The Interactive Image: A Media Archaeology Approach

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ABSTRACT

This paper examines the history of the influential Interactive Image computer graphics showcase, which took place at museum and conference venues from 1987 to 1988. The authors present a preliminary exploration of the historical contexts that led to the creation of this exhibition by the Electronic Visualization Lab (EVL), which included the integrated efforts of both artists and computer scientists. In addition to providing historical details about this event, the authors introduce a media archaeology approach for examining the cultural and technological contexts in which this event is situated.

The Interactive Image featured a collection of computational artworks that encouraged public engagement with interactive graphics in museographic spaces. It was created in 1987 by the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago for Chicago's Museum of Science and Industry and was later installed at the 1988 SIGGRAPH conference, the main academic forum for computer graphics research. Although technologically primitive by today's standards of high-resolution images, responsive devices, and immersive environments, The Interactive Image, at the time of its unveiling in October 1987, was an ambitious public presentation of the state-of-the-art in interactive computer graphics and real-time imaging technology. The exhibit was the first of its kind to "use technology to teach technology in a nonthreatening, entertaining setting" [1]. This approach of intersecting arts and sciences in technology proved to be valuable to the history of computational visualization. With the exception of one video created by EVL and available on the lab's website, there is no other publicly available information about this historical exhibit and its impact on interactive visualization. The primary source materials at EVL preserve an untold story of significant activities in computer graphics and computer art. The documents include letters, manuscripts, brochures, drawings, news clippings, and computer code. Unfortunately, this transformative moment in technological history is in danger of being lost and the primary source materials are imperiled due to a lack of archival efforts. No project at present is focused specifically on analyzing, preserving, or making this history available to the public.

Our continuing investigation into The Interactive Image is important for several reasons. Awareness about and promotion of these archives will help to preserve this material and will reintroduce media artists who produced some of the first interactive artworks in the late 1980s. It will also provide insight into this somewhat neglected period in the history of technology and media arts, which is not as thoroughly explored in comparison to the 1960s and 1970s. Moreover, our investigation highlights the diverse activities of EVL, a perennially influential "ArtSci" lab that has successfully integrated artistic and scientific research to develop new technology for over four decades. Our research also analyzes the organization and production of this ambitious interdisciplinary exhibition, which we believe could be useful for designing new events with a similar focus that could inspire the development and applications of new technologies.

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Interactive Art Exhibits

The use of the term *interactive art* to describe novel uses of digital technology is somewhat contentious. Artists have always pushed the boundaries of their media to experience art in new ways, but exploration of new technology may not in and of itself constitute artistic practice [2]. Nonetheless, we use *interactive art* to refer to the innovative installations exhibited at The Interactive Image, which encouraged participants with no computing experience to manipulate images through digital means. Since the 1960s, media artists have been intently concerned with the aesthetics of interaction and have focused on designing systems that encourage active participation of the viewer. A further exploration into the history of technology and art can be found in Christiane Paul's *Digital Art* [3].

There is a long history of public events that feature the creative use of new technologies to promote new research streams. These events often include various forms of public displays that allow people to interact with these inventions. For example, the Experiments in Art and Technology, or E.A.T., events, which took place in New York during the 1960s, featured groundbreaking visual artists such as Robert Rauschenberg, Frank Stella, and Andy Warhol. E.A.T. provided these artists the opportunity to collaborate with Bell Labs engineer Billy Klüver. *Silver Clouds*, an installation of floating pillows, resulted from Klüver and Warhol's collaboration [4]. Another early example of a public exhibition of interactive technological artworks is the seminal Cybernetic Serendipity, which took place at the Institute of Contemporary Arts in London in 1968 [5]. Throughout the 1970s, EVL faculty and students also showcased newly developed technology at public events, called Electronic Visualization Events (EVEs), in Chicago [6].

In 1987, the most recognized organizations that celebrated digital art at the time were SIGGRAPH in the United States and Ars Electronica in Austria. Other important forums that were established around that time, such as FISEA: the First International Symposium on Electronic Art in 1988 and ArtFutura in 1990, proved that there was worldwide momentum in advocating for digital and electronic art. EVL played a key role in bridging art and technology, while introducing visualization as one of the most important recent scientific tools for the analysis of complex data.

Media Archaeology Approach

Our research utilizes a media archaeology approach to understanding the history of EVL. Media archaeology is an open-ended process that critically examines media-cultural phenomena from a variety of perspectives. Media archaeology has gained traction among social scientists, humanities scholars, and artists, as it provides comprehensive methods with which to make sense of technologies from the past. Rather than focusing solely on technological artifacts, media archaeologists explore the contexts in which these artifacts emerged. In "Media Archaeology: Approaches, Applications and Implications," Jussi Parikka and Erkki Huhtamo explain that:

> On the basis of their discoveries, media archaeologists have begun to construct alternate histories of suppressed, neglected, and forgotten media that do not point teleologically to the present media-cultural condition as their "perfection." [7]

Through a media archaeology approach, we study the complex relationships between events, media, and technology through a preliminary investigation of the forgotten documents at EVL.

Two notable theorists who have utilized the media archeology approach are Huhtamo and Siegfried Zielinski. Huhtamo is interested in connecting the topos, a concept in literary theory, with media archaeology to form the *topoi*. The topoi refers to finding themes or formulas in

media-cultural artifacts. His volume on the history of panoramas, *Illusions in Motion*, develops an extensive and detailed historical study of the origin, uses, and implementation of panoramas as an entertainment system in the 1850s [8].

German scholar Siegfried Zielinski [9] has been able to articulate creative and profoundly diverse historical narratives, a strategy that we could identify as comparative analysis. Zielinski looks for common problems in the historical evolution of media, exploring what he calls the *Deep Time of the Media*. Deep time looks at the layers hidden under the surface of hegemonic history to reveal the past as something new.

Both of these theories (topoi and deep time) have developed a set of methodological tools that have shaped the practice of this transdisciplinary field. In both cases the lesson is clear: there is a need to go back in time, before official history, to more clearly understand media technologies. Moreover, we should pay special attention to the questions that articulate the technological, aesthetic, and social components of media. With the accelerated development of computer graphics over the last 60 years, historical accounts of the early computer art era have just started to emerge. An example of this approach is found in *Peripheral Vision* [10], Patterson's study of the early computer art developments at Bell Labs. Another example is explored in Margit Rosen's *New Tendencies*, which investigates some of the first computer art exhibits in Zagreb in 1968 and beyond [11].

However, most of these historical studies have focused mainly on the first generation of artists who used computers starting in the early 1960s and on the second-generation artists in the 1970s. Less attention has been given to what happened in the following decade, despite the enormous increase in activity in digital art-making in the 1980s. It should be noted that, in general, when we are confronted with the history of computation, there is often an illusion that this history needn't be investigated because the phenomenon took place more recently, over the last 40 years. Roddy Shrock, director of programs at Eyebeam, explains that technological art has been predominantly a future-focused endeavor, "to the detriment of retaining its history." After Hurricane Sandy in 2012, the Eyebeam center reflected on the risks of losing archival materials and made it their mission to look to the past in order to build the future [12].

EVL constitutes one of the "missing links" in the history of digital art, and its study is long overdue. Analyzing these lost documents will address a gap in history and will also make them accessible to the public for the first time since the late 1980s. None of this information has been appropriately catalogued or investigated since that time, and this study is the first to examine this collection. The materials found during our exploration of the EVL archives and The Interactive Image exhibition has shown that the amount of evolution that took place during this time was enormous. However, because some of these materials are disconnected from our present technological environment, the idea of deep time becomes important. The media archaeological approach is essential to understanding what happened at EVL and the early exhibitions, and for shedding light on this era of innovation in interactive art and technology.

Access to the EVL Collection

After establishing contact with Maxine Brown (EVL director), Dana Plepys (EVL associate director) and Angus Forbes (EVL faculty) in the spring of 2016, we were granted access to conduct an initial assessment of the collection. EVL is naturally interested in preserving its past and contributing to this research. Plepys has digitized many videotape recordings of early computer graphics projects from the 1970s and has catalogued many of the time-based visualizations created by EVL students and faculty. Plepys, who graduated with an MFA from

Figure 1. The Interactive Image memorabilia, 1986–1990. (© EVL. Photo: Esteban García Bravo.)

the EVL visualization program, has made these materials available on a YouTube channel, EVLtube [13]. This channel provides excellent video documentation of early video art and performance. Although these videos provide a window into the history of EVL and, more broadly, of computer graphics, many relevant materials are stored in boxes or are stacked on shelves and have not been examined for decades. During a series of visits to the EVL collection, we were able to take samples of manuscripts and photographs to aid understanding of EVL's context. This study is an initial analysis of primary sources at EVL, and many of the materials cited are not publicly available. Figure 1 shows an image of the preliminary data samples taken from EVL. This particular study used a sample gathered during one of our visits. The sample included manuscripts, sketches, press clippings, and correspondence.

Discovering the History of EVL

From the samples collected, we were able to compile a clearer picture of the history and context of EVL. EVL was founded in 1973 as a joint effort by Tom DeFanti and Dan Sandin. Initially named Circle Graphics Habitat, EVL became one of the most relevant places in the world for research in visualization at the early stages of computer graphics. Sandin, trained as a physicist, taught in the art department of the University of Illinois at Chicago. In 1971, Sandin designed and built an image processor that used an analog computer to manipulate video images in real time [14]. The video synthesizer was easily manipulated through knobs and dials in a similar fashion to an oscillator-based musical instrument. Many historic computer animations were created using the Sandin Image Processor, such as Phil Morton's 1974 work *Colorful Colorado* [15].

DeFanti completed his PhD under the supervision of computer arts pioneer Charles Csuri at The Ohio State University. DeFanti's dissertation introduced the GRASS computer framework, intended for artists with little programming experience to create graphics. In addition, EVL faculty, staff, and students helped originate The SIGGRAPH Video Review, or SVR. The SVR was originally created in 1979 by DeFanti as a library of videos to be shown at SIGGRAPH's annual Film & Video Show, which became the Electronic Theater, and is now called the Computer Animation Festival [16].

EVL established "the oldest formal collaboration between engineering and art in the country offering graduate degrees in visualization" [17]. At EVL, artists were able to earn an MFA, while computer scientists earned a Master's of Science. This philosophy of intersecting arts and sciences in technology proved fruitful for the history of computational visualization: "We do not follow the typical production model of operating as a team, but rather expect the artists to learn all the computing they need and the scientists to communicate visually" [18]. Many scientific breakthroughs were first visualized through art-science collaborative efforts. One example of such collaborations is *Astrophysical Jetstreams* by Donna Cox and Michael Norman (1987)

(Figure 2). EVL also played an important role in the establishment of ACM/SIGGRAPH as the world's first and foremost forum for computer graphics, bringing academia, art, and industry together in a yearly conference since 1974.

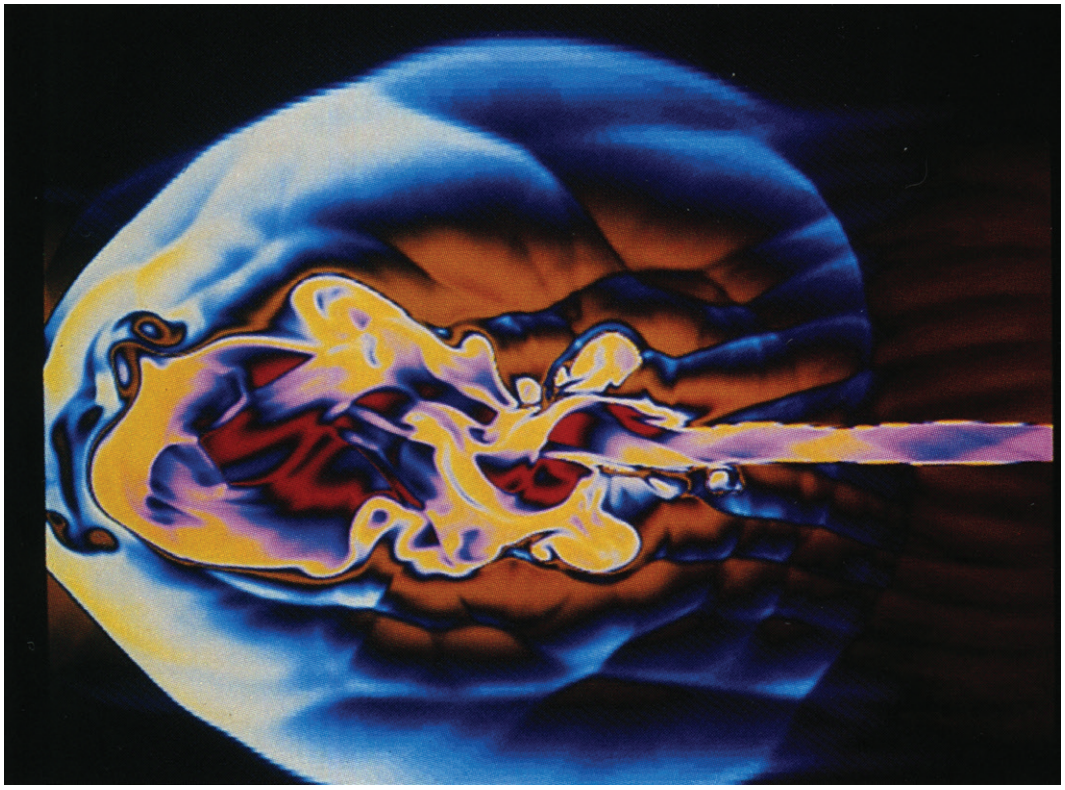

Figure 2. Donna Cox and Michael Norman, *Astrophysical Jetstreams* (fragment), 1987, 8 ½" x 11," color print on paper. (© Donna Cox and Michael Norman)

In late 1986, Maxine Brown was brought in as associate director of EVL to contribute to the design of The Interactive Image for the Museum of Science and Industry in Chicago [19]. Brown furthered EVL's outreach to the scientific community, helping to secure research funds. According to a news report, AT&T donated 1.2 million dollars to EVL in 1988 for the purpose of advancing visualization for scientific imaging. In the same article, Brown explained that "visualization processes are invaluable tools for scientific discovery" [20]. AT&T was just one of many institutions that have sponsored discovery at EVL; others include the National Science Foundation, the U.S. Department of Energy, NASA, the National Institutes of Health, and IBM. Among the most well-known EVL contributions are the ZGRASS language, used for early 3D-animated sequences, including the briefing room scene in *Star Wars* [21]; and the world's first CAVE™ virtual reality theater. Via the CAVE environment, EVL used computer graphics to create visual images that aided in the understanding of complex numerical representations of scientific concepts and results [22].

During the development of The Interactive Image, EVL members also contributed to an NSF committee exploring the use of visualization in supercomputing. The committee was made up of academics, researchers, and industry participants who came together to identify the domain and definitions of Visualization in Scientific Computing (ViSC). This important contribution is documented in a report published by SIGGRAPH in 1987, of which EVL's Maxine Brown and Tom DeFanti were two of the three editors [23]. This discipline (referred to as Scientific

Visualization, or SciVis) was embraced by the general public for its entertainment and exploratory value and by academia as a viable tool for insight and discovery.

The Interactive Image (1987–1989)

The Interactive Image was installed three times: once at the Chicago Museum of Science and Industry, once at SIGGRAPH 88 in Atlanta, and finally in 1989 at the Computer Museum in Boston. In order to understand its significance, we need to understand its context. Today, interactive images are a ubiquitous part of our lives, mainly in the form of smartphones and laptops. In 1987, however, this was a revolutionary concept, as the early raster-based machines and displays that were available barely had the computing power required to present low-resolution pixel images in real time. The Interactive Image pushed the technology forward by making image processing more accessible through creative user interfaces and physical devices. That is, it made computational visualization "interactive" through joysticks, buttons, and trackballs. At that time, these interfaces were not available to the general consumer. It is relevant to highlight that in 1987, image manipulation was also not as easily accessible as it is today—for example, Adobe Photoshop was not officially released until 1990 [24].

The first exhibition of The Interactive Image consisted of both interactive installations and a series of computer graphics animations selected from the SIGGRAPH Video Review. The space layout was designed by one of the art students at EVL. Figure 3 shows an artistic rendering

Figure 3. Interactive Image brochure (fragment), 1987, 7" x 10," color photograph on paper. This is an image included on the exhibit's 1987 brochure. (© EVL)

with a prototype of the show. The seven installations were often referred to as "games," as computational interaction was a new concept in art exhibitions and the collection of pieces resembled a video game arcade more than it did a traditional art exhibition.

The artworks shown in The Interactive Image included the following innovative projects, among others:

- *ERIC: Escher-like Reflective Interactive Computer*: Work by Debra Weisblum Hershmann that included tessellation, kaleidoscope, and animation.
- *Zanimation, Jr.*: An animation software for motion interpolation by Fred Dech.
- *Quark*: A digital image-processing game by Harriet Lurie.
- *Graftals* and *Fractals*: Mathematical techniques for creating complex forms by simple rules. *Graftals* by Sumit Das and Seton Coggeshall, and *Fractals* by Dan Sandin.
- *Exploring Supercomputer Images*: Work by Donna Cox and Michael Norman where visitors interact with selected scientific images such as an astrophysical jetstream or colliding neutron stars (Figure 3).
- *VOILA: Vasarely Inspired Optical Art*: A graphics application by Diane Schwartz.

Other items in the exhibit included the *PHSColograms* sculptures by the group $(art)^n$. The PHSColograms were wood and metal assembled with holograms and barrier-strip autostereograms made using a unique photographic and computer graphics process. The artists described their work as a combination of photography, holography, sculpture, and computer graphics (Interactive Image brochure, 1987). The members of $(art)^n$ included Ellen Sandor, Dan Sandin, Tom DeFanti, Donna Cox, Randy Johnson, and Steven Meyers [25]. Another artifact exhibited at The Interactive Image was the original Sandin Image Processor, referred to at the 1987 show as "The TV Switcher Panel" [26].

Conclusions and Future Work

This study aims to promote the preservation and significance of EVL history. Having played such a significant role in advancing computational art and intersecting the arts and sciences in technology, the artifacts found at the EVL offer deep insight into and understanding of a greater context of work that took place during that time. However, this preliminary research leaves many questions unanswered, and further details about each of the artworks that were exhibited need to be examined in depth. Although we have illustrated some of the activities in which EVL was involved in the 1980s, a complete history of EVL and the media arts landscape will require further study. We argue that the significance of The Interactive Image contrasts greatly with the lack of public documentation available about such a seminal event. The model of exhibiting interactive art proved to be an effective way to encourage collaboration between artists and scientists [27] and provided the public with the opportunity to interact with and experience new technologies, while simultaneously reimagining and expanding the boundaries of original intended use.

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