable accounts of Probe returns constrains the imaginative engagement and story-telling which can be most useful for design.

Beyond these specific concerns, however, it should be clear that the Probes embody an approach to design that go beyond the technique alone. The potential benefits and lessons from this approach are in danger of being lost if Probes are used in a purely "scientific" fashion.

Our colleagues John Bowers and Tom Rodden have suggested an analogy between the Probes and the use of ethnographic studies in HCI. Ethnography was introduced to HCI and CSCW largely by sociologists pursuing ethno-methodological studies of technology use, an approach that encourages the articulation of group behavior in terms used by its own members to account for their activities. The techniques of ethnography and ethno-methodology were intimately linked. Over time, however, ethnographic techniques have been reclaimed in HCI and CSCW to service approaches other than ethno-methodology. This is of some concern to ethno-methodologists because the varying uses of ethnography as a technique can distract from, or muddle, appreciation of ethno-methodology as an approach.

We like this analogy. If Probes are collections of materials posing tasks to which people respond over time, then "probology" is an approach that uses Probes to encourage subjective engagement, empathetic interpretation, and a pervasive sense of uncertainty as positive values for design. We accept that Probes, the technique, may be appropriated for a variety of different ends. We hope, however, that other researchers and designers will embrace "probology" as well as Probes in pursuing design for everyday pleasure.

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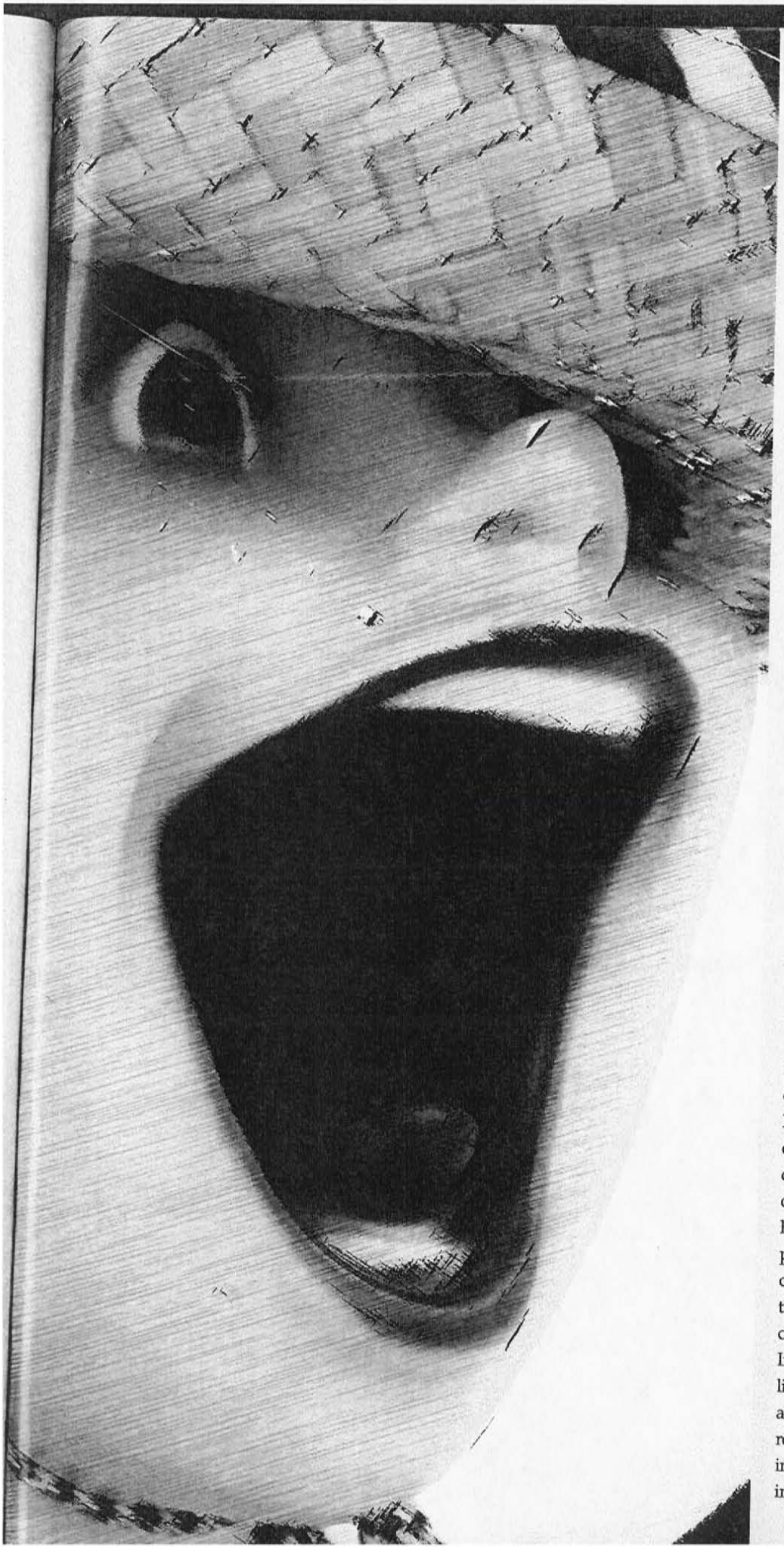

LOL: Humor Online

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I am often asked whether or not it is dangerous to try to be funny online. Are you more likely to be misinterpreted if you crack a joke or use a witticism in email, instant messaging, or on a newsgroup or blog, than if you attempted humor face-to-face? A survey of guides on netiquette would suggest that, indeed, being humorous online could be a risky business for a number of reasons [2].

First, and most obviously, because the vast majority of online communication continues to be text-based, we have fewer cues available to signal our humorous intent when online. Second, humor communicated face-to-face tends to be tightly coordinated between the speaker and the listener. The would-be online humorist, however, doesn't always get timely feedback as to whether their recipient "got" the intended humor. This is especially the case in asynchronous forms of communication, such as email and newsgroups.

But as anyone that has actually engaged in online communication knows, our online conversations are often rife with humor, jocularity, irony, wordplay, puns, etc. For example, when we asked people in our studies how often they used humor online, over 85 percent said they used humor frequently. Although there is surprisingly little empirical research concerned with humor online, what research there is suggests that humor is indeed quite common in email, synchronous messaging, Internet chat, newsgroups, and mailing lists. In fact, in one study participants interacting in an instant messaging type environment produced about five times more ironic humor (e.g., sarcasm) than people interacting face-to-face, despite talking

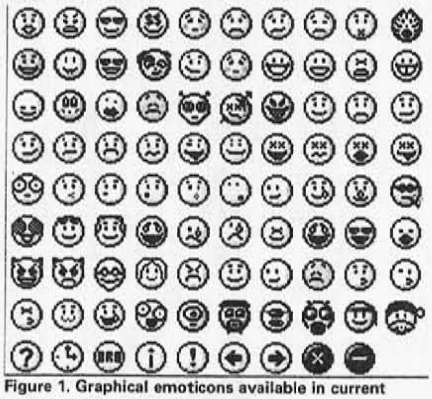

Figure 1. Graphical emoticons available in current instant messaging systems

about the same topics [1]. If the risk associated with using humor is so great, *why* do people produce it so frequently online, *how* do they go about doing it and what principles should we follow when designing interfaces to help support humor online?

Humor can serve a variety of functions that may be especially important in mediated interactions. For example, it may represent an important means for conveying relational information in text-based settings. Humor can also function to enhance bonds between individuals by highlighting a shared sense of humor or common ground, which may be especially important when other methods of demonstrating bonds or ties, such as shared fashions styles, are inhibited in text-based interactions. It seems that when we do not have the usual trappings of face-to-face interactions to convey interpersonal information, humor may be used to compensate.

But how do participants express and understand humor online? Humans are remarkably adaptive communicators and have developed a number of conventions to overcome the deficit of nonverbal cues available in online communication spaces. Perhaps the best known convention is the emoticon, which originally involved using punctuation to represent facial expressions (e.g., ;)), but more recently, communication software allows users to select from a bewilderingly wide range of graphic representations (see Figure 1). Users can attach an emoticon to a message to signal its humorous intent, although research suggests that the actual pragmatic effect of emoticons appears to be quite weak [3]. A second convention is the playful use of punctuation, such as ellipsis (...) or multiple exclamation or questions marks, to highlight that a message may be ambiguous or humorous [1]. In a sense, punctuation can be considered the prosody of online communication. Indeed, our research tends to suggest that humor, perhaps because of its subtlety, is more frequently tagged with playful punctuation than with emoticons. Finally, the specialized nomenclature of online discussion that consists primarily of abbreviations (e.g., "lol" for "laugh out loud" or "j/k" for "just kidding") is an important convention for expressing humor, and perhaps even more importantly, for responding to it. As can be seen in Figure 2, many of these abbreviations function as backchannel responses, which come so easily in face-to-face interactions (e.g., smiling or chuckling in response to a pun) and provide relatively lightweight evidence to the speaker that the addressee has detected the humor.

How might these observations inform design? First, it is clear that the cues that have been developed so far for expressing humor online are quite rudimentary—surely we can do better than emoticons? For example, given that nonverbal signals (e.g., facial expressions or laughter) are not generally part of humorous messages per se but instead tend to *frame* them, then perhaps designers should look to aspects of the interface that frame online communications, such as the border of an instant messaging window, to provide signals for humor. Second, designing more effortless backchannel methods for providing feedback about the comprehension of humor may be particularly important. Allowing the addressee to more easily signal appreciation of the humorous intent of a message should reduce miscommunications and those occasionally worrisome moments when we wonder whether or not our humor was understood.

Even without these kinds of design advances, however, we seem to be surprisingly good at being humorous online. So if users ever ask you whether it is safe to use humor on the net, just tell them to go online and be funny—everyone else is.

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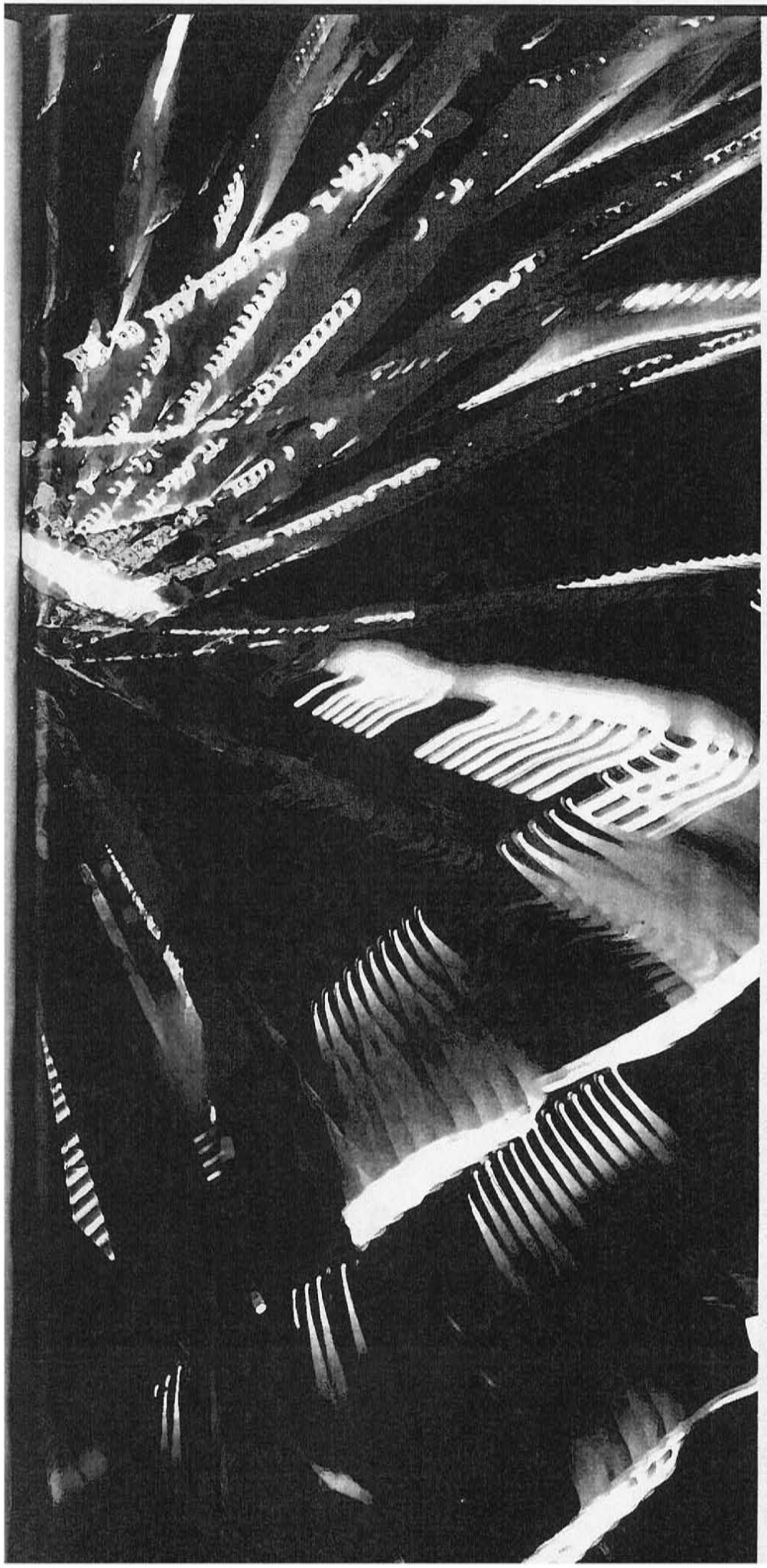
ABBREVIATION	DEFINITION	ABBREVIATION	DEFINITION
BG	big grin	LMSO	laughing my socks off
BWL	bursting with laughter	LOL	laugh out loud
EG	evil grin	LSHMBH	laughing so hard my belly hurts
FOMCL	falling off my chair laughing	LTM	laugh to myself
G	grin	ROTFL	rolling on the floor laughing
GD&R	grinning, ducking and running	SETE	smiling ear to ear
GOL	giggling out loud	SOL	smiling out loud
J/K	just kidding	SWL	screaming with laughter
LHO	laughing head off	VBG	very big grin

Figure 2. Online abbreviations related to humor



Freedom of Fun, Freedom of Interaction

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The modernist tradition still drives our society and our scientific endeavors. Modernity stood for technology push, progress through industry, linearity, money, the abstract, and the logical. But it has resulted in a feeling of uneasiness, even coldness. That is why, we think, there is now such a drive to get human and societal values back in the equation: Think of human-centered engineering, the experience economy, funology, and the like. In this article we give an example of the direction interaction-design research might take. We describe an approach that exploits all human skills, including perceptual-motor and emotional skills. We then reflect on the question of why industry has been slow to adopt this approach.

What can design research do to contribute to an engaging experience?

We begin with the understanding that to incorporate fun, beauty, engagement,

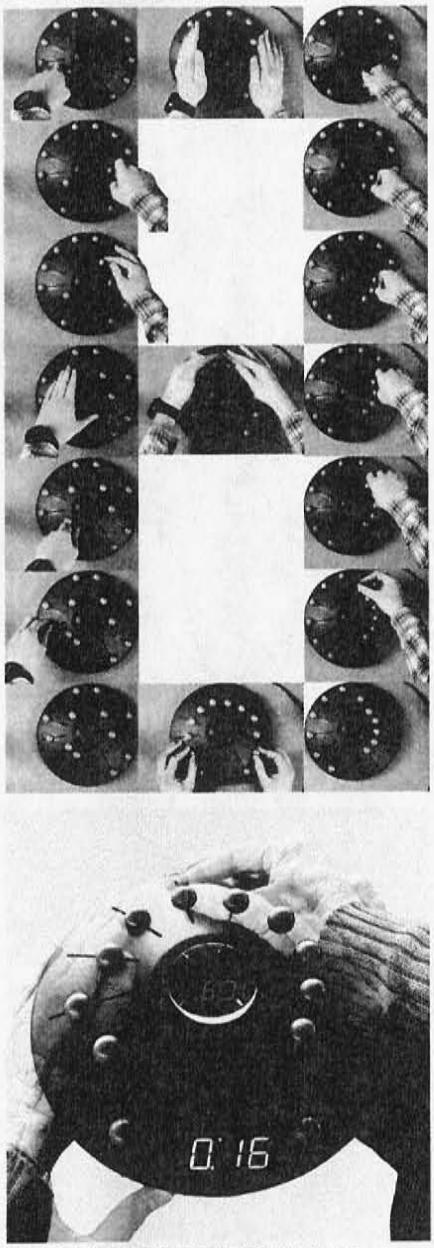

Figure 1 : The top sequence (top to bottom) is an expression of irritation through swift actions resulting in an asymmetrical and chaotic pattern. The bottom sequence is done in a relaxed state with symmetrical actions.

and emotions in person-product interaction, we have to respect all human skills. In HCI-research the primary focus has been on interaction that relies on the cognitive skills of the user. Today, we are seeing new approaches to interaction that focus on the perceptual motor skills, i.e., tangible interaction [1], and those that focus on the emotional skills, i.e., affective interaction [2]. We propose a marriage of these two approaches, i.e., a *tangible* approach to affective interaction. In this approach we take the interaction with the product as the starting point for the detection of emotion. While physical interaction with the product is needed to communicate "factual" information, it is emotional interaction that connects the person to the product.

Expressing Emotions

The way one interacts with the world is colored by mood or emotional state. For successful human-human communication the expression of emotion is essential. In human-product communication people also express emotion (often negative); for instance, they may shove a chair, bang a printer, or slam a door. While this behavior might offer some relief, it does not enhance communication or the experience. On the contrary, if we forcefully express our negative emotions we can break the product and diminish the beauty of interaction. Is it possible to design products that can invite, recognize, and adapt to emotions?

Expressing emotions to an interactive product presupposes freedom of expression and thus freedom of interaction. This freedom of interaction is based on the exploitation of a range of perceptual motor skills by offering the user myriad ways to reach the product's functionality. The designed action possibilities should therefore allow for diversification. This diversification can be realized through variations on the following aspects taken from the physical world, e.g., time, location, direction, dynamics, modality, and expression of the action [4].

In our alarm clock prototype, freedom of interaction is realized by offering myriad ways to set the wake-up time, instead of a fixed sequential procedure. Figure 1 offers a sampling of the many ways to set the alarm clock to 6:00.

In a user test with the alarm clock we demonstrated that the freedom of interaction allowed for freedom of expression from which the person's mood and a level of urgency could be recognized. We found positive correlations between the mood of the users and their creation of beauty of interaction, as measured via the aesthetics of symmetrical and balanced actions [3]. Urgency was expressed in actions that resulted in smooth, yet unbalanced slider patterns. Over time the alarm clock can adapt to this information to engage in an emotionally valuable relationship with the user.

Traces of Action

An important part of expressing oneself is seeing the effects emotionally expressive actions generate in your environment. It allows you to value and appreciate what you have done. This means that there should be more to freedom of interaction than unlimited freedom of action. While unbounded action possibilities might allow for freedom of expression, the experience becomes even more engaging if the result reflects the expressive action, in the way a snowboarder looks back to the slope to appreciate the beauty of the trace left behind. The experience of the descent is not only about getting to the bottom of the mountain, but how one gets there. The trace in the snow is a reflection of this experience and becomes part of the experience. Likewise, setting the alarm is not only about the fact that it will be set to 6:30; it is also about how you set it to 6:30. It's about how the setting expresses your mood and a sense of urgency. Therefore the alarm clock not only informs you about the alarm time, it also reflects the emotional expression of the action. The slider pattern of the alarm clock is an inherent and tangible trace reflecting the expression of the actions that modulated the slider pattern. When the inherent trace in the slider pattern is coupled to the functional feedback, i.e., the alarm sound, it offers information about the current state of the product, i.e. its functional mode. Because both the slider pat-

tern and the alarm sound allow for so many variations there is ambiguity in what the exact relation between the two is. This ambiguity can invoke curiosity and stimulate exploration, keeping the interaction engaging and fun.

Why Industry Doesn't Pick Up

In modernity we are driven by the premise that time costs money, the assumption being that money is the measure of all things—especially a thing's value. But economic value, technological value, cultural value, and therefore human value are not only measured in terms of money or financial capital—perhaps they should never be measured in such terms. The values of modernity also stress that faster is better—the assumption being that speed equals efficiency, time-savings, and therefore, money. In fact, these attributes are favored in humans as well as machines: acceleration, efficiency, order, linearity, simplicity, binary logic, and "machine" like operation, even to the extent that people should reflect these qualities in their behavior and (reflective) relationships with others at all times.

Each one of the "higher" or "emotional" or "humane" qualities which we endeavor to design into our products, flies in the face of modern ideals. The paradox, exemplified by the knowledge that we instinctively want more of these "qualities of life" and yet cannot scientifically prove that they have economic value, is what stops many companies from positioning themselves in this context today. Such qualities are simply measured as too expensive, too complex, too inefficient, too time consuming, and not well organized—even to chaotic.

Most of the world's "corporate" manufacturers and technology development institutions are still evolving in the value environment, driven by the metrics of economic, rather than human value. Despite the fact that this is especially true in the areas of "high" or "intelligent" technology there are glimpses of significant progress in other contexts.

The objects and systems, which have hitherto made us think, remember, imagine the future, feel or simply be, rather than efficiently "do," have been considered mechanically or technologically simplistic, even though on closer inspection, they are seen to be as complex as we can imagine. Things such as clothes, paint brushes, pencils, time pieces, musical instruments, cooking utensils, craft tools, and pieces of furniture have all regained appreciation as sources of enjoyment, objects of expression and creativity. They have enabled us to grow and participate in our personal, local, and global culture.

In the worlds of embedded computational complexity and the everyday tool we simply haven't reached the point yet where the objects are rewarding enough to use, cheap enough to make, and ubiquitous enough in our everyday cultures for them to take on the mantle of cultural carrier, commentator, or in time even protagonist. Perhaps this is because these technologies have not yet moved fully from the state of scientific instrument to fetish object to the embedded every day.

When this happens and the metrics of "value" are fully human-centered we will be free of the modernist restraints, and the tools of "happiness" will be democratized.

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It Felt Like Clown Sparkles

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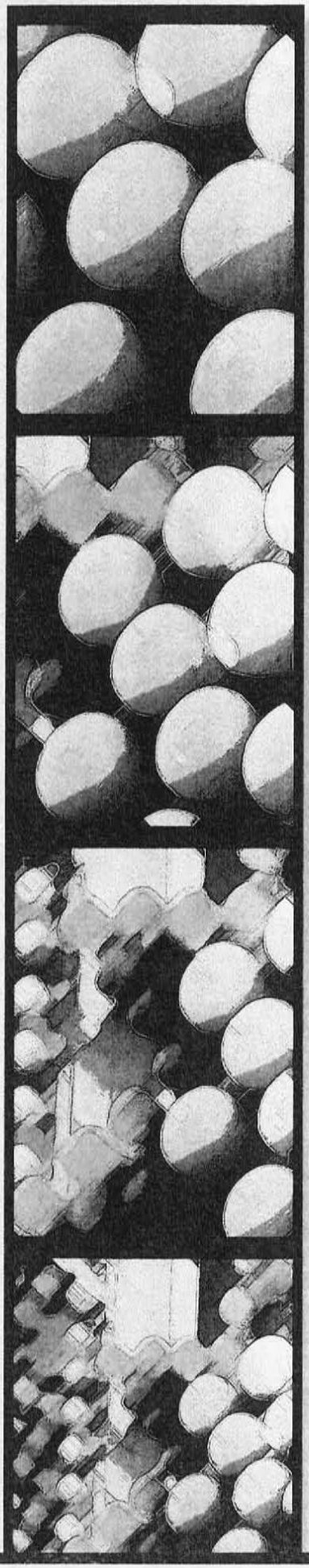
A small group of children are playing in a theatre space. One of them, a four year old boy is carefully investigating a man's hat. The hat is making a singing sound that changes pitch when it is moved. He plays on his own for a long time turning the hat slowly or shaking it and listening to the different qualities of the sound. Then he gives the hat to another child and goes back to where he left his shoes and jacket when he first arrived. There he picks up first one shoe, and then the other. He turns them over and shakes them a bit—but they just don't make a noise like the hat.

The hat is part of a set of dress-up clothes made for a project called ensemble. The other garments are a dress, an umbrella, a bag, a pair of suspenders and

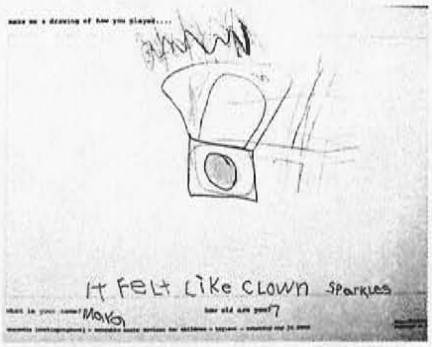


two suit jackets. Each piece of clothing hides a sensor of a different type. The dress has an accelerometer at the hem. The hat houses two tilt switches reacting to any change in position from the horizontal plane. The suspenders hold two linear expansion sensors on each shoulder which are activated by pulling. The umbrella has a pressure sensor at its tip. The handbag has two small light sensors reacting to the light-levels inside the bag. The suit jackets share a sonar that measures the distance between their sleeves. All the sensors are modifying sound in real time.

Ensemble is a speculative project created to investigate how analogue sensors in tangible interfaces are perceived and understood through the emerging intuitions of children. For this purpose we created a workshop environment where the sensors/garments were made available to children and we observed how they played with them. The workshops focused on pre-school children because their understanding of the world is still being developed and they accept and learn new causalities quickly. The observations described here are from an initial set of workshops.

The framework is dressing up, and having fun is the main driver for the experience. Children know everything about dressing up, so they are already experts when they arrive. Paper and pens are available in the room and the children alternate between drawing and playing. This is a way to collect feedback but also to create some relative silence in which some children can experiment with a particular garment and sound while others draw. By using familiar objects and activities like dressing up and making drawings the children enter into the experience with a confidence that supports them when the objects respond in unexpected ways. They investigate the garments through informal social play and appear to remain in control as they modify and develop their intuitions about "how the things work." After a while the garments/sensors are redefined as sound controllers and the workshop becomes an exploration of their affordances and capabilities rather than the original game of dressing up.

By using the drawings as feedback the children get a chance to contemplate how they think the garments work. After the workshop they have the opportunity to explain the drawings to the adults if they feel like it. Children draw to make sense of the world and when drawing they have the opportunity to develop the intuitions they have about the experience. As the experience moves forward from discovering the sounds and testing the boundaries of their control, the drawings are often explorations of this control and the role of the garment as the controlling object.



The drawing above shows a picture of the bag. The girl who made it is seven and, as she explains afterwards, the bag works in the following way: Stuff (the crisscrossed lines) comes into the bag and then clown sparkles (the wavy lines) come out. On the drawing she has added in writing: "It felt like clown sparkles." All the sound from the garments came from two speakers mounted in the ceil-

ing and the children were very aware of this. In the drawing however the bag remains the locus of the interaction and thus the bag must be where the sparkling sound is coming from. The two sources of the sound do not seem mutually exclusive; they simply coexist. The sound comes from both the bag and the speakers in the ceiling.

The bag is fitted with two light sensors. Through playing, the children have developed new interaction models and high levels of control. The bag was designed to be played by opening and closing it, but the children played it in two unexpected ways: Turning the open bag towards the light caused the sound to crescendo towards a high pitch or making shadows with your fingers over the open bag. The distance between hand and bag determines the density of the shadow and thus the quality of the "notes" being produced. In this way it is possible to "pick a specific note out of the air" with surprising precision.

By playing on the threshold between the ordinary and the unexpected, we find ourselves in a "make-believe" situation where we can explore and investigate the impact of prototypes and generate new insights in the design process. As the children's experience of the workshop spontaneously evolves from autonomous play through unexpected discoveries, to serious testing of interface and control, we can find inspiration and ideas in touchable interfaces that informs our use of analogue objects. Through their intuition and enthusiasm we are given the opportunity to rethink our instruments and hopefully create more intuitive and insightful sensor interfaces to sound. On the basis of our experience in these workshops we have decided to not only play with the children in an investigative role in workshops, but move one step further in the next stage and involve them as our co-developers within new playful frameworks.

Taking Fun Seriously

By Alan Dix
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Have you watched a child at play? Small hands carefully pile blocks one upon another, tongue tip protruding between clenched teeth, lost totally, concentrating. Children know how to take play seriously.

Often people feel that play, fun, and aesthetic experience should not be analyzed too deeply; by dissecting them, subjecting them to formal reasoning, even just talking about them, they are somehow diminished. There can be a playfulness and a pleasure in understanding the patternings of experience, but for most this is different from being in the "flow" of that experience.

Many feel a sense that trying to uncover the "whys" and "hows" of human experience will (like some sort of Heisenberg observer effect) dissolve those experiences in the watching.

In contrast, the producers of artworks often feel less constrained. Some compose or construct in the heat of focused passion, but most craft and recraft their ideas and inspirations. The poet Stephen Spender, in his essay "the making of a poem" reflects on this long, often tortuous process and quotes Paul Valéry "une ligne donnée" (the poet is given one line from God, the rest is human graft (Spender 1946).

Some years ago, I was one of the directors of aQtive, a dotcom Internet company. It was approaching Christmas and we wanted to send something seasonal to our registered users and commercial contacts. Electronic greetings cards seemed both passé and boring; everybody does those...and they hardly reflecting the spirit of "aQtive"(pronounced "active"!).

Somehow the idea came...why not electronic Christmas crackers? Une ligne donnée!

Now for those readers without some British connection I will probably need to explain the Christmas cracker. It is party time! Around the Christmas dinner table at each place is a "cracker"(a brightly colored paper and cardboard tube with the ends pinched so that the contents do not fall out. As the food arrives you take your cracker and offer it to someone else. You each take an end and pull. The paper breaks and a small strip of gunpowder-coated card makes a loud bang as the cracker tears apart and

	REAL CRACKER	VIRTUAL CRACKER
Surface elements		
Design	cheap and cheerful	simple page/graphics
Play	plastic toy and joke	Web toy and joke
dressing up	paper hat	mask to cut out
Experienced effects		
shared	offered to another	sent by email message
co-experience	pulled together	sender can't see content until opened by recipient
excitement	cultural connotations	Recruited expectation
hiddenness	contents inside	first page—no contents
suspense	pulling cracker	slow...page change
surprise	bang (when it works)	WAV file (when it works)

Table 1. Elements of the cracker experience.

its contents spill out onto the table: usually a paper hat, a small plastic toy, and a piece of paper with a (very bad) joke.

Now we could have simply produced a Web page with a picture of a cracker, a joke, etc. However, an attempt to produce a facsimile of a cracker on the Web would clearly be disappointing. It would fail to capture the essence of the experience and so not just be "flat," but in failing to live up to expectations be less exciting than a simple electronic card.

In order to create a fun experience, we needed to analyze the design seriously.

The first step is to understand the facets of the experience of cracker pulling. This is a deeply analytic process that teases out the different aspects of the experience (but note, this is not a reductionist step). Here we are seeking to understand the experience. Again, this is just like a poet who may examine meter, use of rhyme, sound patterns of consonants and vowels, image use, connotations of words or even consult a thesaurus. However, there is no suggestion that the poem is reduced to these facets, more that they contribute to the aesthetic effect.

Having understood these facets of crackers, we are then in a position to attempt to recreate them in a new medium, in this case the Web. Table 1 shows a summary of the way in which different aspects of the real cracker experience are mapped onto the Web version of virtual crackers. This deconstruction-reconstruction process is described in detail in (Dix 2003).

Note how some aspects do not map in a simple way. For example, the hat is replaced by a mask on a Web page that can be printed and cut out. The real party hats are often not worn, but you would be disappointed if they were missing; similarly it is likely that few masks have actually been cut out and worn, but the fact that you could wear them captures the spirit of dressing up.

Notice too that the design is not optimal from a traditional interface viewpoint. For example, to see the joke you need to click a URL in an email to a "closed cracker" page, click a link there prompting a very slow JavaScript cracker opening and an open cracker page on which the joke is in two parts: a question, and then another click for the answer (hardly minimal user actions, but capturing the elements of hiddenness and suspense of the real cracker.) Effectiveness and efficiency sacrificed for experience.

Designing for fun and engaging experience cannot be reduced to a formula, but can be supported by analysis. Just as effortless interfaces require the most effort to produce, designing fun experiences is a serious business—ask any child.

For more on this area see:
www.hcibook.com/alan/topics/experience/

To send your own virtual crackers:
www.vfridge.com/crackers/

ACKNOWLEDGEMENTS

Thanks to all in the aQtive team (now in Diaspora) who contributed to virtual crackers and for the support of the EPSRC through the EQUATOR project.

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What Sounds Do People Love and Hate?

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After presenting our research about sounds people love and hate at a recent Stanford Media X Conference, we were approached by a program manager from a large software company. She told us a

story about how her company learned a hard lesson about sound. They were testing a new version of a popular software title. In this application each time the user completed a certain task successfully, the software played a feedback sound. This particular sound had been chosen years ago and never questioned—until now. In the new user studies, they watched their users get confused. She told us that when users completed the task successfully, they heard the feedback sound, but the typical user reaction was, "What did I do wrong?" The company realized they had made a mistake.

In everyday life we rely on sounds to know when we're doing well (e.g. clapping, laughter) and to know when we've made a mistake or are in danger (e.g. car horn, fire alarm). As described in Buxton, Gaver and Bly's work on nonspeech audio, sounds also matter in software experiences [1], from computer games to Web sites to productivity applications. Two years ago our lab ran some controlled experiments to see if sound alone can change user behavior. Our conclusion: Yes, it can. Even during a short experiment, positive and negative sounds had the power to generate predictable user behaviors [3]. We now hypothesize that over time these new behaviors can turn into habits. All it takes is playing the right sound at the right time. Seeing the power and appeal of sound, we decided to study people's reactions to sounds more carefully.

In his dissertation, G.T. Fechner, the founder of experimental aesthetics, wrote that aesthetics could be studied "from above" or "from below," the latter being concerned with collecting empirical data of perception [2]. Along these lines, we set out to study how people responded to over 400 sounds, to gather empirical data about their reactions, and to link this to participant demographics. We deployed the study over the Web (see the interface below in Figure 1).

After some trial and error, we found a way to make it work. We eventually had

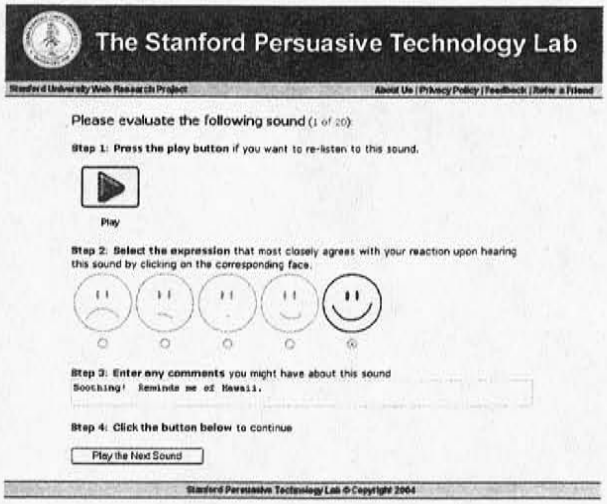

Figure 1: Our sound study let users listen to a sound, rate it, and optionally enter comments

788 participants in our study; they submitted a total of 15,234 sound ratings. The majority of our participants were 18-24 year olds living in California; however, there were also pockets of diversity, including 262 participants from Asia and participants from 28 states and 20 countries.

So what sounds did people love and hate? In general, we found more agreement about what constitutes a bad sound than a good sound. For example, the loud car alarm and the long beep were both given the lowest possible rating by nearly everyone in the study. The sounds with more favorable ratings (the good sounds) had a broader spread of values. One highly rated sound, a baby's murmur, had a very large distribution. An interesting note is that women rated the baby murmur sound 17 percent higher on average than men did. Associations with the sounds seemed to be a key factor influencing ratings. For example, after hearing a sound of a phone ring, one user wrote: "A good old fashioned phone ring —a job offer or a call from a girlfriend." He rated it a five out of five. The variability in response to many of these sounds strongly suggests that the listener's perceptions and context need to be taken into account, rather than assuming sounds elicit intrinsic or universal responses.

Our highest rated sounds generally related to escapism (e.g., fantasy chimes, birds singing) and pleasure (children laughing). The sounds people hated most generally related to disruptions (e.g., alarms, beeps, car crashes) or sadness (e.g., a woman sobbing). Based on our data we created a ranking with hundreds of sounds, with the most favorable sounds at the top, ranging down to the most hated (see box).

We realize that our lab research doesn't go the full distance in determining which sounds developers should use in a given setting in a specific application. That's the next stage of research we leave to those who create commercial products. However, we believe this type of academic research can help companies with their practical projects. Information about sounds people love and hate can help

OVERALL — ACROSS ALL DEMOGRAPHICS	
Listen to these at: http://credibility.stanford.edu/sounds/results.html	
3 Most Loved Sounds	**3 Most Hated Sounds Overall**
1. Harp Scale	1. Loud Car Alarm
2. "Hallelujah" Sound Clip	2. Long, Constant Beep
3. Happy Jingle	3. Screaming Man

developers determine which sounds they should consider for their product and which sounds they should avoid. In other words, by doing a first pass of research in an abstract setting or by drawing on research performed elsewhere, a company can save time by quickly identifying a small number of sounds to test further in the context of their application.

So as we think about the company that learned a hard lesson about research, we wonder: What was the cost of choosing the wrong feedback sound? We don't know. There's probably no accurate way to assess the impact. But one thing that seems clear: It's risky business to rely on intuition alone when selecting feedback sounds.

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Feeling Lucky? Emotions and Information Seeking

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Searching for information is an emotional experience. We've all experienced confusion and frustration while searching the Web, as well as the occasional joy of discovery. But how do we conceive of emotions within search design?

A key message from recent investigations is that feelings affect thought and actions. To some degree, this is something interface designers have tacitly known all along; we've just not clearly articulated the role of feelings, or we've confused them with something else. For instance, the main thrust of *Don't Make Me Think* [1] is really, "don't make me frustrated." (Of course we want users to think.)

But even fields such as "experience design" seem to lack a clear place for emotive criticism and development. Therefore, I advocate formalizing and systematizing considerations of emotions in Web search design. We can begin by turning to existing theories of information seeking for guidance. In particular, Carol Kuhlthau's, Information Search Process (ISP) considers three levels of searching for information: actions, thoughts, and feelings—the last setting her model apart from others [2].

Kuhlthau's ISP has six stages:

1. *Initiation:* The user recognizes a gap in knowledge. Feelings of uncertainty and apprehension are common.
2. *Selection:* The task is to identify the topic. Uncertainty often gives way to optimism.
3. *Exploration:* Returning feelings of uncertainty and doubt are critical: If a focal point does not form, the search may be broken off.
4. *Formulation:* Rising confidence and a sense of direction mark a turning point.
5. *Collection:* Focus is clearer and confidence increases.
6. *Presentation:* Upon completion, feelings of relief are common, as well as feelings of satisfaction. The user makes sense of what was learned.

A fundamental principle within Kuhlthau's model is uncertainty, which has the affective symptoms of anxiety and lack of confidence. Uncertainty in earlier search stages is often caused by the introduction of conflicting information. Moreover, uncertainty is frequently associated with perceived complexity. Both aspects are key stimuli that trigger emotions.

A Framework for Design

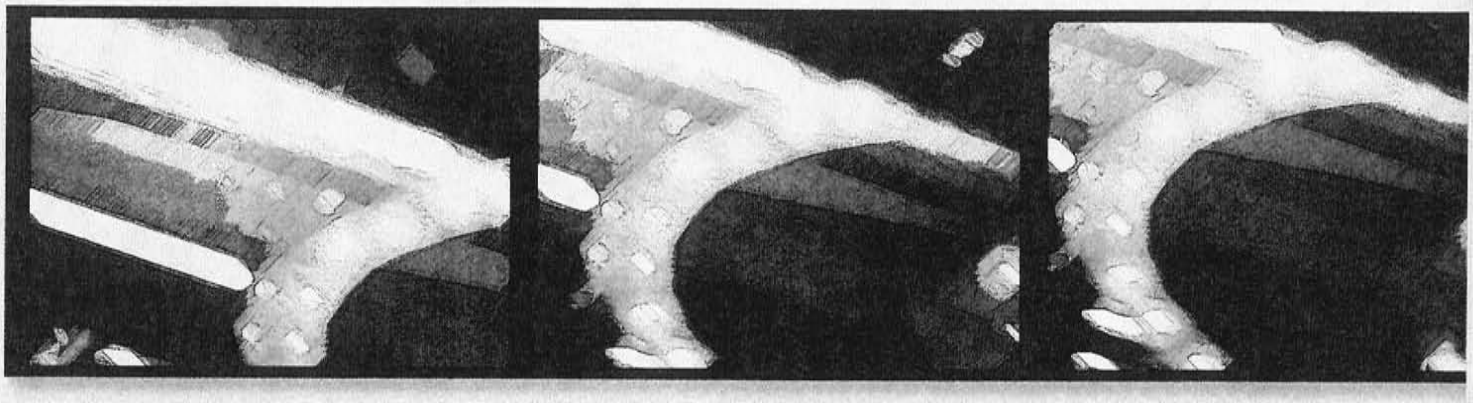
Kuhlthau's theoretical ISP serves as the framework for design. The objective is to create a tailor-made ISP, reflecting variations in user actions, thoughts, and feelings for a specific search context. There are six steps:

1. Segment users and create profiles. An ISP only applies to a particular target group.
2. Identify the search stages and user goals for each. Established phases (described above) serve as a starting point, but must be adapted.
3. Note typical feelings, thoughts, and actions at the individual stages.
4. Summarize each phase with a user requirement: What do they need to achieve their goal?
5. Develop and arrange features to help users achieve their goals at each stage.
6. Map business goals back to user goals and features.

This yields a clear representation of the search process from a user's perspective. Once completed, an ISP enjoys a great deal of longevity. It also scales to different situations and considers business needs.

The ISP framework is primarily intended to facilitate conceptual design, in the same vein as user personas and scenarios. In fact, it fits nicely within other user documentation, expanding and strengthening knowledge of user contexts. Articulating the search process can, for example, provide a common understanding across teams. The ISP can also guide and organize user research, allowing users to make comments about their feelings "on-the-side."

Matching the search interface to emotional ups and downs is the ultimate goal. But developing an ISP may not lead to "killer" features or a totally new,



"emotionally charged" search experience. Subtle changes often make the difference between a negative or positive experience, though. In some cases this may mean simply reordering existing features, and by that, giving them a new rationale.

Reducing complexity at points of high uncertainty clearly emerges as a key tactic. This is not to say a minimalist approach need dominate the entire design. Instead, how and when design elements are presented is vital: Timing is essential.

Examples

Focusing on the "Exploration" stage, here are some preliminary techniques and examples that illustrate this approach:

- Remove unnecessary options and navigation on results pages, while allowing destination pages to be more complex.
- Repeat key elements to provide a sense of familiarity (e.g., the original search query).
- Exaggerate visual priorities to increase focus on key tasks.
- Vary page templates to communicate progress within the search process.
- Provide next steps and recommendations for assistance.

Consider the Search on BBCi (www.bbc.co.uk). Moving from a rather busy homepage to the results page, we get a different experience—one that matches typical seeking patterns. The layout of the results page and over-sized labels create a clear focus. Redundant elements and manual recommendations ("BBCi recommends") provide a safety net for users in doubt. Overall, a reduction of complexity acts to ease uncertainty.

Beyond avoiding uncertainty, try to foster optimism and increase interest. Take the travel portal Opodo (www.opodo.co.uk. See image). While waiting for results to appear, a screen provides more than mere system feedback: Images communicate a relaxed atmosphere. And, concrete information about the database and search status not only quells frustration, it offers a sense of beauty. ("Wow! This is huge and fast.")

Another example is the clippings feature on the International Herald Tribune Web site (www.iht.com). This supports browsing behaviors by allowing readers to skim headlines. (Click any "+" sign to add that title to the clipboard.) This site also varies page templates and reduces clutter at key points in the search process.

The Challenge

Consideration of emotions is not limited to visual appeal: Users also have emotions while interacting with information. When designing search interfaces, the challenge is to make affective considerations part of the design process. Raise "feelings" as a topic within your organization and allow decisions to be based on them.

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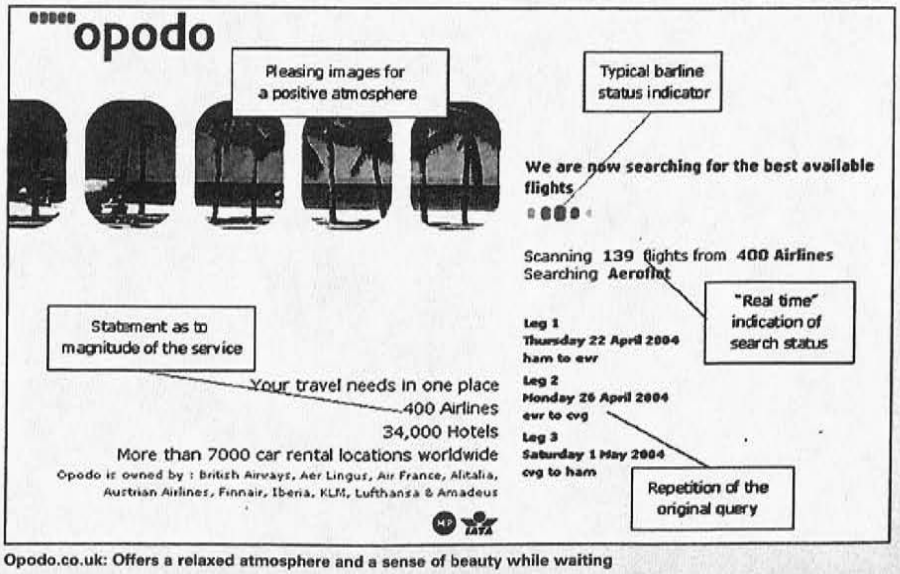
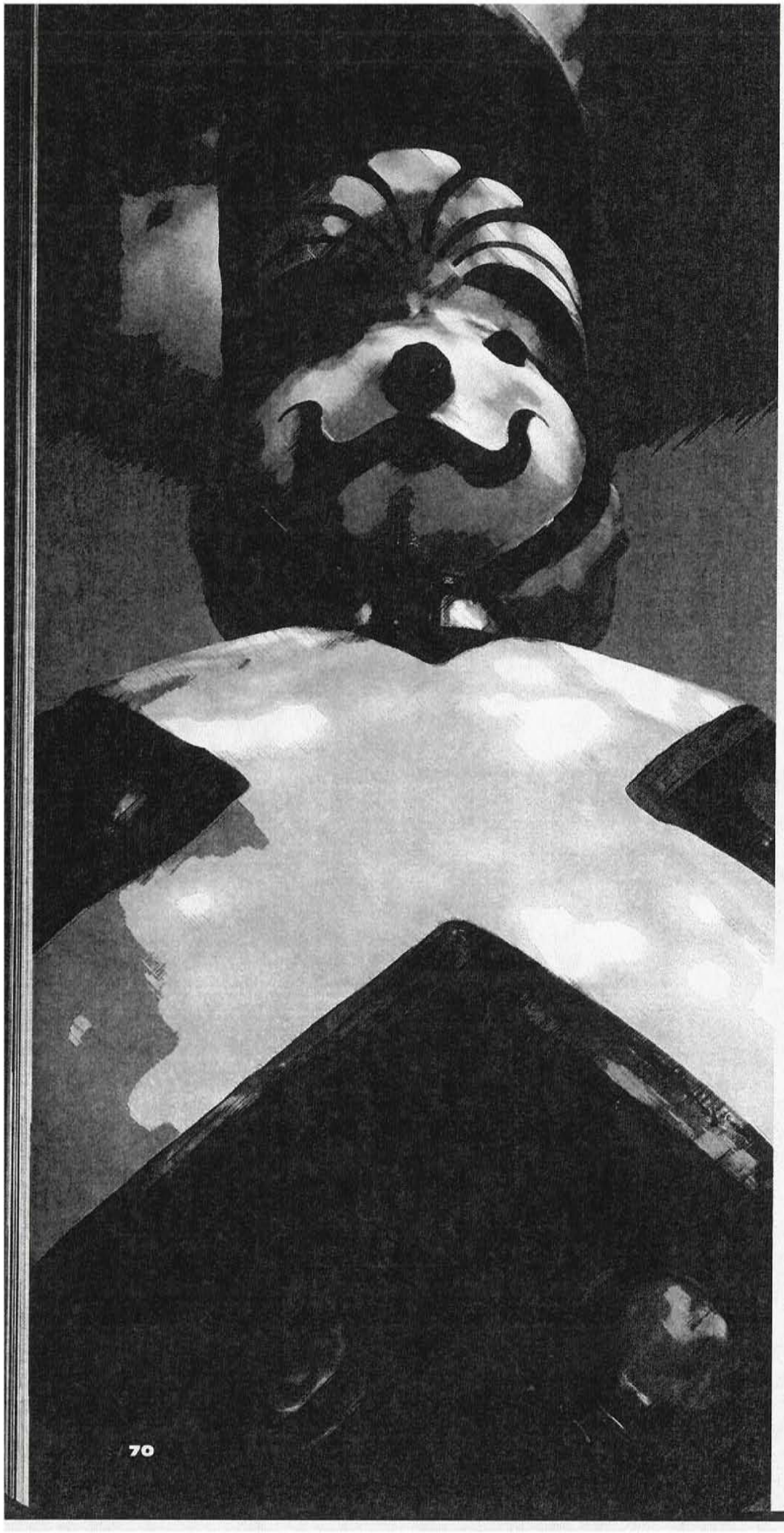


Opodo.co.uk: Offers a relaxed atmosphere and a sense of beauty while waiting



Beyond Usability in Games

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Video games are an art form that combines traditional artistic endeavors such as the visual arts, story-telling, and music, with more modern technical and engineering achievements. At the center of this effort is the game designer who drives the creative vision and who decides what needs to be accomplished in the design and creation of the video game. At some level, we, as user researchers, can provide input at nearly every stage of the development process that is useful for design, but in the end, it is not up to us to design a game. Our role is to assist the designer in the facilitation of their game vision, then provide feedback to help shape that vision into something that users enjoy.

Beyond previous statements made in the literature regarding the limitations of the traditional concept of usability for enjoyment or pleasure, there are certain concepts that we believe are important to address in the design of video games. These include, but are not limited to, fun, challenge, pace, learning curve, engagement, and so on [2, 3]. One of the biggest challenges for video games is taking these global concepts and deconstructing them into a real gameplay experience. However, this is where we make a clear delineation between the *creation* of the experience and the *facilitation* of the experience, by endorsing the view of Overbeek et al. that design should be left to designers, "For too long psychologists have led designers to make overly cogni-

tive designs. We repeat: Design should be left to designers!" [1].

To further clarify, let's take an example of one of the concepts listed above—pace. We've defined pace in the past as "the rate at which players experience new challenges and novel game details."[2]. This is a very high-level definition, but spans across most, if not all, game genres. The way that a game designer will address pace is going to vary widely depending on the genre, their vision, and the experience they want to create. Let's look at two examples.

1. A tennis game. Pace can manifest itself in a number of ways, including the length and number of the cut scenes (or short movie clips or replays) that occur between points and between games. Pace can also manifest itself with ball and player movement speed or the mechanics for hitting the ball. Commercially successful tennis games have varied the pace on both of these dimensions. Therefore, before we know which aspect of pace to focus on, we need to understand the vision of the game designer. If the vision is a frenetic, high-action packed game (as opposed to a simulation), then we may focus on usability and gameplay issues that help speed up the action. Can users get right in and start playing? Do users really want to see a replay after every point? Do users want to see animations of their players walking back and forth between the sides of the court (as in real tennis)?

2. A First-Person-Shooter game (FPS). Pace can be affected in several ways in an FPS, such as the amount of chaotic action in the game or amount of tension that may be experienced. If the designer wants to create a gameplay experience that is pure adrenaline-driving action, pace will be affected if the intended chaotic action was actually perceived as being chaotic, or if the behavior that triggers the chaos is not achievable because the game objectives were not clear. Alternatively, if the design intention was more about stealth and tension, then pace will be affected very differently.

So what methods do we use to begin to address these kinds of issues? It depends on what exactly we are trying to achieve. A think-out-loud usability technique will be very useful to determine whether or not users are able to figure out how to skip scenes in the tennis game. Large sample surveys would be good for measuring the perceived "chaos" in a shooter game. The point is, we must define the problem before we can discuss the appropriate methodologies, and that starting point, the identification of objectives, most often comes from the vision of the game designer.

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Computer Games as Interfaces

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We can learn a lot from computer games. While most application software can be a source of confusion and frustration for users, people consistently find enjoyment in their games. One way to make everyday software more fun is to incorporate game-like elements, such as action, narrative, and interactive graphics. The problem with this approach is that the individual features that make a game entertaining might not work out of context. For example, a cartoon character stranded in a serious application is not only incongruous, but it could feel condescending to the user. So why not use a complete game as a front-end for a "serious" application? Would this hybrid be as fun to use as the original game? To answer these questions, I created PSDoom, a system administration tool that takes its interface from the popular first-person shooter Doom.

From Doom to PSDoom

I wanted to add an interface to the standard set of tools used to manage programs running on a computer, such as the Windows task manager (Figure 1). These provide data about running programs and allow the user to terminate those that have stalled or crashed. What is interesting about this mundane task is the vivid language used to describe it. People talk about "killing" programs or "blowing them away," "fighting for resources," and letting "daemons spawn." I chose to borrow the interface of Doom to reflect this aggressive language.

In 1999, Id Software released Doom's source code, making it easy for me to turn Doom into the program manager PSDoom. I added code to create one monster in the Doom environment for each program running on the user's computer. Each of these new monsters is labeled with the name of its associated program (Figure 2). For example, as I write this article, I can see zombies representing my word processor, a Web browser, and several terminal windows waiting patiently for me in a large room. PSDoom allows the user to affect the running programs by inflicting damage on the monsters. A light wound lowers the corresponding program's priority to give it fewer CPU cycles, causing the program to run more slowly on the computer. If the monster is killed, the associated program is terminat-

Figure 1: The Windows XP task manager. Users can terminate running programs by selecting them from the list and clicking the "End Process" button.

ed (Figure 3). The user's character can also sustain damage, and when it is killed the character is restored to health and loses any items, such as powerful weapons, that he or she had previously acquired. Because part of the fun of Doom is to find and use more powerful weapons, the fear of losing them is a strong incentive to be careful with one's character.

PSDoom appeared to be an immediate success. Only a few weeks after the application was written, tens of thousands of people visited the project's Web page and thousands downloaded the code. The computer community seemed ready to have an interface to match the violent language used for system administration tasks. Many system administrators, who would be the most likely to perform such tasks, have played Doom, so its interface is a familiar one. However, out of the hundreds of e-mails I received from people who loved the interface metaphor, only a handful had actually used PSDoom. These users found it much more satisfying to "shoot" a misbehaving program than to click on it in the task manager or to type kill -9 at a UNIX prompt. Unfortunately, they also enjoyed shooting at everything in PSDoom, killing critical programs and causing the computer to crash in surprising and sometimes spectacular ways. So despite its entertaining interface and compelling metaphor, PSDoom never became a practical application.

Metaphors can initially help users become familiar with a system but will inevitably mislead when the metaphor and the system differ. In this case, the metaphor breaks down when one considers the goals in Doom (the game) and PSDoom (the application). The goal of the game is to kill as many monsters as possible, while the goal of the system administration task is to kill processes only when they need to be killed. The PSDoom interface gives no information about which monsters should be attacked, so users often attempt to kill all of them. Even if there were such information, the user, surrounded by hostile-looking monsters, would probably try to shoot them all anyway. Allowing anything to survive would be antithetical to the Doom narrative.

Conclusion

Game-like interfaces have not entered the workplace, but they have entered the home. Developers of children's software embrace computer games, though not always intelligently. In *Interface as Mimesis*, Brenda Laurel criticizes educational software that interleaves educational drills and short game segments. Writing about a hypothetical program that allows a child to play a game for 20 seconds if he or she solves three math problems, she asserts:

> *Either the math problems or the game segments are gratuitous, depending on Jimmy's point of view. The proper solution is either to eliminate one of the activities, or re-shape the context so that it includes both; e.g., a starfighter simulation in which Jimmy must naturally solve math problems in order to operate the ship.*

Adults at work are in the same situation as Jimmy—surreptitiously playing a few rounds of computer solitaire or browsing the Web as a reward for using a boring application. Is there a way to integrate work and fun? It will be difficult, but the overwhelming response to PSDoom shows that it would be greatly appreciated.

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RELATED URLS

Information on PSDoom can be found here:
www.cs.unm.edu/~dlchao/

Source code for PSDoom (for Linux) can be found here:
http://psdoom.sourceforge.net/

Figure 2: Programs are represented as monsters in PSDoom.

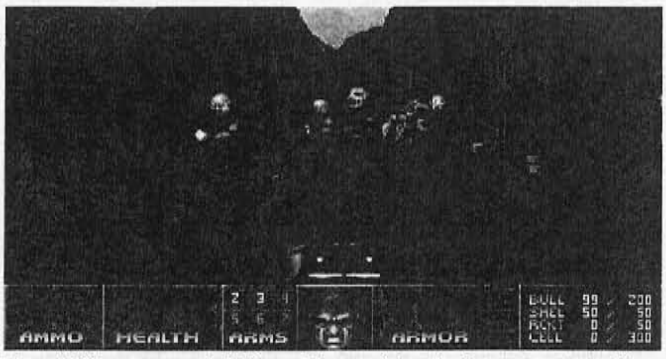

Figure 3: Killing programs in PSDoom. The user is terminating emacs, a text editor, with a shotgun.

Narrative Construction as Play

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Narrative construction as a kind of play is highly underrated in the design of interactive media. I began to uncover evidence of this during my dissertation research. That quest led to my first book, *Computers as Theatre* [2]. I learned more about the powers of narrative construction from the research on gender and play that I conducted between 1992 and 1996 at Interval Research.

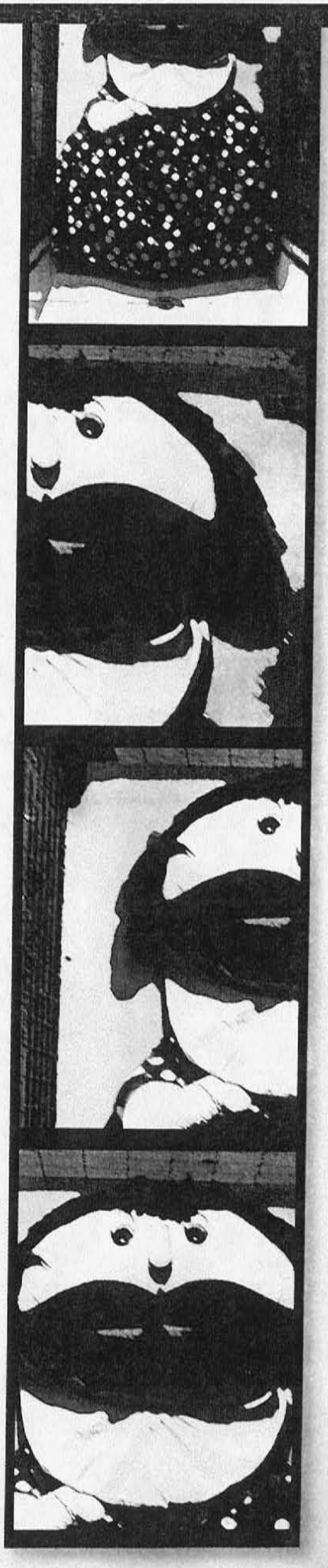
In academic taxonomies of play, "constructive play" is most often framed as play that utilizes objects (real or virtual) to construct other objects, mechanisms, or environments. When defined in this way, constructive play is predominately engaged in by boys. But when you include *stories* as something that may be constructed, you find that girls engage in constructive play with at least the same frequency and relish.

My research at Interval led to the founding of Purple Moon (a transmedia company for girls) in 1996. As we set about to discover or invent computer games that would be attractive to girls, we were tempted, at first, to look at what girls thought of existing games. We did explore that path, but it gave us limited results simply because most girls were not playing computer games at the time and there were few examples of games that they really liked, (Nintendo's *Mario* games and *Ecco the Dolphin* were the favorites). By far the more fruitful research approach was our exploration of how girls play in general. Through interviews with over 1,000 children, our research indicated that narrative construction was the largest category of play for girls ages eight to 12. Stories were made up about existing narratives or from whole cloth. Stories could be told, written, drawn, theatrically performed, or improvised. How can this finding be translated into computer-based game-play?

First and foremost, materials for narrative construction take the form of characters—characters that are drawn with enough depth and potential to engage the player in imaginative construction of their motivations and thought processes. In other words, players should be enticed and enabled to create the backstory for characters that appear in the action of the game. During the course of our research, we queried girls about games that were popular at the time. In the context of the videogame *X-Men*, one subject (a 12-year-old girl) complained that "these characters are so boring you can't even *make up* stories about them."

The history of the audience for the *X-Men* property is relevant in this context. As a comic book series, the characters had plenty of narrative potential, but the medium of comic books was culturally gendered. As a result, girls were not a significant audience for the property. In its videogame incarnation, *X-Men* characters were stripped of most of their narrative qualities and placed in a flat action context. Both the game genre and the character construction discouraged female participation. But when the property was transformed into a film, the characters and backstory elements were plumped up to the point that girls formed a significant segment of the audience and fan community.

A similar story can be told about the *Star Trek* franchise. Almost from the beginning, females dominated the fan community, creating fanzines and slash videos galore [3]. Beginning as a geek-centric TV series that was explicitly pitched to males, *Star Trek* garnered a pas-



sionate female following primarily because of its social content. Through the lives of the various feature films and follow-on series as well as the hundreds of paperback books, Paramount slowly but surely recognized and responded to the gender makeup of its audience by morphing the genre from science fiction adventure to a soap opera in space. That is *not* a slam—as a die-hard *Star Trek* fan myself, I have appreciated the transition toward stories that have more to do with characters and relationships than dogfights in space. As Jenkins' analysis shows, the heart of fan culture is the ability to relate to, appropriate, and repurpose characters and story materials in order to create personal meaning. Fan behavior provides an excellent example of narrative construction as play.

In the Purple Moon products (the *Rockett* and *Secret Paths* series of games), we concentrated on creating affordances for narrative play. We developed characters based on research of girls' descriptions of their own friends and foes, finding reliable patterns in our data that corresponded to character types. We modeled affiliation and exclusionary behavior and other social dynamics of our audiences in the structure of the game. Our research with our audience led us to develop a gameplay pattern we called "emotional navigation," where choices were made by the player in emotional rather than operational terms.

To encourage backstory creation, we populated the games with clues about the characters' inner lives, family situations, and histories by exposing journals, collections, and flashbacks. We gave our audience a publishing venue for their backstory constructions on our Web site. Girls played with the characters through contributions to the "school" newspaper, yearbook, journals, and bulletin boards. We learned Henry Jenkins' lessons well and made an environment that was all about supporting the sorts of things that fan communities do. The result was a site that beat disney.com for several months running in terms of both unique users and dwell-time per log-in. Although the site was closed down by Mattel after their acquisition of the company in 1999, I still get email every week or so from a fan who wants to know when the site will come up again. Boy, did Mattel miss the boat.

With the emergence of massively multiplayer online games like *Ultima Online* and *Everquest* we begin to recognize the construction of characters, habitats, social relationships, and economies as flavors of constructive play. These play patterns have made girls and women a reliable segment of players in the adventure and role-playing genres from the beginning of the computer game era. It is this sort of constructive play that invites women and girls to join the computer-game party. Will Wright's recognition of these important play patterns has resulted in a 65 percent female player demographic for *Sims Online*. As Will describes in his interview in *Design Research: Methods and Perspectives* [1], aggressively incorporating female-inclusive play patterns has led to better game experiences for players in general.

Of course, games are not the only computer-based spaces in which narrative construction occurs! All but the most procedural activities can be seen to have a narrative arc. To re-cast the central observation of *Computers as Theatre*, good experience design provides affordances for narrative construction of a particular type: a story of a successful or delightful action with a beginning, middle and end, where the interactor is typically the central character.

In order to construct a good narrative about an interactive experience, causes and effects cannot be opaque. This does not mean that the process needs to be "transparent" in the sense of faithfully representing the operations of an application or a game; it may simply mean that serviceable representations of those operations are available. Nor does it mean that every story must be a success story; the story of a Google search that yields bizarre results can be a comic masterpiece. But it's only funny, like the man slipping on the banana peel, if no real damage or injury results. The sense of play, like comedy, depends upon the absence of potential harm.

Narrative construction is a wonderful research tool and benchmark as well. I was recently involved in consulting for a group that is designing a middle-school science curriculum in an online environment. They asked me if I could point to gameplay patterns that would enhance a student's enjoyment of online science activities. I suggested that they take a step back and ask students to tell them stories about their most delightful moments in learning about science. Forcing a gameplay pattern into an educational activity is dicey, precisely because the student/player knows that there is real risk involved—the risk of failure. Modeling a happy experience with science learning takes the student away from the world of tests and grades and back into the world of wonder and discovery. Designing online experiences that would prompt students to construct narratives filled with delight would be a mark of real design success.

As Mike Mateas and Phoebe Sengers point out in their book *Narrative Intelligence* [4], we understand the world largely through narrative construction. Researchers from Roger Shank to Jerome Bruner support this view. Story-making is a pleasurable activity because in a very deep way, we look at the world with storytelling brains. The designer of interactive systems should take our narrative predisposition into account in the same way that the designer of physical tools makes affordances for our opposable thumbs.

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