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THE RACE FOR CYBERSPACE: Information Technology in the Black Diaspora

RON EGLASH AND JULIAN BLEECKER

Barbara Christian's (1987) seminal essay, 'The race for theory', analyzed the ways in which the academic competition to create a theory of black women's writing had overshadowed the potent theoretical content of the writing itself. Similarly, this essay examines how the hype over the application of new information technologies to racialized social problems has overshadowed the potent technological content of the communities themselves. Focusing on the black diaspora, we broaden the category of 'information technology' to show how traditions of coding and computation from indigenous African practices and black appropriations of Euro-American technologies have supported, resisted, and fused with the cybernetic histories of the West: a potential source for changes in reconstructing identity, social position and access to power in communities of the black diaspora.

■ ANTI-RACIST TECHNOPHILIA

Those of us who love both people and machines are often seen as traitors to both sides of the 'science wars', and are besieged by demands that we choose between the two. On the one hand, many of our political colleagues seek portraits for the technological underpinnings of race, gender and class domination. On the other hand, many of our technological colleagues seek culture-free portraits of technological progress and prowess. How can we approach science and technology in ways that simultaneously honor both a radical political critique and a technophilic jouissance?

Let's begin with the early 1990s, when the Internet was flooded

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with various versions of the 'cyberspace manifesto', most of which contained something like this passage from John Perry Barlow:

Ours is a world that is both everywhere and nowhere, but it is not where bodies live. We are creating a world that all may enter without privilege or prejudice accorded by race, economic power, military force, or station of birth (Barlow, 1996).

It might be easy to write off such declarations as uninformed optimism, were it not continually echoed by computer experts such as the MIT Media Lab's Nicholas Negroponte: 'While the politicians struggle with the baggage of history, a new generation is emerging from the digital landscape free of many of the old prejudices' (Negroponte, 1995, p. 230). To those gasping for breath in the ozone-rich atmosphere of superlative cyberspace promises, the crucial question is not necessarily why outrageous promises are offered, but rather precisely how do such promises sustain themselves against their own speculative appearance? How do the utterances of scientists, engineers, hucksters and marketers literally move and shape worlds, channel flows of institutional funding, and exert enormous influence in shaping the meaning of life? How is it that such claims are offered and sustained? And how, in the midst of our critique, can we do justice to our frank pleasure in the cybernetic gadgets, information spaces, and cyborg bodies of the wired world?

In the science-studies idiom, technoscience is considered to be that body of knowledge and practice that links representation to intervention, maps strategies for taking action, and encapsulates the skill and technique that evacuates the social and political from itself.¹ As such, contesting its claims to truth as socially contingent proves quite difficult, although hardly impossible. One cannot merely say that the knowledge it produces is 'not so'. So well entrenched is its status as the purveyor of truth that finding the loopholes, the regions of possible contestation, is an arduous process, requiring sustained investigation and intimate knowledge of the practice of technoscience.

We can take solace in our knowledge that the worlds which technoscience makes are not the only possible ones. Popular film, particularly of the science-fiction genre, is one arena wherein other worlds are created and explored. Film is particularly useful in considering what technoscience is, insofar as film makes plain the

linkages between representation and action, between image and metaphor and their effects: this is homologous to technoscience, to the extent that the representation of artifacts is what makes possible their role as actors that can change the world.

Trucage is Christian Metz's expression for cinematic techniques that trick the spectator's eye. The correspondence between trucage and technoscience is that they are both crafted and 'made' artifactually, cobbled together with extraordinary ingenuity, skill, and savvy in an effort to produce the appearance of 'reality'. On the side of the trucage, it is the cinematic apparatus at the level of film production and related technical considerations that must not impinge upon the spectator's enjoyment of the filmic narrative. The expression of this cloaking is revealed when 'the wires are removed'. This is a reference to a concrete practice in trick cinematography whereby a system designed to support a motorcycle making a jump from a height that exceeds margins of safety, for instance, uses metal wires of such gauge that they do not appear on film.

Curiously though, film buffs and film makers alike delight in just such exposures, such as *The Making of Jurassic Park*. Here we are shown in extraordinary detail the secret procedures, cloistered and cubicled artists, and the high-tech machines used to sustain the imperceptible special effects. Industrial Light and Magic, the normally clandestine, top-secret agency responsible for blockbuster special effects production, is cracked open, revealing the wires and pulleys that conjure the *Jurassic Park* magic.

Given the back-stage look of how *Jurassic Park* is done, to what extent is the film's drama un-done? Does revealing the artifice of *Jurassic Park* destroy the credibility of the film's drama? Of course not. It is as if film production is aware of its own artifice, of the craftwork that goes into producing appearances of the 'really real', so that the film sustains such appearances during its viewing. Afterwards, one may derive enjoyment in finding out how it was all done. But this is not just a strategy to awe the ardent film buff and further reap the financial rewards attendant to a major motion picture; it must also be seen in this context as a mode of self-criticality, a kind of self-reflexive and ironic attachment to one's work that is nigh absent from the work of technoscience.

It might seem as though a heavy dose of pessimistic social analysis would be just the thing needed to expose the wires of

cyberspace hyperbole, but doing so would merely produce the optimist's mirror image, a demonology of technoscience filled with passive victims and a nostalgia for romantically organic peasants and savages. While the trucage of cyberspace liberation depends on its claim that technological advances eliminate the need for social movements, it is equally dependent on the claim that social movements make no contribution to technological advances.

It is this second illusion that we seek to expose in this essay, focusing on what Paul Gilroy (1993) calls 'The Black Atlantic'—that is, the cultures created by a lengthy history of African encounters and exodus, here referred to as the black diaspora. A technoscience trucage might portray these black communities as waiting in misery while information technology comes to the rescue. Instead we invite the reader to come backstage to examine the unacknowledged traditions of coding and computation from indigenous African practices and black appropriations of Euro-American technologies, their fusion with cybernetic histories of the West, and their role in constructing identity and access to power.

■ INFORMATION TECHNOLOGIES—MASTER'S TOOLS OR INDIGENOUS INVENTION?

The appropriation of technology by marginalized groups has always been an important component of resistance, and its significance in the black diaspora all the more so because of the extremes in brutality, subjugation and geographic scope. As Michael Adas notes in *Machines as the Measure of Man* (1989), technological superiority provided justification for the mythology of genetic differences in intelligence, the means of domination, and the colonial relation which restricted Africans to the position of laborers. But it would be misleading to write a history of technological appropriation in the African diaspora as a simple path of resistance and revolt.

Writing in her collection of essays *Sister Outsider*, black feminist poet Audre Lorde's (1984) title warns us, 'The Master's Tools Will Never Dismantle the Master's House'. She exhorts us to build resistance through rebirth—not appropriating the tools of our opponents, but rather rediscovering our own. Of course, this approach can be taken too far; for example one black university professor has

claimed that since writing is a European invention, it is therefore unsuitable to black cultural expression.

Nevertheless Lorde's warning well describes the disastrous technology mis-matches in socio-ecological disasters such as high-yield variety rice (which required renting motorized harvesting equipment and special fertilizers), or the post-colonial catastrophes in which African governments poured bank loans into gigantic prestige projects, such as Nkruma's steel mills, which then became useless due to the lack of infrastructure. Lorde's caution also reminds us that appropriation does nothing to counter primitivist ideas; in fact it supports the myth that Africans had to 'borrow' all science and technology from Europeans.

This myth is particularly ironic in the case of information technologies, given that the binary code appears to have a distinct African origin (Eglash, 1997a). The modern binary code, essential to every digital circuit from alarm clocks to super-computers, was first introduced by Leibnitz around 1670. Leibnitz had been inspired by the binary-based 'logic machine' of Raymond Lull, which was in turn inspired by the alchemists' divination practice of geomancy (Skinner, 1980). But geomancy is clearly not of European origin. It was first introduced there by Hugo of Santalla in 12th century Spain, and Islamic scholars had been using it in North Africa since at least the 9th century, where it was first documented in written records by the Jewish writer Aran ben Joseph. The nearly identical system of divination in West Africa associated with Fa and Ifa was first noted by Trautmann (1939), but he assumed that geomancy originated in Arab society, where it is known as *ilm al-raml* ('the science of sand').

The mathematical basis of geomancy is, however, strikingly out of place in non-African systems. Unlike Europe, India, and Arabic cultures, base 2 calculation is ubiquitous in Africa, even for multiplication and division. Doubling is a frequent theme in many other African knowledge systems, particularly divination. The African origin of geomancy—and thus, via Lull and Leibnitz, the binary code—is well supported.

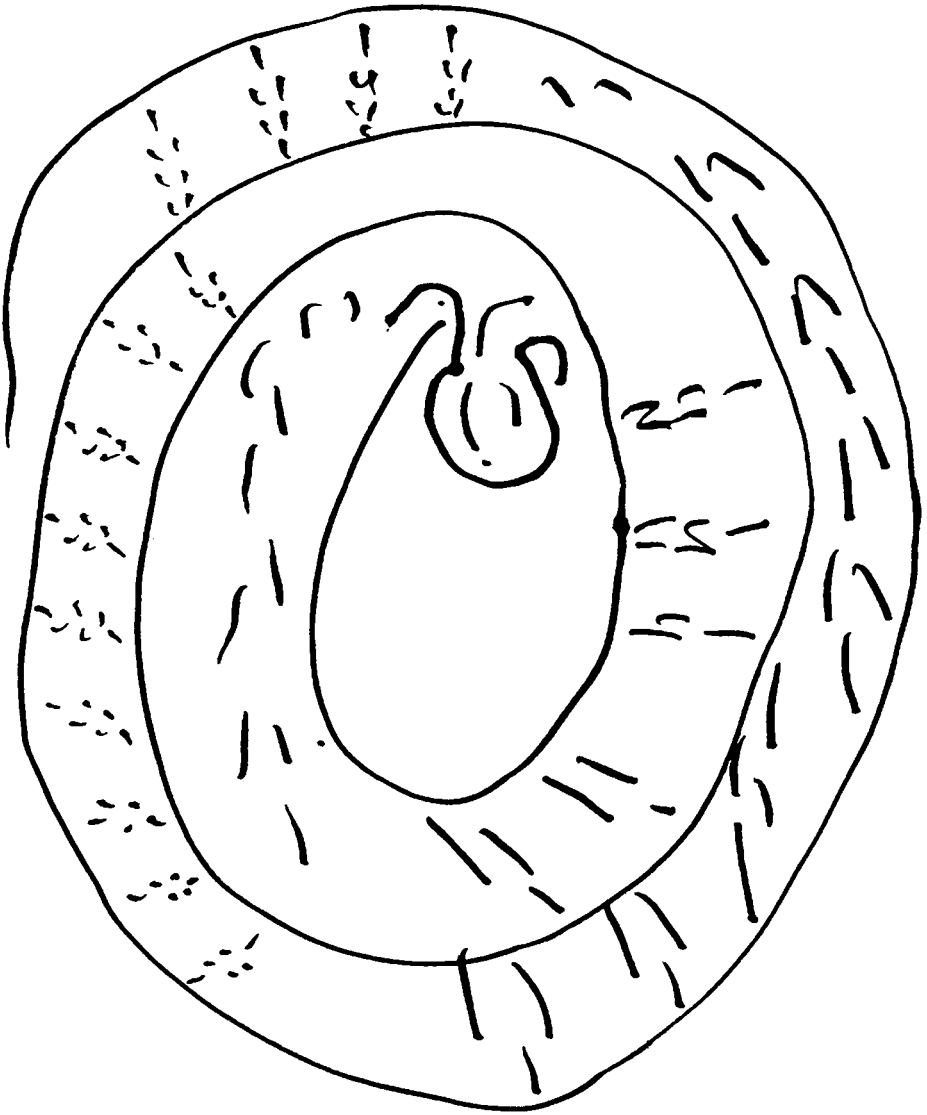
Other indigenous African information technologies include computational aspects of Owari, geometric algorithms, and the codes of drums and whistle languages (Ansu-Kyeremeh, 1998; Eglash, 1999). Thus, when examining the appropriation of technology, it is important to consider not only the down side of appropriation—the possible

disadvantages of attempting to ‘use the master’s tools’—but also the fact that Africans already had many technologies to begin with, and thus some of the supposed appropriations may have had African influences in their own histories of invention.

■ ANALOG REPRESENTATION IN INDIGENOUS AFRICAN KNOWLEDGE SYSTEMS

While binary coding is widely used in African divination systems, there is also an extraordinary pre-colonial utilization of analog representation. Unlike digital representation, which is based on physically arbitrary signals, analog representation is created when variation in the physical structure of the signal is proportionate to variation in the information structure it represents. In a digital medium, like a CD-ROM, music is encoded as a series of binary digits, strings of ones and zeros represented by long bumps and short bumps in the aluminum layer of the plastic disk. But in an analog medium, like a record player (phonograph), the waveforms we see in the vinyl grooves are proportionate to (that is, tiny models of) the waveforms we hear in the air. Analog systems are not necessarily ‘old-fashioned’ however, since contemporary cybernetics includes neural net computation, nonlinear phase space analysis, and other sophisticated, cutting-edge technologies that are forms of analog representation.

Indigenous African analog representational forms are closely related to two pervasive cultural traditions: music and animism. Animism is a religion in which the life force that sustains living beings can be transferred to other systems—organic, inorganic, or mixtures of the two—often by sacrifice. Bamana divination priests have diagrammed this force as a spiral waveform, marked by their binary code and emanating from the sacrificed life (Figure 1). A vodun priest in Benin provided a similar interpretation for the helix in Figure 2, the royal memorial staff of King Ghezo (1818–1858). He told a story in which Ghezo defeated a buffalo by grabbing his horns with his hands, and explained that the royal staff showed this animist *puissance* (power) flowing between his hands. Blier (1995) notes that such representations are closely related to images of the umbilical cord, as a symbol of the life force. As in the case of the Bamana waveform, this power in vodun is closely associated with communication. The power of the ancestors to solve particular



Drawing by divination priest in Dakar, Senegal.

Credit: Photo by Ron Eglash.

problems, for example, can be released if they are dancing the appropriate dance, so the use of particular drum patterns in vodun rituals is actually a communication system with the dead.

Visualization of these waveforms can be quite sophisticated, as shown in Figure 3, a textile from the Ijebu Yoruba which they

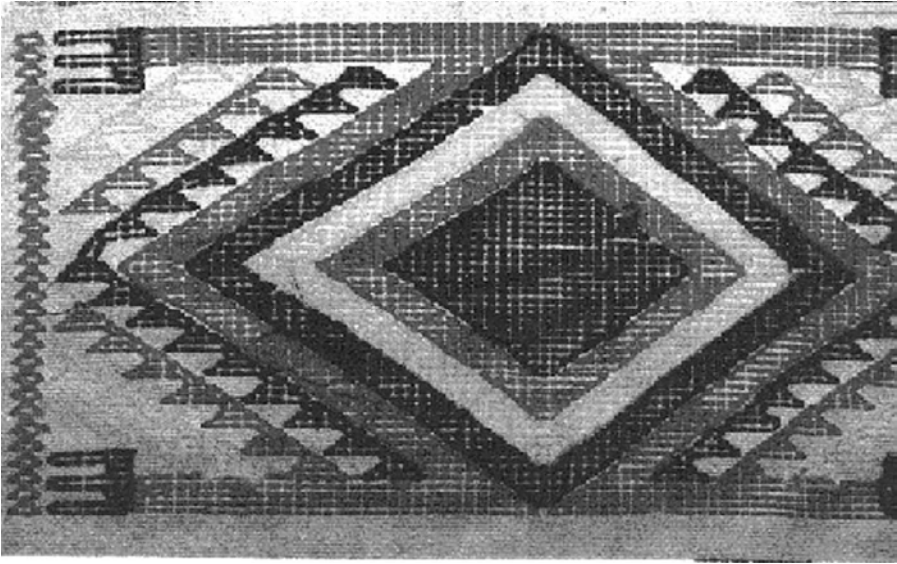


Iron sculpture showing hands holding a wave.

Credit: Reproduced with permission from IFAN, Dakar.

describe as the pattern of movement made by the drum membrane when it is struck (Aronson, 1992, p. 56). In European mathematical physics these are known as Chladni patterns, and they have been an important source for the development of theories of waves and vibrations (Waller, 1961). Concepts of phase relations are also evident in African textiles, such as that of Figure 4. Robert Farris Thompson (1983, p. 207) describes such patterns as a visualization of ‘the famed off-beat phrasing of melodic accents in African music’, noting that indigenous terminology used to describe these strip cloth weavings makes explicit use of musical analogies.

Jola musicians in the Casamance region of Senegal also report striking indigenous terminology, distinguishing between oscillation



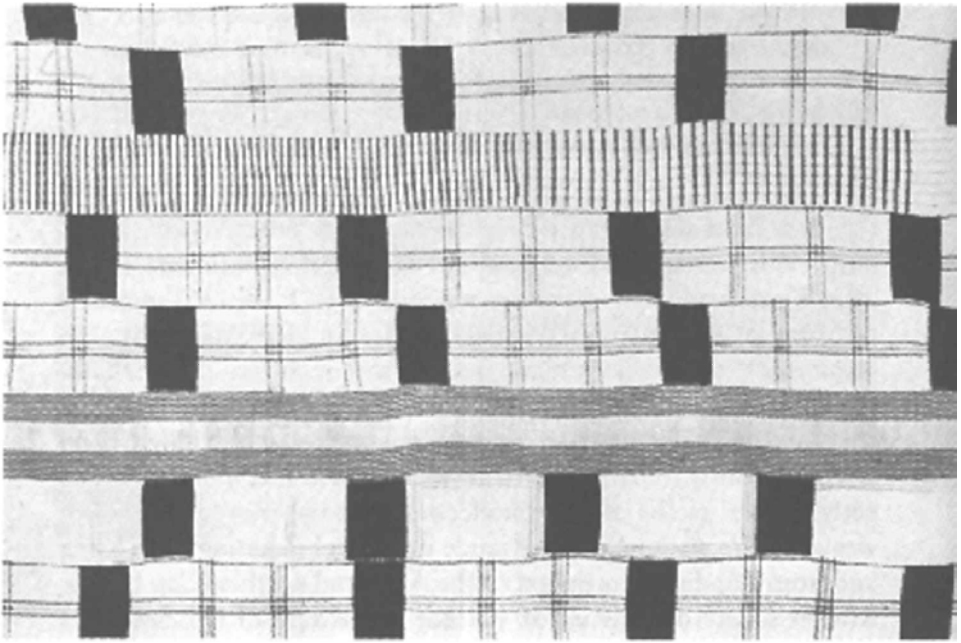
Yoruba textile.

Credit: Photo by Lisa Aronson. Reproduced with permission.

(‘owowogene’, which applies to both instrument strings and the way that palm trees sway in the wind), resonance (‘ebissa’, in which a plucked string can cause a nearby string tuned in harmony to vibrate), and pitch. The pitch terms are inversely linked to owowogene, such that high frequency (‘chob’) is said to have short owowogene, and low frequency (‘xi’) has long owowogene; thus an indigenous counterpart of the Western equation $\omega = 1/e\lambda$. In other words, frequency is the inverse of wavelength. Figure 5 shows a possible² visualization of this understanding from indigenous musicians in Cameroon, a double flute in which a short wave is etched into the high pitch pipe and a long wave is etched into the low pitch pipe.

Movement is also closely linked to the indigenous understanding of these analog waveforms, as most vividly portrayed in dance, where resonance, hysteresis, feedback, and phase relations are used to provide visual analogs for social dynamics (Chernoff, 1979; Kozel, 1997). Such traditions are quite old in Africa; even ancient Egyptian images often show movement as an oscillatory waveform in time (Figure 6).

How can we think about these indigenous technologies in relation



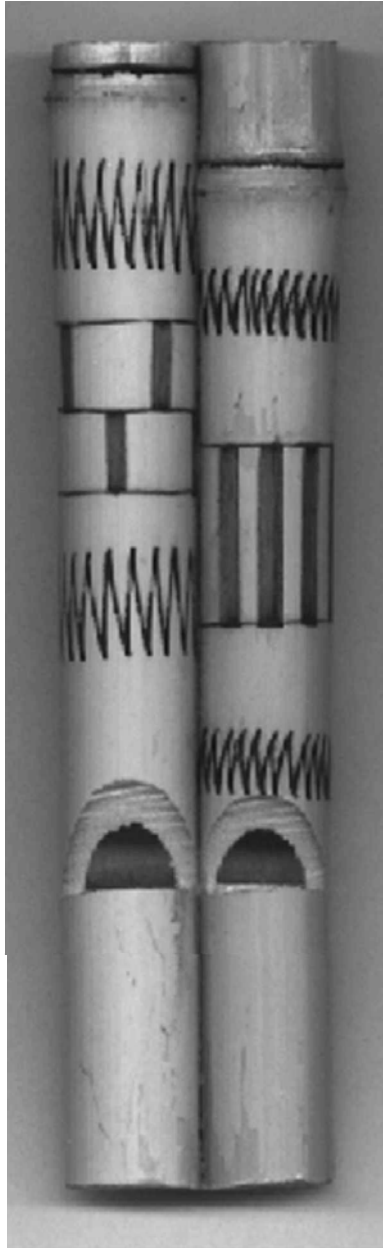
Mande-influenced Akan cotton multistrip cloths.

Credit: Reproduced with permission from Thompson (1983).

to contemporary cyberspace? Black cultural connections are often made by corporations seeking to add an exotic gloss. For example, 'Voodoo Graphics' (tm) is a chipset manufactured by the 3Dfx corporation, and the 1997 Intel MMX ads featured a 1970s funk ambiance. But this is appropriation in the wrong direction for anti-racist technophiles; indeed, Intel deleted the line 'white boy' from the Wild Cherry tune used in the MMX ad's background music. One way to guard against such hegemonic slippage is to seal off the borders to 'cyberspace proper', as attempted in Silver's critique of Dery:

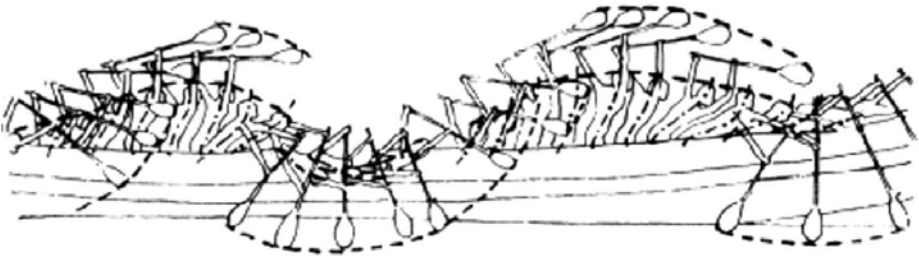
Although Dery's book explores interesting issues surrounding Internet identities and communities, it also includes chapters on Mark Pauline and Survival Research Labs and tribal tattoo artists. While the book is interesting, it is difficult to ascertain what is cyber about tribal tattoos (Silver, 1996).

We can appreciate Silver's efforts to create a disciplinary identity for cybercultural studies, and indeed his writing includes a strong

**Flute.**

Credit: Photo by Ron Eglash.

anti-racist critique. Yet the move to separate ‘official’ cybernetic technologies from those of vernacular street artists or indigenous



Credit: Reproduced from Badaway (1959).

cultures is troubling. Rather than a border guard with bigger walls and less leaky dams, we need better linkages, ones which allow flow against the hegemonic current.

■ AFRICANISMS IN AMERICAN INFORMATION TECHNOLOGY

In the 1940s a debate raged between Melville Herskovits, who had documented the cultural retention of African traditions in the Americas, and E. Franklin Frazier, who argued that slavery had caused American blacks to be 'stripped of their social heritage'. Phillips (1990), reviewing this debate and its contemporary legacy, suggests a synthesis, noting that in addition to Africanisms among blacks, there are African cultural influences among white Americans, non-African cultural legacies of slavery among black Americans, and various syncretic mixtures of all three. Phillips' interest in de-racializing cultural heritage is particularly appropriate to the history of information technology, where such mixtures can thrive, recombine, and mutate in ways unpredicted by static social codes.

**Helical drill bit.**

Credit: Sketch by Ron Eglash.

Figure 7 shows an iron drill bit created around 1821 by Old Solomon, a ‘Negro blacksmith’ in Natchitoches Parish, Louisiana. Christian (1972, p. 23) notes that this double helix is ‘reminiscent of a piece of sculpture out of African ancestor worship’. Indeed, the geographic areas that Christian notes as origins for most slaves bought for iron work—from present day Benin to Angola—do have helical sculptures; usually in reference to the umbilical cord as a symbol of life (e.g. Swiderski, 1970, Fig. 12).

What would such cultural and technological syncretism mean to the enslaved blacksmith who created this? Under such circumstances survival itself is an act of resistance. And this is true not only for physical survival but also for cultural and technological survival. Taking a line from poet Audre Lorde, 'never meant to survive' became the title for Aimee Sand's interview with Evelyn Hammonds, a description of Hammonds' experience as a black physics graduate student at MIT. In his aptly titled essay, 'Tools of the Spirit', Alton Pollard reflects on Africanisms in American slavery:

It is of course a given that the demeaned and oppressed will develop strategies of subversion, resistance, even armed combat against those who persecute them. But always, beyond the immediate goals of liberation, they also strive to create other images—cultural signposts, hope-filled intimations of a more just and humane world (Pollard, 1996, pp. 1–2).

Africanisms in American culture include many of the indigenous African technologies, such as waveform representations in textiles, numeric and symbolic doubling, scaling geometries in hairstyles, and animist concepts of spiritual energy embedded in artifice (contrary to the Western stereotype that animism is 'nature worship'). If we examine the work of African-American scientists such as Benjamin Banneker, George Washington Carver, and Ernest Everett Just, we can often see possibilities for African cultural survival in their technological work (Eglash, 1995, 1997b). Ernest Everett Just (1883–1941), for example, is often cited in social studies of science because his social critique of the 'master-slave' model for nucleus-cytoplasm interactions motivated his discovery of cytoplasm dynamics (e.g. Hess, 1994). But these descriptions often overlook the possibility of African influence. Just grew up on James Island, South Carolina, where the black population still spoke Gullah (a mixture of English and west African languages), and had retained a wide variety of African customs and traditions (Manning, 1983, p. 15). Just's work was not just a critique of nucleus versus cytoplasm, but also digital versus analog: information transmitted by the genetic code versus information transmitted by the propagation of biochemical waves through the cell. In his technical writing, Just used an analogy to music to describe how such analog waveforms could carry inform-

ation. In his private communication to anthropologists (including Melville Herskovits, who came to Howard University at Just's invitation), Just remarked that music offered the best case for African cultural retentions in American blacks. There was a strong resemblance between the information waves in Just's scientific models and those he heard echoing across the middle passage.

■ INFORMATION TECHNOLOGIES AND AFRICAN-AMERICAN IDENTITY IN THE MODERN ERA

Just's work did not remain isolated; G. Ross Henderson brought his framework to the scientific community in a form that would later become General Systems Theory. This is part of a longer history in which more subtle influences from black culture were also at work, informing, contesting and appropriating mainstream technologies. Historian Rayvon Fouché, for example, has described the ways in which black inventors used both social and technical strategies to get around Jim Crow restrictions from patent rights. Fouché (1997) notes that Granville Woods (1856–1910), inventor of the Synchronous Multiplex Railway Telegraph, developed expertise in patent interference claims to counter corporate attempts to use his race to cheat on contracts.

Technology has often served as a sign of white privilege, and it is no surprise that black fiction often played with new visions of technology. In 1938 African-American journalist George Schuyler published *Black Empire*, a science fiction in which a black revolt of 'intellectuals, scientists, and engineers' includes a black biologist named 'Ransom Just'. Even black literature not typically considered science fiction, such as Ellison's *Invisible Man* or Bambara's *Salt Eaters*, often have strong technological themes.

Science fiction is also credited by some black scientists as playing a pivotal role in their dedication to technological careers. Derek Harris, the president of the first black-owned computer company, recalled that the *Mission Impossible* character 'Barney Collier', an African-American electronics wizard, was a major influence in his childhood fascination with technology. There is, of course, a big difference between black science fiction, and black characters in science fiction written by white authors. Samuel Delany makes this point in an interview where he rejects the figures of the 'Rastas' in

Gibson's *Neuromancer* as providing an oppositional political stance (Dery, 1994, pp. 194–197).

And it is worth keeping in mind how those fictional roles are filled. On popular television during the 1960s, for example, we saw technologically adept black characters restricted to the roles of 'communications officer' (read secretary?)—as in the case of Greg Morris' Barney Collier in *Mission Impossible*, Ivan Dixon's 'Sgt. Ivan Kinchloe' in *Hogan's Heros*, and Nichelle Nichols' 'Lieutenant Uhura' in *Star Trek*. But when Nichols announced that she was planning to leave the show at the end of the first season, she was confronted by none other than Dr Martin Luther King Jr, who told her 'you cannot leave ... you have opened a door that must not be allowed to close'. Decades later, the first African-American woman in space, Dr Mae Jemison, credited Nichols with her early aspirations towards space.

While the intertwinings between black popular culture, science, and science fiction are an important part of this story (and often disregarded by the 'minorities in science education' efforts), the success of African Americans in information technology is hardly a matter of easy dreaming. Best known is probably John P. Moon, a Silicon Valley engineer who dedicated years to studying memory storage systems. His work culminates in what is still the most popular transportable storage medium in existence today, the 3.5" floppy disk. At the other end of the high-tech/low-tech spectrum, black appropriations of information technology by members of economically disadvantaged communities have often utilized a bricolage of cast-off hardware, as described in this 1995 message from a DJ at KPOO radio in San Francisco to the listserv for the National Urban League:

The folks working with the Save Mumia Committee utilized CDs, ISDN lines, the Internet, laser printers and faxes to quickly spread information about Mumia's case that would have cost tens of thousands of dollars if done using traditional means of organizing (printers, newspaper ads, phone trees). ... [W]e have found that the biggest thing keeping technology from marginalized communities are the myths that the technology is expensive and hard to use. It's not in the best interest of the computer industry, trying to make a buck

off of everyone having the biggest and fastest computer, 600 × 600 dpi laser printer and ... T-3 links. [We need] to let people know that they can successfully get on line free with an XT, 2400 baud modem and an inexpensive dot matrix printer. This is what I'm using right now and my whole setup cost less than \$75, and it's not hard to find people willing to give away XTs or 286s. The San Francisco Public Library offers free, text-only Internet dial-in access and the San Francisco *Bay Guardian* has free e-mail service. However you won't hear about this in the computer press. ... The key is getting the word out and making low-cost on-line communications as accessible in the hood as Old English and St. Ides.

■ POSTMODERNITY AND THE AFROFUTURISTS

If television in the late modern era turned technologically adept African Americans into the black secretary, the postmodern equivalent would have to be the black cyborg. This includes LeVar Burton as Lt. Geordi LaForge from *Star Trek: The Next Generation*, Philip Akin as Norton Drak from *War of the Worlds*, and Carl Lumbly as Dr Miles Hawkins from *M.A.N.T.I.S.* Like the double-edged status of 'communications officer', there are both advantages and disadvantages to this position. On the negative side, one might cynically read this as a diversity two-for-one (you get both a disabled character and a black character in one blow). More ominously, one wonders if the figure of a technologically empowered African-American man (there are apparently no female black cyborgs) was considered too threatening for an American audience, and thus the disability was required to keep him in check.

On the other hand, one could not ask for a position more imbricated with technology than that of the cyborg. *M.A.N.T.I.S.* (Mechanically Augmented Neuro Transmitter Interception System), for example, is loosely based on a black comic book hero, *Hardware*, which was written and drawn by African-American artists at Milestone Media. Here a disabled black scientist seeks revenge on the corporate forces which cheated him (and eventually left him a paraplegic) by creating an alter-ego powered by a cybernetic exoskeleton. Although gutted of much of its original political message, the television version did manage to occasionally carry the themes

connecting racial identity, disability, and resistance through technological metaphors.³

Music critic and writer Mark Dery (1994) coined the term 'Afrofuturist' to describe the self-conscious appropriation of technological themes in black popular culture, particularly that of rap and other hip-hop representations. The term has been used as an organizing principle by Alondra Nelson and Paul Miller in creating a listserv dedicated to 'explor[ing] futurist themes in black cultural production and the ways in which technological innovation is changing the face of black art and culture'. Nelson is a graduate student at NYU, and manager for a cybercafe in a mixed working class/middle class neighborhood in Brooklyn. Paul Miller is a senior editor at *Artbyte* magazine, and performs as D.J. Spooky, master of 'illambiant' digital sound collage (most recently featured in the soundtrack for the film *Slam*). These dual roles in Nelson and Miller's own lives reflect the potent mixture of cultural analysis and cultural production promised by the Afrofuturist perspective.

Members of Nelson and Miller's listserv have suggested a wide spectrum of Afrofuturist fore-runners and fellow travelers: analog musicians Lee 'Scratch' Perry (Ska), George Clinton (funk) and Sun Ra (jazz), science fiction writers Samuel R. Delany, Octavia Butler, Charles Sanders, and Nalo Hopkinson, cultural critics Greg Tate, Mark Sinker, Kodwo Eshun, and Mark Dery, digital musicians Singe, Tricky, and Dr Octagon, visual artists Fatima Truggard, Keith Piper, and Hype Williams, and performance artists Rammelzee and Carlinhos Brown.

Conspicuously absent from this mix are engineers and scientists. For example, Philip Emeagwali, a Nigerian-American genius whose seminal work developed parallel processing for nonlinear dynamics, takes a strongly historical approach, drawing on sources as diverse as the African origin of the Fibonacci sequence and the 1938 Risenkampf partial differential equations. If there is a downside to the Afrofuturist movement, it is the tendency to dwell too much in the imaginary spaces created by fiction and music, rather than work at fusing these domains with functional science and technology.

As an exception to this elision, Miller points to Bob Powell, 'African-American physicist, philosopher, and architect who studied in west Africa and who worked with NASA and still has really interesting ideas on physics, music, and African and African-

Ameri-can art' (Miller, 1999). Writing in *Black Noise*, Tricia Rose (1994) suggests a promising area for historical study in positing that many of the early innovations in computer graphics, such as morphing, were based on early hip-hop visual arts such as graffiti and break-dancing. Another possibility for historical research is the phenomenon of clusters of black scientists and engineers in particular domains. In opto-electronics, for example, we find Earl D. Shaw (physicist, co-inventor of spin-flip laser), William R. Northover (chemical innovations for laser fiber optics) and Thomas C. Cannon (mechanical innovations for fiber optic cables). This may be due to the 'founder effect' (similar to immigrant neighborhoods in cultural geography); if so it speaks well for the Afrofuturist thesis that culture and technology can have collaborative results. More recently black computer engineers have become leading entrepreneurs; these include Clarity CEO Howard Smith, Vice Presidents Kenneth Coleman and Marc Hannah of Silicon Graphics, Myra Peterson, President of Omniverse Digital Solutions, and Dr Glen Toney of Applied Materials.

■ BLACK WEB NETWORKS

The celebration of the 'cyborg' identity in recent pop culture representations, such as *Robocop*, is an important warning to those who would see the Afrofuturists' contribution as purely one of 'transgressing boundaries' or 'bricolage'. We now live in an era in which cyborg bricolage is no longer a shocking transgression, but rather a technique for computer programming and postindustrial labor management. Nor should we rely on the mimetic theory that 'role models' of black achievement will counter problems in 'self-esteem'. For artists and inventors alike, the Afrofuturist movement has the ability to reveal the relations of social power in the construction of technoscience. By illuminating the politics of information technology, Afrofuturism offers a powerful technocultural syncretism.

Perhaps the best case for such collaboration between African-American cultural politics and information technology is the emergence of black web networks. The oldest of these is The Drum; launched in 1988 as an informal group of computer users, it was a pioneer of Afrocentric on-line services. Another pioneer is Melanet, started in 1989 by William and Rodney Jordan.

Averaging 40,000 hits per month, it maintains a focus on black culture and spirituality.

Net Noir, the largest commercial success, was started in 1995 by David Ellington and Malcom CasSelle. Averaging 120,000 hits per month, it includes web channels under the categories of Culture, Entertainment, News, Business and Politics, and Shopping. The separation of culture and entertainment categories is unusual for web organization, and reflects Net Noir's responsibility to black cultural issues; meanwhile the fusion of Business and Politics into a single category reflects their emphasis on entrepreneurship as a means to black liberation. The City of New Elam network was started 1994 by Rey Harris and Stafford Battle. Averaging 2,000 hits per month, they have focused on introducing black-owned small business to the web. Perhaps the strongest commercial potential can be found in SOHH ('Support On-line Hip-Hop'): started in 1995 with Felicia Palmer and Steve Samuel as 'cybermics', they are currently negotiating with Intel, CNET and Mediadome for on-line sales of music that could mount into the millions.

■ CONCLUSION

We began with Barbara Christian's framework, which shifted the focus of literary analysis from theories of black women's writing to black women writers' theories. By relating her case to technological contexts, we shifted the analytical focus from attempts to devise a cybernetics of black communities, to searching instead for the communities of black cybernetics. Such histories of black contribution to and collaboration with information technologies are, we maintain, masked by the narrative of cyberliberation, the truce of a culture-free technoscience. In examining this history of black cybernetics, we find that the invention of technology and cultural identity are deeply intertwined. Most importantly, there are anti-hegemonic flows to this confluence that allow people, artifacts and ideas to chart a new course in contradiction to dominant currents or 'proper' locations.

Bleecker (1995) described the ways in which the absence of race in the virtual game SimCity allows for 'raceless' urban riots. One can see that the simulation parameters of heat, crime and unemployment are all related to the propensity for urban riots, but race itself does

not exist as a simulation variable. But writing race back into Sim-City—putting race back into our social accounts of information technology in general—means not just adding a pessimistic realism. We can seek sources of more positive confluence between the cultural capital of personal identity and the political economy of information technology in ways that offer reconfiguration and resistance.

□ NOTES

1. For one of the earliest uses of the term in this context, see Latour (1987, chapter 4).
2. I was unable to locate the artisan who could have confirmed this interpretation.
3. For example, in episode 12, 'Through the Dark Circle', aliens attempt to defeat disabled scientist Hawkins by giving him the hallucination that he can walk again. By forcing himself to reconnect with his own disability—refusing to live in the fantasy world of 'passing'—he recovers the power of his cyborg body suit.

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