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# SPECIAL ISSUE

# D A C 0 9

# after media :

# embodiment

# and context

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# Making Inroads: Promoting Quality and Excellency of Contemporary Digital Cultural Practices and Interdisciplinarity

I would like to welcome you to the first special volume of the Leonardo Electronic Almanac. *DACOG: After Media: Embodiment and Context*, is a volume that generated from the conference by the same name that Prof. Penny chaired at the end of 2009.

*DACOG: After Media: Embodiment and Context* is the first of a series of special volumes of the Leonardo Electronic Almanac that are realized in collaboration with international academic, editors and authors.

Prof. Penny was inspired for this LEA special issue by the continuous developments in the interdisciplinary arena and in the fields of new media and digital art culture. He wanted to collate research papers that would provide the seeds for innovative thinking and new research directions. The authors featured in this volume, to whom we are most grateful for their hard work, will provide the reader with the opportunity to understand and imagine future developments in the fields of digital art culture and interdisciplinarity.

As I look at the electronic file of what we now internally refer to simply as *DACOG* the first issue of the revamped LEA, *Mish Mash*, printed and delivered by Amazon, sits on the desk next to my keyboard. The possibilities and opportunities of e-publishing, which also has physically printed outcomes, provide me with further thoughts on the importance and necessity of the work that is done by 'small publishers' in the academic field. The promising news of a new open access journal to be launched by The Wellcome Trust or the 'revolution' of researchers against Elsevier through the website <http://thecostofknowledge.com/> with 9510 Researchers Taking a Stand (Thursday, April 12, 2012 at 10:57 AM) highlights the problems and issues that the industry faces and the struggles of young researchers and academics.

The contemporary academic publishing industry has come a long way from the first attempts at e-publishing and the revolution, if it can be defined as such, has benefited some and harmed others.

As the struggle continues between open access and copyrighted ownership, the 'revelation' of a lucrative academic publishing industry, of economies of scales, of academics exploited by a system put in place by publishing giants (into which some universities around the globe have bought into in order to have an internationally recognized ranking system) and the publishers' system of exploitation structured to increase the share of free academic content to then be re-sold, raises some essential questions on academic activity and its outputs.

The answers to these problems can perhaps be found in the creativity of the individuals who participate in what is, at times, an harrowing process of revisions, changes, reviews, replies and rebuttals. This is a process that is managed by academics who donate their time to generate alternatives to a system based on the exploitation of content producers. For these reasons I wish to thank Prof. Simon Penny and all the authors who have contributed to *DACOG: After Media: Embodiment and Context*.

Simon Penny in his introduction to this first LEA special volume clearly states a) the importance of the *DACOG* and b) the gravitas and professional profile of the contributors. These are two points that I can support wholeheartedly, knowing intimately the amount of work that this volume has required in order to maintain the high standards set by *Mish Mash* and the good reception it received.

For this reason in announcing and presenting this first special volume I am proud to offer readers the possibility of engaging with the work of professionals who are contributing to redefining the roles, structures and semantics of new media, digital art practices and interdisciplinarity, as well as attempting to clarify what digital creativity is today and what it may become in the future.

The field of new media (which are no longer so new and so young – I guess they could be better described as middle aged, slightly plump and balding) and digital practices (historical and contemporary) require new

definitions and new engagements that move away from and explore beyond traditional structures and proven interdisciplinary partnerships.

*DACOG: After Media: Embodiment and Context* is a volume that, by collating papers presented at the *DACOG* conference, chaired by Prof. Simon Penny, is also providing recent innovative perspectives and planting seeds of new thinking that will redefine conceptualizations and practices, both academic and artistic.

It also offers to the reader the possibility of engaging with solid interdisciplinary practices, in a moment in which I believe interdisciplinarity and creative practices are moving away from old structures and definitions, particularly in the fraught relationship between artistic and scientific disciplines. If 'cognitive sciences' is a representation of interdisciplinarity between artificial intelligence, neurobiology and psychology, it is also an example of interdisciplinary interactions of relatively closely related fields. The real problem in interdisciplinary and crossdisciplinary studies is that these fields are hampered by the methodological problems that still today contrapose in an hierarchical structure scientific methodologies versus art and humanities based approaches to knowledge.

This volume is the first of the special issues published by LEA and its appearance coincides with the newly revamped website. It will benefit from a stronger level of advocacy and publicity since LEA has continued to further strengthen its use of social platforms, in fulfillment of its mission of advocacy of projects at the

intersection of art, science and technology. *DACOG* will be widely distributed across social networks as open access knowledge in PDF format, as well as being available on Amazon.

I extend a great thank you to all of the contributors of *DACOG: After Media: Embodiment and Context* and wish them all the very best in their future artistic and academic endeavors.

**Lanfranco Aceti**

Editor in Chief, *Leonardo Electronic Almanac*  
Director, *Kasa Gallery*



ACKNOWLEDGEMENTS

I would like to thank Ozden Sahin, LEA Co-Editor, for having delivered with constancy another project of which LEA could be proud. The LEA special issues are more similar to small books – 200 pages is not a small endeavor – that require special care and attentive selection.

I am very grateful to Prof. Simon Penny for the hard work that he has put into this volume and to the authors who have patiently worked with us.

To all of you my heartfelt thanks.

*DACOG: After Media: Embodiment and Context* is the first special volume of the *Leonardo Electronic Almanac* to be followed by many others that are currently in different stages of production, each of them addressing a special theme and focusing on bringing to the mainstream of the academic debate new forms of thinking, challenging traditional perspectives and methodologies not solely in the debates related to contemporary digital culture but also in the way in which these debates are disseminated and made public.

To propose a special volume please see the guidelines webpage at: <http://www.leoalmanac.org/lea-special-issues-submission-instructions/>

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# Two decades of Digital Art and Culture

An introduction to the LEA DACog special edition

by

Simon Penny

Director of DACog  
Professor of Arts and Engineering  
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This volume of LEA is composed of contributions drawn from participants in the 2009 Digital Art and Culture conference held at the University of California, Irvine in December 2009. DACog was the eighth in the Digital Art and Culture conference series, the first being in 1998. The DAC conference series is internationally recognized for its progressive inter-disciplinarity, its intellectual rigor and its responsiveness to emerging practices and trends. As director of DACog it was these qualities that I aimed to foster at the conference.

The title of the event: After Media: Embodiment and Context, was conceived to draw attention to aspects of digital arts discourse which I believe are of central concern to contemporary Digital Cultural Practices. "After Media" queries the value of the term 'Media Arts' – a designation which in my opinion not only erroneously presents the practice as one concerned predominantly with manipulating 'media', but also leaves the question of what constitutes a medium in this context uninterrogated. 'Embodiment and Context' reconnects the realm of the digital with the larger social and physical world.

'Embodiment' asserts the phenomenological reality of the fundamentally embodied nature of our being, and its importance as the ground-reference for digital practices. 'Embodiment' is deployed not only with respect to the biological, but also with reference to material instantiations of world-views and values in technologies, a key example being the largely uninterrogated Cartesianisms and Platonisms which populate computational discourse. Such concerns are addressed in contemporary cognitive science, anthropology and other fields which attend to the realities of the physical dimensions of cognition and culture.

'Context' emphasises the realities of cultural, historical, geographical and gender-related specificities. 'Context' brings together site-specificity of cultural practices, the understandings of situated cognition and practices in locative media. The re-emergence of concerns with such locative and material specificity within the Digital Cultures community is foregrounded in such DACog Themes as Software and Platform Studies and Embodiment and Performativity.

The DACog conference included around 100 papers by an international array of contributors. In a desire to be maximally responsive to current trends, the conference was to some extent an exercise in self-organisation by the DACog community. The call for papers and the structure of the event was organized around nine conference themes which were themselves the result of a call to the community for conference themes. The selected themes were managed largely by those who

proposed them. Much credit for the success of the event therefore goes to these hard-working 'Theme Leaders': Nell Tenhaaf, Melanie Baljko, Kim Sawchuk, Marc Böhlen, Jeremy Douglass, Noah Wardrip-Fruin, Andrea Polli, Cynthia Beth Rubin, Nina Czegledy, Fox Harrell, Susanna Paasonen, Jordan Crandall, Ulrik Ekman, Mark Hansen, Terry Harpold, Lisbeth Klasturp, and Susana Tosca, and also to the Event Organisers: David Familian, Michael Dessen, Chris Dobrian, Mark Marino and Jessica Pressman. I am particularly grateful to Ward Smith, Information Systems Manager for DACog, who for two years, as my sole colleague on the project, managed electronic communications, web design and the review and paper submission processes amid, as he would put it, a 'parade of indignities'. In the several months of final planning and preparation for the event, the acumen and commitment of Elizabeth Losh and Sean Voisen was invaluable.

I first published on what we now refer to as digital arts in 1987. <sup>1</sup> Not long after, I was lucky enough to have the opportunity to attend the first ISEA conference in 1988. Since that date I have been actively involved in supporting the development of critical discourses in the field, as a writer, an editor and an organizer of events. My role as director of the DACog conference gave me a perspective from which to reflect on the state of digital arts discourse and its development over two decades. As I discussed in a recent paper, <sup>2</sup> the first decade on media art theory was a cacophonous interdisciplinary period in which commentators from diverse fields and disciplines brought their expertise to bear on their perceived subject. This created a scenario not unlike that of various viewers looking into a house via various windows, none of them perceiving the layout of the house, nor the contents of the other rooms. In the ensuing decade, a very necessary reconciliation of various disciplinary perspectives has occurred as the field has become truly a 'field'.

While post structuralist stalwarts such as Deleuze and Derrida continue to be referenced in much of the more critical-theory oriented work in Digital Cultures, and the condition of the posthuman and posthumanist are constantly referenced, theoretical reference points for the field are usefully broadening. The emerging field of Science and Technology Studies has brought valuable new perspectives to media arts discourses, counterbalancing the excesses of techno-utopianism and the sometimes abstruse intellectualism of post-structuralist theoretical discourses. In this volume, Mark Tuters provides an exemplar of this approach in his *Forget Psychogeography: Locative Media as Cosmopolitics*, bringing Rancière and Latour to bear on a discussion of HCI, Tactical Media and Locative Media practices. Tuters provides a nuanced argument replete with examples which questions the sometimes, superficial and dogmatic re-citation of the originary role of the Situationists with respect to such practices. At DACog, Connor McGarrigle also took a thoughtful revisionist position with respect to the Situationists. <sup>3</sup>

In this context, the new areas of Software Studies and Platform Studies have emerged and have been nurtured in previous DAC conferences. In this spirit, Chandler McWilliams attempt to "thread the needle between a reading of code-as-text that obfuscates the procedural nature of code, and an overly technical description of programming that reinstates the machine as the essential arbiter of authentic acts of programming" is emblematic of the emergence of Software Studies discourses which are quintessentially interdisciplinary and erudite on both sides of the science wars divide. Similarly, Mark Marino's meditations on heteronormativity of code and the Anna Kournikova worm call for what he calls Critical Code Studies, here informed by queer theory. In their proposal for an 'AI Hermenteutic Network' Zhu and Harrell address the question of intentionality, a familiar theme in AI critical discourse (i.e., John Searle 'Minds,

Brains and Programs' 1980). Citing Latour, Agre, Hayles and others, they offer another example of the science-wars-sidestepping technical development based in interdisciplinary scholarship noted in the discussion of Chandler McWilliams' contribution.

Another trend indicative of the maturation of this field is its (re)-connection with philosophical discourse. In this context, the deep analysis of Electronic Literature in terms of Wittgensteinian Language Games by Mauro Carassia is something of a tour de force. While a tendency to extropianism is here not explicitly discouraged, this discussion places such technological practices squarely as indicators of transition to post-human subjectivity, and in the process, open the discussion to phenomenological, enactive and situated critiques as well as a drawing in the relevance of pre-cognitivist cybernetic theorisation.

One of the aspects of contemporary media arts discourse which I hoped to foreground at DACoG was questions of embodiment and engagement with contemporary post-cognitivist cognitive science. Several papers in the current collection reflect such concerns, and indeed they were foregrounded in several conference themes. One example of the value of the application of such theory is evidenced in Kenny Chow and Fox Harrells leveraging of contemporary neuroscience and cognitive linguistics in their deployment of the concept of "material-based imagination" in their discussion of Interactive Digital Artworks. In a quite different approach to embodiment and computation, Carrie Noland discusses choreography and particularly the choreography of Cunningham, with reference to Mauss and Leroi-Gourhan, and with respect to digital choreographic tools.

The DAC community did not choose to make Game Culture a focal theme in DACoG – perhaps because the field has grown so quickly and has built up a struc-

ture of conferences and journals. Nonetheless, gaming culture was referenced throughout the event, and was the subject of numerous presentations, such as Josh and Karen Tannenbaums reconsideration of 'agency as commitment to meaning', which addressed the acknowledged problematic of the tension between authorial and user agency in terms of a critique of the humanist subject. Like wise, phraseology such as Boluk/Lemieux's: "player performance in and around games has matured to the point of beginning to express underlying serial logics through heavily mannered gameplay mechanics" (in their contribution to this volume) signals the establishment of a mature and erudite critical theory of games and gaming. On a more technical note, Sullivan/WardripFruin/Mateas make an argument for enriching computer game play by application of artificial intelligence techniques to the authoring of 'quests'.

As Digital Arts became established as a practice the question of pedagogy inevitably arose – what to teach and how to teach it. Though rhetorics of convergence pretend to the contrary, one cannot dispute the profound epistemological and ontological dilemmas involved in attempting to bring together intellectual environments of such disparate communities as engineers, artists and critical theorists, in the classroom and the lab. Interdisciplinarity was therefore the ground upon which these programs were developed, and each context inflected that idea with its own color. My own reflections on the subject are published at *Convergence*. It therefore seemed timely to address pedagogy at DACoG. In the process of elaboration of digital cultural practices, such emerging practices have themselves come into consideration as pedagogical tools and systems. In this volume, Elizabeth Losh surveys and discusses various pedagogical initiatives (mostly in Southern California) deploying digital tools and environments. In a contribution which crosses between the pedagogy thematic and concerns with

cognition, Harrell and Veeragoudar Harrell offer a report on a science, technology, engineering, and mathematics (STEM) educational initiative among at-risk students which considers the relationships between users and their virtual identities.

In his essay, Garnet Hertz discusses the work of three artists – Reed Ghazala, Natalie Jeremijenko, and Tom Jennings. None of them 'media artists' in the conventional sense, they, in different ways and for different purposes, re-purpose digital technologies. Rounding out this volume is presentation of two online artworks by Sharon Daniels which were presented at DACoG. *Public Secrets* and *Blood Sugar* are elegant web-based art-works, both poetic and examples of a committed activist practice.

In my opinion, this collection offers readers a survey of fields addressed at DACoG, and an indication key areas of active growth in the field. Most of them display the kind of rigorous interdisciplinarity I regard as characteristic of the best work in the field. While the science-wars rage on in certain quarters, in media arts discourse there appears to be an attitude of intelligent resolution – a result in no small measure of the fact that a great many such commentators and theorists have taken the trouble to be trained, study and practice on both sides of the great divide of the 'two cultures', and to take the next necessary step of attempting to reconciling or negotiate ontologies traditionally at odds. This professional profile was very evident at DACoG and is represented by many of the contributors in this volume. Such interdisciplinary pursuits are in my opinion, extremely intellectually demanding. The obvious danger in such work is of superficial understandings, or worse, a simple re-citation of a new canon of interdisciplinary media studies. Dangers that, happily, none of the papers grouped here, and few of the papers presented at DACoG, fell victim of. ■

The electronic proceedings of DACoG are available at this link: [http://escholarship.org/uc/ace\\_dacog](http://escholarship.org/uc/ace_dacog)

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# ART AFTER NEW MEDIA

Exploring Black Boxes, Tactics and Archaeologies

## ABSTRACT

*This paper discusses three methodological themes employed by contemporary media artists who reuse obsolete information technology hardware in their work. Methodologies include the exploration of the hidden “black-boxed” layer of technology by circuit bending artists like Reed Ghazala, the tactical use of technologies to bring social change by artists like Natalie Jeremijenko, and the archaeological use of outdated technologies to intervene in history by artists like Tom Jennings. These themes are presented as useful tools to construct a language of reuse which serves a valuable function in a culture increasingly confronted by electronic waste and assists in critiquing assumptions of obsolescence, technological progress and understanding digital culture primarily within the framework of “new media.”*

by

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## 1. INTRODUCTION

**The ubiquity of computing and the rapidly increasing capabilities of microprocessors and consumer electronics have created an explosion of obsolete media technologies in contemporary culture.** In the United States, about 400 million units of consumer electronics are discarded every year. Electronic waste, like obsolete cellular telephones, computers, monitors, and televisions, compose the fastest growing and



Figure 1. The Incantor, a modified, or “circuit-bent” Speak & Spell, Reed Ghazala, First developed in 1978.

most toxic portion of waste in American society. As a result of rapid technology change, low initial cost and planned obsolescence, the federal Environmental Protection Agency (EPA) estimates that two-thirds of all discarded consumer electronics still work – approximately 250 million functioning computers, televisions, VCRs and cell phones are discarded each year in the United States.

This paper takes these millions of discarded yet functioning media technologies as a starting point, and proposes that study of the intelligent repurposing and reuse of these devices is an important research task. A growing subculture of do-it-yourself (DIY) technologists working with reused and repurposed technologies in the arts also highlights the importance of a language to describe this art *after* new media.

Three themes will be introduced to help describe differences in how contemporary media artists reuse obsolete or trailing-edge hardware: 1. Use for the sake of exploring and unraveling the “blackboxed” technological layer of the device that is usually concealed, 2. Tactical reuse aimed at a social institution for the purposes of bringing forward social change, and 3. Archaeological reuse for rewiring and intervening in history or historiography.

These categories and examples are not intended as an exhaustive categorization of how obsolete information technologies are repurposed, but are constructed to help bring articulation, understanding and discussion to a diverse, dynamic and growing field of practice.

## 2. HISTORICAL CONTEXTS

Repurposing objects can be thought of within the earliest frameworks of human tool-building and creative production, an activity that humans have engaged in since the Stone age.<sup>1</sup> Repurposing, reusing and modifying objects is a natural part of the evolution of human culture, with social practices evolving in collaboration with continually reinvented objects around us. As Marshall McLuhan stated in 1964, “we shape our tools, and thereafter our tools shape us.”<sup>2</sup>

### 2.1 Readymades and Assemblage

Although the reuse of information technologies by artists can be envisioned under the banner of digital media art, its methodology has more in common with the histories of artistic appropriation, collage, assemblage and readymades. In particular, the reuse of consumer commodities has a strong presence in the history of early twentieth century contemporary art: with Pablo Picasso and Georges Braque's work with found newspapers in 1912 playing a pivotal role alongside Marcel Duchamp's Bicycle Wheel of 1913 or inverted Bedfordshire urinal “fountain” of 1917.<sup>3</sup>

In 1961, the New York Museum of Modern Art featured the exhibition “The Art of Assemblage” that brought together the work of European artists of the early twentieth century like Pablo Picasso, Georges Braque, Marcel Duchamp, Jean Dubuffet and Kurt Schwitters parallel to Americans including Man Ray, Robert Rauschenberg and Joseph Cornell. The curator of the show, William Seitz, clearly positioned the work as being made up of manufactured or natural objects that were not initially intended as art materials.<sup>4</sup>

In the publication accompanying the exhibition, the English critic Lawrence Alloway is quoted to establish a context for the mindset of collage, the contemporary city and the obsolescence caused by mass consumerism:

*“Its source is obsolescence, the throwaway material of cities, as it collects in drawers, cupboards attics, dustbins, gutters, waste lots, and city dumps. Objects have a history: first they are brand new goods; then they are possessions, accessible to few, subjected, often, to intimate and repeated use; then, as waste, they are scarred by use but available again .. Assemblages of such material come at the spectator as bits of life, bits of the environment.”<sup>5</sup>*

Since that time, art history has continued to slowly carve out languages of found art, collage, readymades and assemblage to describe the dynamics of this work which has become a key theme in contemporary art practice.<sup>6</sup>

Apart from the direct issue of non-art materials being used to dispel the aura of authority and the sanctity of art, readymades and assemblage can be viewed as a straightforward use of the inexpensive and available. For example, Pablo Picasso's *Guitar, Sheet Music, and Glass* of 1912 is an intervention into the institution of art, but also is part of a “junk culture” of repurposing simple everyday objects.<sup>7</sup>

Much less lofty than exploring “the nature of reality and the nature of painting itself,”<sup>8</sup> the history of repurposing can be seen as an outgrowth of the debris of consumerism: “the detritus of capital and commodity serve the dual purpose of announcing their own historicity and residing as a standing reserve, as Heidegger might have put it, for conversion into subsequent artifacts, memories, and stories.”<sup>9</sup>

The mass production of consumer commodities has shifted significantly since Braque, Picasso and Duchamp's readymade work in the 1910s. In addition to the newspapers and bicycles, the fastest growing “readymade” portion of trash in American society is electronic waste: obsolete cellular telephones, computers, televisions, and household gadgets. The proliferation of computing and electronic technologies – along with the rapidly increasing capabilities of microprocessors and consumer electronics – has created an explosion of obsolete media technologies in contemporary culture.

## 3. EXPLORING THE BLACK BOX

*“technological information ... rests on a substratum of machinery that is becoming concealed from the understanding of those who operate on its surface. The blackboxing that is the consequence of progress in information technology encloses ever larger spaces of hardware and software. It is an unavoidable development. The larger black boxes support more powerful tools.”*

— Albert Borgmann, *Holding On to Reality: The Nature of Information at the Turn of the Millennium.*<sup>10</sup>

The inner workings of consumer electronics and information technologies are increasingly concealed as a result of the development of newer generations of technologies. Once developed and deployed widely, technical components are understood by users as objects that serve a particular function: an electronic toy makes a sound when a button is pressed, a computer printer prints a document when it is requested. The inner workings of the device are unknown to the user, with the circuitry of the device like a mysterious “black box” that is largely irrelevant to using it. From a design perspective, the technology is intentionally designed to render the mechanism invisible and usable as a single *punctualized* object.<sup>11</sup>

Blackboxing, or the development of technological objects to a point where they are simply used and not understood as technical objects, is a requirement of infrastructure and technological development. A computer system, for example, is almost incomprehensible if thought of in terms of its millions of transistors, circuits, mathematical calculations, and technical components. Black boxes are the punctualized building blocks from which new technologies and infrastructures are built out of.

A black box, however, is a system that is not technically understood or accessed, and as a result obsolete

Circuit bending, a term coined by Ghazala, is a methodology for modifying inexpensive second-hand circuits that he first explored in Ohio in the late 1960s. The origin of his method came as a result of a random malfunction while a high school student:

*"In my drawer a small battery-powered amplifier's back had fallen off, exposing the circuit. It was shorting-out against something metal causing the circuit to act as an audio oscillator. In fact, the pitch was continuously sweeping upward to a peak, over and over again... I soon modified the amplifier in numerous ways. Placing the circuit within a larger housing, I added rotary switches to the short circuit paths so I could run the new circuits through various resistors, capacitors, diodes, photocells, and any other electronic component I could find. Potentiometers and push buttons were added. I discovered places on the circuit that, if touched, would make the circuit howl."*<sup>12</sup>

### 3.1 Ghazala, Incantor (1978)

Likely the most popular example of Ghazala's work is his Incantor series of devices, highly customized Speak & Spell children's toys that he has built since 1978. The methodology of bending the toy involves dismantling the electronic device and adding components like switches, knobs and sensors to allow the circuit to be altered and shifted by the user. As an outgrowth of Texas Instrument's research in the area of synthetic speech, the Speak & Spell learning toy was designed to educate children age seven and older how to spell and pronounce more than 200 commonly misspelled words.<sup>13</sup> However, Ghazala's Incantor completely reconfigures the synthesized human voice circuitry to spew out a noisy, glitchy tangle of sound that stutters, loops, screams and beats.

Similar to the early twentieth century artists employing readymade materials, Ghazala sees the surplus of consumer devices as an "immediate canvas" that can be simply modified to discover a mysterious, surreal world of sound. Although the junk culture of reuse is consistent between early 20<sup>th</sup> century readymade artists and contemporary circuit benders, there is a dis-

or broken technologies are often unusable. Once the input/output or desired functionality of the device stops working it is often unfixable and inaccessible for modification for most individuals. Unlike a household lamp that can at least be serviced by replacing its bulb, many consumer electronic devices have no user-serviceable parts, and the technology is discarded after it breaks. The depunctualization, or breaking apart the device into its components, is difficult due to the highly specialized engineering and manufacturing processes used in the design of the artifact: contemporary electronic devices are intentionally built to be discarded, their obsolescence is clearly planned.

Despite a planned obsolescence, the probing, exploring and manipulating of consumer electronics outside of their standard lifespan or use is a key tactic of reuse for individuals and media artists. This process traverses through the hidden content inside of a technological system for the joy of entering its concealed under layer, often breaking apart and reverse engineering without formal expertise, manuals, or defined endpoint.

Reed Ghazala, a Cincinnati-based American artist born in the 1950s, is a pivotal figure in the development of what is termed "circuit bending": the creative short-circuiting of consumer electronics primarily for the purpose of generating novel sound or visual output. Spelunking in circuitry, the technique of circuit bending takes found objects like battery-powered children's toys and inexpensive synthesizers and modifies them into do-it-yourself musical instruments and homemade audio generators.

tinct difference in present-day work: bending takes a unique pride in the folk process of reverse engineering without any formal expertise. The work is motivated by the unauthorized short circuiting of blackboxed technologies and of customizing devices that were engineered to be discarded.

Circuit bending, as promoted by Ghazala and others, has developed over the last decade into a diverse network of practitioners, with annual international festivals dedicated to the topic since 2004.<sup>14</sup> The



**Figure 2.** Back cover image from Derek Seibel's DVD Documentary of Bent 2004, the first International Circuit Bending Festival (NTSC, 150 minutes).

continued proliferation of consumer electronics has made the raw materials of circuit bending ubiquitous, with folk knowledge around circuit bending practices increasingly dispersed over the Internet, in magazines and through local workshops.<sup>15</sup> Circuit bending takes the trash of electronic culture as a starting point, and its key tactic of reuse is driven by a punk-like breaking apart and exploration of blackboxed consumer technologies. Hacking the circuits and changing the taken for granted function of the technology without formal training is part of its allure, and its folksy, low-tech and literally "trashy" methodologies serve as a useful counterpoint to envisioning digital culture only in terms of a high-tech *new media*.

## 4. TACTICAL REUSE

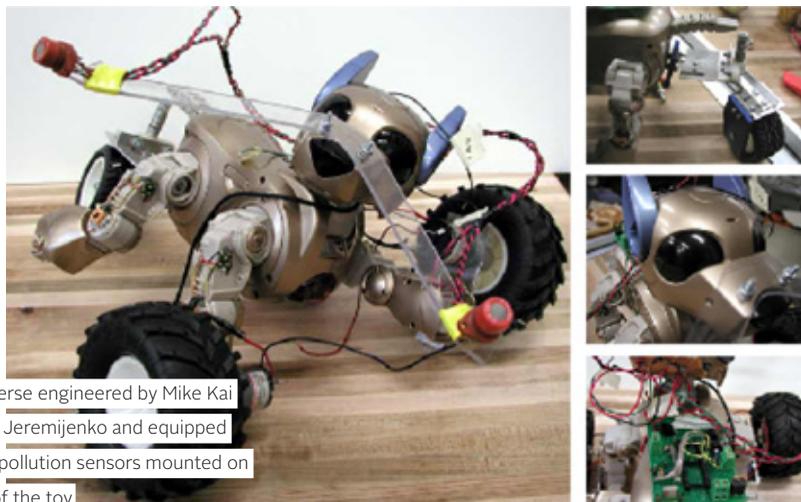
The second theme of reuse in the media arts will be referred to as *tactical reuse*. This method of reuse is focused on challenging institutional structures through the tactical repurposing of media technologies. Situationist détournement, tactical media and critical design are borrowed on to construct a type of reuse that is used to directly clash with social and institutional conventions, often targeting themes of social injustice, globalization, consumer culture, or the environment. Unlike circuit bending, this work is not primarily concerned with exploring the black box of technology: it is an artistic activism that reuses technologies in a directly political manner.

Tactical reuse can be seen as borrowing from the concept of détournement, a technique of appropriation outlined by the Situationists in the 1950s. In détournement, well-known objects and images are used and taken through a detour to create an alternate message, often in oppositional contrast to the original source. The original is directly sampled and turned on its head: unlike a satire or parody, détournement directly reuses large portions of the original work and hijacks and derails it. Détournement acknowledges the readymade artworks of Duchamp, for example, but sees that the "opposition to the bourgeois notion of art and genius has become pretty much old hat."<sup>16</sup> Instead, everyday life needs to be liberated through subversive, targeted propaganda through extremist resampling and innovation. Tactical reuse is a style of subversive détournement, but uses discarded or obsolete media technology hardware as a starting point for political action.

Tactical reuse can also be seen as a subset of tactical media, an area of practice that pulls influence from the juxtapositions of Situationist *détournement* and the tactics of practice in de Certeau's "The Practice of Everyday Life."<sup>17</sup> Articulated by Geert Lovink and David Garcia in their 1997 essay "The ABC of Tactical Media," this cluster of activities is described as:

*"what happens when the cheap 'do it yourself' media, made possible by the revolution in consumer electronics and expanded forms of distribution (from public access cable to the Internet) are exploited by groups and individuals who feel aggrieved by or excluded from the wider culture. Tactical media do not just report events, as they are never impartial they always participate and it is this that more than anything separates them from mainstream media ...Tactical media are media of crisis, criticism and opposition."*<sup>18</sup>

Tactical media and reuse are seen as being opposed to institutional strategies, which belong to the established powers of states, economies, corporations, and scientific bodies of knowledge.<sup>19</sup> Tactical reuse organizes in a guerilla fashion and attacks its target in a hit-and-run style. Like *détournement*, tactical media is deceptive, nomadic and infiltrating: a tricksterism that appropriates for the purposes of pointing out the flaws in protological and proprietary command and control.<sup>20</sup>



**Figure 3.** Feral Robotic Dog, reverse engineered by Mike Kai following instructions by Natalie Jeremijenko and equipped with volatile organic compound pollution sensors mounted on a beam connected to the nose of the toy.

Lastly, tactical reuse also resonates with the concept of critical design; a term first used in Anthony Dunne's book *Hertzian Tales* (1999) and later in *Design Noir* (2001).<sup>21 22</sup> Critical design, as opposed to tactical media, is targeted at bringing a change in the mind of the viewer or consumer, not the institution. Critical design is involved in creating speculative design proposals to challenge narrow assumptions; preconceptions and givens about the role products play in everyday life. Individuals, not institutions, are targeted through the creation of sarcastic and disturbing industrial product designs that are intended to put the viewer in a dilemma: "is it serious or not? Real or not?" The intended effect is to question the limited range of psychological and emotional experiences that contemporary products usually promote: critical design embraces the dark complexity of human nature, and rejects design as an affirmative discipline. Tactical reuse, especially when presented from the perspective of a plausible product or a fictitious institution, carries forward many of the objectives of critical design.

#### 4.1 Jeremijenko, Feral Robotic Dogs (2002)

A clear example of the tactical reuse of obsolete consumer electronics is Natalie Jeremijenko's Feral Robotic Dogs project, initially built in collaboration with students at Yale and through public workshops since 2002. The project reuses inexpensive and discarded children's robotic dog toys as a platform to detect pollution in public parks, schoolyards and local communities.

Jeremijenko's project is more a methodology than an artifact, and information on the technique of constructing feral robotic dogs is outlined online through do-it-yourself instructions and in community workshops organized by Jeremijenko.

The method of taking domestic robots and turning them into tactical and feral devices goes roughly as follows: toy dogs, like the Sony Aibo, are initially amputated and equipped with wheels to better navigate rough outdoor terrain and configured with pollution sensors. The logic of the system is then upgraded to smell out environmental contaminants and move toward it. Optionally, the devices can be configured to communicate with other dogs, record pollution levels, or perform special behaviors when they find highly polluted sites: barking, playing the American national anthem, or rolling over and playing dead.

Combining the "hardware hack" mentality of circuit bending with a tactical sense of environmental activism, the project leverages the economies of scale in mass consumerism to highlight its environmental downside: toxic benzene, radioactive materials, and other harmful pollutants generated by industry. The results, a pack of robotic dogs sniffing for environmental contaminants is also legible to a wide audience: a moving physical device in actual space is much easier to comprehend than a table of statistics or a bar graph. "The value of this project comes from who is doing the interpretation, who is doing the monitor-

ing and who cares," says Jeremijenko, "and when you release a pack of hot-rodded robotic dogs on a contaminated site it becomes newsworthy."<sup>23</sup>

In the process, Feral Robotic Dogs hijack and detour children's toys into a powerful and localized social intervention. Entertainment electronics are subverted as a situated *détournement* to create, in the style of tactical media, a guerilla attack on the institutions, powers of state and corporations that have, for the most part, ignored public health concerns. Lastly, as a packaged methodology, the Feral Robotic Dog project reminds us of critical design: its design does not affirm us, but challenges us to deal with the uncomfortable reality of our immediate environments.

**Figure 4.** Students with Feral Robotic Dogs explore former gas plant locations for contaminants in January 2003 on the Bronx River in New York, NY.



## 5. ARCHAEOLOGICAL REUSE

“An artwork can function as a site for re-enacting and unraveling discursive constellations of media-cultural relevance. Situated at the present, it may become an observation post and conceptual laboratory to access the cultural landscape ... art has certain advantages, including its freedom to travel freely back and forth in time, drawing together seemingly discrepant elements from various discourses.”

— Erkki Huhtamo, *An Archaeology of Networked Art*.<sup>24</sup>

The third and final theme of reuse in the media arts will be referred to as *archaeological reuse*. This archaeology pulls its influence from media archaeology; an approach to media studies and history that has emerged over the last two decades characterized by a desire to uncover and circulate repressed or neglected media approaches and technologies. The lost traces of media technologies are deemed as important topics

to be excavated and studied: “dead” media technologies and idiosyncratic developments reveal important themes, structures and links in the history of communication that would normally be occluded by more obvious narratives. Media archaeology is a multilayered approach that includes tracing irregular developments and unconventional genealogies of present-day communication technologies and suggests that the most interesting social and technological developments often happen in the neglected margins of history.

These themes from media archaeology also inspire artists to use obsolete media technologies as materials in their work. Like a time machine, artifacts from a

different era summon up a discarded mode of thought and bring forward its lost conceptual nuances. The purpose of invoking the past is to bend and short circuit the marginal past with the present: media archaeology remixes and challenges our memories of the past, the historically marginal and our experience in the present.

5.1 Jennings, *Story Teller* (1999)

A useful example of archaeological reuse is *Story Teller*, a project initially exhibited in 1999 built by American artist Tom Jennings (born 1955, Boston). Using the obsolete telecommunications storage medium of perforated tape, the project narrates its stories through a custom-built system of forgotten technologies ranging from the cold war to the 1980s: a teletype machine, a paper tape reader, and a phoneme-speech processing system. These technologies have been reengineered and reworked to deliver a strange proto-multimedia performance and multilayered narrative which functions as a rethinking of history as narrative, the process of mediation and the origins of digital computing.<sup>25</sup>

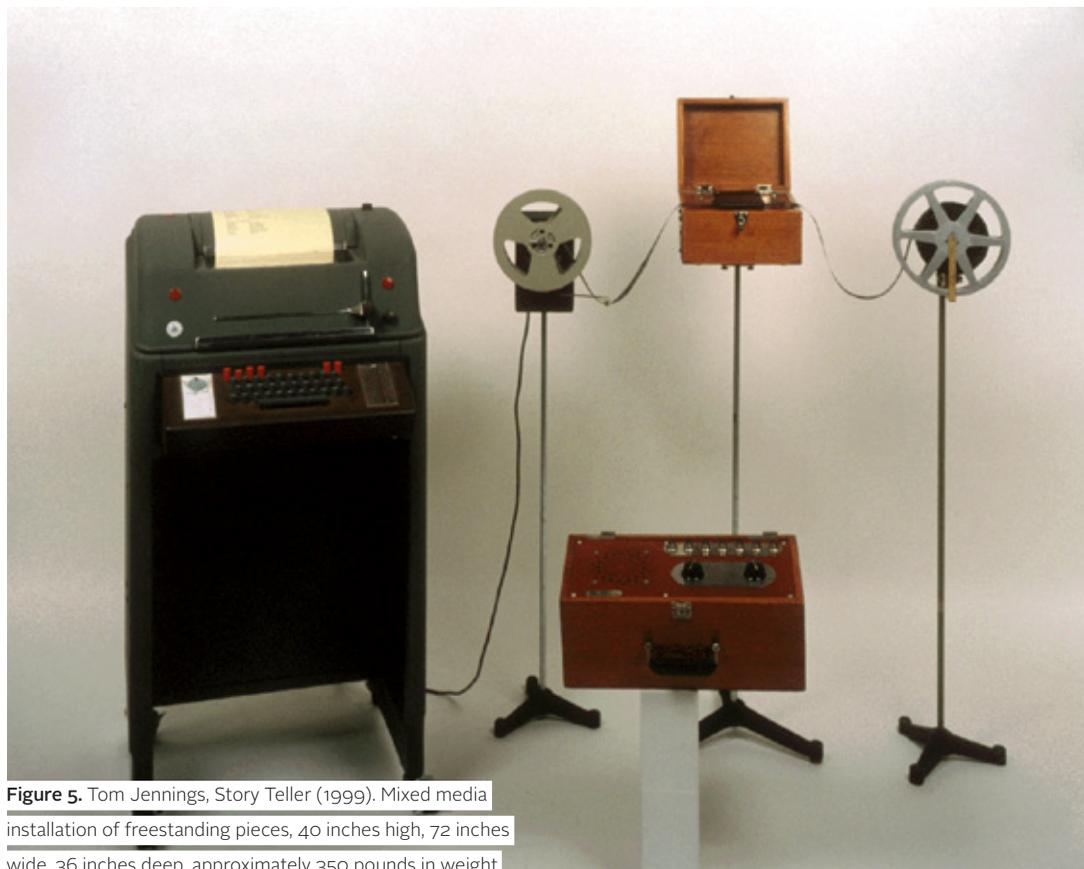
In public exhibitions between 1999 and 2007, Jennings' system has been used to audibly recite an eight-hour narrative of the British mathematician and founder of the discipline of computer science, Alan Turing. Turing (1912–1954) is credited as being one of the first individuals to envision a calculating machine that could process more than just numerical data, envisioning a machine that read and punched paper tape to modify its own programs.<sup>26</sup> Jennings' work revisits the foreign mindset of early computing through a careful revival of archaic media technologies: a bulky teletype machine recalls the era of the telegram, and spools of punched paper recollect binary data in the middle of the Twentieth Century. These technologies reconstruct a blend of dead media from the past that are not replicas of an exact time and location, but a

speculative conglomeration of lost forms of communication from the history of computing. Jennings goes to considerable lengths to present artifacts that appear that they came from the past, including the functionality of paper tape and Teletype, the careful use of historical materials like Bakelite, Micarta and brass, and building of handcrafted enclosures from oak. Together, the *Story Teller* system is a hybrid blend of obsolescence where unfamiliar time periods are layered into a functional system that is almost impossible to differentiate from an actual historical artifact from the 1950s.

This is Jennings' point, though. By rewinding, reviving and revising media history, he highlights unique and multilayered threads through the conceptual nuances wrapped up in communication technologies from the era of Turing. Jennings terms his work as an “obsolete forgery” of history, a communication technology that might have impossibly existed, which brings us closer to the original context of Turing in the process.

The lost mode of Turing's thought as presented by Jennings in *Story Teller* acts as groundwork to the contemporary computing era; they are discarded artifacts of the past that in a contemporary context seem curious, uncanny or even absurd. However, as Kuhn notes, the absurdities found in these discarded modes of thought can be used as tools to change the meaning of how we understand the present.<sup>27</sup> In this case, the strangeness of *Story Teller* shifts our perceptions of contemporary computing.

*Story Teller* transports us into a time when data and computing had a tactile, mechanical quality that is almost completely foreign to contemporary sensibilities: the system is visceral and mechanical with large spools of punched paper data being fed, crunched and spit out of the tape reader. Jennings' work does not explore the black box of current technologies: it trans-



**Figure 5.** Tom Jennings, *Story Teller* (1999). Mixed media installation of freestanding pieces, 40 inches high, 72 inches wide, 36 inches deep, approximately 350 pounds in weight.

ports us away to a foreign mindset where information was simultaneously digital, tactile *and* visual. In comparison, a contemporary computer retrieves data in almost a completely automated manner, and requires no physical exertion beyond a mouse click. The read information is transferred from its sealed hard drive through an invisible process only hinted to with faint mechanical sounds.

Jennings' visceral tape-driven data system provides a pause to rethink the process of mediation: Story Teller highlights, even in our post human era, that information still requires a carrier, even if it is magnetic, etched with lasers, or transmitted through the air. Information and technology can be more usefully considered as mutually constitutive and ultimately indissoluble, like light and illumination, a dancer and dance, or rivers and banks.<sup>28</sup>

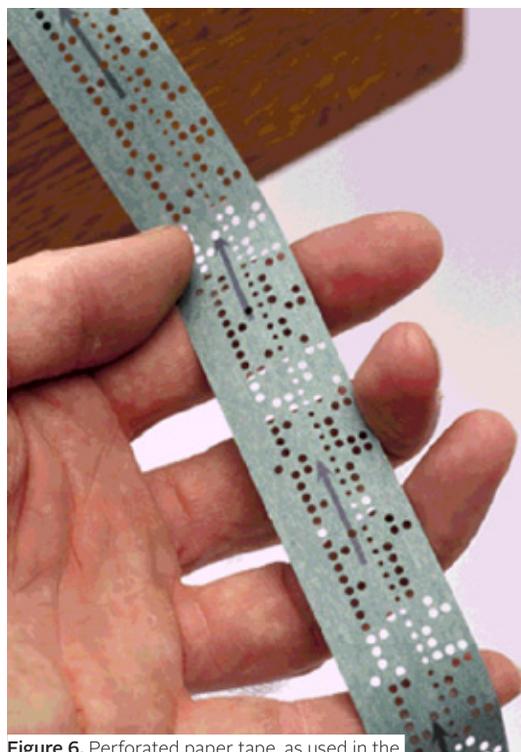
## 6. CONCLUSIONS

*"The goal is not to destroy technology in some neo-Luddite delusion, but to push it into a state of hypertrophy, further than it is meant to go. Then, in its injured, sore, and unguarded condition, technology may be sculpted anew into something better, something in closer agreement with the real wants and desires of its users."*

— Alex Galloway, *Global Networks and the Effects on Culture*.<sup>29</sup>

Obsolete information technologies are used by media artists as materials in their work for a number of different reasons, including explorations inside the black box of technology, to tactically target institutions for the purposes of social change, and to short circuit and rewire the historical past with the present. Innovators – like Reed Ghazala, Natalie Jeremijenko and Tom Jennings – sculpt technological devices to their desires as creative musicians, activists and historiographers and in the process help clarify how discarded media technologies serve variegated and engaging roles in contemporary culture.

Together, these tactics of reuse are useful in rethinking the role of technology in the media arts and critically challenging wider cultural concepts of prog-



**Figure 6.** Perforated paper tape, as used in the Story Teller system (1999) by Tom Jennings.

ress and planned obsolescence. Although the social problem of electronic waste is an issue that cannot be solved solely through creative repurposing, articulating and exploring the topic of reuse is essential in shifting assumptions of technological advancement, what it means to be innovative, and how to conceptualize electronic surplus as a rich platform for creative development. ■

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