You Amateur!

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In almost all the varied walks of life, amateurs have more freedom to experiment and innovate. The fraction of the population who are amateurs is a good measure of the freedom of a society.
—Freeman Dyson [1]

Listen. In case you didn't get the memo, ubiquitous computing has already arrived, allowing us to communicate, buy, sell, connect, and no doubt do miraculous things. However, it's time for this technology to empower us to go beyond finding friends, chatting with colleagues, locating hip bars, and buying music.

While we should celebrate the success of our extended community at delivering many vital components of Mark Weiser's original vision of ubiquitous computing, we should also question the scope of this progress. Step back for a moment. What really matters? Everyday life spans a wide range of emotions and experiences, from moments of productivity and efficiency to play, reflection, and curiosity. But our research and designs in ubiquitous computing do not typically reflect this important life balance. The research we undertake and the applications we build often employ technologies in the pursuit of improving tasks and solving problems. While these are indeed noble and important areas of research, the successful computing tools—the ones we will really desire to cohabitate with—will be those that incorporate the full range of life experiences. We want our tools to sing of not just productivity and efficiency but of our love of curiosity, the joy of wonderment, and the freshness of the unknown.

We are at an important technological inflection point. Most of our technological systems have been designed and built by professionally trained experts (that is, us—computer scientists, engineers, and designers) for use in specific domains and to solve explicit problems. Artifacts often called "user manuals" traditionally prescribed the appropriate usage of these tools and implied an acceptable etiquette for interaction and experience. A fringe group of individuals usually labeled "hackers" or "nerds" have challenged this producer-consumer model of technology by hacking novel hardware and software features to "improve" our research and products, while a similar creative group of technicians called "artists" have redirected the techniques, tools, and tenets of accepted technological usage away from their typical manifestations in practicality and product. Over time the technological artifacts of these fringe groups and the support for their rhetoric have gained them a foothold into

▸ Energy Parasites (Eric Paulos)

computing culture and eroded the established power discontinuities within the practice of computing research.

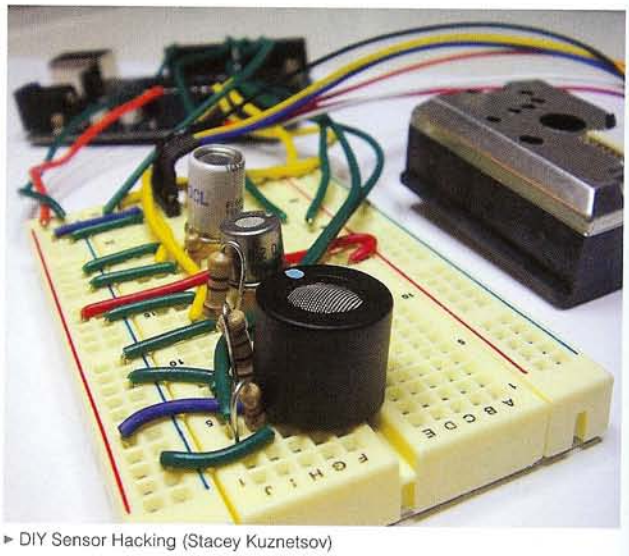
In fact, Weiser actually called for this collaborative and interdisciplinary framing of our future in his 1994 UIST keynote talk, in which he said that to build our future technologies, "we need to start from arts and humanities such as philosophy, phenomenology, anthropology, psychology, postmodernism, sociology of science, feminist criticism, and our own experiences" [2]. Even then, he understood this interdisciplinary framing as so vital to the evolution of the field that in his talk he directly said, "This is the most important part of the talk. You may not get it on first hearing. Patience. When I am done you'll know what is wrong with creating an entertaining and dramatic user interface, computers magically meeting our desires, or a computer idealized as a virtual reality assistant as the ultimate user interface" [2]. With some notable exceptions, our community largely struggled with this call to engage and collaborate with others outside our own community. By failing to heed Weiser's own warning, we built many devices and systems that were designed to appeal to everyone equally but failed to touch anyone deeply.

However, in the emerging milieu of computing culture, we now expect our computing artifacts to be driven by an architecture of open participation and democracy that encourages users to deconstruct, add to, and repurpose their tools and applications as they use them. This personal and cultural technology remixing, tracing its roots to the cut-ups and collages of the Dadaists, Burroughs, and Gysin [3] enriches our individual experience and emotional connection to these technologies.

In fact, it was the technologies that embraced a freedom to share and reuse, a spirit of open communication, and a decentralization of authority that played pivotal roles in the recent Arab Spring of 2011. In those movements, across a collection of Arab countries, most notably Tunisia and Egypt, citizens creatively reappropriated and remixed a range of technologies, such as Twitter, Facebook, and YouTube, as the tools of revolutionaries as they organized to replace their governments with more democratic leadership. Now, that's impact!

It's natural to ask what role the HCI community played in this dramatic social and cultural change. Though elements of social media can be traced back to practitioners in our field, it was ultimately the citizens' deep and genuine love of their country that motivated their creative reuse of these tools. We often forget that the word "amateur" comes from the Latin *amator*, meaning to love. In fact, the individual citizens who participated in the revolution in Egypt could be called "amateur Egyptians"—lovers of Egypt. In its definitions of amateur the Oxford English Dictionary includes "one who loves or is fond of," but unfortunately the more

► iPhone Air Quality Prototype (Eric Paulos)



► DIY Sensor Hacking (Stacey Kuznetsov)

common usage of the term differs from this meaning. The OED also defines amateur as "one who cultivates something as a pastime, as distinguished from one who prosecutes it professionally; hence, sometimes used disparagingly, as dabbler, or superficial student or worker." It is this second definition, a rather condescending view of amateurs as inferior dabblers, that often prevails in our culture. However, that has not always been the case. For example, the world of today's professional scientist, shaped by peer-review journals and the priorities of funding institutions, would feel foreign to many early scientists. In fact, historically, many of these early scientists were simply curious amateurs—lovers of science. As noted historian and sociologist of science Steven Shapin writes:

Well into the 19th century, and even into the 20th, doing science was typically more of an avocation than a job. In the 17th century, the great chemist Robert Boyle not only financed his science out of his own deep pockets but also shared a common view that doing science as a "trade" was demeaning. Anyone who accepted money to pursue knowledge would compromise their integrity—who paid the piper called the tune. Isaac Newton, as professor of mathematics at Cambridge University, was not paid to do physical or mathematical research but to teach. The 19th century's most famous scientist, Charles Darwin, was never paid to do science. And Einstein's three great papers of 1905 were not part of his job specifications: He was then a patent clerk in Switzerland. True, over the course of history, many scientific researchers were in academic employment, but with few exceptions, before the 20th century, the job of a science professor was not to produce new knowledge but to transmit and safeguard existing knowledge. Until quite recent times, the number of people in the world paid to do original scientific research "for its own sake" was infinitesimally small. The transformation of science from a calling to a job happened largely during the course of the past century. Indeed, science is arguably the world's youngest profession: The routinization of the paid role is less than a hundred years old; the word "scientist," coined in 1840, was not in standard usage until the early 20th century [4].

The appearance of professional scientists did not diminish the role or passion of the nonprofessional practitioners of science—the amateurs. Even across our own familiar, ubiquitous computing research territories, we find nonexperts and novices readily embracing and creating fascinating and ingenious computing artifacts. In nearly every case, these individuals and groups operate entirely outside of the officially sanctioned academic and industrial research communities.

But how have we as "expert" practitioners been participating in this discussion? By constructing a practice around the design and development of technologies for task-based problem solving, we have unintentionally established such work as the status quo for the human-computing experience. We have failed in our duty to open up alternate forums for technology to

▸ Spectacle Computing: Air Quality Balloons (Stacey Kuznetsov, George Noel Davis, Eric Paulos, Mark Gross, Jian Chiu Cheung)

▸ Air Quality Sensing: WearAir T-Shirt (Sunyoung Kim and Eric Paulos)

We want our tools to sing of not just productivity and efficiency but of our love of curiosity, the joy of wonderment, and the freshness of the unknown.

express itself and touch our lives beyond productivity and efficiency. Blinded by our quest for smart technologies, we have forgotten to contemplate the design of technologies to inspire us to be smarter, more curious, and more inquisitive. Our field is changing and we must evolve with it.

We owe it to ourselves to rethink the impact we desire to have on this historic moment in computing culture. We must choose to participate in and perhaps lead a dialogue that heralds an expansive new practice of designing to enable participation by experts and nonexperts alike. We are in the midst of the rise of the *expert amateur*. Our role is changing from "professional idealizer" and "problem solver" to "nonprofessional facilitator of new artifacts." We can reject or ignore this and simply continue on with our existing practices, further isolating ourselves and our community, and diminishing our impact on the world, or we can embrace this change and proactively strategize an exciting range of future potential collaborations and synergies with these expert amateurs. The outcome will almost certainly improve our acceptance and shared responsibility in partnering to improve our lives, environment, and well-being through populist innovation rather than proprietary innovation.

Although there is considerable debate about exact research directions and intersections for engagements with expert amateurs, we offer up for discussion four strategies for framing future participatory collaborations.

Citizen Science

We and others have been working on ideas that deconstruct our current perceptions of mobile technologies as not simply tools for communication but as measurement instruments. By rethinking sensor technology, interactive and social experiences, and physical designs of such systems, we believe a new technological usage model can emerge—that of empowering everyday citizens to participate in collecting, sharing, and taking collective action based on personal measurements. Citizen science is positioned to synergize a new cooperative and collaborative approach to problem solving across a variety of expert practitioners such as computer scientists, engineers, social scientists, atmospheric chemists, environmental health organizations (such as the EPA), urban planners, local and national governments, artists, activists, and grassroots organizations. We believe that successfully designed citizen science projects can effect positive societal change and produce a more participatory and transparent democracy with improved public understanding of our environment and urban ecology. The potential for grassroots efforts to emerge from this work and produce solutions to current local and global health and environmental issues is very real.

Spectacle Computing

Artists have a long history of integrating "the spectacle" into their work—from Allan Kaprow's Happenings [5] and the writings of Guy Debord and the Situationists in the 1960s [6], to more contemporary tactical media artists such as the Yes Men, Critical Art Ensemble, RTMark, Preemptive Media, and Institute for Applied Autonomy. The Situationists differentiated between passive subjects—consumers of the spectacle—and those who transform their own ideas, concerns, and passions into the spectacle itself. This movement applied concepts of commodity fetishism [7] to contemporary mass media to expose the common politics of its day. Spectacle computing intentionally and overtly foregrounds these ideas, using expressive technologies to inspire new thinking, curiosity, and beliefs. Stakeholders who otherwise may not be aware of or care about an issue are drawn into the spectacle.

Contrary to contemporary rhetoric of invisible interfaces and seamless computing, we argue for a complementary strategy explicitly designed to generate spectacles. First and foremost, spectacles are difficult to ignore. The barrier to engagement is thereby effectively lowered because individuals need not download an application or carry specific hardware. The spectacle is intentionally designed to distract the individual or group. Moreover, it invites people to engage in otherwise socially unacceptable behaviors, such as overt public voyeurism, gossip, and curiosity. Finally, it presents an acceptable context for individuals to

participate in the spectacle, in the spirit of a Happening, even if such participation involves odd, unusual, or socially awkward activities (e.g., willingly taking and carrying around a glowing balloon [8]).

We view these insights as experience-design opportunities. We observe how spectacle computing moves people from a personal and private context through public voyeurism. To be clear, spectacle computing is not intended to mimic the experience of yelling "Fire!" in a crowded theater, but to more tactfully and expressively engage public audiences in issues of personal or societal concern. While this approach is tangentially related to FlashMobs, which draw large groups of people to suddenly assemble and perform unusual acts in public places, the goal of spectacle computing is to foster discourse between stakeholders, technology, and space through the use of dynamic computing elements. Also, unlike FlashMobs, which may create feelings of both inclusion and exclusion, spectacle computing invites participation from everyone.

Micro-Volunteerism

There is a tremendous opportunity to design new models of participation and volunteerism. Though traditional mechanisms for volunteering exist, most involve commitments on the order of hours (e.g., beach cleanup), days (e.g., Habitat for Humanity), months (e.g., teaching abroad) or years (e.g., national military service). Micro-volunteerism explores the newly emerging design territory for volunteering on the order of seconds or minutes—"I have 42 seconds at this bus stop—how can I volunteer?" This "just-in-time volunteering" is culturally aligned with the short, saccadic, "just in time" usage of technology through platforms such as Twitter, Facebook, Foursquare, SMS, Yelp, blogs, Flickr, and YouTube. In our research, we are explicitly developing frameworks to enable and study this novel and potentially rich untapped model of citizen participation and volunteerism.

DIY Culture

We must change our mantra. Not simply *usability*, but *usefulness and relevancy to our world, its citizens, and our environment*. We must design for the world and what matters. This means discussing computing research alongside new keywords such as *the economy, the environment, activism, poverty, famine, homelessness, literacy, religion, health,* and *politics*.

How do we design computing tools to support grassroots activism? How do we design technologies to effect real political and societal change? We have the ability to create entirely new forms of citizen volunteerism, community involvement, and participation. We need to think big impact. This means thinking outside of our immediate worlds of academic and industrial computing, outside of our peer-review processes, outside of our institutions, and more important, outside of our traditional comfort zones.

In 1961, President Kennedy's challenge was to "commit ourselves to achieving the goal of landing a man on the moon and returning him safely to the Earth." Ultimately, the individuals who rose to this challenge were the brave engineers and scientists of the day. What is our challenge today? Perhaps it is climate change, our environment, education, healthcare, famine, or our economy. In any case, the technological tools that will be central to our problem-solving efforts will be characterized by open communication, decentralization of authority, freedom to share, and public participation. And who will participate as leaders in helping to solve the challenges ahead? Not simply the scientists and engineers, as in generations past, not us as computing researchers, but *everyone*—you, me, all of us, as everyday citizens of our world. As practitioners passionate about your work, be it art, design, engineering, or science, be proud in calling yourself a true lover of your field—indeed, be proud to be an *amateur*.

ENDNOTES:

1. Dyson, F. In praise of amateur. *The New York Review of Books*. (Dec. 5, 2002).

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3. Geiger, J. *Nothing Is True, Everything Is Permitted: The Life of Brion Gysin*. Disinformation, New York, 2005.

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7. Marx, K. *Capital: Volume 1: A Critique of Political Economy*. Penguin, London, 1992.

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