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23 May, 2017

The Unending lives of net-based artworks: Web archives, browser emulations, and new conceptual frameworks

Abstract

Research into net-based artworks is an undertaking divergent from much prior art historical scholarship. While most objects of art history are stable analog works, largely in museum collections, net-based artworks are vital and complex entities, existing on artists' websites alongside older versions captured in web archives. Scholars can profitably use web archives, browser emulators, and other digital methods to study the history of these works, but these new methods raise critical methodological issues. Art historians must contend with how the artwork changes over time, as well as the ever-evolving environment of the web itself. Probing the piece *Homework* by Alexei Shulgin as a test case, I investigate the methodological issues that arise when conducting art history research using web archives. In applying these methods, scholars must also attend to the evolving and multiple nature of these artworks. Drawing on the archival theory of Wolfgang Ernst and the records continuum model developed by Frank Upward and Sue McKemmish, I present a framework for conceptualising net-based artworks as plural and heterogeneous archives. This framework is generative of new readings of net-based artworks, accommodates new methods, and can also usefully equip scholars approaching dynamic cultural heritage objects in web archives more broadly.

Keywords

net art, art history methods, Alexei Shulgin, digital preservation, web archives

Framing net-based art

Framing an artwork is no easy task. Paintings, sculptures, and other objects encountered in museums as ‘artworks’ are constituted as such through complex sociotechnical processes. Pearce (1993) describes these objects as “lumps of the physical world to which cultural value has been ascribed,” (p. 4), and the processes by which this ascription of value occur are historically contingent and responsive to the particular materiality of the ‘lump’ in question. The means by which a moderately-sized Renaissance era oil painting is cataloged, stored, or hung for display will be quite different from that of a large ancient Greek statue. The art historian studying either the contemporary painting or the ancient Greek statue attends to the processes of objectification, but also contributes to these processes in how she frames and contextualises these material entities as ‘works.’ Perhaps the ancient Greek statue is broken into several pieces, some fragments missing and others owned by several institutions, and the scholar attempts to hypothetically reconstruct the whole statue. Perhaps the painter of the Renaissance era work is unknown and the scholar makes a case for a potential creator. Whether explicit or implicit, art historical scholarship responds to existing processes of objectification, and initiates new processes that contest or confirm the boundaries of the art object as it stands.

Framing a net-based artwork is more complicated still, when the ‘lump’ in question is not paint or stone, but a network of webpages that change over time. Processes of objectification are still in play for net-based artworks, a general term referring to artworks that use network technologies like HTML, email, or web browsers as a medium, as defined by Ippolito (2002), who distinguishes these from analog artworks that have been digitised for the web. However, these processes are quite distinct from those involved in intellectually and materially

constructing oil paintings and ancient statues as objects of art history. Digital artworks call for new methods of art historical research, such as the analysis of the underlying source code as a means of gaining insight into the creative processes of the artist and the functionality of the work (Engel and Wharton, 2015), but digital artworks—and net-based artworks specifically—also raise anew the question of how we define the ‘artwork’ as such in the first place. In this essay, I consider how net-based artworks become objects of art historical study not through traditional museological practices, but rather through the techniques and tools of web archiving. I provide an overview of challenges and approaches to the preservation of net-based artworks, illustrating how these processes shape the artifacts of net-based artwork available for art historical study. Using *Homework* (1997) by Alexei Shulgin as an example, I explicate how the constitution of this art object through web archives, browser emulators, and other digital methods for art historical analysis signal the need for a new conceptualisation of the ‘artwork,’ which is not an easily bounded entity like a painting, nor an impermanent and immaterial performance like Conceptual art of the 1960s and 70s (Lippard, 1973).

From one perspective, *Homework* (figs. 1 and 2) is a single webpage, in which the artist playfully represents the experience of waking up and being overwhelmed by bodily experience; but Shulgin’s piece also exists as part of a broader constellation, created in response to a homework assignment created by Natalie Bookchin for a computational arts course, and circulated by Shulgin on a number of listservs and forums, inspiring a number of artists to create their own related pieces. Enmeshed in this broader network of interactions, net-based artworks like *Homework* need to be conceptualised in ways that attend to their plural nature as art objects and web archival records: the interrelated electronic documents that constitute net-based

artworks take shape and transform over time in response to the sociotechnical processes of archival appraisal, collection, and preservation. Jones (2016) and Van Alphen (2014) have considered the ways in which contemporary installation and new media art has treated archives as the subjectmatter, or even medium, of artworks, but what I suggest is that net-based artworks in their dynamic lives on the web, intersecting with digital archival spaces like the Internet Archive (IA), proliferate into the shape of archives themselves. Reflecting on the particular case of *Homework*, I will draw on archival theory, and specifically the continuum model of recordkeeping (Upward, 2000), to develop a framework for studying net-based artworks through web archival collections where archival captures of components of the work are stored, but to also consider these works themselves as plural and heterogeneous archives.

Stabilising instability

Among the central concerns in the long-term sustainability of net-based artworks is how best to preserve inherently dynamic content, though as Serexhe (2013) alerts, the broader critical discourse on this issue remains woefully nascent. Serexhe suggests that the digital age has ushered in a paradigm shift in artistic production and dissemination, making it “necessary to undertake a thoroughgoing revision of previous theories and practices of art,” including curation, exhibition, and preservation (p. 23), though scholars and museum professionals have only just begun this revision. As discussed above, the problem of bounding, stabilising, and preserving a material entity as an ‘artwork’ is not unique to net-based art. Conti (2007) describes how 17th century painters crafted the hue and tone of their paintings with an eye to how the oils would yellow and brown as they aged, “when time, through the settling of materials, had rendered them sweeter,” and 17th century gallerists accordingly arranged paintings for display based on how

these colours harmonised over time, a resonance honed through “various varnishings and opportune tonings” (p. 107). As this example makes clear, analog works like paintings are also dynamic objects, actively constructed over time by artists, conservators, and audiences.

However, net-based artworks trigger these questions in a new light given their radically different materiality and composition. As compared to more physically stable artworks, the component parts of net-based works are an ever-updating web of electronic documents, raising a preservation issue that Besser (2001) describes as the inter-relation problem:

as the World Wide Web dramatically demonstrates, information is increasingly inter-related to other information. Any given web page typically contains links to numerous other web pages. These links are important to the content, meaning, and contextualization of that web page, yet the pages that are linked to are likely to change their location or content over even a short period of time.

Although analog artworks physically change over time, a complex issue addressed in arts conservation discourse, net-based artworks are distinct in that the constitution of the work cannot be delimited to a discrete set of material components, but rather exist as a difficult-to-define network of electronic documents, the parts of which continue to shift in relation to an amorphous whole. Traditional arts institutions are structured to handle artworks as fixed objects, however, maintaining this physical and conceptual stability through wall labels and catalog entries that establish the boundaries of the ‘work,’ and conservation practices that manage the material integrity of the art object (Clavir, 1998). Stallabras (2009) suggests that this “post-medium condition” is a primary factor as to why net-based art has eluded institutionalisation in museums and scholarly treatment in art history discourse: not only does this ‘inter-related’ art trouble the notion of a single autonomous creator, but “worse still [lacks] the comfort of materiality and (often) museum display” (p. 173).

Arts organisations have collected net-based artworks in a variety of ways, including special online galleries like the Whitney ARTPORT¹ (Graham, 2014), though these strategies stretch the traditional notion of the museum as a carefully arranged exhibition space; the visitor follows a link, and quickly leaves the sanctioned space of the museum, entering again into the broader context of the web. Beyond these more traditional collecting models, net-based artworks are collected in the growing digital archives of organisations like Rhizome and the IA, which store archival captures of net-based artworks even as the ‘original’ works continue to live on the artist’s servers and homepages. This is the case for *Homework*, which resides in both of these collections, as well as Shulgin’s own homepage, <http://www.easylife.org>.

Similar to a traditional cultural heritage institution, the Artbase collects and preserves significant examples of net-based artwork, in many cases working closely with artists to ensure that pieces are preserved according to the original intentions for the work (Fino-Radin, 2011). Users accessing *Homework* through the Artbase will discover a catalog entry for the work that provides contextual information and a link to a static version of the piece.² While the catalog information in the Artbase describes how Shulgin’s piece was created as a part of a larger participatory project, users experience *Homework* as a more or less discrete entity. In contrast to the focused scope of Rhizome’s Artbase, the mission of the IA is to preserve a broad historical record of the web. While Rhizome collects a particular version of an artwork to preserve over time, the IA collects expansively across the web, using automated crawlers to capture websites extensively and intensively, capturing the same URL many times over months, years, and now

1 <http://artport.whitney.org/about.shtml>

2 <http://rhizome.org/art/artbase/artwork/homework/>

decades. The page for Shulgin's *Homework*, as well as a number of the related pages such as Bookchin's original coursepage and assignment,³ have all been captured intermittently by the IA.

The collection and preservation of net-based artworks like *Homework* can be seen as a special case of web archiving. As Summers and Punzalan (2017) describe, web archives are constituted through sociotechnical infrastructures, at the nexus of negotiation between people, web archiving platforms and interfaces, and a variety of manual and automated tools for appraising, capturing, and preserving websites. This is also at work in the archival capture and preservation of *Homework* by both Rhizome and the IA. In both of these archival collections, Shulgin's piece becomes an object in the dual sense outlined by Foot and Schneider (2010). According to their object-oriented web historiography, the web is constituted as object of study both in the sense of an activity, or a dynamic entity collaboratively co-co-constructed by a number of actors, and artifact, or a demarcated material entity. Foot and Schneider emphasise the role that researchers play in this dual objectification of the web, and art historians likewise participate in the objectification of net-based artworks: alongside other actors like the artist and curators, the scholar actively reaches towards the work, pulling together the constellation of interrelated webpages into an art object; the scholar also constitutes the art object through artifacts, accessing archival captures in institutional archives, or even contributing their own artifacts, perhaps in the way of screenshots of unique configurations of a given piece, or by creating emulators to parse the work in otherwise defunct browsers. To study net-based artworks, then, art historians need to be able to read not only the artwork, but also the archives, accounting for how archival processes affect the ways in which an artwork is accessed and experienced. Put

³ <https://web.archive.org/web/19980502192835/http://artslab.ucsd.edu:80/ARTSLAB/Homework/homeworkspecs.html>

another way, art historians need to be able to read the artwork *as an archives*: a multifarious body of electronic documents shaped by a number of developmental forces both human and non-human, including the artist, but also archivists, institutional appraisal and collection policies, and tools like web crawlers and emulators. All of these forces shape the artwork as an object, the vitality of which continues to expand as myriad activities and artifacts augment the expanding body of web archival materials that constitute the work.

Participation and pop-ups

I have chosen to focus on Shulgin's *Homework* as it is both conceptually and aesthetically representative of the broader net art scene in the 1990s. *Homework* was produced out of communication among a social network of net-based artists, incorporating signature features of the early web such as a text-heavy display and pop-up messages, and linking beyond Shulgin's own domain space to related projects by other artists. All of these characteristics also make *Homework* a difficult work to preserve or study as a stable object, as the work emerges not out of the experience of a single electronic document, but across a web of interrelated documents managed by a number artists and organisations beyond Shulgin himself. The work originated not from Shulgin, but from an actual homework assignment for a class taught by media artist Natalie Bookchin, "Introduction to Computing in the Arts," at University of California San Diego. In the original assignment description, Bookchin linked to a page hosted on Heath Bunting's server. Bunting stumbled across the assignment and posted a link on the listserv 7-11, which is where Shulgin discovered it, who in turn continued the chain of communication about the assignment, posting announcements on various other listservs, calling for artists to complete the assignment

and turn in pieces for Bookchin to grade (Dietz, 1998). Shulgin, Bunting, Vuk Cosic, jodi, and several other net artists all turned in artworks.⁴

Shulgin's piece begins with large, black text on an otherwise blank webpage reading, "Well I woke up this morning and realised that," a message quickly followed by a barrage of pop-up boxes expressing a range of desires: "I want to piss," "I want to work." These pop-ups continue as the main screen changes to declare, "all at once!" which is written multiple times in a staggered pattern that marches left and right across the page. The formative element of the piece, the pop-up message, seems strange and even jarring, an archaic feature of a long-gone Web, as these are now automatically blocked by most browsers. For this particular work, this basic change in the functionality of browsers radically alters how most contemporary users approach the work. Even if a user temporarily switches off her pop-up blocker to allow the piece to fully function, the significance of the pop-up on the web in 2017 is quite different than it would have been in 1997, when many sites employed this web operation for purposes ranging from spam advertising to playful interactivity as in the current work. In fact, the present work mimics the experience of spam: the pop-ups flit around the screen, making it almost impossible to close the flashing windows without shutting down the browser entirely. Interacting with the work, the user is made aware of the capacities and functions of the browser window as a virtual yet constructed object. The browser is no longer a transparent window for the consumption of content, but a launching pad for provocative pop-up messages.

As with the pop-message, the visual aesthetic of *Homework* is of a piece with the web of the mid-90s, at a time when discourses surrounding best practices for web design were still nascent, spurned on in part by critiques against gimmicky, obtrusive textual effects like the

⁴ <https://web.archive.org/web/19990203112342/http://jupiter.ucsd.edu/~bookchin/finalProject.html>

<blink> and <marquee> tags (Whipple, 2010). Net artists, though, reveled in the aesthetic of the early web, creating works that formally experimented with the possibilities of this still largely text-driven medium. Greene (2004) describes strategies such as extending text over multiple pages or deliberately dispersing text in spatial patterns to “[transform] a text into something more filmic” (104). This impulse is certainly at play in *Homework*, with its dancing words and flashing pop-up messages. Despite the fervent critiques against this kind of mobile text, Whipple (2010) finds cause to celebrate these effects as they demonstrate expanded possibilities afforded by electronic textuality. *Homework* too evinces a sense of joy: with a simple string of code, the artist conjures text alive.

Representative of 1990s net-based art, Shulgin works in a design diction that Lialina (2005) has called the ‘vernacular web’:

To be blunt it was bright, rich, personal, slow and under construction. It was a web of sudden connections and personal links. Pages were built on the edge of tomorrow, full of hope for a faster connection and a more powerful computer. One could say it was the web of the indigenous...or the barbarians. In any case, it was a web of amateurs soon to be washed away by dot.com ambitions, professional authoring tools and guidelines designed by usability experts.

Lialina enumerates many features that characterise the vernacular web, such as starry night backgrounds to homepages, libraries of lo-fi .GIF and .MIDI files, and lots of links on every page. Overall, these features speak to an amateurish and experimentalist experience of the web, where anyone with a bootstrap knowledge of HTML and an Internet connection could easily launch a homepage and join a community of users. As Lialina’s description of the vernacular web illustrates, the homespun aesthetic of early net-based artworks has a clear political and economic valence, asserting a vision of the web driven by the self-determined interests of community participants.

As Ries (2009) articulates, the earliest examples of net-based art activity, such as the online arts community THE THING, operated on just this principle; artists sought to establish autonomous spaces, producing a “pure sociality” and fostering the exchange of ideas via these electronic forums more so than singular ‘artworks’ (pp. 65-79). Daniels (2009) marks 1997 as a “dead end or turning point” for net-based art, as the full-scale commodification of the technological infrastructure of the web by Internet Service Providers (ISPs) made extra-commercial autonomy for online social communities increasingly untenable (p. 31). *Homework*, first created in 1997, lies on the cusp of this transition, falling into what Dieter classes as the second phase of net-based artwork, in which artists moved away from strictly open-ended participation and exchange in community forums like The THING and towards the creation of more defined ‘works.’ As we have seen with *Homework*, this second phase of net-based art still strives to maintain a space on the web for personal expression and community building, even if this persists in a subversive, minor mode within an environment increasingly dominated by commercial applications of networked technologies like Amazon and eBay. Although *Homework* does exist in some ways as a more or less bounded work with a specified creator and date of creation, the work resists any kind of singular objectification: the ‘work’ manifests both in the webpages created by Shulgin and others, but also the community listservs which disseminated the call for artists to participate in this piece and the UCSD domain space that these artists infiltrated with their extracurricular submissions.

The importance of the social and political content *Homework* has only become more clear in the years following the initial creation. Promising a more ‘social’ web, the advance of the ‘Web 2.0’ paradigm in the early 2000s actually marked a re-entrenchment of corporatism online

following the dot-com crash of 2001. As O'Reilly (2005) urges, "far from having 'crashed,' the web was more important than ever," with Google taking over as the web's standard bearer. While this promise has been born out by the explosion of social media platforms, all of which provide users means to quickly and easily establish a web presence, this 'community' is a far cry from the vernacular web espoused by Lialina and practiced in *Homework*. Twitter and Facebook, after all, are businesses. Not only must participants agree to strict terms of use in order to join the platform, but these terms secure the commodification of the content generated as a result their participation (Srnicek, 2017). Billions have signed up for Facebook accounts, using the platform to create social networks among friends and acquaintances, but do so without ever fully knowing how the platform works and with extremely limited means to gain this insight.

Created before the rise of these platforms, but at a time when the commodification of the web was ratcheting up, *Homework* counters this trending corporate influence by initiating a generative albeit temporary social space: a mock classroom in which anyone could contribute an artistic project. Taking the classroom as its model, *Homework* replicates structures of authority and expertise, with Bookchin assigning grades, categorising projects into different genres of net-based art, and even delivering admonishments. Bookchin's assessments echo the processes of valuation performed by museums and art history discourse, selectively including or excluding particular artists into the critical scope of the institution. However, in *Homework*, these critical processes are rendered absurd, with Bookchin (1997b) playfully assuming the caricature of an authority figure, chiding the ascendant net art duo jodi to "Turn off your computers! Look out your window not into your screen! Smell the flowers, feel the sun."

The enduring aspects of the work, however, is not any particular contribution, but rather the communal output of all of the contributors, and the processes by which this community was formed. Shulgin tapped existing networks of online artists, sending announcements through popular arts listservs and websites. Artists responded to these calls, illustrating the effectiveness and potential of these social networks; their participation evidenced a shared investment in generating self-determined social spaces for creating and exchanging ideas online, and a commitment to the playful aesthetic of the vernacular web. The participatory environment of *Homework* was not intended to be sustained, and was indeed impermanent by design. As with any class assignment, participants had to meet a stated deadline: December 3, 1997. Active participation in this temporary community ceased after this time, but Bookchin's (1997a) site serves as a record of this brief but productive social space, collating links for all of the assignments turned in (as well as a couple late submissions).

There is a temptation to compare participatory net-based artworks like *Homework* to performance art, where the ‘work’ happens in a particular time and place, with only documentation of the work entering the record. In carving out an art historical context for net-based art, Greene (2004) draws a genealogy back to 1960s conceptualism and performance art through a shared “emphasis on audience interaction, [and] transfer of information and use of networks, simultaneously bypassing the autonomous status traditionally ascribed to art objects” (p. 10). The key difference with net-based artworks like *Homework* is that the activity constituting this performance occurred in and through the exchange and accrual of electronic documents, many of which continue to live on the web and in web archives, proliferating from the initiation of the project through to the present day. These documents are not documentation

of a past performance—they are the still-living manifestation of that work. We can conceptualise net-based artworks performance and conceptual artworks, and even more bounded analog artworks like paintings, all as living entities that transform over time, but the ontogeny of net-based artworks is unique among these. *Homework* has entered into digital archives even as it continues to live on Shulgin's domain space, accessible via emulations of legacy browsers even as it can be called up on an iPhone (fig. 3). The heterogeneous circumstances for *Homework* stem from a diverse set of technologies and practices: web archiving tools and emulation platforms among others. All of these act as development forces on this single ‘work,’ which I have elaborated as both a complex of electronic documents as well as interactions and exchanges between multiple artists in a participatory social space. Access to this participatory social space may now be closed off, but the work-as-archive lives on—and continues to expand and morph in unexpected ways.

Archives, emulators, and the continuum

Shulgin himself puzzled over the objectification of his artistic activity into more bounded ‘works’. In an interview with Medosch (1997), Shulgin reflects that “the net at present has very limited possibilities for self expression, but there is unlimited possibility for communication.” In this quote, we can see *Homework*: a visually simplistic webpage, but situated in a complex conceptual project designed to inspire communication between many participants. Throughout this interview, Shulgin posits net-based art as existing between pure communication and exchange among artists and creeping institutionalised arts systems of categorisation and curation: “Imagine if there are working 50,000 people on the net as artists, who will be looking at that? There must be some system of contextualization, some system of hotlists, even curating...which

in a way is again another power structure, but on the other hand we cannot do things without, its a very ambivalent situation.” Even as Shulgin resists the power structure of institutional efforts to curate, catalog, and package artworks, he questions if there is any alternative: “But how can you record this communicative element, how can you store it?”

The answer to this, perhaps, are the tools and techniques of web archiving. In the IA’s web archives, users will find 157 archived versions of Shulgin’s *Homework*, intermittently captured on dates spanning 1998 to 2017. Users can browse through the years and months and select the date of the specific archived version of the work that they wish to visit. As these versions of *Homework* have been captured as part of a much larger archive of the web, users can click through to the links to Bookchin’s site and on to the related projects submitted by the other participating artists. Although this provides users with a sense of how Shulgin’s piece continues to operate within a networked social space, the IA’s collection is not comprehensive by any means. Users will quickly run into dead links or try to access pages that have not been as consistently archived as Shulgin’s contribution. Connections across the artists’ different domain spaces persist, but the capacity of these connections is now determined by incidence as much by choice, with many connections only now possible because an automated crawler captured a certain set of sites at a certain time.

Homework remains ‘incomplete’ in Rhizome’s Artbase as well, which has captured Shulgin’s individual piece and the call for participation sent out to other artists,⁵ but has stopped short of archiving the total network of artists’ contributions or Bookchin’s coursepage. However, I urge that we cannot see these disparate captures of *Homework* in various web archival collections as distinct objects, or as separate but ‘incomplete’ versions of the work. Instead, I

⁵ <http://archive.rhizome.org/artbase/1734/homework/index.html>

argue that all of these electronic documents—the page presented on Shulgin’s homepage, the 157 captures in the IA, Rhizome’s curated copy, the captures that I have created for my own web archive—all make up the ‘art object,’ which comes to look more like an archives than a discrete and bounded artwork. The archival nature of this work becomes more apparent when we distinguish the logic of digital archives from that of analog archives, as Ernst (2013) describes: while analog archives involve the permanent, stable storage of materials, digital archives operate on a principle of dynamic transfer of materials across a network. Although cultural heritage institutions like archives and museums have long followed the model of amassing vast quantities of material objects in a fixed geographic location, global networked infrastructures of digital computing environments have sparked a transformation in this model, with an emphasis on access and transfer of data over and above storage. “Repositories are no longer final destinations but turn into frequently accessed sites. Archives become cybernetic systems” (Ernst, 2013, p. 99). Analog archives are built for duration over centuries, with access deliberately limited to facilitate physical preservation, whereas digital archives are constituted through the almost immeasurable micro-temporality of data flowing across points on the network, moving rapidly and constantly out of the institutional space and onto users’ computers.

In the case of *Homework*, both ‘archived’ and live versions of piece co-exist in this flow of data. Archived captures of *Homework* are no less on the web than the version of the work that continues to live on Shulgin’s homepage: all 157 versions collected by the IA, the archived version in the Artbase, and the version on Shulgin’s site all circulate simultaneously, sharing analogous material existences as electronic bits of information, abstracted and formalised as HTML documents, and parsed and visually presented by web browsers. Returning to the object-

oriented approach to web historiography (Foot and Schneider, 2010), preservationist motives drive the archival activities of IA and the Artbase, ensuring that a plethora of captures of the piece persist, guarding against the perhaps inevitable time when Shulgin's site is no longer active; these activities generate artifacts, joining the large and multiple body of electronic documents constituting the living entity of this work. These archival systems influence the shape of *Homework*, inducing a proliferation of component webpages, coming as a direct effect of the medium of the work itself. Shulgin's piece arose out of a social space created on the web, and these archival systems sustain and invigorate that space through the very same medium. There is no distinct 'original' or 'preserved' version for this piece, but rather a still-living network of interrelated documents accrued over the course of nearly 20 years.

To return to Shulgin's question over how to store the communicative element so central to 1990s net-based artworks, though, this body of web archival material captures the electronic documents constituting the work, but fails to capture the performative online space that first initiates this proliferation of documents. It remains absolutely crucial to historicise the piece and point to a specific date of creation, acknowledging that the initial artistic activity that sparked *Homework* in 1997 escapes the archive. But we must also attend to the ways in which this art object has transformed over time as a body of web archival materials—this too is a critical part of the history of this net-based artwork. In order to account for the breadth and complexity of net-based artworks, existing as both performative social exchanges situated at a particular time and also as proliferating bodies of web archival documents that continues today, we need to avoid seeing this works as a dichotomy of the 'original' and the 'archived,' and instead envisage this works in terms of a continuum.

Upward (2000) describes continuum theory as a tool for modeling the complexity of archives (p. 116), which carry multiple meanings derived from the various functions, situations, and utilities incurred as archival objects move across spacetime. Upward models spacetime according to four dimensions or processes: creation of the record, as a trace of some activity; capture, as records are brought into various individual, corporate, or institutional systems; organisation, as records are marshaled into shared structures of understanding and access; and pluralisation, as records push beyond discrete systems into the broader communal memory. All of these processes are at work in the web archival development of *Homework*. The piece begins as a number of webpages, traces of the communal activity of the participating artists. These are captured in web archives like the IA, and then organised by arts institutions like Rhizome. As the web archival network of the piece expands, the work continues to pluralise, spreading past discrete institutional collections and entering into the broader cultural memory—the totality of these processes, for this piece as well as expressive online culture in general, also captured and organised in web archives, we might describe as the vital formation of a cultural heritage of the web.

According to continuum model, these processes do not occur in discrete intervals or select spaces; rather the record overlaps and intersects these dimensions, accruing multiple, variable layers of context as it moves through spacetime, both in and outside the custody of cultural heritage institutions. The continuum framework helps archivists and other information professionals to recognise and parse out these contextual layers in a critical way, applying this, for instance, to inform descriptive practices and generate metadata that represents the complexity of the object (McKemmish, 2001, p. 353). Art historians, examining net-based artworks that exist

in and through web archives, can also apply the continuum theory to understand these as works “always in a process of becoming” (McKemmish, 1994). If source code analysis offers art historians an approach to dig into the granular particularities of a digital artwork (Engel and Wharton, 2010), continuum theory complements this, providing a broad lens to conceptualise the artwork as it has moved across and developed over spacetime.

Across these dimensions, records encounter human and non-human agents, “stretched into new shapes and structures” by sociotechnical mechanisms and processes (Upward, 2001, p. 119). Emulators are such a factor, and one especially important for art historians interested in approximating the look and feel of a work in an earlier web environment. One particular tool, oldweb.today, developed by Illya Kreymer along with Dragan Epsenschied, is an emulation platform for legacy browsers, enabling users to load archived versions of websites from the IA and other digital archives onto browsers, such as Netscape Navigator and Mosaic (“Cyberspace”). Rothenberg (1999) first championed emulation for the preservation of all manner of digital objects, describing emulation as a flexible strategy that could “handle current and future documents of unknown type in a uniform way, while being capable of evolving as necessary” (p. v). Given the unpredictable development of the web standards and browsers, emulation of past web browsers provides some assurance that historic webpages will continue to be accessible now and into the future.

Despite this potential for preservation and historical inquiry, emulation cannot be taken as a direct recreation of the original context of a net-based artwork like *Homework*. Emulation adds formal and representational layers on top of the work, in effect engineering a new and altogether unique context for the work, raising the question of the ‘authenticity’ of the emulated work.

Many researchers have addressed the concern as to whether emulation can truly mimic the look, feel, and functionality of the original computing environment for a piece of software or electronic document. Rieger et al. (2015) note that emulators running on current machines introduce a number of differences that alter how a given work is experienced: new hardware may display colors differently or provide new functions not possible on older machines, which might be as subtle as a change in the design of a mouse or keyboard (p. 12). In a user study comparing side-by-side experiences of emulated and original digital objects, Hedstrom et al. (2006) found that ‘authenticity’ was difficult to pin down as an evaluative criteria, in that “subjects used a complex reasoning process that took many different factors into account to judge the authenticity of digital documents” (p. 183). Although ‘authenticity’ is a concern when dealing with emulated artworks, this study suggests there is no one set of properties to exactly define or assess the ‘authenticity’ of the emulated work.

Even if we cannot specifically define ‘authenticity,’ this is certainly at issue with the oldweb.today platform. The emulation of Netscape Navigator, for instance, may look like the late-90s browser, but likely loads pages at a much faster clip than the rate to which users of dial-up Internet were accustomed. Beyond concerns over the look and feel, users also need to be aware of how the emulation platform interfaces with web archives to present webpages in the browser. While a non-emulated browser will access the version of a webpage currently hosted at the designated location on the requested server, oldweb’s emulated browser loads archived captures from the IA or other institutional collections. As discussed earlier, these archived pages are still part of the web, but the oldweb emulator requests and presents these pages through different protocols than a non-emulated browser.

This can lead to potentially problematic renderings of net-based artworks. For example, when I attempt to load an archived version of *Homework* from 1998 using an emulation of Netscape Navigator 4.06 for Macintosh, this seemingly cohesive instance of the piece is actually composed using 28 different archival captures spanning a period of 10 years (fig. 4). This disparity is caused by the pop-up function of the work itself. While the background page reading “all at once!” was archived in 1998, the various pop-ups were all archived at different times. In the directory for Shulgin’s site, each pop-up is located at a unique URL; while the artwork is constituted in the experience of rapid pop-up messages flashing over the dancing message on the background page, in practice the work is broken into many discrete webpages that are only united when a user accesses the index page via a web browser. The emulated browser re-creates this performance of the artwork, but due to web archiving processes that rely on automated crawlers to capture websites, the entirety of the piece was not uniformly archived. Although I experience this as a complete version of the work, I am actually viewing a patchwork version of the work that never existed at all—or at least did not exist until I loaded this particular suite of archival captures onto this particular emulated browser.

The situation of the emulated net-based artwork, culled together from temporally-disparate web archival fragments, appears from one perspective to be a disintegrated work, an inauthentic rehash. However, from the perspective of the continuum theory of archives, this emulation is not a distinct copy of some past object, but another contextual layer the work has accrued as its web archival body moves through spacetime. As Brügger (2010) articulates, the web as an artefact is not static nor discrete, but rather part of a “recurrent process of (re)-creation with its surroundings” (p. 33). Brügger describes web history as “writing the complex strategic

situation in which an artefact is entangled” (p. 33), and for the history of net-based artworks like *Homework*, preservation tools like browser emulators are a factor that enter into this complex strategic situation.

To move past this stumbling block of ‘authentic original’ versus emulated copy, I would frame emulation *not* as a tool strictly for recreating the ‘original’ viewing context of a given work, but rather as another developmental force, shaping our current experience of the work even as we might use the platform to imagine past experiences. As with the digital archives of IA and Rhizome, the oldweb.today platform is also part of the present web, a dynamic environment in which *Homework* continues to live, change, and proliferate. Digital archives and emulators help to preserve *Homework* in this environment, but these preservation strategies are themselves generative, keeping the work alive by providing the means for its renewal, a strategy described elsewhere as the variable media approach (Ippolito and Rinehart, 2014). The sense of preservation as an essentially creative act is not a new notion with digital art. As Viollet-Le-Duc (1854/1996) describes the restoration of historic buildings, “to restore an edifice means neither to maintain it, nor to repair it, nor to rebuild it; it means to reestablish it in a finished state, which may in fact never have actually existed at any given time” (p. 314). Much like the restorative work of the oldweb emulator, which composes a cohesive version of *Homework* out of many pieced together captures of HTML documents from Shulgin’s domain space, the restored building or monument incorporates new and old materials to reestablish a complete entity. This building is none the more stable for being made of brick and wood.

Forking paths and dead ends

Throughout this essay, I have described *Homework*, and net-based artworks more generally, as living entities. The preservation of *Homework* in digital archives and through emulators does not make a static copy of a once living thing, but inform the continued development of this living entity, providing a host of new ways to experience the work that co-exist on the web alongside the ‘original’ version still residing on Shulgin’s homepage. The essential point is that these preservation strategies proliferate the work, adding mass and complexity to the web of interrelated electronic documents that constitute the work, as well as new means for accessing this dense and multiple body. The records continuum theory, in turn, helps us to envisage this body of web archival materials as a unified object, albeit gaining rich layers of context as the work passes through spacetime. The preservation context for net-based artworks calls for new critical definitions for the ‘work’ and how this becomes an object of art historical study. Clearly, *Homework* cannot be delimited to a single electronic document. The study of this work involves journeying down forking paths: comparing multiple archived captures, analysing the underlying HTML of the composite documents, experimenting with different settings on emulated browsers, seeking out gaps and absences where portions of the work have *not* been preserved.

For all of the forking paths that digital archiving and emulation forge, there will always be dead ends. While we still have access to Shulgin’s piece and many of the other projects contributed, the archival record for many of these other nodes in this collaborative project are not as complete as is Shulgin’s contribution. Another aspect, the participatory social space at the heart of the project, became another dead end early on in the life of the work. Although this participatory activity remains alive in the network of electronic documents amassed, in the era of

Facebook, the ability of future viewers to recognise the possibility of this kind of social space on the web may weaken or become foreclosed entirely. Keeping this possibility alive, however, is not the sole purview of the technical and automated systems of web archives like the IA. Human agents, such as scholars, curators, or general viewers, also contribute to and enliven the work. Foot and Schneider (2010) call for social science researchers to be engaged in web archiving practices, and I would echo this call for art historians and other scholars of expressive digital culture, who can help sustain the vitality of net-based artworks by co-constructing archives of the work itself and related digital documents, as well as by enriching the metadata and contextual record surrounding the archival body of the art object. Accomplishing this requires a critical knowledge not only of the aesthetic content of the work, and its social and cultural context, but also an awareness of the technological means for its material existence over time. For net-based artworks, a variety of technological systems intervene early on in the life of the work. The archive and the emulator are part of the web environment, and enter into the content and context of net-based works shortly after the point of creation, shaping the development of these complex and interrelated artworks as simultaneously living and dying entities.

Figures

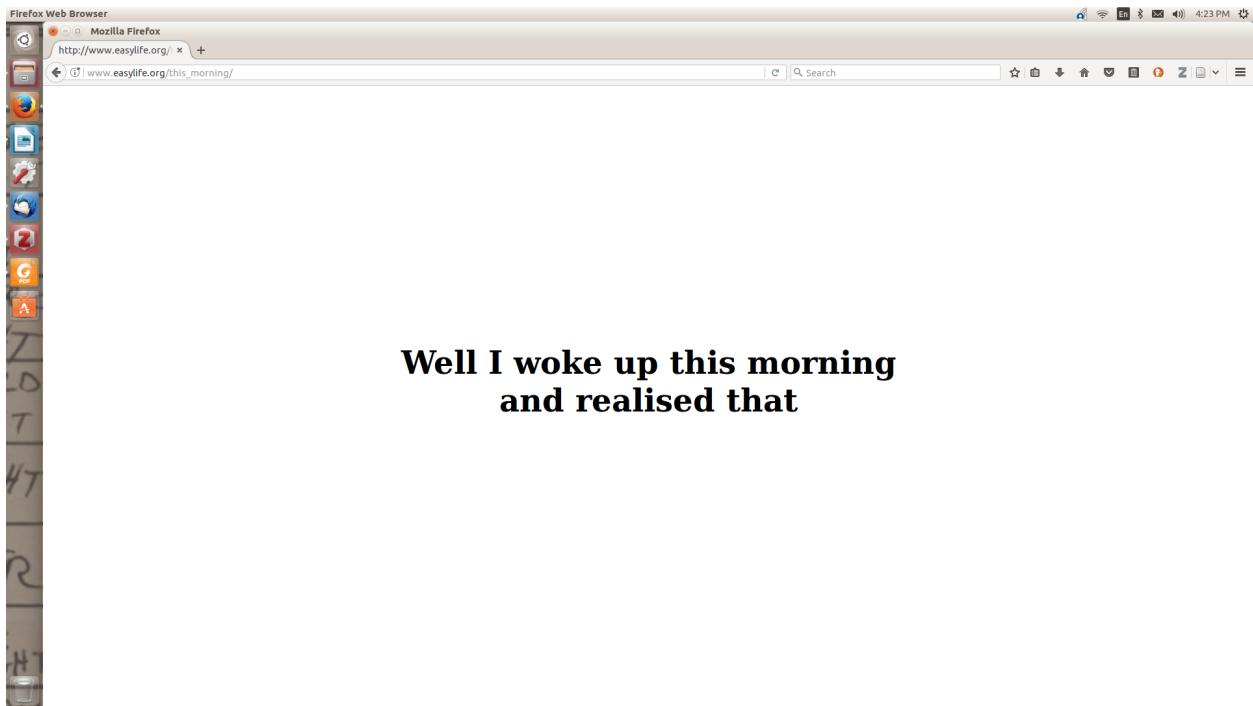


Fig. 1 Shulgin, Alexei. *Homework*. 1997. <http://www.easylife.org> (screenshot by author)

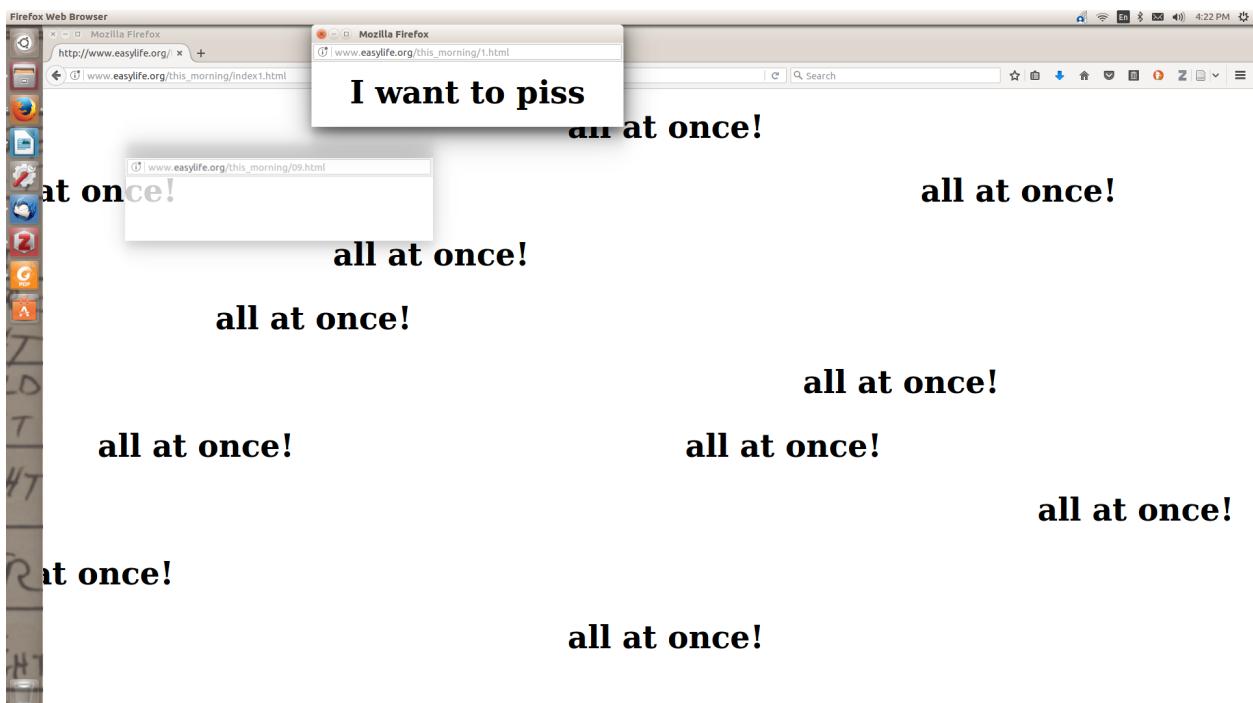
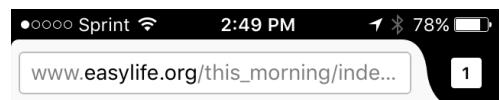


Fig. 2 Shulgin, Alexei. *Homework*. 1997. <http://www.easylife.org> (screenshot by author)



all at once!

all at o

at once!

all at once!

all at once!

all at once!



Fig. 3 *Homework* accessed on iPhone 5s (screenshot by author)

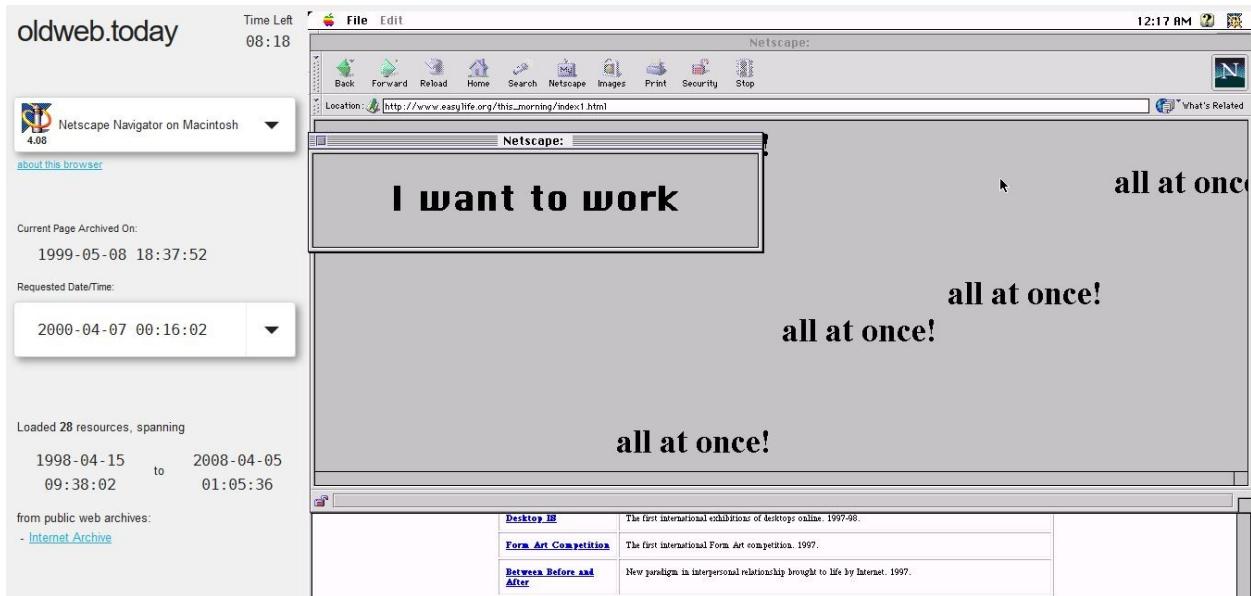


Fig. 4 *Homework* accessed using oldweb.today emulation of Netscape Navigator 4.06 for Macintosh (screenshot by author)

References

- Besser, H. (2001). Longevity of Electronic Art. In *Proceedings of the International Cultural Heritage Informatics Meeting*. Retrieved from <http://besser.tsoa.nyu.edu/howard/Papers/elect-art-longevity.html>
- Bookchin, N. (1997a). Final Grade. Retrieved May 16, 2017, from <http://web.archive.org/web/20000302213538/http://jupiter.ucsd.edu/~bookchin/finalProject.html>
- . (1997b). Jodi's grade. Retrieved May 16, 2017, from <https://web.archive.org/web/19990204002813/http://jupiter.ucsd.edu:80/%7Ebookchin/jodi.html>
- Brügger, N. (2010). Website History: An Analytic Grid. In N. Brügger (Ed.), *Web history* (pp. 29-59). New York: Peter Lang Publishing.
- Clavir, M. (1998). The Social and Historic Construction of Professional Values in Conservation. *Studies in Conservation*, 43(1), 1–8.
- Conti, A. (2007). *A history of the restoration and conservation of works of art*. Oxford: Butterworth-Heinemann.
- Daniels, D. (2009). Reverse Engineering Modernism with the Last Avant-Garde. In D. Daniels & G. Reisinger (Eds.), *Net pioneers 1.0: contextualizing early net-based art* (pp. 15-62). Berlin: Sternberg Press.
- Dietz, S. (1998). The Network Is the Artwork: (Reverse Engineering the Author). Retrieved May 5, 2017, from http://www.museumsandtheweb.com/mw98/beyond_interface/bookchin_fr.html
- Engel, D., & Wharton, G. (2015). Source Code Analysis as Technical Art History. *Journal of the American Institute for Conservation*, 54(2), 91–101.
- Ernst, W. (2013). *Digital memory and the archive*. (J. Parikka, Ed.). Minneapolis: University of Minnesota Press.
- Fino-Radin, B. (2011). *Digital Preservation Practices and the Rhizome Artbase*. Rhizome.
- Foot, K., & Schneider, S. Object-Oriented Web Historiography. In N. Brügger (Ed.), *Web history* (pp. 61-79). New York: Peter Lang Publishing.
- Graham, B. (2014). Modes of Collection. In B. Graham (Ed.), *New collecting: exhibiting and audiences after new media art* (pp. 29-55). Farnham: Ashgate.

- Greene, R. (2004). *Internet art*. London: Thames & Hudson.
- Hedstrom, M. L., Lee, C. A., Olson, J. S., & Lampe, C. A. (2006). "The Old Version Flickers More": Digital Preservation from the User's Perspective. *The American Archivist*, 69(1), 159–187.
- Ippolito, J. (2002). Ten Myths of Internet Art. *Leonardo*, 35(5), 485–498.
- Ippolito, J., & Rinehart, R. (2014). *Re-collection: art, new media, and social memory*. Cambridge, MA: MIT Press.
- Jones, D. (2016). *Installation art and the practices of archivalism*. New York, NY: Routledge.
- Lialina, O. (2005). A Vernacular web. Indigenous and Barbarians. Retrieved April 28, 2016, from <http://art.teleportacia.org/observation/vernacular/>
- Lippard, L. (1973). *Six years: the dematerialization of the art object from 1966 to 1972*. New York: Praeger.
- McKemmish, S. (1994). Are Records Ever Actual? Retrieved May 16, 2017, from <http://www.infotech.monash.edu.au/research/groups/rcrg/publications/smcktrc.html>
- . (2001). Placing Records Continuum Theory and Practice. *Archival Science*, 1, 333–359.
- Medosch, A. (1997). Interview with Alexej E.Shulgin. Retrieved May 5, 2017, from <https://web.archive.org/web/20040805135715/http://www.heise.de:80/tp/english/special/ku/6173/1.html>
- O'Reilly, T. (2005). What Is Web 2.0? Retrieved April 28, 2016, from <http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html>
- Pearce, S. (1993). *Museums, objects, and collections: a cultural study*. Washington, D.C.: Smithsonian Institution Press.
- Rhizome. (2015). Cyberspace, the old-fashioned way. Retrieved February 22, 2016, from <http://rhizome.org/editorial/2015/nov/30/oldweb-today/>
- Rieger, O. Y., Murray, T., Casad, M., Alexander, D., Dietrich, D., Kovari, J., Muller, L., Paolillo, M., & Mericle, D. K. (2015). Preserving and Emulating Digital Art Objects. Retrieved from <http://ecommons.cornell.edu/handle/1813/41368>

- Ries, M. (2009) Rendezvous: The Discovery of Pure Sociality in Early Net Art. In D. Daniels & G. Reisinger (Eds.), *Net pioneers 1.0: contextualizing early net-based art* (pp. 65-79). Berlin: Sternberg Press.
- Rothenberg, J. (1999). *Avoiding technological quicksand : finding a viable technical foundation for digital preservation*. Washington, DC: Council on Library and Information Resources.
- Serexhe, B. (2013). Born Digital—But Still in Infancy. In B. Serexhe (Ed.), *Preservation of digital art: theory and practice* (pp. 21-34). Vienna: Ambra V.
- Srnicek, N. (2017). *Platform capitalism*. Cambridge, UK: Polity Press.
- Stallabras, J. (2009) Can Art History Digest Net Art?. In D. Daniels & G. Reisinger, G. (Eds.), *Net pioneers 1.0: contextualizing early net-based art* (pp. 165-179). Berlin: Sternberg Press.
- Summers, E., & Punzalan, R. (2017). Bots, Seeds and People: Web Archives as Infrastructure. In *Proceedings of the 2017 ACM Conference on Computer Supported Collaborative Work and Social Computing* (pp. 821–834). Portland, Oregon: ACM.
- Upward, F. (2000). Modelling the continuum as paradigm shift in record keeping and archiving processes, and beyond: a personal reflection. *Records Management Journal*, 10(3), 115–139.
- Van Alphen, E. (2014). *Staging the archive: art and photography in the age of new media*. England: Reaktion Books.
- Viollet-Le-Duc, E.-E. (1854/1996). Restoration. In A. Melucco Vaccaro, N. Stanley-Price, & M. K. Talley (Eds.), *Historical and philosophical issues in the conservation of cultural heritage* (pp. 314–321). Los Angeles: Getty Conservation Institute.
- Whipple, B. (2010). The Evil Tags <blink> and <marquee>: Two Icons of Early HTML and Why Some People Love to Hate Them. In B. Dilger & J. Rice (Eds.), *From A to <A>: keywords of markup* (pp. 98-110). Minneapolis: University of Minnesota Press.