

Reactive Books: A Report to the Museum of Modern Art

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Biography: Sandra Gibson...1

Description: Jennifer Blaylock...2

Exhibition History: Xiaofei Mo...5

Working Method: Joseph Gallucci...8

Key Qualities: Jonah Volk...9

Summary of Risks: Stefan Enalbi...11

Recommendations: Walter Forsberg and Andy Uhrich...15

Introduction

In the spring of 2010, the second-year class of the Moving Image Archiving Program (MIAP) at New York University's Tisch School of the Arts teamed with the Museum of Modern Art (MoMA) in conducting research in the conservation of John Maeda's current installation, *Reactive Books*. Under the guidance of Professor Mona Jimenez, the class collaborated to produce this narrative and separately, one conservation report for each "book" in *Reactive Books*. It should be noted that different students undertook the conservation reports; thus the information in the conservation reports will demonstrate different styles and varying emphasis. The topics to be covered were agreed upon in advance; however, there was insufficient time to have students read each other's reports and come to a more consistent presentation.

Biography of Artist

John Maeda is a world-renowned artist, graphic designer, computer scientist and educator whose career reflects his philosophy of “humanizing technology.” For more than a decade, he has worked to integrate technology, education and the arts into a 21st-century synthesis of creativity and innovation. Maeda's early work redefined the use of electronic media as a tool for expression by combining skilled computer programming with sensitivity to traditional artistic concerns. This work helped to develop the interactive motion graphics that are prevalent on the web today.

As a digital artist, Maeda has exhibited in London, New York and Paris. His work is in the permanent collections of the Museum of Modern Art, the San Francisco Museum of Modern Art and the Cartier Foundation in Paris.

As a public intellectual and academic, Maeda has held university positions, has written prolifically, and gained a wide following at the world’s most influential venues. A former professor at the Massachusetts Institute of Technology, Maeda taught media arts and sciences there for 12 years and served as associate director of research at the MIT Media Lab. He has published four books, including his most recent *The Laws of Simplicity*, which has been translated into 14 languages. Maeda has lectured widely, including at Carnegie Mellon, Columbia, Harvard, Princeton, the Royal College of Art, Stanford and UCLA; at the Centre Pompidou, TED conferences and Walker Art Center.

Born in 1966 and a native of Seattle, Maeda earned bachelor's and master's degrees in Computer Science and Electrical Engineering from MIT,

followed by a PhD in Design Science from the University of Tsukuba Institute of Art and Design in Japan and an MBA from Arizona State University. Maeda is currently the president of the Rhode Island School of Design.

Description of *REACTIVE BOOKS*

The 2010 MoMA installation of John Maeda's *Reactive Books* includes five interactive computer based works installed along a wall in the following order from left to right: *Mirror Mirror*; *Flying Letters*; *12 o'clocks*; *Tap, Type, Write*; and *The Reactive Square*. MoMA's gallery configuration of the piece was originally created for the 2006 MoMA exhibition, however the 2006 installation ordered the *Reactive Books* differently than the 2010 version, with *The Reactive Square* coming first and *Mirror Mirror* last. This installation includes iMac computers with PowerPC processor and OS9 operating systems, each with one of the *Reactive Books* programs installed on the computer's hard drive, a flat screen LCD monitor, and peripheral equipment (external microphone, external web-camera, keyboard, keypads and touchpad) that are used to interface with the computer programs. The iMacs are mounted on the wall just above a six-foot eye line, angled down towards the user. Above each iMac a flat screen is mounted to display what is on the computer screen to museum visitors who are not operating the program. A keyboard is used to interact with *Tap, Type, Write*; keypads are used for *Mirror Mirror* and *The Reactive Square*; a touchpad for *Flying Letters*; a microphone for the *Reactive Square*; and a web-camera for *Mirror Mirror*. Each of the peripherals is mounted on the wall directly below an iMac, except for the microphone and web camera, which are connected to the computer through

USB. Users stand below the computer screen, looking up to see how their interaction with the peripheral equipment impacts the visual image on the computer screen. However, the installation of *12 o'clocks* does not have any peripheral equipment or an interactive function. Below is a description of the original four CD-ROM based *Reactive Books*. It's important to note that the descriptions in the art files and the descriptions posted on the wall in the exhibition all relate to the CD-ROM objects; not to the work as it is exhibited in the 2010 exhibition.

REACTIVE BOOKS (CD-ROMs):

Four books/CD-ROMs were released from 1994 to 1998 through the publisher Digitalogue. These works – including *The Reactive Square*, *Flying Letters*, *12 o'clocks* and *Tap, Type, Write* – explored the interrelationship of sound and image, the mouse as the site of interface between user and computer, visual representations of time, and the computer keyboard as technological heir to the typewriter. Digitalogue went out of business before the fifth book, *Mirror Mirror*, could be released.

- *The Reactive Square* (released 1994): includes a vellum cover with letterpress typographic design on front, 32 letterpress illustrations, letterpress text with typographic designs and page tabs as well as a CD-ROM, which contains an executable program for Macintosh computers with OS9. This program uses sound captured either by an external or internal computer microphone to change a visual representation of a square onscreen. There are 10 squares that all react differently to sound input.

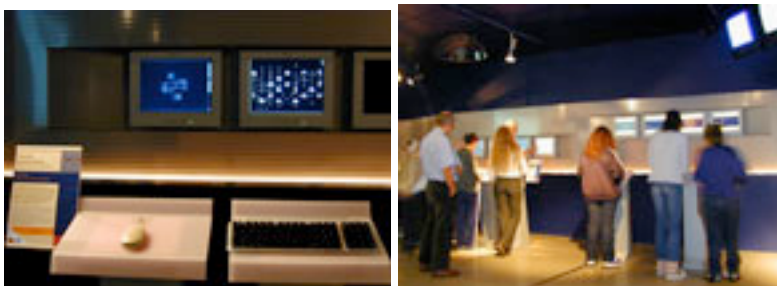
- *Flying Letters* (released 1995): includes a 15-page foldout letterpress booklet and CD-ROM, which contains an executable program for Macintosh computers with OS9. This program allows users to use a computer mouse to interact with visual graphics or what Maeda calls “typographic marionettes.” There are 10 different “pages” that the mouse interacts with differently.
- *12 o’clocks* (released 1996): includes a 35-page letterpress book and CD-ROM, which contains an executable program for Macintosh computers with OS9. This program uses the computer’s internal clock to display 12 different versions of digital clocks.
- *Tap, Type, Write* (released 1998): includes a relief-printed book jacket and folded lithograph poster insert with an interactive CD-ROM, which contains an executable program for Macintosh computers with OS9. *Tap, Type, Write* pays homage to the typewriter, stimulating playful interactions between the keyboard, the computer and the user. There are 10 different “pages” that the keyboard interacts with differently. *Tap, Type, Write* was nominated for the 1999 MILIA d’Or Prize in the General Culture category, and was awarded the 1999 I.D. Magazine Gold Prize and the 1999 New York ADC New Media Gold Award.

Exhibition History

In the ‘90s, *Reactive Books* had already been part of many exhibitions such as solo exhibition *The Work of John Maeda* at Digitalogue Gallery in 1997 and *Mirror Mirror*, which inaugurated *The Media Test Wall Project* at List

Visual Arts Center in 1998, among others. Since 2000, the works have been showcased internationally in many major exhibition venues around the world.

The five pieces of *Reactive Books* were exhibited in *Print on Screen*, as part of the Ars Electronica Festival 2000 in Linz, Austria titled *NEXT SEX - Sex in the Age of its Procreative Superfluosity*, together with 7 other pieces (*Dakadaka* by Golan Levin / Csey Reas, *Text Rain* by Romy Achituv / Camille Uterback, *An Interactive Poetic Garden* by David Small / Tom White, *Life Species II* by Christa Sommerer / Laurent Mignonneau, *Zeitgenossen* by Zelko Wiener / Ursula Hentschlager, *Letters of Bit* by Kenji Komoto and *dominoa* by Petra Harml-Prinz / Angelika Mittelmann / Renate Plöchl / Ilse Wagner / Anja Westerfrölke). The exhibition catalogue includes an article on *Reactive Books* that recognizes the influence of Maeda's style of simplicity on the web and other new media work, and describes computer as an artistic medium or a multi-dimensional canvas on which "Maeda has created a total of 52 compositions that demarcate the expressible spectrum of interactive media"¹.



Tap, Type, Write was featured in *010101: Art in Technological Times* in the San Francisco Museum of Modern Art, March 03 - July 08, 2001, a major

¹ Ars Electronica 2000 Catalog, http://90.146.8.18/en/archives/festival_archive/festival_catalogs/festival_artikel.asp?iProjectID=8299

investigation into the increasing presence of digital media and technology in art which showcased works by 35 artists, architects and designers. The exhibition was presented both in the galleries and online. According to the catalogue, “*Tap, Type, Write* is inspired by some of the great typographic experiments of the modernist era whose designers were seeking to push letters beyond their supposedly neutral position as carriers of meaning to reveal their nature as marks of a particular technology. They also wanted to make designs that responded to the speed and distraction that were typical of the way in which modern people read.”²

Later in 2001, John Maeda had his first major mid-career retrospective in NTT InterCommunication Center, Tokyo entitled *John Maeda: Post Digital*, from August 10 to October 21. As one of the largest exhibitions of digital art at that time, this show was divided into 10 sections (*Begin, Time, React, Reactive Books, Industrial, Web, Paper, Process, Post Digital* and *ICC Special*) and presented over 100 pieces created by Maeda from 1977 to 2001, including the five *Reactive Books* which emphasize the viewer's participation via the interfaces provided, as well as his print design and works on the internet such as *The One-Line Project*.

² Overview of John Maeda by Aaron Betsky, from online exhibition catalogue of 010101: Art in Technological Times, SFMOMA, <http://www.sfmoma.org/media/exhibitions/010101/start.html>



Reactive Books were exhibited twice in Museum of Modern Art, New York; first in *Digitally Mastered: Recent Acquisitions from the Museum's Collection* from November 22, 2006 to November 27, 2007, organized by Curator Paola Antonelli, and Christian Larsen, Curatorial Assistant, Department of Architecture and Design. All five digital components of *Reactive Books* were included in the installation as examples of the first interactive design objects. In total about 25 works were presented ranging from objects directly produced by the computer through robot-controlled processes like CNC milling and rapid manufacturing to digitally designed objects such as laser-cut models, interactive graphic displays, CAD renderings, and digital typography and magazine layout.

The second exhibition in MoMA is *Action! Design over Time*, which began on February 5, 2010 and is currently ongoing. The exhibition was organized by Senior Curator Paola Antonelli and Curatorial Assistants Patricia Juncosa-Vecchierini and Kate Carmody from the Department of Architecture and Design. All five parts of *Reactive Books* are presented again, however they are contextualized very differently in terms of temporality. The exhibition tries to discuss the often-overlooked dimension of design objects, namely “trajectory in

time or relationships with people”³, instead of the “static aesthetic and functional qualities”⁴. Other objects featured include Ingo Maurer’s *Porca Miseria! Chandelier*, Ammar Eloueini’s *CoReFab chair*, Christien Meindertsma’s book *PIG 05049*, among others.

Another recent exhibition was *Design USA: Contemporary Innovation* at Cooper-Hewitt National Design Museum from October 16, 2009 to April 4, 2010. *Tap, Type, Write* was shown in order to celebrate the accomplishments of John Maeda, who is one of the winners of the prestigious National Design Awards.

Other awards John Maeda has received include the 1994 Japan Multimedia Grand Prix for *Reactive Square*, the 1997 Tokyo Type Director’s Club Interactive Prize for *12 o’clocks*, the 1999 Gold Prize at Media Award of ID MAGAZINE for *Tap, Type, Write*, and the 1999 New York Art Director’s Club New Media Gold Award for *Tap, Type, Write*.

Reactive Books have been collected by Cooper-Hewitt National Design Museum; San Francisco Museum of Modern Art; Museum of Modern Art, New York; and Ars Electronica Archives.

Working Method of Artist

Maeda’s overall vision for the *Reactive Books* was “simple input, simple programming, simple things”, driven by a curiosity to “make something out of less data.” Inspired by Soviet Suprematist painter Kasimir Malevich’s black square, Maeda began to question what the role of the “black square” would be in the realm of the digital, where the computer monitor is itself a black square. For

³ <http://www.moma.org/visit/calendar/exhibitions/1039>

⁴ <http://www.moma.org/visit/calendar/exhibitions/1039>

the *Reactive Books*, Maeda designed his programs on paper first, owing to his chronic repetitive strain injury (RSI), which makes it difficult for him to hand-code at length on a computer. The paper drawings consist of the algorithms of the computer program he is working on, which he later types up as code. These initial sketches took Maeda upwards of one year for each of the five *Reactive Books*.

When asked whether he receives any help from studio assistants in coding and creating his works, Maeda replied that he purposefully works by himself on each piece. In the artist interview, he stated that he “used to believe that artists made everything [but then] I realized they have assistants making everything...When people see Christo’s orange gates...the average person thinks that guy Christo, he made all those gates”. As a result of Maeda’s initial conception of the artist working alone, Maeda conceived of and created all aspects of the *Reactive Books* by himself, from the computer program to the physical books accompanying each program. Each of the *Reactive Books* was programmed in the C language; the code was compiled with a basic C compiler (in Maeda’s words, “nothing fancy”). Maeda mentioned that he used “graphics tricks” to make each of the programs run at higher speed. By making them faster, the reactivity is more readily apparent, as opposed to slower programming that would not react as readily to human input.

Key Qualities of the Work

In the artist interview and previously published writings, John Maeda has highlighted several aspects as being key to the meaning of *Reactive Books*. First, he has emphasized the point that these works are meant as a commentary on the computer culture during the mid-to-late 1990s when he was creating the works.

Specifically, they exist in relation to artists' interactive CD-ROM works that were being released at the time, as well as to the "demoscene" – a computer art subculture, often based around competitions, involving the creation of real-time computer animations created via complex code. With *Reactive Books*, Maeda borrowed the demoscene's competitive aspect, attempting to show off his coding skills by creating animations that would run much faster than other works available at the time, while also adding the element of interactivity from the artistic world. With the works now removed from this specific time period, this context is no longer present, though it could perhaps be preserved via documentation.

Maeda has also highlighted this interactive element as a key quality of the work, specifically the interaction between the software designer, the computer technology/hardware, and the physical inputs of the user, via microphone, keyboard, keypad, touchpad, or camera. In a seeming contradiction, he has also said that, were the works no longer able to be displayed, video documentation of user interactions would be an acceptable substitute, suggesting that the true key quality may not be the actual interaction but the behaviors produced by the interaction. It is also worth noting that Maeda actually recoded *12 o'clocks*, one of the works, to remove the layer of user-computer interactivity, though the computer-code interactions are still maintain.

It is also important to state that Maeda does not consider the hardware and installation profile of the works as currently presented at MOMA to be key qualities. Rather, the current MOMA installation should be considered one acceptable instantiation of the works, alongside previous installations and home

usages. The common element between these instantiations is that the software is running in its native environment – a PowerPC Macintosh with operating systems between OS7 and OS9. Thus, while emulation and/or recompiling could be considered as possible preservation solutions, these would need to be done carefully to ensure that the removal of the software from this native environment would not alter any of the key behavioral qualities mentioned earlier.

Summary of Risks

Based on the artist interview in April 2010, one can conclude that the *Reactive Books* series is tied to its technological context. The works were designed in response to technological developments of their respective time periods as explorations of the computing environment at the time of release. Therefore, the risks outlined will relate to legacy hardware and software components, the practical realities of installation, and conservation and preservation concerns.

The *Reactive Books* ultimately face significant long-term risk of hardware failure and obsolescence. The five works were specifically designed for Macintosh computers running on PowerPC processors (G3, G4, G5) in Mac OS9. In 2006, Apple Computer Inc. transitioned to Intel processors, creating a risk associated with hardware and software compatibility. Since the *Reactive Books* code was written in C, which can communicate with the system hardware, it is likely that the *Reactive Books* will not work on non-PowerPC Macintosh computers. The current MoMA installation features the *Reactive Books* series on “Snow” iMac computers running Mac OS9. These iMacs were developed with PowerPC processors. Given the current technological environment, as it is rapidly

advancing, and the fact that such iMacs are now legacy computers, these iMacs should be considered to be obsolete. With each passing day, the risk of hardware failure of these iMacs, accompanied by the risk of loss of PowerPC Macintosh computers altogether, makes the *Reactive Books* series extremely vulnerable. It should be noted that hardware failure is an inevitability given the practical realities of museum installation and usage. As such, attention should be given to the accumulation of replacement components for failed hardware. Storage areas for the iMacs should be cool and dry. Furthermore, technological advancement will undoubtedly lead to changes in how the work is viewed, in terms of resolution and aspect ratio. Accumulating legacy hardware will allow MoMA to install the *Reactive Books* in a way that preserves the original experience as best as possible.

Significant long-term risk of software obsolescence also accompanies the *Reactive Books*. While it is not necessary that the *Reactive Books* be installed utilizing iMacs, it is necessary that they are installed on PowerPC processor Macintosh computers that are running either OS7, OS8, or OS9. OSX will not allow the *Reactive Books* to run. Apple no longer supports OS9 and no longer makes a “Classic” OS9 available on its new computers. This operating system is currently legacy software, termed “abandonware” because Apple Computer Inc. no longer supports the operating system. However, there are retailers that still distribute Mac OS9 at a price.

With respect to the program applications for each respective work, they are fully compiled executable files that exist in various digital forms at MoMA: CD-ROM, external hard drive, and digital repository. Each of these carriers has a

component of physicality. Physical carriers are naturally prone to decay and deterioration. With regard to CD-ROMs, an optical medium, excessive temperature and humidity can accelerate deterioration. CD-ROMs can be stored in an environment of 62° to 68° F and 33 to 45% relative humidity, but it is advised to keep CD-ROMS in cooler and less humid environments. External hard drives should be kept in environments similar to CD-ROMs, however the complexity of such devices with movable parts places them at higher risk for mechanical failure. Digital information contained on hard drives must be *refreshed* (or moved) onto other hard drives so as to mitigate the risk of digital loss in case of hard drive failure. However, refreshing can result in errors; therefore there is a concern for measuring checksums of the data to ensure integrity of data after refreshing. Similar concerns accompany digital repositories, systems based on the relatively complex integration of hardware and software. Digital information contained on servers must be refreshed, and checksums used to check against known values to ensure the integrity of the data over time.

Each work in the *Reactive Books* has instructions for what input device is necessary for its respective installation. Among the input devices are an external microphone, a *track pad* mouse, a keyboard, and a camera. The iMacs currently installed at MoMA have internal microphones, but an external one is used for functionality in the exhibition space. A track pad mouse, which is a touch-based pad, is not a necessary style of mouse, since a traditional mouse can function in the same way. Keyboards are essential to the works, and cannot be replaced by virtual keyboards in the future (this would negate the artist's intention of

exploring interactive potential with the technological means at the time of original release). Cameras for the work appear to interchangeable, however contemporary cameras may not have the small . All of these components must be put in the context of hardware and software obsolescence. They must be compatible with PowerPC Macintosh computers running Mac OS9. This dependency contributes significantly to the risks associated with the work over time. In addition, the physical components of keyboard and mouse could disappear from the marketplace in the future. These plastic components are disposed toward decay and wear. Keyboards currently installed with the work require constant maintenance due to wear and tear on the keys.

Additionally, MoMA possesses copies of the commercially distributed forms of the *Reactive Books*. These physical objects pose conservation and preservation issues. Each book is accompanied by a CD-ROM. The same conservation requirements for CD-ROMs outlined above apply. In addition, the books must be kept in environments suitable for paper-based materials with attention to variable factors such as light, temperature, relative humidity, pollution, and pests. Cool to cold temperature and low to moderate humidity is preferred.

Short-term risks to the *Reactive Books* series include loss of functionality of input devices, software or hardware glitches, and interference by users. Input devices like the track pad and keyboard require maintenance when physically broken or virtually non-responsive. Software and hardware glitches are inevitable considering the daily use of these components when installed. Additionally, users have shown the ability to disable programs by using common shortcuts on

keyboard interfaces. Such shortcuts must be disabled so that the works are not disrupted.

In summation, the *Reactive Books* series requires attention to its specific technological requirements. Factors of software and hardware loss or obsolescence and external input dependencies pose the greatest long-term risk. Furthermore, short-term risks must be dealt with on a regular basis because they create problems that are prone to happen at any time during installation.

Conservation Recommendations for *Reactive Books*

Overview of Recommendations:

- Re-interview Maeda
- Hoard Mac hardware that most reliably runs OS9
- Dedicate hardware to each of the *Reactive Books*
- Obtain code from Maeda, to study future possibility of writing drivers for new peripherals to interface with OS9
- Establish checksum schedule for data integrity verification of software backups
- Develop plan for videotape documentation, in collaboration with Maeda
- Additional gathering of extant literature and bibliography on works

ARTIST'S INTERVIEW & HIS PRESERVATION PREFERENCES

The artist interview between Maeda and the NYU-MIAP class in Handling Complex Media conducted on 26 April 2010 at the Tisch School of the Arts, New York University elicited a good deal of discussion about his lack of a long-term vision for the interactive installations of *Reactive Books*. Of his responses, MoMA Conservator Glenn Wharton remarked: “the larger sense I have is that he’s not engaged” in his older works. Indeed, Maeda’s comments evidenced a degree of disinterest in specifically mandating steps for preservation: “There are people

who spend their careers thinking about these things [archival issues of technological longevity] infinitely. I can't do that.”

In total, he offered a contradictory set of opinions that complicate MoMA's planning for future preservation strategies of the works. For Maeda, *Reactive Books*' essential concept was an expressive interactivity between the user and the computer, yet he advocated preserving the series as videotaped documentation, which would totally eliminate any responsive interface. The works were created as a reply to a historically specific set of computer technologies and Maeda designed the programs to optimize the slow processing speed of the era computers, yet through his disinterest in the work and its longevity he seemed to offer MoMA carte blanche in choosing what it thinks to be the appropriate preservation approach. Maeda was equally inconsistent when talked turned to the individual works and their peripheries, such as the camera, microphone, keyboard, and track pad.⁵ For example in regards to the keyboard in *Tap, Type Write* he seemed fine with a hypothetical preservation that would replace the physical keyboard with an on-screen virtual one. (This came after his evocative description of the piece's intent to reveal and transform the prosaic and unconsidered act of pressing a key.) However, for *Flying Letters* he stressed that the track pad was chosen over a mouse for its improved response, indicating a strong preference for that technology.

⁵ Though the name periphery implies a lesser status that these objects act as the lens through which the users' actions are transmitted to the software, their response characteristics heavily shape the users' experience of the work.

When asked about specific avenues of preservation solutions that might be immediately ruled out as inappropriate, Maeda responded: “I’m not gonna lie. I haven’t thought about it. I get no joy from the display, or the interaction, anymore. I’m more curious about why I made these things. Or, why is it that when I made these things they were more valuable or lasting [than other works].”

When prompted for an ideal exhibition/installation configuration, Maeda responded: “I don’t have a strong feeling about these things. I think I used to have that part in me, and then I just gave up. Because technology stuff is just so messy. See that was the whole point of those books: that you could have a regular computer, and you can have an art experience. But, it isn’t like the whole experience became art. You lived in that space, and then it goes away.”

Indicating that for him the works are intrinsically tied to a past technological era, Maeda stated: “Nowadays, this is gonna happen all over the place, so it isn’t that big of a deal. Now, I’m just kind of stymied by what you can do....I’m more interested in vocabularies that are changing. That’s what excites me, now.”

A discussion of the possibility of re-compiling the code to retain the work’s interactivity in future computer environments elicited Maeda’s opinion that they should instead be allowed to pass into obsolescence along with the technology on which they now run. As the interviewers addressed the issue of obtaining the artwork’s original C programming code, Maeda specified that he had used, “a regular C compiler.” Maeda continued to appear somewhat ambivalent about the range of preservation strategies: “I used to think that the code was important, but, now I think maybe it’s not so important. I think maybe the video of what the

visual experience is, and what the interaction is with the [unintelligible], may be far sufficient. It is easier to archive. And, that's coming from the guy who actually writes the code. A lot of the people who do this stuff don't make the code. This new model makes no sense, whatsoever. We're desperate to ascribe this kind of sense to source code—'oh, this code is like the fibers of the paper.' But, it's not...I would say that the code argument is actually incorrect." MoMA conservator Wharton followed Maeda's comment with a question about video documentation being sufficient to convey the work. Maeda agreed it would be. He continued, "I would say what's important, here, is the artist's relationship to the code because if you're an artist that makes the code, versus an artist that had the code made, I guarantee the response is going to be different."

Even so, he regularly and rather lyrically described the interactive nature of the series. Maeda: "All those pieces are absolutely boring, unless you do something in front of them. If you do something in front of them, then it comes to life." Maeda: "It's like a musical instrument, with all of those notes in there. But, it's only as good as the person that sees it. That's what I feel. It sounds very clichéd, but I realized it's all about the people." Maeda's description of the working relationship between the software source code and the external inputs that drive the interactivity of the piece: "It's telekinetics. It's all mathematics, tied to the visuals, tied to input."

Speaking generally on his self-perceived approach to the artwork, Maeda responded: "I think my purpose was to point out things in the garden. Other people can harvest things. My role was to define some of the vegetables; to show that there was a garden there."

RECOMMENDATIONS FOR PRESERVATION STRATEGIES

Given Maeda's lack of a clearly preferred means for preserving specific implementations of *Reactive Books*, MoMA conservator Wharton indicated that his takeaway from this interview was that the onus of deciding preservation strategies may not be heavily influenced by the artist's contemporary dictums. While this is unavoidable given Maeda's contradictory detachment from the series, such a decision presents a host of ethical and aesthetic difficulties for MoMA's conservation efforts.

Maeda's indifference to these older works is not totally out of the norm, as working artists can be more concerned with their next project instead of decades old work. Three points reinforce *Reactive Books'* relation to the time and technology in which they were created. First, Maeda strongly connected the series to a historical past since overtaken by technological obsolescence and cultural shifts in what the computer means. The *Reactive Books* were created before the web, as we now experience it, had transformed digital art and the models of user/computer interface. Second, Maeda coded the works to maximize the speed of a specific computer technology and operating platform—e.g. removing the grey scale of the fonts and reducing the screen size. Third, they were created in direct response to the prevailing format in which users experienced computer interactivity at the time—namely, the CD-ROM. Therefore, *the Reactive Books* were not only created at a specific historical moment, with a corollary particular set of technological constraints on the users' interface with the computer; the works are expressly concerned with exploring the limits of computer technology

at that point in time. Any meaning and aesthetic experience of the works are inextricably linked to their technology.

As such, conservation work should be designed with this essential fact in mind. This would indicate that the preferable approach would be storage or preservation of the original technology. Obviously, this limits the longevity of the pieces as technologies break down, pass into obsolescence, and require efforts of repair that might be onerously expensive and time consuming. By recommending that the works live on merely as videotaped documentations, Maeda implied that he accepted the eventual passing of *Reactive Books* from aesthetic objects still accessible in the present to inert records of a historical past.⁶

The question remains whether MoMA agrees with Maeda's viewpoints. If so, MoMA should gather and preserve the original technologies for as long as functionally possible. While the artworks remain fully operational at present, MoMA should set about documenting the wide range of the series interactivity. While continuing to stave the day off to as far into the future as possible, the museum should prepare for *Reactive Books* eventual demise by creating a sort of living will that determine when the works become too unresponsive to exhibit.

⁶ In the post-interview discussion, MoMA Cataloguer Paul Galloway brought up a comparison with the related video documentation of performance art, specifically in relation to the current Marina Abramovic exhibit. While the comparison is intriguing, there are some significant differences between the documentation of a live performance piece and an interactive work such as *Reactive Books*. True, documenting both transforms a live contingent experience into a fixed and historically removed one. However, the degree of transformation is much greater in regards to interactive works. With a performance such as those by Abramovic, the role of the original audience was mainly as observer, a function replicated in the video recording, though a certain intimate proximity is missing. However, an important degree of Abramovic's aesthetic intent is still accessible in the video. On the other hand, interactive works such as *Reactive Books* entire purpose is the interface between the user and the work. Videotaping that interaction completely eliminates the aesthetic intent of the work. A video documentation of *Reactive Books* should therefore be only seen as a research tool and not something exhibited in the future such is currently the case with the Abramovic show.

If MoMA disagrees with Maeda's assessment it should explore various options into re-presenting the series on newer computing platforms. If this approach is considered, MoMA should work to limit the extent of transformation caused by the chosen preservation method. MoMA should therefore adopt strategies that limit the loss of authenticity as *Reactive Books* was created for a specific set of technologies. The greater the gulf between *Reactive Books* and its original technologies the larger chance that unforeseen changes in how the programs respond will arise, thereby negatively affect the users' experience of the works.

Also, any increased transformation of the works increases the number of aesthetic decisions made by people other than Maeda on how the work operates and is experienced. Since he personally coded the programs MoMA should be very careful about transforming them without Maeda's involvement. If Maeda is not involved the museum should only consider the least transformative approaches. This would favor emulation over re-compiling especially since Maeda implicitly rejected recompiling. Even emulation presents obstacles in preserving the work. While an OS9 emulator may run the applications, the new computers' point of interface would likely not work with the original code. Further, the different forms of user interface with the computer may not make aesthetic sense even if controllable by the program. For example, using a virtual keyboard to operate *Tap, Type, Write* may not be pleasurable in the way that a physical keyboard is. MoMA would need to experiment to test how such a transformation affects experience and how to adjust for the transformation. It is in this transformation that the risk lies in straying too far from the original intent

of the work. In attempting to save the works through updating them to run in the future, one might end up invalidating them as aesthetic and intellectual objects.

Crucial to any form of emulation or re-compiling would be access to the original source code. Even emulation might require some transformation of the code to allow the program to control newer peripherals.

RE-INTERVIEW

At some point in the near future, perhaps when the current exhibition of *Reactive Books* comes down, MoMA should re-interview Maeda on the conservation issues related to the series. This interview should be conducted one-on-one between Maeda and Media Conservator Glenn Wharton. Due to time constraints, not all of the works in the series were specifically addressed during the hour-long artist interview between Maeda and the NYU-MIAP. Further, perhaps due to Maeda's role as an educator, he often addressed the class in a tone that was provocative for pedagogical ends, but was less informative for directing MoMA's conservation of the works. Perhaps, in a non-group conducted interview Maeda may be more forthcoming about technical specifics.

In this second interview the MoMA conservator should again broach the subject of attaining the programs' source code. Wharton should consider confirming with Maeda his opinion that the most appropriate long term preservation strategy for the works are video documentation of their interactivity, user interface, and graphical response.

PRESERVING THE TECHNOLOGY

At present, according to MoMA Preparator Pamela Popeson, MoMA has eight dedicated iMacs for *Reactive Books*—five used in the exhibition, and three

backups. These iMacs are the “snow” generation of iMac, run OS9, and are compatible with Maeda’s code—written for OS9. Maeda initially provided multiple input devices required for installation, such as USB 1.0 mics and cameras. However, MoMA has since needed to purchase additional input devices.

If it is the determination of the MoMA conservation department that *Reactive Books* should not be subjected to the financially burdensome process of re-compiling for an OSX environment, then the purchase of additional Macs that operate in the OS9 environment and USB 1.0 peripheral inputs is a recommended course of action. MoMA should research the average life expectancy of Macs running OS9 to determine which models will prove the most stable over time. It may very well be the case that the “Snow” iMacs currently used in the installation are not necessarily the Macs MoMA should purchase at least two OS9-compatible Macs per *Reactive Book*, so that each book has a dedicated back-up computer. In the same way that paintings sensitive to UV radiation must only be exhibited at carefully selected occasions, perhaps an understanding of the life cycle of an iMac will help determine how often these works can be shown and for how many hours per day they should be turned on.

It is important to note that in the same way that *Reactive Books* cannot be currently run on OSX environments, newer peripherals (webcams, microphones, etc.) may equally lack functionality with Maeda’s coded executable applications. Therefore, MoMA should investigate the possibility of utilizing newer versioned peripheries on the OS9 iMacs. Special software and/or drivers may be needed to enable this function, and research into how drivers interface with the application/artworks’ code will likely be advantageous.

BACKUP of CODE & EXECUTABLE APPLICATIONS

Currently, MoMA has backed up the Maeda-provided executable applications for *Reactive Books* in multiple locations, and on multiple formats: CD-R, external hard drive, and server. It is recommended that MoMA work to establish authenticity of the various duplication digital versions of the applications and/or code using a preservation appropriate checksum, such as MD5. This is an easy task to perform, and it is not recommended that MoMA wait for its “OAIS Digital Repository” to be implemented before undertaking such action. Eventually, upon creation of its long-term digital repository, checksums should be a regularly scheduled and automated function to ensure the integrity of data over time. Additionally, it may be desirable to write authenticated data to magnetic data tape (such as LTO-4 or LTO-5), and stored off-site for additional insurance against loss at the MoMA facility in Manhattan.

VIDEO DOCUMENTATION

If the MoMA conservation department chooses to follow Maeda’s suggested video documentation of the work, it will be important to ensure that the full range of functionality and interactivity of the works be documented. With each discrete work, a systematic and well-documented test of the limits of the work’s behaviors must be undertaken. For example, how do different volumes affect the *Reactive Square*, versus different tonal pitches, or durations of sound? In the case of *Mirror Mirror*, how do varying levels of light in the exhibition space impact the ‘reactiveness’ of the work? Since each work has up to 10 variations such an intensive and rigorous documentation may easily prove a large

project, perhaps, appropriate for future NYU-MIAP classes and/or other researchers.

Ideally, any video documentation would include a two-camera set-up. One camera would be fixed on the user and the other on the screen. Alternatively, a video feed from the computer should be recorded in some form to supplement video documentation of any user stimuli and interaction with the work. In this way, the interaction between *the Reactive Books* and users should be obvious. Future video documentation should also ideally display the two screens in a split screen format. MoMA should investigate how to precisely sync up the two cameras so combining them shows the exact same instant in both. This would allow for a designation of any delay between a user's action and the computer's response.

LONG-TERM HARDWARE FUNCTIONALITIES

While undertaking the approach of exhibiting the work on original native OS9 Mac environments is not a sustainable long-term preservation solution, if it is to be one of the approaches of MoMA it will be important to periodically test all related hardware to extend the life of the work. The very fact that the work is being exhibited once again in 2010, after being shown in 2007, is likely a significantly advantageous act of 'exercise' for the work, its installation staff, and—as evidenced by this study by NYU-MIAP—the conservation department.

ADDITIONAL BIBLIOGRAPHIC & EXHIBITION RESEARCH

As part of this report, an initial bibliography of publication references to the works comprising the *Reactive Books* has been compiled. It is recommended that MoMA engage a staff member, or researcher, to further compile exhibition

and installation documentation for each discrete work from other institutions. Such documentation may prove invaluable for informing future conservation decisions about the work, can elucidate future research into the work, and generally augment the value and quality of MoMA's custodianship of the work.

Interviews with current and former installation and curatorial staff, to document the history of decision-making processes with regards to *Reactive Books*, should be undertaken.