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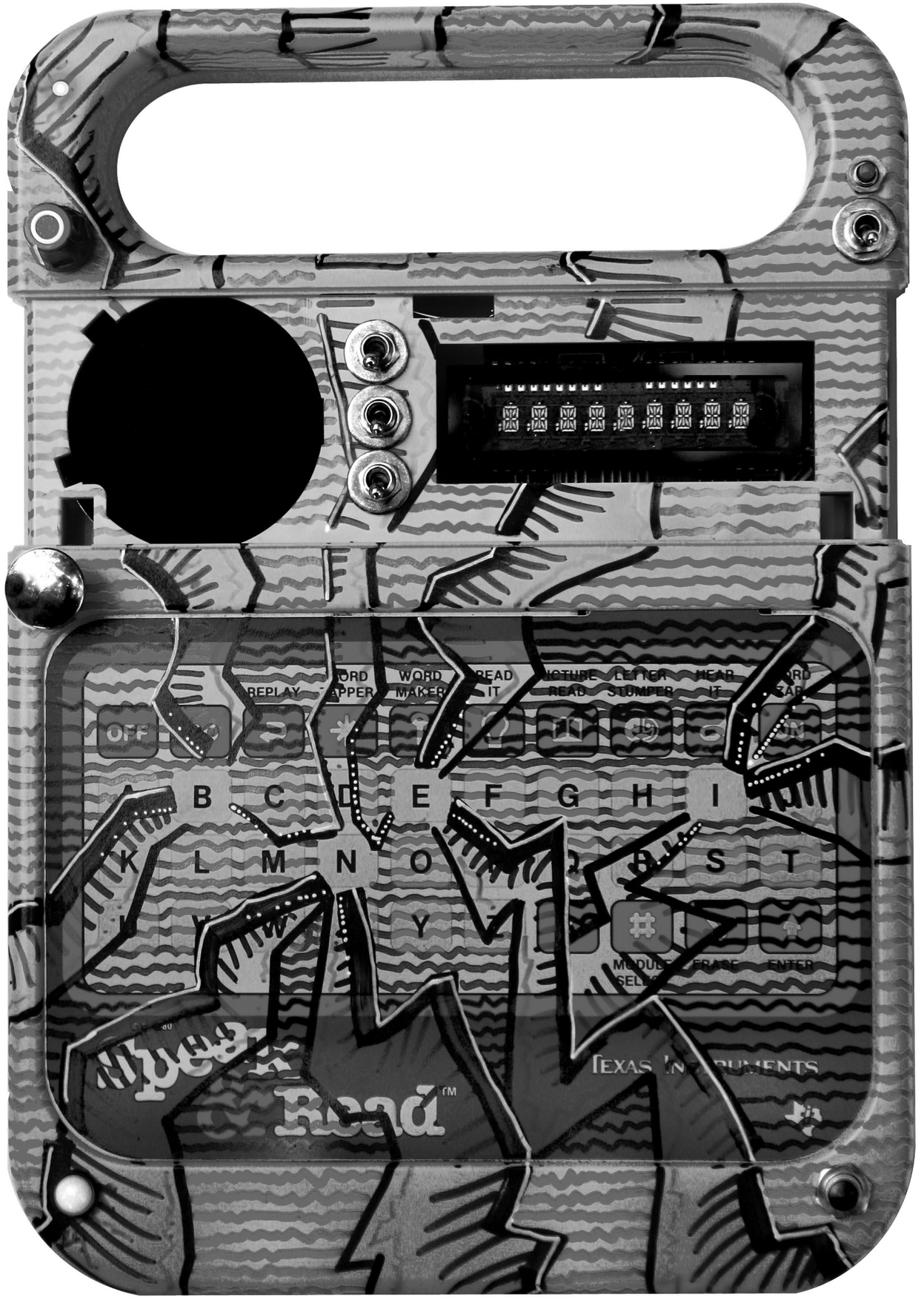
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Garnet Hertz and Jussi Parikka

ABSTRACT

This text is an investigation into media culture, temporalities of media objects and planned obsolescence in the midst of ecological crisis and electronic waste. The authors approach the topic under the umbrella of media archaeology and aim to extend this historiographically oriented field of media theory into a methodology for contemporary artistic practice. Hence, media archaeology becomes not only a method for excavation of repressed and forgotten media discourses, but extends itself into an artistic method close to Do-It-Yourself (DIY) culture, circuit bending, hardware hacking and other hacktivist exercises that are closely related to the political economy of information technology. The concept of dead media is discussed as "zombie media"—dead media revitalized, brought back to use, reworked.

In the United States, about 400 million units of consumer electronics are discarded every year. Electronic waste, such as obsolete cellular telephones, computers, monitors and televisions, composes the fastest-growing and most toxic portion of waste in American society. As a result of rapid technological change, low initial cost and planned obsolescence, approximately 250 million functioning computers, televisions, VCRs and cell phones are discarded each year in the United States [1]. The federal Environmental Protection Agency (EPA) estimates that two-thirds of all discarded consumer electronics still work.

Digital culture is embedded in an endless heap of network wires, lines, routers, switches and other very material things that, as Jonathan Sterne acutely and bluntly states, "will be trashed" [2]. Far from being accidental, the discarding and obsolescence of technological components is in fact integral to contemporary media technologies. As Sterne argues, the logic of new media does not mean only the replacement of old media by new media, but that digital culture is programmed with the assumption and expectation of a short-term forthcoming obsolescence. There is always a better laptop or mobile phone on the horizon: New media always becomes old.

This text is an investigation into planned obsolescence, media culture and temporalities of media objects; we approach this under the umbrella of media archaeology, a branch of media theory focused on old and dead media devices. In our work, we aim to extend media archaeology into an art methodology. Hence we follow the work of theorists such as Erkki Huhtamo [3] and others who have given the impetus to think about the complex materiality of media as technology—from Friedrich Kittler to Wolfgang Ernst and Sean Cubitt. Media archaeology has been known for its innovative work in excavating repressed, forgotten or past media technologies in order to understand the contemporary technological audiovisual culture in alternative ways. However, we extend media archaeology into an artistic method close to Do-It-Yourself (DIY) culture, circuit bending, hardware hacking and other exercises that are closely related to the political economy of information technology. Media in its various layers embodies memory: not only human memory, but also the memory of things, of objects, of chemicals and of circuits.

Planned Obsolescence

The concept of planned obsolescence was first put forward by Bernard London in 1932, as a proposed solution to the Great Depression. In London's mind, consumers that continued to use and reuse devices long after they were purchased prolonged the economic downturn. His proposal outlined that every product should be labeled with an expiration date and that the government should charge tax on products that were used past their determined lifespan:

> I propose that when a person continues to possess and use old clothing, automobiles and buildings, after they have passed their obsolescence date, as determined at the time they were created, he should be taxed for such continued use of what is legally "dead" [4].

Although London's proposal was never implemented as a government initiative, the planning of obsolescence was adopted by product designers and commercial industry: artificially decreasing the lifespan of consumer commodities—as with new fashions that make old clothing appear outdated—increases the speed of obsolescence and stimulates the need to purchase. Industrial designers such as Brooks Stevens popularized the dynamic of planned obsolescence in 1954 as instilling a "desire to own something a little newer, a little better, a little sooner than is necessary" [5]. Retailing experts such as Victor Lebow further clarified this mandate in 1955:

> These commodities and services must be offered to the consumer with a special urgency. We require not only "forced draft" consumption, but "expensive" consumption as well. We need things consumed, burned up, worn out, replaced, and discarded at an ever-increasing pace [6].

In reference to contemporary consumer products, planned obsolescence takes many forms. It is not only an ideology, or

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Article Frontispiece. Reed Ghazala, an *Incantor*, a modified, or "circuit-bent" Speak & Read, 2002, first developed in 1978. (© Reed Ghazala)

a discourse, but more accurately it takes place on a micropolitical level of design: difficult-to-replace batteries in personal MP3 audio players, proprietary cables and chargers that are only manufactured for a short period of time, discontinued customer support or plastic enclosures that are glued shut and break if opened [7]. In other words, technological objects are designed as a "black box"—not engineered to be fixable and with no user-serviceable parts inside.

Repurposing Obsolescence in Contemporary Art

Despite planned obsolescence, the probing, exploring and manipulating of consumer electronics outside of their standard lifespan is a key tactic in contemporary art practice. Reuse of consumer commodities emerged within various art methods of the early avant-garde in the early 20th century, from Pablo Picasso and Georges Braque's work with found newspapers in 1912 to Marcel Duchamp's *Bicycle Wheel* of 1913 or his inverted Bedfordshire urinal *Fountain* of 1917. Media art historical writing has widely addressed such practices [8], and hence we will focus on other aspects in our article.

The mass production of commodities has shifted significantly in the century since Braque, Picasso and Duchamp's readymade work in the 1910s: Since a significant "readymade" portion of commodities in American society is electronic, artists have moved to working with and exploring electronics, computers, televisions and household gadgets. Early artistic repurposers of consumer electronics include Nam June Paik, who rewired televisions as early as 1963 to display abstract, minimalist shapes. Although many artists using electronics have focused on exploring the potentials of new media forms, others have approached using electronic commodities in the spirit of assemblage, *bricolage*, readymade or collage: as an everyday and standing reserve, or Heideggerian *bestand*, of available raw materials [9]. Instead of using electronics to explore or develop cutting-edge technologies, this approach uses "trailing edge" everyday and obsolete technologies as its key resource.

Bending Circuits: *The Incantor*

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 [10]. The technique of circuit bending takes found objects such as battery-powered children's toys and inexpensive synthesizers and modifies them into DIY musical instruments and homemade audio generators.

Likely the most recognizable example of circuit bending is Ghazala's *Incantor* series of devices, highly customized Speak & Spell, Speak & Read and Speak & Math children's toys that he has built since 1978 (Article Frontispiece). The methodology of "bending" the toy involves dismantling the electronic device and adding components such as switches, knobs and sensors that allow users to alter and shift the circuit. Ghazala's *Incantor* devices completely reconfigure the synthesized human voice circuitry within a toy to spew out a noisy, glitchy tangle of sound that stutters, loops, screams and beats.

The process of circuit bending typically involves going to a second-hand store or garage sale to obtain an inexpensive battery-powered device, taking the back cover of the device off and probing the mechanism's circuit board. The tinkerer uses a "jumper" wire to connect any two points on the circuit board and thus temporarily short-circuits and rewires the device. The battery-powered device is powered on during this process, and the individual listens for unusual sound effects that result from probing. If an interesting result is found, the connections are marked for modification. It is possible to insert switches, buttons or other devices between these points to enable or disable the effect.

The Circuit Bending of (Formerly) New Media

Circuit bending is an electronic DIY movement undertaken by individuals without formal training or approval and focused on manipulating circuits and changing the taken-for-granted function of the technology. The manipulator of consumer electronics often traverses through the hidden content inside of a technological system for the joy of entering its concealed underlayer, often breaking apart and reverse-engineering the device without formal expertise, manuals or defined endpoint. This approach is characteristic of the early-20th-century wireless and radio culture, post-World War II electronic culture (especially post-1970s electronic amateurism), hobbyism or DIY-tinkering that was typified in organizations like the Homebrew Computer Club [11]. Conceptually the history of such techniques can be related to nomadic, minor practices in the manner outlined by Deleuze and Guattari, but also it can be connected to tinkering as a methodology of media archaeological art in the work of such artists as Paul DeMarinis, as Huhtamo has noted [12]. In Certeau's terms, "these 'ways of operating' constitute the innumerable practices by means of which users reappropriate the space organized by techniques of sociocultural production" [13]. Circuit bending is a way of operating that reminds us that users consistently reappropriate, customize and manipulate consumer products in unexpected ways, even when the inner workings of devices are intentionally engineered as an expert territory. Ghazala's *Incantor* is useful as a tool to remind us of sociotechnical issues in contemporary society, including planned obsolescence, the blackboxing of technology and the interior inaccessibility of everyday consumer products.

As a way of operating, circuit bending is an aspect of digital culture that does

Fig. 1. A blackboxed system processes input into output without the user's knowledge of the interior functionality of the system. (© Garnet Hertz)

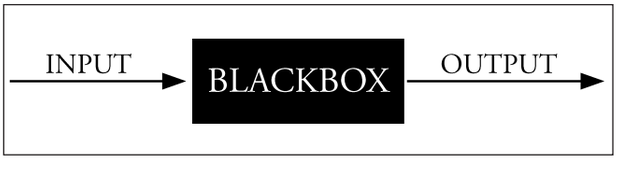

Fig. 2. When a blackboxed system is broken, output stops. At this point, the black box becomes depunctualized. (© Garnet Hertz)

Fig. 3. The interior of a blackboxed system is expert territory and tends not to be user serviceable. (© Garnet Hertz)

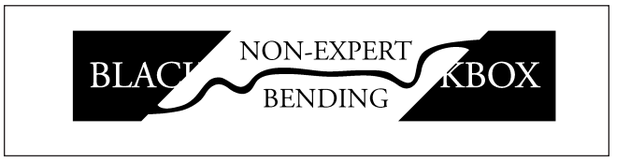

Fig. 4. Despite being expert territory, portions of the non-user-serviceable interior of the blackbox system can be manipulated and bent by non-experts. The authors propose that both computer hardware and historical archives can be bent. (© Garnet Hertz)

not easily fit under the term "new media"; the customized, trashy and folksy methodologies of circuit bending recall historical practices of reuse and serve as a useful counterpoint to envisioning digital culture only in terms of a glossy, high-tech "Californian Ideology" [14]. We find Ghazala's explorations similar in spirit to media archaeology and propose a stronger articulation of media archaeology as an art methodology—and furthermore not only an art methodology that addresses the past, but one that expands into a wider set of questions concerning dead media, or what we shall call zombie media—the living dead of media history [15] and the living dead of discarded waste that is not only of inspirational value to artists but signals death, in the concrete sense of the real death of nature through its toxic chemicals and heavy metals. In short, what gets bent is not only the false image of linear history but also the circuits and archive that form the contemporary media landscape. For us, "media" is approached through the concrete artifacts, design solutions and various technological layers that range from hardware to software processes, each of which in its own way participates in the circulation of time and memory. Media is itself an archive in the Foucauldian sense, as a condition of knowledge, but also as a condition of perceptions, sensations, memory and time. In other words, the archive is not only a place for systematic keeping of documents, but is itself a condition of knowledge. In this text, we place a special emphasis on hardware, even if we do not wish to claim that it is the only aspect about media we should consider.

Media Archaeology as Bending Circuitry

The political economy of consumer capitalism is a media archaeological problem as well. Media archaeology has been successful in presenting itself as a methodology of lost ideas, unusual machines and re-emerging desires and discourses searching for elements that set it apart from mainstream technological excitement and hype, but not always connecting such ideas to political economy or ecology.

With wide implications for media archaeological methodology, the concept of the archive is increasingly being rethought not as a spatial place of history, but as a contemporary technological circuit that redistributes temporality. This is how Wolfgang Ernst suggests theorists and artists rethink media archaeology: not only as an excavation of the past, but as an intensive gaze on the microtemporal modulations that take place in computerized circuits of technology [16]. This alternative sense of technological temporality is closer to engineering diagrams and circuits than to the historian's hermeneutic interpretation of documents. By technological temporality we understand how technology itself is not only of time, but itself has its own time in which it functions. Drawing directly from Foucault, media archaeology is for Ernst monumental, not narrative: It focuses more on the real technological conditions of expressions than on the content of media. Hence, Ernst is not interested in alternative media histories (in the vein of for example Huhtamo or Siegfried Zielinski), or even in imaginary media that challenges mainstream discourses of media technology [17], but in concrete devices through which we can understand the nature of temporality in contemporary electronic and digital culture. For Ernst, media archaeology starts from the media assemblage—a device that is operational. This is also the case for many media archaeological artists, such as DeMarinis, Gebhard Sengmüller and a more recent wave of young artists such as Institute for Algorhythmics who are interested in concrete sonic archaeologies of contemporary media.

Circuits are what define modernity and our IT-oriented condition. Circuits inside radios, computers and televisions are only one face of circuitry. The circuits we can open up from their plastic enclosures are only relays to wider, more abstract circuits in terms of cables and lines, of electromagnetic radiation and wireless transmission. The air is filled with waves of "disembodied" information technology, and culture is permeated with circuits of political economy. Hence, it would be an important project to write a media archaeology of circuits. The circuit, not the past, is where media archaeology starts if we want to develop a more concrete design-oriented version of how we can think about recycling and remediation [18] as art methods.

> *What does a media archaeology of consumer objects look like when, instead of going back in time to media history, we go inside a device?*

Yet, there is a special challenge for work that takes as its object a concrete opening up of technologies. The inner workings of consumer electronics and information technologies are increasingly concealed as a result of the development of newer generations of technologies, a feature that is characteristic of recent decades of technological culture. What does a media archaeology of consumer objects look like when, instead of going back in time to media history, we go inside a device?

Once developed and deployed widely, technical components are understood by users as objects that serve a particu-

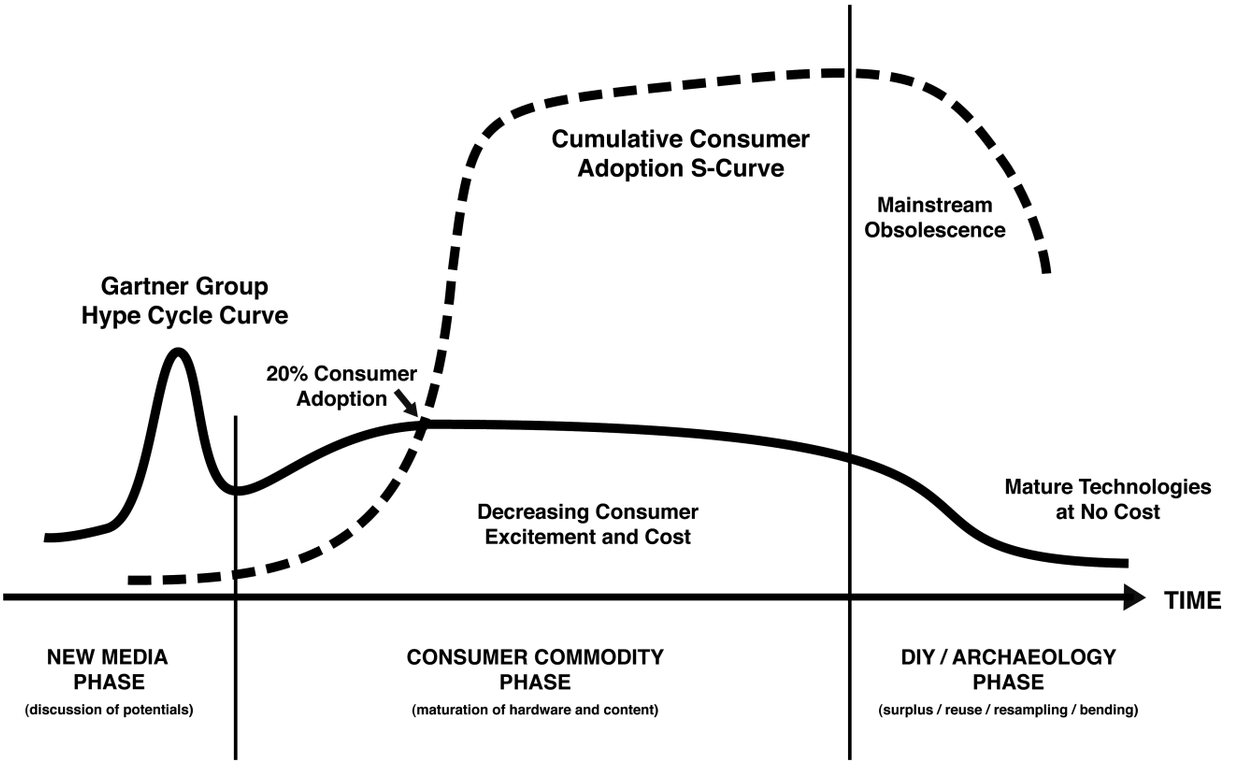

Fig. 5. Phases of media positioned in reference to political economy: New Media and Media Archaeology are overlaid on Gartner Group's Hype Cycle and Cumulative Consumer Adoption Curve diagrams, graphic representations of the economic maturity, adoption and business application of specific technologies [31]. (© Garnet Hertz)

lar function: an electronic toy makes a sound when a button is pressed, a telephone makes a telephone call, a computer printer outputs a document when 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 (Fig. 1). It is only an object with a particular input that results in a specific output; its mechanism is invisible. From a design perspective, the technology is intentionally created to render the mechanism invisible and usable as a single, punctualized object.

Punctualization refers to a concept in Actor-Network Theory [19] that is used to describe bringing components together into a single complex system that can serve as a single object. We refer to the disassembly of these single objects as "depunctualization"—which is a practice that shows a circuit of dependencies and infrastructures [20].

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 [21].

A black box, however, is a system that is not technically understood or accessed, and as a result these technologies are often completely unusable when they become obsolete or broken. 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 we can fix with replacement light bulbs, many consumer electronic devices have no user-serviceable parts, and the technology is discarded after it breaks (Fig. 2). The depunctualization, or breaking apart of 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 so that users will discard them, and their obsolescence is clearly planned (Fig. 3).

Within the framework of media archaeology, it is important to note that there is not simply one black box. Instead, one box hides a multitude of other black boxes that work in interaction, in various roles, in differing durations. As Bruno Latour notes, it is often when things break down that a seemingly inert system opens up to reveal that its objects contain more objects, and actually those numerous objects are composed of relations, histories and contingencies.

Consider Latour's methodological exercise as an art methodology for media archaeology:

> Look around the room. . . . Consider how many black boxes there are in the room. Open the black boxes; examine the assemblies inside. Each of the parts inside the black box is itself a black box full of parts. If any part were to break, how many humans would immediately materialize around each? How far *back* in time, *away* in space, should we retrace our steps to follow all those silent entities that contribute peacefully to your reading this chapter at your desk? Return each of these entities to step 1; imagine the time when each was disinterested and going its own way, without being bent, enrolled, enlisted, mobilized, folded in any of the others' plots. From which forest should we take our wood? In which quarry should we let the stones quietly rest? [22]

For the arts, objects are never inert

but consist of various temporalities, relations and potentials that can be brought together and broken apart. Things break apart everyday anyhow—especially high technology—and end up as inert objects, dead media, discarded technology. Yet, dead media creeps back as dangerous toxins into the soil, or alternatively as zombie media recycled into new assemblies. According to Ernst, media archaeology is less "about dead media, but . . . media undead. There is an untimeliness of media which is incorporated here" [23]. Hence, there is a distinct difference between Wolfgang Ernst and the Dead Media Project of Bruce Sterling, which in a different way addresses forgotten media and the obsolete. Zombie media is concerned with media that is not only out of use, but resurrected to new uses, contexts and adaptations.

Archivist/Circuit Bender

For the figure of the artist, technical media has meant nods towards both engineering as well as the archive, as Huhtamo has noted:

> The role of the artist-engineer, which rose into prominence in the 1960s (although its two sides rarely met in one person), has at least partly been supplanted by that of the artist-archaeologist [24].

Yet, methodologies of reuse, hardware hacking and circuit bending are becoming increasingly central in this context as well. Bending or repurposing the archive of media history strongly relates to the pioneering works of artists such as Paul DeMarinis, Zoe Beloff and Gebhard Sengmüller—where a variety of old media technologies have been modified and repurposed to create pseudo-historical objects from a speculative future.

Referring to DeMarinis's various sound-based projects such as *The Edison Effect* (1989–1993) and *Gray Matter* (1995), Huhtamo has suggested that the notion of the artist-archaeologist can be approached as a "t(h)inkerer" [25]. In the age of consumer electronics, the artist can also be seen as an archaeological circuit bender and hacker, thus creating a link between media archaeology and the political agenda of contemporary media production. The black boxes of the historical archive and consumer electronics are cracked open, bent and modified (Fig. 4).

Media Archaeological Time: Time of the Living Dead

We now want to bring these various components together: planned obsolescence, the material nature of information and electronic waste. Planned obsolescence was introduced as the logic behind consumer technology cycles, embedded in a culture of material information technologies that in themselves should increasingly be understood as a source of chemicals, toxic components and other residue left behind after their media function has been "consumed." The realization that information technology is never ephemeral and therefore can never completely die has both ecological and media archaeological importance. Information technology in the form of its material assemblages also has a duration that is not restricted to its human-centered use value: media cultural objects and information technology have an intimate connection with the soil, the air and nature as a concrete, temporal reality. Just as nature affords the building of information technology—consider how, for example, gutta-percha was an essential substance for insulating 19th-century telegraphic lines or how columbite-tantalite is an essential mineral for a range of contemporary high-tech devices—so do these devices eventually return to nature [26].

In short, information technology involves multiple ecologies that traverse political economy and natural ecology [27]. This Guattarian take on media ecology is connected to an ecosophical stance: an awareness of overlapping ecologies feeding into interrelations between the social, mental, somatic, non-organic and animal. Indeed, following Sean Cubitt's lead, we argue that archaeologies of screen and information technology media should increasingly look not only at the past, but inside the screen to reveal a whole different take on future-oriented avant-garde:

> The digital realm is an avant-garde to the extent that it is driven by perpetual innovation and perpetual destruction. The built-in obsolescence of digital culture, the endless trashing of last year's model, the spendthrift throwing away of batteries and mobile phones and monitors and mice . . . and all the heavy metals, all the toxins, sent off to some god-forsaken Chinese recycling village . . . that is the digital avant-garde [28].

Hence, this archaeology of tinkering, remixing and collage would not start from Duchamp and the historical avant-garde, but from opening up the screen, the technology.

Media archaeological methods have carved out complex, overlapping, multi-scalar temporalities of the human world in terms of media cultural histories, but in the midst of an ecological crisis a more thorough non-human view is needed. In this context, bending media archaeology into an artistic methodology can be seen as a way to tap into the ecosophic potential of such practices as circuit bending, hardware hacking and other ways of reusing and reintroducing dead media into a new cycle of life for such objects. Assembled into new constructions, such materials and ideas become zombies that carry with them histories but are also reminders of the non-human temporalities involved in technical media. Technical media may process and work at sub-phenomenological speeds and frequencies [29], but it also taps into the temporalities of nature—thousands of years of non-linear and non-human history [30].

In conclusion, communications technologies have moved beyond the new media phase and through the consumer commodity phase; much of it is already obsolete and in an "archaeological phase." The practice of amateurism and hobbyist DIY characterize not only early adoption of technologies, but also the obsolescence phase. Chronologically, digital media has moved from its speculative opportunity phase in the 1990s through its wide adoption as a consumer commodity in the 2000s and has now become archaeological. As a result, studying topics such as reuse, remixing and sampling has become more important than discussions of technical potentials (Fig. 5). Furthermore, if temporality is increasingly circulated, modulated and stored in technical media devices—the diagrammatics and concrete circuits that tap into the microtemporality that is below the threshold of conscious human perception—we need to develop similar circuit bending, art and activist practices as an analytical and creative method-

Zombie media is concerned with media that is not only out of use, but resurrected to new uses, contexts and adaptations.

ology: hence, the turn to archives in a wider sense that also encompasses circuits, switches, chips and other high-tech processes. Such epistemo-archaeological tasks are not only of artistic interest but tap into the ecosophical sphere in understanding and reinventing relations between the various ecologies across subjectivity, nature and technology.

Although arguments concerning death-of-media may be useful as a tactic to oppose dialog that only focuses on the newness of media, we believe that media never dies: it decays, rots, reforms, remixes, and gets historicized, reinterpreted and collected (see Fig. 5). It either stays in the soil as residue and in the air as concrete dead media, or is reappropriated through artistic, tinkering methodologies.

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22. Latour [20] p. 185.

23. Wolfgang Ernst, personal correspondence with Garnet Hertz, 20 October 2009.

24. Erkki Huhtamo, "Time-Traveling in the Gallery: An Archaeological Approach in Media Art." In *Immersed in Technology: Art and Virtual Environments*, edited by Mary Ann Moser with Douglas McLeod (Cambridge, MA: The MIT Press, 1996), 243.

25. Huhtamo [3].

26. Gutta-percha is a natural latex rubber made from tropical trees native to Southeast Asia and northern Australasia. Columbite-tantalite, or "coltan," is a dull black metallic ore, primarily from the eastern Democratic Republic of the Congo, whose export has been cited as helping to finance the present-day conflict in the Congo.

27. Félix Guattari, *The Three Ecologies*. Trans. Ian Pindar and Paul Sutton (London and New Brunswick, NJ: Athlone Press, 2000).

28. Sean Cubitt interviewed by Simon Mills, Framed, online at <www.framejournal.net/interview/10/sean-cubitt>.

29. Such hidden, partly abstract but completely real and material "epistemologies of everyday life" are investigated in a media archaeological vein by Institute for Algorhytmics, <www.algorhythmics.com/>.

30. Cf. Manuel DeLanda, *A Thousand Years of Non-Linear History* (New York: Zone Books, 1997).

31. For more information on Gartner Group's Hype Cycle theory, see Jackie Fenn and Mark Raskino, *Understanding Gartner's Hype Cycles*, 2009. Gartner Group.

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