The Complex and Multifarious Expressions of Digital Art and Its Impact on Archives and Humanities

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Introduction

Compared to traditional art forms—such as painting or sculpture—media art has more multifarious potential for expression and visualization; although underrepresented on the art market, which is driven by economic interests, it has become "the art of our time," thematizing complex challenges for our life and societies, like genetic engineering (Anker and Nelkin 2003; Reichle 2005; Hauser 2008; Kac 2007), the rise of post-human bodies (Hershman-Leeson 2007), ecological crises[1] (Cubitt 2005; Himmelsbach and Volkart 2007; Demos 2009; Borries 2011), the image and media revolution (Grau 2011; Mitchell 2011) and with it the explosion of human knowledge (Vesna 2007; Manovich 2011), the move toward virtual financial economies,[2] and the processes of globalization[3] and surveillance, to name just a few. Visually powerful, interactive media art, often supported by databases or the World Wide Web, is offering more and more freedom for creative expression and evidently is much better equipped to directly address the challenges of our complex times within the very medium that shapes them. Although it has been around for decades and has even quantitatively dominated many art schools, digital media art has not fully arrived in the core collecting institutions of our societies. Due to the lack of institutional support and rapid changes in storage and presentation media, works that originated approximately ten years ago can often not be shown anymore. It is no exaggeration to state that we are facing the "total loss of an art form" created in the early years of our post-industrial digital societies. Over the last fifty years digital media art has evolved into a vivid contemporary form. Although there are well-attended festivals worldwide,[4] funded collaborative projects, discussion forums, publications (Grau 2003a, 2011; Dixon 2007; Popper 2007; Sommerer and Mignonneau 2008; Vesna 2007; Shanken 2009; Da Costa and Kavita 2010; Gardiner and Gere 2010; Wilson 2010), and database documentation projects,[5]

digital media art is still rarely collected by museums, barely supported within the mainframe of art history, and has relatively low accessibility for the general public and scholars.

Media Art's Revolution?

Media art is the art form using the technologies that fundamentally change our societies. Globalization, the information society, social networks, and Web 2.0—the list could be far longer—are enabled by digital technologies. Although not all digital media art comments on social, cultural, and political conditions, it is nevertheless the art form with the most comprehensive potential for cultural urgency. We know that digital art today is taking highly disparate forms, like time-based installation art, telepresence art, genetic and bio art, robotics, net art, and space art; this "art of our times" is experimenting with nanotechnology, artificial or A-life art; and creating virtual agents and avatars, mixed realities, and database-supported art. Through its expressive potential—visually, aurally, and beyond—all senses can be addressed, an ability which exceeds technically that of traditional art media from earlier centuries such as painting and sculpture; thus digital media art attains a key role in the reflection of our information societies. The artworks both represent and reflect on the revolutionary development that the image has undergone over the years—even as visionary demonstration of new instruments for visual analysis and tools for playful or scientific comparison of large amounts of images.[6]

Contemporary media art installations can include digital stills and video, 3D objects and animation, digital texts and music, sound objects, noises and textures, whereby different meanings may be inscribed and combined with each other. Meaning can develop by chance, experiment, and well-directed strategy. Active, "combining" users become the source for generating art and meaning if the artist leaves enough degrees of freedom to them to engage. They are dynamically involved in navigation, interpretation, transfer, contextualization, or production of images and sounds which may be generated by their participation. Memory, thoughts, and experiments—along with chance—may create fertile connections. The art system increasingly transforms itself into a type of organism comprising slices that organize themselves while the user has an opportunity to experience and produce combinatory meaning.

Media Art's Multifarious Potential for Complex Expression

Thousands of artworks make use of and express the multifarious potential of media art. In the installations *Osmose* (1995) and *Éphémère* (1998) Charlotte Davies transports us into a visually powerful 3D simulation of a lush mineral-vegetable sphere, which we can explore via a bodily interface consisting of a vest that monitors breathing; both works are classics of digital media art that generated more than 100 scientific and art-historical articles but were ignored by museum collections (Davis 2003; Davis and Harrison 1996).

Open-ended questions about the complicated ethical issues involved in the manipulation of DNA are raised in Eduardo Kac's installation *Genesis* (1999) (Kac 2005, 2007, 2011; Kac and Ronell 2007). For *UNMAKEABLELOVE* (2007), inspired by

Samuel Beckett's *The Lost Ones* (1971/1972), Jeffrey Shaw and Sarah Kenderdine used their cybernetic theatrical environment *Re-Actor* to create a real-time augmented world of thirty simulated humans. The dark space or "prison camp" formed by a hexagon of six rear-projected silver screens results in a powerful reappearance of the phantasmagoria. Shaw got inspiration from media arts history:

> The history of the cinematic experience is a rich chronicle of viewing and projection machines. Before Hollywood imposed its set of ubiquitous formats, there were a myriad of extraordinary devices, like the Lumiere Brothers Photodrama, the Cyclorama, Cosmorama, Kineorama, Neorama, Uranorama and many more. The Kaiserpanorama—a stereoscopic cylindrical panoptic peepshow—is an especially relevant forerunner of a newly configured display system, *Re-Actor*. (Kenderdine and Shaw 2009)

William Kentridge, one of the best known artists of our time, also has been working on the subject of a history of vision for years. Even historic image media like the mirror anamorphosis[7] have made their way into his contemporary media art. In 2007 he created a hybrid previously nonexistent in the media history of seeing: for his eight-minute *What Will Come (Has Already Come)* he combines a hand-drawn animation film with cylindrical mirror anamorphosis, connecting it for the first time to moving images and thereby helping us to put the latest image revolution into historical perspective.

Victoria Vesna's *Bodies@Incorporated* (1993) allowed visitors to construct their own avatars. Using a variety of web tools, users could create a 3D representation of their body. Throughout the site, references are made to identity politics and other concepts used to separate and identify bodies (Vesna 1998; Gonzales 2010).

The Golden Nica winner *Murmuring Fields* (1998–2000) by Fleischmann and Strauss is yet another example of a work largely ignored by museums. Here, interacting users maneuver through a virtual space of media philosophy in which statements by Flusser, Virilio, Minsky, and Weizenbaum can be heard—a new type of *Denkraum*, or sphere of thought (Fleischmann and Strauss 2000, 2008), and an early prefiguration of web-based knowledge exchange.

Johanna and Florian Dombois' *Fidelio, 21st Century* (2004), named after Beethoven's *Fidelio*, was the first classical opera directed as an interactive virtual 3D experience. Protagonists embody music, follow the dramaturgic direction and react to the interventions of the audience (Dombois and Dombois 2001; Dombois 2009). All these examples demonstrate that digital media art can deal with questions and challenges of our time in an experimental and participatory way, where traditional art media could simply offer metaphorical approaches. In the best humanistic tradition, digital media art takes on the big contemporary questions, dangers, and proposed transformations, yet it is not adequately collected, documented, and preserved by traditional museums and art institutions. A techno-cultural society that does not understand the challenges it is facing and is not equally open to the art of its time is in trouble.

Today we know that the virtualization and increasing complexity of financial products is partly responsible for the crisis that cost us trillions of euros and dollars in the crash of 2008. More than a decade ago the architecture and art studio Asymptote proposed a 3D info-scape for the New York Stock Exchange (NYSE) to manage financial data within a real-time virtual environment, providing a better, more transparent image and thereby a better idea of transactions—before we get driven into the next mega-crash.[8]

The NYSE did not want further development of a visualization of their "financial products"—and following Lehman Brothers' bankruptcy in 2008 we know why.

Ingo Günther's obsessive cartographic work *Worldprocessor*—an artwork that implicitly conveys the explosion, ubiquity, and the availability of data by the introduction and consolidation of digital media on illuminated globes—multiplies more and more and appears as a clairvoyant prefiguration of the attempts of the growing visualization industries to make our complex time understood. Between the late 1980s until now he destroyed more than 10.000 globes in his creative process and the attempt to create a more realistic image of economy, power, and all kinds of meaningful parameters (Günther 2007).[9]

At least since the time of Edward Snowden's release of documents we have known that Facebook also is systematically used for US National Security Agency surveillance, but many artists, like Seiko Mikami in her robotic installation *Desire of Codes, 2011*, were already dealing with this big issue of our time before the worldwide espionage became generally known[10] (also see Levin 2002; Ozog 2008). Paolo Cirio and Alessandro Ludovico's *Face to Facebook* (2011) also addressed the issue in the form of a "media hack performance" as social experiment: the artists stole one million Facebook profiles, filtered them with face recognition software and then posted them on a custom-made dating web site, searchable by gender and characteristics identified on the basis of their facial expression. Cirio and Ludovico's mission was to give all these virtual identities a new shared place to expose themselves freely, breaking Facebook's constraints and boring social rules. The project is a form of artistic activism that also is meant to explore the contested space of ownership rights to personal data from multiple perspectives, crossing boundaries between personal and corporate spaces and opening them up for controversy and dispute, and exposing the simplifying aspects of face recognition. The performative intervention generated approximately a thousand items of media coverage around the world, eleven lawsuit threats, five death threats, and an exchange of letters between the artists' and Facebook's lawyers.[11]

In addition to shaping highly disparate areas of culture, digital media art also questions notions of the "original" work of art. As we know, the interconnection "artist—original," which was still apparent in the age of craftsmanship, became complicated through machinization and multiplication in the post-industrial era. Today, the software supporting digital artwork by definition exists in a multiplied state. Intensifying this condition are the complicated iterations generated by the interactive interventions of users within the framework of a piece enabled by the degrees of freedom that the artist offers—a multiplication of the expressions of the work.

The more open the system of the artwork is, the more the creative dimension of the work moves toward the normally passive beholders who transform into players and can select from a multitude of information and aesthetic expressions. They can recombine, reinforce, or weaken; can interpret and even partly create. The previously critically distanced relationship toward the object—the precondition of the aesthetic experience and scientific insight in general, as described by Cassirer (1954, 1963), Adorno (1973), or Serres (1981, 152)—now changes to become a field of participatory experience.

Media Art and the Humanities

It is essential to create an understanding of the fact that the present "image revolution," which uses new technologies and has also developed a large number of so far unknown visual expressions, cannot be conceptualized without our image history. Art history

and media studies help understand the function of today's image worlds in their importance for building and forming societies. By telling the history of illusion and immersion, the history of artificial life or the tradition of telepresence, art history offers sub-histories of the present image revolution. Art history might be considered a reservoir in which contemporary processes are embedded—an anthropologic narration, on the one hand, and the political battleground where the clash of images is analyzed, on the other. Furthermore, art-historical methods may strengthen our political-aesthetic analysis of the present through image analyses. Last but not least, the development and significance of new media should be illuminated, since the first utopian expressions of a new medium often take place in artworks.

The evolution of media art has a long history and by now a new technological variety has appeared. Today's media art cannot be fully understood without its history. In 2005, the Database for Virtual Art, the Banff New Media Institute, and Leonardo produced the first international MediaArtHistories conference. Held at the Banff Centre in Canada, *Re:fresh!* represented and addressed the wide array of nineteen disciplines involved in the emerging field of media art.[12] Through the success of the following conferences—at House of World Cultures in Berlin in 2007 (following a brainstorming conference in Göttweig in 2006 hosted by the Department for Image Science at the Danube University, Austria), Melbourne in 2009, Liverpool in 2011, Riga in 2013, and Montreal in 2015—an established conference series was produced.[13] It was not planned to create a new canon, but rather to build a platform for the many-voiced chorus of the approaches involved. The subtitle HistorIES opened up the thinking space to include approaches from other disciplines beside "art history."

All the conferences around the world were organized via the MediaArtHistory.org platform, which is developing into a scholarly archive for this multifaceted field, ranging from art history to media, film, cultural studies, computer science, psychology, and so on. A couple of thousand peer-reviewed applications have been coordinated on MediaArtHistory.org.[14] With the nineteen disciplines represented at *Re:fresh!* serving as its base, MAH.org is evolving with future conferences under the guidance of an advisory board including Sean Cubitt, Douglas Kahn, Martin Kemp, Timothy Lenoir, Machiko Kusahara, and Paul Thomas.

Image Science: From the Image Atlas to the Virtual Museum

The integration of a "new" image form into image history does not constitute a new method; there have been different historic forerunners. Inspired by Darwin's work *The Expression of the Emotions* (1872), Aby Warburg began a project outlining an art-historical psychology of human expression. His famous *Mnemosyne* image atlas from 1929 tracks image citations of individual poses and forms across media—most significantly, independent of the level of art nouveau or genre. He redefined art history as medial bridge building, for example by including many forms of images. Warburg argued that art history could fulfill its responsibility only by including most forms of images including the most recent in time. The atlas, which has survived only as "photographed clusters," fundamentally is an attempt to combine the philosophical with the image-historical approach. Warburg arranged his visual material by thematic areas. He considered himself an image scientist and reflected upon the image propaganda of World War I through examination of the image wars during the Reformation.

Warburg intended to develop art history into a "laboratory of the cultural studies of image history" that would widen its field to "images … in the broadest sense" [*Bilder … im weitesten Sinn*] (Warburg 1922, 261).[15] Therefore every reflection on the complexity of digital imagery and its multifarious potential could start with Warburg's research.

We all know about the fundamental historical importance of archives to both scholarship and the creation of new knowledge. Let us remember, too, that the discipline of film studies was started by art historians. An initiative by Alfred Barr and Erwin Panofsky founded the enormous Film Library at New York's MoMA (Museum of Modern Art), called the "Vatican of Film" by their contemporaries. Thus film research in the 1930s already incorporated a dominant image science approach and further cultivated it. The initiative allowed for the large-scale comparison of films for the first time. The same spirit, committed to new investments for infrastructures to provide for and analyze the media art of our time, is needed in the digital humanities.

Art History—Visual Studies—Image Science

With strong representation from art history (Belting 2007; Bredekamp 2010; Grau 2011; Kemp 2011; Mitchell 2011), image science[16] (and its sister discipline of visual studies/visual culture in the Anglo-Saxon tradition) encourages interdisciplinary connections with history of science, neuroscience, psychology, philosophy, communication studies, emotions research, and other disciplines (Bredekamp, Bruhn, and Werner 2003; Müller 2003; Grau and Keil 2005; Sachs-Hombach 2005; Jakesch and Leder 2009; Zeki 2011).[17]

Preconditions

In contrast to other disciplines concerned with images, ones that frequently try to explain images as isolated phenomena originating in and of themselves, art history has the critical potential to define images in their historical dimension, which is the discipline's primary strength. Precisely because art history emphasizes a rigorous historicization and the practice of a critical power of reflection it can make the most natural possible contributions to the discussion around images. No image can be "read" if one has not read other images before.

Scientific work with images is based on three preconditions: (1) definition of the object; (2) building of an image archive; and (3) familiarity with a large quantity of images. This enables and defines the understanding that images follow a diachronic logic; without this historic base, image science remains superfluous and cannot realize its full potential.

All of these approaches to comparison are based on the insight that images act diachronically, within a historical evolution, and never function simply as an act without reference. This diachronic dynamic of image generation is increasingly interwoven with an understanding of images alongside those of their time, the synchronic approach. This dynamic process of change has fueled the interdisciplinary debate about the status of the image, a debate with protagonists such as Mitchell, Belting, Elkins, Stafford, and Manovich (Freedberg 1989; Crary 1990; Mitchell 1995; Elkins 1999; Manovich 2001; Stafford 2001; Gunning 2003; Huhtamo 2004). Image science, or *Bildwissenschaft*, now allows us to consider media from peep-show to panorama, anamorphosis,

stereoscope, magic lantern, phantasmagoria, films with odors and colors, cinéorama, IMAX, and the virtual image spaces of computers (Grau 2003a).

Since the academic institutionalization of art history at around 1800, different discourses emerged that dealt with the autonomy of art as well as with questions of the complexity of the image (Wind 1994): that is, art as a (rationalized) expression of diverse cultural expressions; questions of art history in the means of a history of style; the style of a certain epoch as a manifestation of the "Kunstwollen" (Alois Riegl)—an appropriate translation would be "artistic will"—that fades away the differentiation of high and low artistic expressions by emphasizing the (hedonist) will to create art.

Contrary to the emphasis of the form as a means of classification of art and image making—as, for example, in the perspective of formal aesthetics most prominently developed by Heinrich Wölfflin (Wimböck 2009)—Aby Warburg opened up a viewpoint that analyzes images in a complex cultural setting. His aim was to reveal the authentic position of an artwork and its visual complexity in order to understand images (Hofmann, Syamken, and Warnke 1980, 58) not only in the context of artistic mastery, but in their contemporary meaning which is informed by the "afterlife" of certain visual traditions (Didi-Huberman 2010). Even though this technique, which led to the iconological method of Erwin Panofsky,[18] pointed out that the complexity of a visual work can only be understood by unfolding its intrinsic discourses, it led to profound criticism; Ernst Gombrich claimed that Warburg's notion of the image and the solution of a "visual puzzle"—that is, the decoding of a complex religious depiction in its contemporary contexts—was too rational. In his groundbreaking essay "Icones Symbolicae" Gombrich (1986) demonstrates that the complexity of images in art history is solved not only by "decoding" the meaning of a certain symbol or allegory but also by considering its aesthetics and expressions (Gombrich 1986, 153). Following the concept of imagery in Neoplatonic thought,[19] Gombrich states that the complexity of images is not revealed in its entirety by solving what is rationally explicable.

However, images do not reveal their meaning only in terms of hermeneutic and semiotic analyses either. Again it was Warburg who introduced the term "Schlagbild" (pictorial slogan) (Diers 1997) to the discourse on the complexity of images to point out that (political) images have to deliver certain meanings in an immediate and effective manner. The idea of the "Schlagbild"—but without its political connotations—emerges again in Roland Barthes' notion of the "punctum" (Barthes 1980) as well as the "starke Bild" (strong image) (Boehm 1994); The image turns out to be a medium that is able to communicate higher emotional values than the written word.

Older definitions of the image, such as those by Gottfried Böhm, Klaus Sachs-Hombach, or W.J.T. Mitchell, became problematic in the context of the digital age. Beside earlier definitions of interactive, immersive, telematics, and generative digital images (Grau 2000) this carefully crafted definition by Thomas Hensel is a good start for outlining the problems:

> IMAGES are not reducible to a particular technology (like graphic prints or neutron autoradiography), not to certain devices or tools (paint brushes or telescope), not to symbolic forms (perspective), not to genres in the broadest sense (still life or summation image), not to an institution (museum or lab), not to a social function (construction or diagnostics), not to practices/media (painting or Morse Code), materials (canvas or photographic paper) or certain symbolism (Christian iconography or alphanumeric code)—but they are virulent in all of them. (Hensel 2008, 39)

Complex Imagery

We find complex and detailed images of the past, rich in information, in the special light atmospheres produced by medieval church windows or illuminated book narratives (Pächt 1962; Kemp 1994, 67). Before 1500 the medieval image system (Kemp 1989) was characterized by a multiplicity of "image frames" ("Bildfelder"). Therefore, medieval visual works were "complex image systems" (Kemp 1989, 123) that were systematically organized by a narrative, thematic, or figurative structure. Even though the visual artworks were not coherent in an illusionary way, they were aggregate spaces (Erwin Panofsky) that combined a multitude of materials, perspectives, and themes. A look at medieval triptychs, paintings, ceilings etc. would underscore this hypothesis, but it is also instructive to examine artworks that are situated in times of transition, as is the case with the ceiling of the Sistine Chapel by Michelangelo—a Renaissance masterpiece that illustrates the complexity of visual artworks.[20] In terms of complexity, Renaissance and baroque ceiling panoramas sometimes demonstrated a real cosmos of religious or pagan knowledge. We discover complexity in graphic prints—perhaps the most detailed image medium of the past—with their attempts to circulate encyclopedic visual knowledge, and we find it in 19th-century panoramas, the dinosaur of image history, showing scientifically and visually complex landscapes too far away to reach or thousands of humans engaged in bloody battles.

Complex images are also at the core of media arts' potential and gain their distinctiveness from their undistinctiveness: media arts' complexity nowadays is produced through interaction and variability, simultaneity, sequentiality, and narration. In media arts, connected polydimensional visual spaces of experience and immersion can be created, image spaces open for unfolding and compression, development or evolution, theoretically resembling fractals of unlimited resolution—to use some keywords. They are produced through endless creations of interfaces through ever new display innovations (Grau 2003a).

In today's social media-based image world definitions have become even more difficult: images, along with the cultures from which they originated, are on the move; myriads of images, with extreme mobility, flow around the globe as messages of transnational and transcultural communication in fractions of a second. Images from formerly separate contexts are occupied, interpreted, amalgamated, and given new meanings. What we are witnessing at the moment is a shift in our image cultures, which are connected to international media, toward a single image culture that increasingly operates transculturally. Formerly passive recipients, who reflected on discrete works of art in a distanced yet intellectually active manner, have now become interactive users with considerable degrees of freedom in their processing of images. Moreover they have become active mediators and facilitators of image worlds, as well as their producers, in that they increasingly collect, modify, distribute, and position images selectively and strategically. New visual information often arises through dialogue in which one or more networks are involved.

The *mise en scène* of the images, individually or in clusters, their metamorphoses and their dissemination, are significantly determined by the users of social networks. Vibrant subcultures develop unbeknownst with a speed of image turnover hitherto unimaginable. Something completely new, image and meaning, often arises from the contradictions, tensions, and differences which manifest visually. This process is nothing new in terms of theories of interculturalism: the fruitful fusion of Roman and

Greek cultures, for example, or of Christian and Islamic cultures in medieval Spain, demonstrated this procedure over long periods of time.

In addition to global icons—seemingly banal but, as we know, actually highly complex—there also are myriads of image clouds arranged in clusters that lie over the globe like a second visual sphere. This is where different ways of seeing the world encounter each other and are actively negotiated; this is where the rudiments of a new culture form. If one wants to understand an image, at least partly, it has to be considered in context. And contexts are becoming more and more complicated due to the many different visual media surrounding them: what is new here is that there apparently is no limit to the acceleration of visual exchange processes, which, because of their multifaceted branching and connections, cannot be captured or analyzed by the instruments employed by the humanities in the 19th and 20th centuries.

If ever the theory of a homogeneous or "pure" culture—ideologically elevated and repeatedly misused—had any validity, this idea is now virtually obsolete. A cultural theory that is playful and favors egalitarian exchange may be desirable, but is rather naïve if one considers the power of commercial global players to create global icons, the inroads of political control over the networks, language barriers, inadequate knowledge of digital cultural techniques, and the power of certain media conglomerates that are coming together to form economic cartels.

Collective Strategies: New Tools for the Humanities

In the first generation of digital humanities,[21] data was everything. In the 1990s massive amounts of data were archived and searched, and databases combined for interoperable searches, yielding a complexity and realization of data at a previously inconceivable rate. Yet the amount of material to be digitized is so vast that, in reality, we are only at the tip of the data iceberg. In non-textual fields, such as the visual arts, music, performance, and media studies, we are only "at the tip of the tip." Let us remember that digital art has still not "arrived" in our societies, no matter how well attended digital art festivals are or how many art-historical and scientific articles the artists have published. Due to the fact that this art depends entirely on digital storage methods, which are in a constant state of change and development, it is severely at risk. Many artworks that are not even ten years old can no longer be shown, and it is no exaggeration to say that half a century of art of our time is threatened to be lost for the next generations.

If we look beyond the humanities we can conclude that, during the last decades, the natural sciences started to pursue new research goals through large collective projects: in astronomy, for example, the Virtual Observatory compiles centuries worth of celestial observations[22]; global warming is better understood with projects like the Millennium Ecosystem Assignment, which, at a detail never before calculable, is evaluating twenty-four separate life systems and the global change of which they are part.[23] The rapid expansion of computational power has also affected biology, and the Human Genome Project has already become legendary.[24] So far, unknown collective structures give answers to complex problems. For the field of media art research and the digital humanities in general, an appropriate approach is needed to achieve equivalent goals.

Comparable with the developments in the natural sciences, digital media and new opportunities for networked research catapult the cultural sciences within reach of new and essential research, such as appropriate documentation and preservation of media art or, even better, an entire history of visual media and human cognition by means of thousands of sources. These topics express current key questions with regard to image revolution. In order to push the development of humanities and cultural sciences, it is necessary to use the new technologies globally. Timelines and new methods of visualization are part of the history of the invention of visual techniques, image content, and especially their reception in the form of oral history in the popular and high culture of Western as well as non-Western cultures. We live in an exciting time for both image science and the humanities. The credo is to not give up the established individual research, but to complete it in a new way through collective, Net-based working methods that allow us to deal with explosive questions in the field of humanities and cultural sciences.

The Archive of Digital Art (formerly Database of Virtual Art)

As a counterpart to the systematic analysis of the triad of artist, artwork, and beholder in the context of digital or virtual art, we originated the first documentation project in digital art, the Archive of Digital Art (ADA; formerly Database of Virtual Art),[25] which celebrated its tenth anniversary in 2010 (Grau 2000) (see Figure 1.1). As a pioneering effort supported by the German Research Foundation and Austrian Science Fund, it

FIGURE 1.1   Archive of Digital Art (ADA). Screenshot. Source: Oliver Grau, Danube-University Krems, Austria.

has been documenting the last decades of digital installation art as a collective project done in cooperation with renowned media artists, researchers, and institutions. We know that today's digital artworks are "processual," ephemeral, interactive, multimedia-based, and fundamentally context-dependent. Because of their completely different structure and nature they require a modified or, as it was termed a few years ago, an "expanded concept of documentation" (Grau 2003b).

As probably the most complex resource available online—hundreds of leading artists are represented with several thousand documents including technical data, and more than 3500 articles and a survey of 750 institutions of media art are listed—the database became a platform for information and communication. The database runs completely on open-source technology and, since the artists are members, it avoids copyright problems. Besides the artists, there also are more than 250 theorists and media art historians involved in making ADA a collective project.

The system allows artists and specialists to upload their information, and the ADA relies on its advisory board for making selections. Besides that, the criterion for determining whether artists are qualified to become members is the number of their exhibitions, publications, awards, and public presentations; high importance also is ascribed to artistic inventions like innovative interfaces, displays, or software. The system offers a tool for artists and specialists to individually upload information about works, people, literature, exhibits, technologies, and inventions.[26] Over the last ten years about 5000 artists have been evaluated, of which 500 fulfilled the criteria to become a member of the ADA. From the beginning, the long-term goal of the project was not simply the documentation of festivals, awards, or similar events, but a scientific overview with the corresponding standards of quality. Members have to qualify with at least five exhibitions or articles about their work, or, alternatively, may be suggested by the board.

Bridging the Gap: New Developments in Thesaurus Research

Now coexisting with one of the probably most important yet little-known art collections, the Göttweig print collection—representing 30,000 prints with an emphasis on Renaissance and baroque works[27] and a library of 150,000 volumes going back to the 9th century, among them the Sankt Gallen Codex—the Archive of Digital Art strives to achieve the goal of providing a deeper media art-historical cross-examination. Just as the MediaArtHistories conference series aims to bridge a gap, the combination of the Göttweig collection and ADA and other databases seeks to enable further historic references and impulses. The Göttweig collection also comprises proofs of the history of optical image media, intercultural concepts, caricatures, and landscapes in panoramic illustrations. This range will provide resources for a broader analysis of media art in the future (Figure 1.2).

It is important to note that keywording is bridge building! The hierarchical thesaurus of the ADA constitutes a new approach to systematizing the field of digital art. It was built on art-historical thesauri from institutions such as the Getty and the Warburg Institute as well as categorizations developed by festivals and discussions with artists in order to support historical comparisons. On the one side, keywords that have relevance in media art were selected from the Getty Art & Architecture Thesaurus, in the subject catalogue of the Warburg Library in London. On the other, new keywords
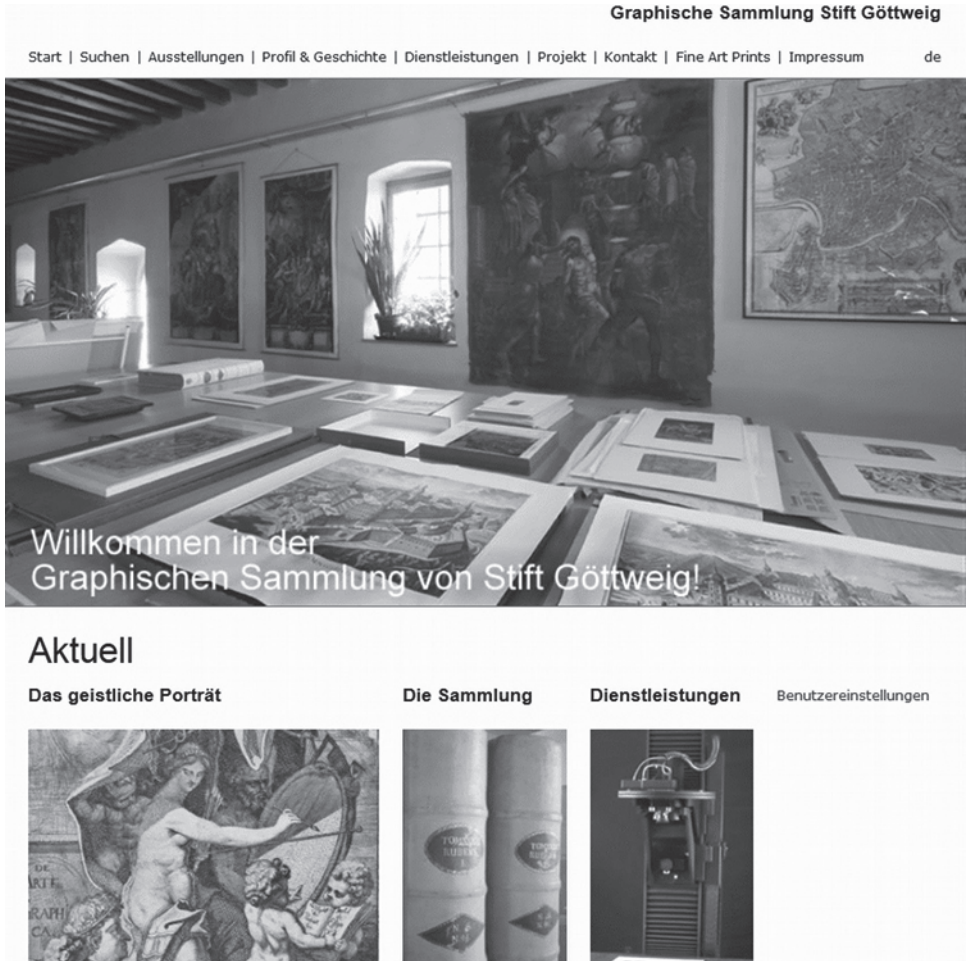
FIGURE 1.2   Göttweig Print Collection Online. Screenshot. Source: Oliver Grau, Danube-University Krems, Austria.

were selected from the terms most commonly used by media festivals such as Ars Electronica, DEAF, and Transmediale. Important innovations such as "interface" or "genetic art" are considered along with keywords that play a role in traditional arts—such as "body" or "landscape"—and thus have a bridge-building function. It was important to limit the number of keywords to a few hundred words so that members of the ADA can assign terms and tag their works without lengthy study of the index.

The range of categories leads to a natural overlap, so that the hybrid quality of the artworks can be captured through clustering. The thematic usability of the categories for the humanities was important —to avoid developing only new terminology, separated from our cultural history. It was crucial to compile a thesaurus that connects cultural history with media art and does not isolate them from one another. As to be expected, the material has also produced a multitude of fractures and discontinuities, which are made visible in the terminology of the database.

One of the goals for the future is to both document works within a context of complex information and, at the same time, allow users to find individual details quickly. In addition to statistically quantifiable analyses and technical documentation, databases should also present personal connections and affiliations, as well as funding information, with the goal to reveal interests and dependences. Going beyond searches of themes, media art documentation should also consider questions of gender, track the movement of technical staff from lab to lab and technical inventions pertaining to art, as well as public and private funds allocated to research, and, through the thematic index, show virtual and immersive art's reminiscences of its predecessors, for example, panorama or laterna magica. Media art documentation becomes a resource that facilitates research on the artists and their work for students and academics. By these means, documentation changes from a one-way archiving of key data to a proactive process of knowledge transfer.

Media Art Education

The future of media art within the digital humanities requires further establishment of new curricula, like the one we developed for the first international Master of Arts in MediaArtHistories with renowned faculty members from around the world—a program that also addresses the practice of and expertise in curating, collecting, preserving, and archiving media arts. The necessity for an international program capable of accommodating future scholars coming from diverse backgrounds and all continents was met by a low-residency model allowing professionals to participate in the advanced program of study parallel to ongoing employment and activities. Students and specialists are brought together for concentrated blocks of time in an intensely creative atmosphere focusing on the histories of media art and its kindred arenas.

The needs of the field made it necessary to create a program specific to MediaArtHistories—with a faculty of experts that universities typically would not be able to gather in one institution—in order to pave the way for the development of innovative future educational strategies in media arts. Offering both an overview of relevant approaches and the possibility for specialization through focused projects and master's theses, the Masters of Arts program provides an introduction for students new to this emergent field and depth for experienced students. The integration and continuing evolution of the aforementioned projects—the ADA, the Göttweig Graphic Collection online, and the platform MediaArtHistory.org with the MediaArtHistories Archive—creates synergies with the development of courses for the program in order to support curators and archivists in their professional needs. The ultimate goal is to set a standard for administrators and policy makers so that we can work toward joining up common methods, histories, and research in the spaces shared by art history and media studies.

The Problem of Media Art Documentation Today—Future Needs

After the foundation of the original Database of Virtual Art, a number of online archives for documentation were established: the Langlois Foundation in Montreal (2000–2008), Netzspannung at the Fraunhofer Institut (2001–2005),

and MedienKunstNetz at ZKM (2004–2006). Although they continue to exist as online archives, all these projects were eventually terminated, or their funding expired, or they lost key researchers like V2 in Rotterdam, Netherlands.[28] The Boltzmann Institute for Media Art Research in Linz (2005–2009) was also closed. Thus the original archives that often represent the only remaining image source for some works do not only, step by step, lose their significance for research and preservation, but also partly disappear from the Web. Not only the media art itself but also its documentation fades and is partly lost, so that future generations will not be able to get an idea of the past. What we need is a concentrated and compact expansion of the ability to sustain it. Although a number of preservation projects[29] have been supported over time, a concerted and sustainable strategy, neither institutional nor governmental, so far does not exist. There still seems to be a tendency toward particularization in preservation, instead of a focus on concentrating forces, which is an essential strategy in most other fields.

A New Structure for Media Art Research

University-based research projects, in particular, and also some of those linked to museums have developed expertise that needs to be included in cultural circulation, not only in order to pass it on to future generations of scientists and archivists but also to give it a chance to flow into future university curricula in the fields of art, engineering, and media history. Clearly, the goal also must be to develop policies and strategies for collecting the art of our recent history under the umbrella of a strong, Library of Congress-type of institution. Ultimately, however, this effort can only be organized with the help of a network of artists, computer and science centers, galleries, technology producers, and museums. The projects that collected culturally important documents in the past and often expired or were not further supported or lost their base must be supported and reanimated. They should be organized like a corona around an institution that takes on the duty of documentation and maybe even collection of contemporary media art. Interestingly, libraries show increasing interest in archiving multimedia works and their documentation. However, the usually complex cultural and technical knowhow needed to preserve principal works of the most important media art genres of the last decades is often lacking.

Not only can the international status of media art, its international themes and international protagonists be a hindrance in creating common projects, but the funding infrastructure of media art so far has typically promoted national projects for only two, three, or a limited number of years, neglecting sustainability. A structure that updates, extends, and contextualizes research—whether in historical or contemporary contexts—is badly needed. The funding and support infrastructures that have been built toward the end of the last century are not suitable for the scientific and cultural tasks in the humanities of the 21st century.

The European Commission expressed the goal to double funds for pilot projects in interdisciplinary foundational research.[30] But this is not enough: for up-to-date digital humanities, the funding structures must be internationalized in ways similar to those enabling modern astronomy, genomics, and climatology. In order to create enough momentum and the necessary sustainability, responsible sponsors like the NSF, DFG, EU and so on have to ensure long-term and sustainable international structures. Only

if we develop systematic and concentrated strategies for collection, preservation, and research will we be able to fulfill the demands of digital culture in the 21st century.

But even the best documentation and archiving cannot replace the preservation of digital-born projects, which started to be researched in a range of international projects such as DOCAM[31] in Canada, the Variable Media Network[32] or the Capturing Unstable Media[33] project carried out by V2. We should welcome the fact that further basic means for promoting the reception of media art are provided, even though much larger efforts still must be undertaken on a national and international level. We need proper and sustainable international collection and research funding policies, similar to the ones that facilitated the success of the natural sciences or collections in museums, which in many countries are forced by law to collect and preserve contemporary art also.[34] As recently expressed in an international declaration,[35] signed by more than 450 scholars and leading artists from forty countries as of 2014, there is an urgent need to create a stable international platform of interoperable archives, of expertise and support for important regional histories, and to internationalize research, modes of interpretation, and shared resources. The signees of the declaration intend to establish an appropriate scientific structure for documenting and preserving, for promoting study and appreciation; to create a permanent resource for future scholars, artists, curators, and creative engineers; and to make major interventions in the understanding of media as a basic framework of society. In astronomy, the funding agencies developed and modernized their systems toward sustainability, which is needed in the humanities as well. The Virtual Observatory infrastructure is funded on an ongoing basis, and there is international coordination between a dozen or so countries that produce astronomical data. Considering the current upheavals and innovations in the media sector, where the societal impact and consequences cannot yet be predicted, the problem is pressing.

We are experiencing exciting developments in Web 2.0, experimenting with new strategies for collective documentation and content management that exceed the work of expert networks. But one needs to keep in mind that amateurs cannot replace the work of professionals who have been educated in their field over many years—a process common in other dissemination systems. Nevertheless, amateurs can play a very important role in facing the enormous challenge of negotiating and traversing through a network of helpful exchanges and efficient guidance. Moreover, a long-term commitment to the profession by the best experts in the field is needed. An enormous and sustaining infrastructure has been developed and established for traditional artistic media such as painting, sculpture, architecture, even film, photography and their corresponding archives over the course of the past century. Publicly financed archives, museums, and educational institutions may be obliged to collect and preserve the art of our time, but the archival systems of our society were caught off guard by the shorter lifespan of digital storage media. What is urgently needed is the establishment of an appropriate structure to preserve at least the usual 1–6% of present media art production. This important step is still missing for the first two generations of media art. If we compare the available budget for traditional art forms worldwide with the one for digital culture, we understand how inadequate the support for our present digital culture is—so low it is almost statistically immeasurable. The faster this essential modification to our cultural heritage record can be carried out, the smaller the gap in the cultural memory will be and the more light will be shed on "the dark years," which started about 1960 and last until now.[36] We need to take into account the

hybrid character of media art, which requires a paradigm shift toward process and context recording, which increasingly includes the capture of the audience experience (Grau 2003b; Muller 2008).

The hope for the future is to bring together the expertise of the most important institutions in order to create an up-to-date overview of the whole field; to provide the necessary information for new preservation programs within the museum field; new university programs for better training of the next generation of historians, curators, restorers, engineers, and others involved in preservation; and new forms of open access to media art. Just as research in the natural sciences has long recognized team efforts, a similar emphasis on collaborative research should govern the thinking of the humanities.

Notes

1   The topic of the Transmediale Berlin in 2009: "Deep North;" Ars Electronica festival in 2009: "Human Nature." See also the (educational) art project "Media Art Ecologies Program" by furtherfield.org.

2   See the dissertation of Daniela Plewe, Paris, Sorbonne, 2011. http://www.transactional-arts.com/summary.html (accessed January 4, 2015).

3   Ars Electronica's festival theme in 2002: "Unplugged. Art as the scene of global conflicts." Also see art projects such as Ken Goldberg's *Telegarden* (1995–1996), Nam June Paik's *Global Groove* (1973), Viktoria Binschtok's *Globen/Globes* (2002), etoy's *The Digital Hijack* (1996), Marko Peljihan's *UCOG-144: Urban Colonization and Orientation Gear-144* (1996), Ga Zhang's *Peoples' Portrait* (2004).

4   For example: Ars Electronica, Austria; Transmediale, Germany; Intersociety of Electronic Arts (ISEA) Conference; Dutch Electronic Art Festival; European Media Art Festival, Germany; FILE, Brazil; Microwave Festival Hong Kong; Korean Media Art Festival; Siggraph and others.

5   For example, Archive of Digital Art: https://www.digitalartarchive.at/; Netzspannung. org: http://netzspannung.org/archive/; V2_Archive: http://framework.v2.nl; Docam: http://www.docam.ca; Daniel Langlois Fondation: http://www.fondation-langlois. org; Variable Media Initiative: http://variablemedia.net (accessed January 4, 2015).

6   Accessed January 4, 2015. For an overview: http://digitalartarchive.at.

7   The anamorphosis is an imaging technique that was invented in the Renaissance, most prominently developed by Leonardo da Vinci. From a technical standpoint, anamorphic images are "distorted" images that are reconstituted either by a mirror or by the particular position of the beholder. Besides its lesser known importance in early cartography and other scientific imaging techniques, it is a technique that made an appearance most prominently in Hans Holbein's *The Ambassadors*. The anamorphosis was also of great importance for baroque church ceilings to create certain illusionary effects.

8   Asymptote, *NYSE 3D Trading Floor* (1998). http://www.asymptote.net (accessed January 4, 2015).

9   Also see Rafael Lozano-Hemmer, *Zero Noon* (2013), and George LeGrady, *Data Flow* (2008).

10 Also see art projects such as Timo Toots's *Memopol* (2012), Mediengruppe Bitnik's *Surveillance Chess* (2012), and Dragan Espenschied and Alvar Freude's *Insert Coin* (2001).

11 http://www.lovely-faces.com (accessed January 4, 2015).

12 Some of the conference results can be found in the anthology *MediaArtHistories* (Grau 2007) and Broeckmann and Nadarajan (2009).

13 http://www.mediaarthistory.org (accessed January 4, 2015).

14 The content development of *Re:fresh!* was a highly collective process. It involved three producing partners, a large advisory board, two chairs for each session, call and review for papers, a planning meeting in 2004, keynotes, poster session, and the development of application content over the time of two and a half years.

   The conference brought together colleagues from the following fields: invited speakers (based on self-description from biographical material) HISTORIES: Art History = 20; Media Science = 17; History of Science = 7, History of Ideas = 1; History of Technology = 1; ARTISTS/CURATORS: Artists/Research = 25; Curators = 10; SOCIAL SCIENCES: Communication/Semiotics = 6; Aesthetics/Philosophy = 5, Social History = 2; Political Science = 2; Woman Studies = 2, Theological Studies = 1; OTHER CULTURAL STUDIES: Film Studies = 3; Literature Studies = 3; Sound Studies = 3, Theatre Studies = 2; Performance Studies = 1; Architecture Studies = 1, Computer Science = 2; Astronomy 1.

15 We know that National Socialism put a sudden end to this work and although its emigrants could create important impulses in the United States and England, the image science approach did not return until the 1970s with the Hamburg School. Also see Wedepohl (2005).

16 Image science has been established as the common translation of the German *Bildwissenschaft(en)*, and is used at the *Wissenschaftskolleg*, Berlin, the *Journal on Interdisciplinary Image Science*, the Center for Image Science, Danube University, and by American colleagues like W.J.T. Mitchell and Barbara Stafford. Earlier translations such as "visual science," "image history," or "picture studies" are no longer in use.

17 Albeit concentrated on the gravitational field of art history, the programs in image science at Danube University are interdisciplinarily aligned. http://www.donau-uni. ac.at/dis (accessed January 4, 2015.

18 "Ikonologie"—the English term "iconology" conveys a different approach to images (see Mitchell 1989)—is a method of analyzing artworks that was highly influenced by the philosophy of the symbolic form of Ernst Cassirer. Warburg introduced "Ikonologie" to art history, whereas Erwin Panofsky "institutionalized" the methodology of emphasizing the meaning of an artwork instead of its form.

19 By combining the philosophy of Plato with Jewish and Egyptian traditions, the Neoplatonic philosophy introduces—in short—a mystical system of thought that emphasizes irrational aspects in the creation of (a higher) knowledge.

20 Hofmann states that Michelangelo evokes an effect that is distinct from the concept of the central perspective (1998). The combination of multiple frames on an area of 13×36 meters is characterized by its polyfocal composition: instead of offering a coherent illusion, Michelangelo establishes a complex pattern of different layers that dispenses with the idea of a spatial and temporal fixation. Hofmann as well as Panofsky points out that the dimensions of the bodies are varying and different layers of reality are united. The ceiling establishes a complex reference system in between the different areas. Therefore, the beholder is encouraged to follow certain visual axes to understand the complexity of the painting.

21 For the discussion and development of the field, see the journal *Digital Humanities Quarterly* and also the *Companion to Digital Humanities*. http://www.digitalhumanities. org/companion (accessed January 4, 2015).

22 The International Virtual Observatory Alliance (IVOA) was formed in June 2002 with a mission to "facilitate the international coordination and collaboration necessary for the development and deployment of the tools, systems and organizational structures necessary to enable the international utilization of astronomical archives as an integrated and interoperating virtual observatory." The IVOA now comprises seventeen international VO projects.

23 The Millennium Ecosystem Assessment assessed the consequences of ecosystem change for human well-being. From 2001 to 2005, the MA involved the work of more than 1360 experts worldwide. Their findings provide a state-of-the-art scientific appraisal of the conditions and trends in the world's ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them sustainably.

24 The Human Genome Project was an international scientific research project with the primary goal of determining the sequence of chemical base pairs which make up DNA and identifying and mapping the approximately 20,000–25,000 genes of the human genome from both a physical and functional standpoint. The mega project started 1990 with the collective work of more than 1000 researchers in forty countries; the plan was to achieve the goal in 2010. A working draft of the genome was released in 2000 and a complete one in 2003. See International Human Genome Sequencing Consortium (2004).

25 http://digitalartarchive.at (accessed January 4, 2015).

26 The PostGreSQL Database is open source and the operation system is Linux-based.

27 The digitization of the collection is a project developed by the Department of Image Science at Danube University and conducted in cooperation with the Göttweig Monastery. The collection of prints at Göttweig Monastery, which itself was founded in 1083, is based on acquisitions made by various monks since the 15th century. The first report of graphic art kept in the monastery dates back to 1621, with an archive record that mentions a number of "tablets of copper engraving" ("Täfelein von Kupferstich"). The actual act of founding the collection is attributed to Abbot Gottfried Bessel whose systematic purchases in Austria and from abroad added a remarkable total of 20,000 pieces to the collection in a very short space of time! Reaching to the present day, the print collection at Göttweig Monastery has grown to be the largest private collection of historical graphic art in Austria, with more than 30,000 prints. The Department of Image Science's digitization center at the Göttweig Monastery uses technology to scan paintings and prints from the collection (up to 72 million pixels). http://www.gssg.at (accessed January 4, 2015).

28 Also compare the OASIS (Open Archiving System with Internet Sharing, 2004–2007) or the GAMA project (2008–2009), a gateway and meta-database that is not connected with the Europeana. "The issue of generally accepted machine-readable descriptive languages in these semantic and metadata approaches and the long-term interoperability of databases have led to an emphasis on questions concerning the openness of the sources and the source codes" (Wolfensberger 2009).

29 There are a number of promising case studies archived by TATE, the Guggenheim, or MOMA, as well as individual research projects by colleagues such as Caitlin Jones's "Seeing Double: Emulation in Theory and Practice, The Erl King Case Study." http://206.180.235.133/sg/emg/library/pdf/jones/Jones-EMG2004.pdf (accessed January 4, 2015).

30 http://ec.europa.eu/digital-agenda/en/our-goals (accessed January 4, 2015).

31   DOCAM is a multidisciplinary research endeavor initiated by the Daniel Langlois Foundation in collaboration with numerous national and international partners, such as the Database of Virtual Art, who wrote letters of support, and is funded by the Social Sciences and Humanities Research Council of Canada. http://www.docam.ca/ (accessed January 4, 2015).

32   http://www.variablemedia.net/ (accessed January 4, 2015).

33   http://v2.nl/archive/works/capturing-unstable-media (accessed January 4, 2015).

34   Museum collections and archives—especially when state owned—have the legal obligation to ensure the physical preservation, appropriate documentation, and accessibility of cultural objects to researchers and the public; regulations are stipulated in Austria by the Denkmalschutzgesetz (Landmark Protection Law) or the Bundesmuseengesetz (Federal Museums Law) and in Germany by the Kulturgutgesetz (Cultural Asset Law).

35   MEDIA ART NEEDS GLOBAL NETWORKED ORGANISATION & SUPPORT—International Declaration. http://www.mediaarthistory.org (accessed January 4, 2015).

36   The loss might be even more radical and total than that of the panorama, the mass media of the 19th century. Almost twenty panoramas survived, which is much more than 3% of the 360° image worlds—we should be glad if 3% of the most important exhibited media artworks survived.

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