"Resistance is futile": reading science fiction alongside ubiquitous computing

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Abstract Design-oriented research is an act of collective imagining—a way in which we work together to bring about a future that lies slightly out of our grasp. In this paper, we examine the collective imagining of ubiquitous computing by bringing it into alignment with a related phenomenon, science fiction, in particular as imagined by a series of television shows that form part of the cultural backdrop for many members of the research community. A comparative reading of these fictional narratives highlights a series of themes that are also implicit in the research literature. We argue both that these themes are important considerations in the shaping of technological design and that an attention to the tropes of popular culture holds methodological value for ubiquitous computing.

1 Introduction

Mark Weiser's paper outlining the ubiquitous computing research agenda was entitled "The Computer for the twenty-first century." In so labeling his vision a decade before the end of the twentieth century, Weiser initiated a concern with futurism and futuristic vision that continues to characterize ubicomp research and writings [3]. Design-oriented research is, of course, inherently directed toward the future and is predicated upon envisionments of alternative futures enabled by technological progress. But, we would argue, the kinds of future visions invoked by

ubicomp research are of a very particular sort. Rather than simply envisioning improvements in the performance of particular algorithms or computational tools, pervasive computing research argues for a wholesale reconfiguration of the relationship between people and their everyday lives, based on responsive environments and embedded computation: a form of collective imagining.

What is particularly interesting—and highly specific—about this vision is that it is one that is already familiar to us, albeit in the very different fictive frame of science fiction novels, films, and television productions. Penley [17] explores the extent to which the research and engineering activities of NASA are frequently and quite explicitly founded upon the visions of exploration and expansion embodied by the Star Trek television series, and these visions—whether of portable communicators for easy communication, digital pads replacing paper, or virtual environments in which we can be immersed—have been explicitly invoked in contemporary research in human–computer interaction and ubiquitous computing. Arguably, a range of contemporary technologies—from PDAs to cell phones—have adopted their forms and functions from science fiction. As in the famous case of British science fiction, author Arthur C. Clarke's speculative "invention" of the communication satellite, science fiction does not merely anticipate but actively shapes technological futures through its effect on the collective imagination.

At the same time, science fiction in popular culture provides a context in which new technological developments are understood. Science fiction visions appear as prototypes for future technological environments—the visualizations of photo enhancement and search technology in Ridley Scott's 1982 film *Blade Runner* for instance presages contemporary digital image manipulation technologies by nearly two decades. Inversely, previously futuristic

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technologies are presented as mature by highlighting the fact that they are "not science fiction any more" [21]. Of course, this can also lead to a range of different frustrations in the present when newly realized technologies do not meet expectations long established by television (and other science fiction media); voice recognition does not distinguish between accents; video-conferencing is not picture perfect; and most sensing technology is hardly seamless.

Scholarly analysis of science fiction and related literary endeavors proceeds not least from the position that visions of the future are particularly revealing about the present [20, 23]. An account of "how we shall live" is inherently grounded in assumptions about the problems and opportunities of the time at which it is written. This is true, of course, of all forms of fiction, whether they paint images of past, present, or future, but we are interested here particularly in science fiction, conventionally construed, precisely because of the way in which science and technology play a central role and are open to question. By "science fiction," then, we have in mind a genre that is explicitly future-oriented and in which technology and its role feature as a recurring leitmotif.

Thacker [25] defines science fiction as "a contemporary mode in which the techniques of extrapolation and speculation are utilized in a narrative form, to construct near-future, far-future, or fantastic worlds in which science, technology, and society intersect." (p. 156). We find this a particularly useful definition, for two reasons. The first is the explicit attention drawn to extrapolation and speculation as the twin bases for the production of science fiction, and which we would argue applies also to the ways in which design-oriented research is typically carried out, with an explicit focus not only on the extrapolation of current technological opportunities, but also the imaginative and speculative figuring of a world in which new technologies can be applied. The second is the acknowledgment of the ways in which science fiction, while naively characterized as concerned primarily with science and technology, in fact operates at the nexus of science and society. Again, we would argue that much the same is true in design-oriented research, where techno-centric discourse (Weiser's "dramatic computer") tends to obscure the central role of sociological and cultural considerations.

Even for those who are not immersed in the genre, science fiction shapes popular imaginings of the future. From early radio plays ("War of Worlds", etc.) and film (e.g.: A Trip to the Moon [*Le voyage dans la lune* 1902], King Kong [1933], Flash Gordon [1936]—just to name a few), to a wide range of television programming, science fiction has been part of the popular cultural imaginings of many nations. Whether utopian or dystopian, these visions of the future shape our collective understandings of the relationship between science and progress and between people and technology, and as such have a profound, albeit little documented, impact on ubiquitous computing and its discursive practices. As children of the British Empire, the authors grew up on British Broadcasting Corporation (BBC) science fiction television shows; as long time residents of the United States, we have been immersed in American science fiction imagery and imaginings; and as researchers sitting at significant sites of new information, entertainment, and communication technology production and critique, Intel's Interaction and Experience Research laboratory and the University of California Irvine, we are always already implicated in such future visions.

In this paper, we utilize the lens of popular American and British science fiction television shows to examine a range of issues relevant to contemporary in ubiquitous computing. This is not an attempt to be comprehensive by any means; rather, we will use a specific and selective collection of television series to raise questions about people, technology, and progress. It is our contention that a closer reading of these indexical shows can inform conversations and discussion within the ubicomp discursive frame. To that end, we have consciously chosen programs that embody quite different assumptions about technology and society, as well as having different sites and modes of creation, representing a range of particular geopolitical moments and regimes. We have also chosen to focus on television shows, rather than other media. We have two reasons for this. First, as television shows tend to play out over multiple seasons, they have a regular and reoccurring presence in daily life, and they offer a larger body of material for analysis. Second, given the role of television in contemporary popular culture, television shows have arguably a larger impact, often in circulation on various television stations (especially American cable) well beyond their moments of broadcast.

We have selected a set of shows particularly to draw attention to the ways that their contrasting visions offers us some critical perspective on the assumptions about technology and the future that are the basis for ubicomp imaginings. We briefly introduce them below and then explore a series of relevant themes, before illustrating what kinds of relevance these hold for ubiquitous computing.

2 Don't panic: five indexical shows

Science fiction, it seems, has always had a place in American and British television programming. In February 1938, a 35-min segment of *RUR* (*Rossum's Universal Robots*), a Czech play by Karel Čapek, was broadcast on BBC television—it was the first piece of television science fiction ever to be produced. Other shows quickly followed, with adaptations of Orwell and Wells, and the *Quatermass*

Experiment in the 1950s and *Dr Who* commencing in the early 1960s.

American television too had a fascination with science fiction. *Captain Video and his Video Rangers*, a children's program which ran from 1949 to 1955, attracted a view audience of more than 3.5 million which was a familiar story line with a heroic quasi-military figure battling for law order with equipped with "scientific secrets and secret weapons" [27]. Other networks followed suit, creating a "space opera" fad with such programs as *Space Patrol* (ABC, 1950–55), *Buck Rogers* (1950–51), *Johnny Jupiter* (DuMont and ABC, 1953–54), *Rocky Jones, Space Ranger*! (syndicated, 1954–55), and *Tom Corbett, Space Cadet* (all four networks at different times, 1950–55) [27].

Many of these early shows on British and American television concern themselves with future societies, space travel, aliens, and an array of new technologies. However, for the purposes of this paper, we want to focus on television shows produced in a 25-year window, between 1963 and 1989—the ones that arguable played a role in shaping both the current science fiction offerings (as in, for example, the genealogy from Star Trek and Blake 7 to Babylon 5, Andromeda, Firefly) and also the current generation of researchers of which we are a part.[1] Here, we are interested in just five shows: *Dr Who*, *Star Trek*, *Planet of the Apes*, *Blake's 7,* and *Hitchhiker's Guide to the Galaxy*. We selected these shows because they represent a significant breadth of science fiction television, spanning a quarter century, two distinct cultural traditions (British and American), three broadcasting corporations (BBC, NBC, CBS), a range of political eras and regimes (notably Thatcher's Britain and Reagan's Cold War America), a host of production and postproduction technologies (film, video, digital, stereo surround sound), and which draw on very disparate story arcs, narratives, and styles (Westerns, Robin Hood, Ulysses, drama, comedy). We also selected these shows because they have had an enduring influence and impact on both British and American (and by proxy many other) discourses around science and technology and also ultimately society and culture.

2.1 Doctor Who (1963–1989)[2]

One of the world's longest running television shows*, Dr Who,* was first broadcast on BBC1 in 1963 in an early

saturday evening slot [18]. Originally conceived as an educational adventure serial for children teaching them about history and science, the adventures of "the Doctor" a renegade "Time Lord" (or time traveler) and his companions quickly became a favorite amongst British and later worldwide TV viewers of all ages [10].

One of the show's most significant visual markets, aside for the sonic screw driver and collection of neurotic twitches on the part of the various incarnations of the Doctor, was that of the TARDIS—or Time and Relative Dimension in Space. This technology was reported to be able to its occupants to any point in time or space and always much larger than its exterior; it was capable of blending seamlessly into its environment. However, the Doctor's TARDIS is less than fully functional—a running sight gag in this show and a feature of much British science fiction—and its chameleon circuitry is broken, causing it to appear always as a 1950s-style, London police box. This particular police box TARDIS was always slightly erratic, and many a series began with a misfiring of the time and space circuitry, and an unexpected and ill-timed arrival somewhere unexpected.

2.2 Star Trek (1966–1969)

Perhaps the prototypical television science fiction series, *Star Trek,* comprised just 80 episodes over three seasons between 1966 and 1969 on NBC, but subsequently gave rise to several more series, ten feature films, and a plethora of popular culture references. Famously envisioned by creator Gene Roddenberry as "a Wagon Train to the stars," referring to a popular continuing serial set in the American West, the explorations of the USS Enterprise blended colonial frontierism, military expansion, and scientific exploration. The enterprise, faster-than-light and well-armed, carried a multi-ethnic and mixed-gender crew on voyages "where no Man has gone before," although the plot frequently revolved around diplomatic tensions between the Earth-based Federation and other galactic "superpowers"—reflecting the show's Cold War heritage.

Star Trek and the shows it has given rise to share an affinity for technology which has entered the popular consciousness in a variety of ways. "Beam me up, Scotty" and "Lock on phasers" are expressions one might hear everyday; the physical form of the original communicator is mirrored by contemporary clamshell phone designs and those of the early PDAs [5]. While technology may certainly run amok in the Star Trek universe, it is, in the right hands, a powerful force for good; it is the combination of technology and knows how that allows the crew to prevail.

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[1] The 1980s also represent the period in which personal computing became a reality and in which Mark Weiser began ubicomp research at PARC.

[2] The show was relaunched in 2005, and new episodes are produced in Britain and shown around the world. While many of our comments are relevant to both shows, it is the original in which we are especially interested, again because its of intersection with the emergence of the ubiquitous computing vision.

2.3 Blake's 7 (1978–1981)

Created by Terry Nation, who had achieved earlier successes as a writer for *Dr Who*, *Blake's 7* ran for four seasons from 1978 to 1981 [22]. Set in an unidentifiable future time—the third century of the second calendar—and evoking the Robin Hood narrative structure, it told the story of a small band of adventurers, mercenaries, and political dissidents "resisting" the Federation—a totalitarian regime with the Earth as its imperial center. The show's low budget props and its reliance on Surrey quarries and abandoned factories were the subject of mockery, but the biting dialog and the bleak view of humanity struck a cord in Thatcher's Britain, and the show was a surprising hit.

The show featured several very different computational devices: ZEN, ORAC, and SLAVE. ZEN and later SLAVE are the onboard ship computers for the Liberator and Scorpio, respectively. They have very different personalities and physical manifestations but share an ability to receive and understand verbal commands and control complex machinery. In addition to these onboard computation devices, early portable computing is also represented, in the form of ORAC, a deeply disdainful super computer, with abilities to communicate with all other known computers as well as with many living forms. Represented as a Perspex box filled with Christmas lights, ORAC not only listened and spoke, and indeed frequently opined, but briefly was able to communicate via telepathy.

2.4 Planet of the Apes (1968)

Originally, a 1968 movie based on the 1963 French novel *La Planète des Singes* [4], *Planet of the Apes*, like *Star Trek*, launched a franchise which included four film sequels (plus one remake), and two television series on CBS. Three astronauts crash-land on a planet and find it populated by intelligent, civilized apes and mute, primitive humans. The apes live in a highly organized and advanced society in which their roles are divided according to their species: orangutans as politicians, gorillas as a military, and chimpanzees as scientists. The arrival of the (seemingly) sole-surviving astronaut, a human who can speak, causes great division amongst the apes. Subsequent movies explore the historical antecedents of the relationship between humans and apes put forth by the first film.

Although based on an inversion of humans and apes, the setting for *Planet of the Apes* is broadly postapocalyptic, with the consequence that neither group is technologically advanced. While the humans seem to persist in a state of stone-age tool-wielding, the apes have a science and an advanced civilization but without a highly developed technology (for reasons that become clear as the series

progresses). Where the technology is not well developed, the social order is highly elaborated.

2.5 The Hitchhiker's Guide to the Galaxy (1981)

Based on a radio comedy show, the *Hitchhiker's Guide to the Galaxy* played on BBC2 for one short, six-episode season in January and February of 1981. Based on the writings of Douglas Adams [1, 2], the show is a tale of a future that seemed remarkably approachable, albeit rife with bureaucracy run amok and a fascination with everyday objects (like the towel). The viewers follow the adventures of Arthur Dent, a displaced Englishman in a bathrobe whose home planet has just been destroyed to make way for a hyper-space bypass, and Ford Perfect, a stringer for the Hitchhiker's Guide to the Galaxy, who comes from a small planet somewhere in the vicinity of Betelgeuese.

The TV show, while subject to the usual underfunding of BBC science fiction, had a wonderful array of gadgetry and computational technology, from the Hitchhiker's Guide book itself, to robots, sensing doors and furniture, the Babel Fish, and the Nutri-Matic Dispenser. The ultimate electronic book and ultra-mobile PC wrapped up into one; the Guide also came with the helpful instructions "DON'T PANIC" in big pink letters on its cover. With the notable exception of the Babel Fish, which arose as a product of evolution and functions as a natural language translator when stuck in one's ear, and the Guide Book itself, the bulk of other technology in the TV show was seen to be produced by a larger multi-planetary industrial complex—the Sirius Cybernetics Corporation. Sirius specialized in, among other things, robots with GPP (Genuine People Personalities), resulting in a show populated by preternaturally perky computers, prescient elevators, sighing doors, and at least one paranoid android. All of this technology responded to natural language, providing seamless, albeit imperfect, service. This show also made much of energy and power requirements of technology objects; in case, the computing power of an entire spaceship required to produce one pot of Earl Grey tea.

3 Themes

The basic strategy that we adopt here is to read a factual scientific project and its publications against a body of fiction. This is an unconventional approach in the scientific literature, but a more common one in the humanities, and particularly in cultural and media studies. So, it is in terms of this body of work (and in terms of the ubiquitous computing community's broad commitment to interdisciplinarity) that this work should be approached. By reading these two bodies of work together, we are not suggesting

that they are equivalent or interchangeable; we want to read ubiquitous computing *alongside* science fiction, not to read ubiquitous computing *as* science fiction. Instead, we want to make two arguments. First, we suggest that a close reading of both bodies of work reveals a series of common ideological strategies by which technological futures are shaped; in that, any consideration of a technological future is inherently also an imaginative figuring of a world in which those technologies will be desired and deployed, even if the imagining is that the world will be just the same as we know now; Nunberg [16] commented that H. G. Wells' imaginative genius lay not in the ideas of time machines and air travel, but rather in the speculation that they would be embedded in a world in which men still wore neckties. Our second argument is that, given this common imaginative purpose, we might usefully look at the science fiction literature in order to find critiques of the relationship between technology and society which may illuminate both the opportunities and the problems that may attend ubiquitous computing technologies. Our interest, of course, is not in these shows per se, but rather in how a reading of them together can point to a series of themes that illuminate contemporary imaginings of the relationship between science, technology, and society. We discuss the themes here, before tying them more directly to the ubiquitous computing agenda in Sect. 4.

3.1 First against the wall when the revolution comes: images of bureaucracy

An instructive contrast between the images presented by the different series is the varying positions on individualism and bureaucracy. Alongside any technology, it is useful to imagine the kinds of administrative and bureaucratic structures that must be introduced alongside those technologies as a means to regulate and manage their use and structure the lives of those making such use. It is notable that stories of personal flying craft common in the 1950s tend to emphasize freedom and efficiency, but tend not to talk about the bureaucracy of flight plans and air traffic control.

Star Trek, with its "frontier" mentality, tells stories of rugged individualism and independence. Kirk is the archetypal rule-breaker. A ship captain operating at the fringes of Federation space, and he is presumably less bound by the Federations regulations than most; it is notable that the appearance of admirals and other authority figures, whether in person or on view screens, is a much more prominent characteristic of later series than it is of the original. Nonetheless, even those rules that do apply are regularly flaunted in the interest of the greater good. It is a regular joke in later series that a rule the protagonists encounter is one which was crafted specifically in response

to an action taken by Kirk long before. If space is "the final frontier," then technology is the tool placed in the hand of individuals who are also accorded the freedom to wield it. That said, even in *Star Trek*'s vision of the future, forms, signatures, star logs, captain's reports, and other manifestations of larger bureaucratic apparatus make occasional appearances, and the Federation's prime directive shapes much of the crew's everyday activities.

In contrast, *Hitchikers*, *Blake's 7* and even *Doctor Who* place much more emphasis on the administrative and bureaucratic structures that continue to underlie everyday life, and which, in the future as well as now, manifest themselves through some combination of arrogant officiousness, mindless tedium, and outright absurdity. Indeed, a great deal of *Hitchhiker*'s plot lines revolve around the twin administrative regimes of the Hitchhiker's Guide corporate headquarters and that of the Galaxy's Vogon apparatchik, and where rationalizations of bureaucratic structure and elimination of mid-level functionaries on the planet of Golgafrinchan results in the untimely death of the planet's remaining population from telephone-borne pathogens. Where the characters in *Star Trek* encounter leaders, chiefs, and villains, the characters in these British shows spend their time with minor functionaries and faceless bureaucrats. While Kirk boldly goes, they stand in line and fill out forms.

While the manifestation of petty bureaucracy within the frame of futuristic societies is often played for comic effect, what we find useful here is the way in which it points out the very erasure of bureaucracy in the "frontier"-mode science fiction visions. It is a useful exercise, perhaps, when a new technological marvel appears on a science fiction show, to inquire into the licensing and credentialing arrangements that might be associated with its use. Does it have to be inspected annually? Must it be tested for its flame-retardant properties? Are there forms to fill out to gain permission to use it, or to requisition new supplies? Are there also left-handed versions? When we imagine a technology, we imagine too the administrative and organizational infrastructure that attends its creation and use.

3.2 Technological breakdown

Thinking about administration and bureaucracy leads us toward related considerations of maintenance and technological efficacy. Again, an interesting distinction between different shows is the question of whether the technology in question works. All of the TV shows with which we are concerned here regularly feature technological failures, many of these failures are spectacular, taking the form of a massive engine failure that jeopardizes the safety of the ship, a computer or robot running amok, a mysterious

problem with weapons, or the breakdown of a planet's defensive grid or climate regulation system—all the sorts of problems that engender both heroism and ingenuity in order to win the day.

In sharp contrast, and of arguably more scholarly interest, are the forms of failure that are less spectacular, more like the moral space equivalent of a flat battery or a run in a pair of tights, than total computer shutdowns. These forms of technological breakdown are manifested in a number of other shows, perhaps most notably *Blake's 7* and *Doctor Who*, where there is a form of persistent, niggling, failure to live up to expectations; devices that operate with creaks and groans, or erratically, or not at all. Perhaps they worked once and are simply aging; perhaps they have broken and lie beyond the power of the protagonists to repair. Again, what is useful here is that these forms of persistent, mundane failure point to the curious ease with which things "just work" in more technologically optimistic shows—and work, what is more, without the kinds of continual maintenance and intervention that we might associate with contemporary infrastructures such as transit systems or plumbing. In part, the differences we note are related to cultural considerations (such as a British "mustn't grumble" attitude versus an American "can do" mentality); again, this underscores our reading these as narratives about science and society.

3.3 Frontier and empire

A further distinct characterization of several of these shows is how they conceptualize the spaces within which action is set as being inscribed within particular modes of governance. If *Star Trek* is a narrative of American frontierism, exploration, and "boldly going," *Planet of the Apes* is quite explicitly a parable of race relations and instability [7], and *Blake's 7* is narrative of decaying empire—again, unsurprising as reflections upon the times when they were produced.

In *Star Trek* (at least, the original series), the focus of attention is the enterprise, operating generally at the limits of Federation influence, engaged in a voyage of exploration and discovery, "boldly going" beyond the previous reach of human endeavor. What is striking is the independence between the enterprise and Starfleet Command; it is not until the later series that we even see the headquarters from which Starfleet's orders and directives issue. *Blake's 7*, by contrast, is not about the edges of empire but about the relationship between those edges and the center—about centers of power, about its flows, about influence and resistance. If *Star Trek's* narrative is about the rise of empire, then *Blake's 7* is about its decline. Indeed, Season 3 of *Blake's 7* ends with the total collapse of the Federation, as it faces "alien" invasion from the far reaches of the empire. Where *Star Trek* focuses on hope and opportunity, *Blake's 7* talks of corruption and decadence.

More generally, what is interesting here is the range of ways that technology, governance, and resistance are coupled together. *Doctor Who* flies through time and space in a broken-down ship that he has stolen, and the cast of *Blake's 7* occupy a succession of "liberated" vessels and bases that they never truly understand, while the Starship Enterprise is the flagship of Starfleet. Technology—or, perhaps more accurately, technological optimism, even utopianism—is linked to the smooth functioning of governmental regulation. Technology use may be a site of resistance, but one's troublesome relationship to forms of power and government is mirrored in an equally problematic relationship with recalcitrant technology. Rebellion means never having to read the manual.

4 Implications for ubiquitous computing

Our goal in turning to this material is not simply to conduct a comparative inquiry into the themes of a range of science fiction shows, fascinating though that may be, but rather to open up a dialog concerning the technological imagination as it manifests itself within pervasive computing research. We have turned to these particular shows for a couple of reasons; most particularly, first, that they set an important historical context for the work of at least a first generation of pervasive computing researchers, and, second, that science fiction provides an interesting parallel to scientific research in the ways in which it thinks about future technologies and the settings in which they will be deployed and used. When we say that we want to use science fiction as a lens through which to consider contemporary arguments about ubiquitous computing, it is not simply to see whether ubicomp technologies succeed or fail in living up to the promises of the future that science fiction has offered. Instead, we want to examine those aspects of the discussion of technologies that manifest themselves in *both* science fiction and ubicomp research, to look at the ways in which contemporary ubicomp research reflects particular themes or tropes from fictive accounts of technological futures and to inquire into those that are missing. In particular, as is doubtless clear from the discussion above, we are interested in the ways in which science fiction—the literary figuring of future technologies rather than the practical figuring of much contemporary research—engages with a series of questions about the social and cultural contexts of technology use that help us reflect upon assumptions within technological research.

4.1 Regimes of surveillance

One example of these considerations is the question of surveillance as it figures in different accounts of technological futures. Of course, the issue of surveillance is raised regularly in ubicomp research, both explicitly in work on privacy and control over information sharing and implicitly in accounts of the infrastructural support for location-based and related systems (as marked, for example, by a 2007 special issue of IEEE Pervasive Computing). However, what we find by looking at even this comparative small number of science fiction television shows is a rather different set of imaginings about surveillance, its practice, and its consequences. It is not simply the case that surveillance is an endemic aspect of all the science fiction accounts we have outlined. The issue is the forms of surveillance, their pervasiveness, and the institutions to whom they are available.

Momentarily leaving to one side the question of the desirability or morality of pervasive surveillance, we note that talking of pervasive surveillance in science fiction allows one to place it in the future and then to suggest that the current environment is one that is not already strongly surveilled. Talking of this surveillance as something yet to be achieved (in support of a ubicomp agenda) allows one to imagine the surveillance environment as a pristine one, one in which new technologies can be introduced without too much concern about existing infrastructures and arrangements. By corollary, the infrastructures of pervasive surveillance in fictional accounts are generally also uniform and stable, rather than the more fractured, contested, and heterogeneous infrastructures of research experience. In a world where little else functions as it should, the closed-circuit surveillance cameras in *Blake's 7* swivel with remarkable regularity.

What we find useful to reflect on here, then, in putting together the ubicomp research and science fiction literatures, is the things that they both leave out of the picture. By focusing on surveillance as something either manifestly not present or stably pervasive, we lose the sense of surveillance infrastructures as continually in the process of becoming, and doing so in complex technological and social environments. The environments into which we might imagine introducing ubicomp technologies of surveillance are ones that are already thoroughly staked out by existing surveillance infrastructures. What is on offer for ubicomp is not to move into a pristine environment, nor to replace and drive out a series of redundant facilities, but rather to live alongside them in a complex jumble of technologies, some old and crumbling, some not yet ready for prime time, some stable but owned and operated by others.

In turn, this brings us to a second question, which is the question of the agents of surveillance. One significant disjuncture that we see worked through in science fiction accounts is the relationship between different institutional entities whom might be engaged in pervasive surveillance for one reason or another. While one science fiction tradition renders to the State the authority to maintain and operate a surveillance infrastructure, the accounts of such infrastructures in the research literature are typically based on commercial entities engaged in market exchange (indeed, in a neoliberal mode, such market regulation is sometimes figured as the most natural way even for state function to be managed.) In part, this is connected to the remarkable absence of any discourse about state entities in ubicomp at all [3]; and see below. What we want to point to here, though, is the organizational and institutional complexity of the kinds of fragmented, contested, heterogeneous, and unstable infrastructures to which we drew attention a moment ago. For instance, while the presence of CCTV cameras blanketing central London or Manhattan is well known, the organizational complexity of that as a "surveillance infrastructure," given the many different organizations and administrative domains involved, raise significant questions for any kind of "ubiquitous" or "pervasive" account of computing. By placing the science fiction accounts alongside the ubicomp research accounts, we begin to see the ways in which they both present only one part of the picture.

4.2 The Federation—putting the state into ubicomp

Running through the 5 television shows with which this paper is concerned is strong senses of power, and the lines of its transmission. Many individual episodes concern themselves with issues of power: relationships of inequality and inequity, resistance to authority, execution of its orders, or outright refusal to capitulate to authority figures, or institutions all figure in the story lines. According to Terry Nation, for instance, *Blake's 7* was really about a "little guy against City Hall" [14]. In *Blake's 7*, the center of power, "City Hall", or the (Terran) Federation, is stellar regime with centralized control on Earth, and a fluid empire of colonized planets held together by an aging and increasing fragile information and transportation system. It is pictured as fascist, corrupt, and ultimately pursuing an immoral agenda of domination and control facilitated by the use of pacification drugs—the iconographic shorthand for the Federation was always a closed-circuit surveillance camera, an armed solider (with full face mask), and blank faced citizens [14]. It is a conscious rebellion against this Federation that motivates the story lines of *Blake's 7* and that frames much of the action in the show. In *Star Trek*,

power and authority are also centered in the Federation (the United Federation of Planets) which is conceived as an interstellar federal state with more than 150 member planets and thousands more colonies—perhaps a reprising of the United Nations, as much as the United States. In *Star Trek*, the Federation is always portrayed a strong force for social good—with a stress on such values as universal liberty, peace, quality and cooperation and a clear prime directive. These values help set the larger agenda within which the crew operates and are instructed, and provide a clear backdrop against which to read the array of new technologies with which Kirk and his crew are equipped.

In either incarnation—democratic or totalitarian—the importance of the Federation to the telling of the story should not be under-estimated. Indeed, we would argue that all the shows with which we are concerned turn on the relationships between the major protagonists and some larger judico-political body (as one might argue are many more not included within this paper). Of course, this judico-political body takes many different forms—the Federation in *Blake's 7* and *Star Trek*, the Vogon Construction Fleet and Vogon bureaucratic representatives of the Galaxy in *Hitchhiker's Guide to the Galaxy*, the primate rulers of Soror and the Time Lords in *Doctor Who*—as does the structuring of the relationship and interactions—rebellion, resistance, distain and distance, whole-hearted embrace or governing body. The presence of a "Federation"-like body is a critical to the business of doing science fiction—they provide an anchor point for the narrative, but also a larger contextual framework within which to interpret the action and the role of the technologies in that action.

The larger judico-political bodies are for the most part, "states" of one form or another. Anthropologists (and other social scientists) have long been concerns with ideas of the nation-state [6, 12] and with the special methodological challenges studying them might entail [13, 15]. In anthropological theory, states are seen as important social actors [8, 9], as collections of competing agendas, personalities and vested interests [24], as a form of cultural practice [26]; and as framers of both the moral economy but also the terms of resistance to such moral economies [19]. Yet any of these notions of states or judico-political bodies are largely absent from the ubicomp literature and activity. Indeed, one might go as far as to argue that some of the current pre-occupations with young or older users is tacitly anti-state, suggesting as it does that old people all over the world have more in common with each other than with others of different life stages inside their own nation-states.

So, what is being erased here, when the state falls out of our conversations about technology and new technology developments and deployments?

4.3 Equality, diversity and the Other

A further consideration that emerges from the juxtaposition of these two discourses is a complex set of questions about equality, diversity, and other-ness.

Several of the shows we have discussed were written with explicit intent to comment on aspects of contemporary society, and often quite particularly questions of ethnic integration and race relations. This was an explicit concern of the writers of the *Planet of the Apes* movies, who saw their work as very directly commenting upon contemporary racial issues in the United States, writing as they were at the time of fights for civil rights and integration, race rebellions in Watts, etc. [7].) Similarly, *Star Trek's* commitment to equality—one of the central values that creator Gene Roddenberry wanted the show to espouse—is reflected in the bridge crew of the enterprise—multi-ethnic, gender-neutral, with a Russian crewmember at the height of the Cold War, and even a (somewhat token) non-human. Indeed, the Federation, throughout the franchise, is continually presented as concerned with unity, equality, and integration. The limits of this integration and equality, though, are continually tested and seem to be based largely on a collective commitment to a technology-driven, secular-humanist philosophy strongly recognizable not only as distinctly human but as a distinctly Western, twentieth-century vision of enlightened governance. Given the context, this is hardly surprising. However—and again, for one moment, putting aside questions of desirability and the moral force of this vision—it is a useful point at which to think about the ways in which equality and difference are constituted in both the fictional and research narratives around certain forms of technology adoption. Technology is not independent of the values being expressed; indeed, it is what enables those values (Picard comments explicitly in *Star Trek: The Next Generation* on the link between replicator technology, the death of money, and wars or strife over material goods.) Sameness, partnership, and participation are based on a common commitment to the forms of technology; and by corollary, alterity is characterized not least in terms of asymmetric views of technoscientific humanism. Indeed, the reason that Starfleet's "Prime Directive" (not to interfere in the development of other species and cultures) has any kind of dramatic force in the writers' hands is precisely because the one truly Alien characteristic is *not* to adopt technology for social good.

This erasure of difference, and the enshrining of equality in diversity on both a large scale (planetary Federations) and a small scale (ship-board conferences) again lies in contrast to the product of British shows written by a generation who had lived through the end of Empire. Similarly, the sub-genre of postcolonial science fiction— science fiction written by the peoples of former colonial

outposts (e.g. [11]—evinces a rather different perspective on the structures and processes by which equality is managed as a daily event in the encounters between peoples.

We have argued above that much technological research implicitly substitutes a globalized market capitalism (such as that of the Sirius Cybernetics Corporation) for the institutions of the nation-state, looking to technology to erase a series of boundaries—geographical, political, ethnic—that seem irrelevant to the technological enterprise (or more broadly to the human enterprise.) The postcolonial critique of science fiction utopianism draws our attention to the fact that discourses and practices of equality do not themselves happen on level ground, and we argued a moment ago that it is important to consider, in our research endeavors, what nations and states do, as both political entities and objects of collective imagining. What we see here though is that it is fruitful also to consider the ways in which those notions of equality, difference, and other-ness play out on a smaller scale, in individual interactions and encounters, and the ways that a technological liberalism should not be imagined as the absence of cultural distortions and imbalances, but as hegemonic itself.

5 Conclusions

We have been drawing here on a series of thematic resonances between contemporary research on ubiquitous computing and accounts of technology and society in science fiction. The arguments we have presented to do not, we believe, require that our account of the science fiction literature to be comprehensive or representative, and we do not make any such claims here. That effort would be beyond the scope of this paper. Instead, we hope to open up a conversation to which others may want to contribute. We have been highly selective, then, in both the science fiction upon which we draw and in the arguments that we draw from it. The fact that particular—even highly influential—pieces of the science fiction corpus is, we hope, an opportunity to develop these arguments in new directions rather than an omission or a failing of those that we present. More broadly, we hope to have illustrated a productive approach to examining not just the properties and consequences of emerging technologies but their ideological commitments.

By the conventions of technical publications on ubiquitous computing, the themes we have identified may seem remote. Questions of statehood and alterity are not ones we normally pose when thinking about our technological infrastructures. This is not to say that they seem wholly irrelevant to the research agenda, but rather that, by and large, we tend to see them as issues that are not *yet* relevant. Technological problems—problems of power

management, calibration, secure data exchange, user interface design, location sensing, and so forth—are problems for today, and problems of cultural context are ones that come into play later, once our technological infrastructure rolls out into the world. However, what we have tried to show here is that these questions are ones that arise not in the deployment of technologies but in the imagining of them—an imagining that arises before design. Wittgenstein argued that to imagine a language is to imagine a form of life; we might make the same observation about imagining technologies. Cultural questions, then, are *prior* to, not consequent to, design practice. The kinds of questions we have raised then are not, we would argue, remote ones that we have yet to encounter; they are ones to which, as a research community, we have already committed ourselves.

To take a simple example, consider the provision of location-based services on handheld and portable devices, a common focus of attention in pervasive computing research. Various research groups have noted the privacy implications of different approaches to location monitoring (principally to do with whether a device's location must be reported to a central infrastructure or to other users in order to achieve localization), and also looked at the strategies by which a user might take control of this information and its reporting. These are important considerations but at the same time, we would note that the very figuring of this as an act of decision-making prespecifies a context of, for instance, commercial exchange with a service provider in the presence of market-based decision making. Questions, then, of individuality and the nature of one's relationships to others, to commercial entities, and to states, and questions of responsibility for ensuring the accuracy, provenance, and protection of data, and questions of the rights to particular forms of spatial representation are *already figured* by a technological solution. Our goal here, then, is not to point out the "implications for design" that follow from some understandings of the social; it is to point out the implications for cultural embedding that are already inherent in design.

Our investigations here have been tied to specific topics that emerge in the set of shows that we have chosen to examine. As we have worked through various topics, we have explored the potential consequences for pervasive and ubiquitous computing research, but taking a step back, there are two larger conclusions to be drawn from the material we have presented—one methodological, and one conceptual.

Our methodological conclusion is that there is value in a close reading of research texts. Much of the conceptual work to be done in an enterprise like ubiquitous computing is to defamiliarize the contexts of technology development and use so that we can reflect upon underlying, and often

implicit, assumptions that constrain our thinking. What we have attempted to demonstrate here is that by reading the ubiquitous computing literature against science fiction literature, and by examining these two different yet related ways of conceiving of the relationship between science and society, we can cast light upon the contexts in which technology is deployed and the narratives that motivate specific sorts of designs—narratives of progress, individualism, surveillance, etc. Reading the research literature as in some ways "fictive" is not intended to denigrate or dismiss it; rather, we want to draw attention to the ways in which both science fiction and the research literature are founded upon acts of collective imagination and that any imagination of a possible future is grounded in expectations, frustrations, and understandings of the present. One might go so far as to suggest that this is not simply a reading of scientific practice alongside popular culture, but rather a recognition that scientific practice cannot be entirely separated from the popular culture upon which it draws and to which it contributes.

On a conceptual level, what we have found through looking at these readings is that the character of technology use is strongly shaped by cultural and institutional arrangements. Since this seems like a facile conclusion, let us state it a different way in order to draw attention to its import. It is not the case that some technological descriptions focus on social context and some do not; any description of a technology is always already social and cultural. Nor is it the case that social and cultural forces come into play after a technology is deployed, shaping its diffusion and appropriation; rather, social and cultural are already thoroughly implicated in how a technology is imagined and designed. So, the distinction we might draw is not between research that involves social and cultural factors and research that does not, but rather between research that acknowledges these factors and research that suppresses, ignores, or denies them. Ironically, what we achieve through an engagement with science fiction is a series of reminders about scientific fact.

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