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Artists Engaging with Technology—for Better or Worse

Nick Lambert[1]
1. Department of History of Art and Screen Media, School of Arts, Birkbeck, University of London, email: n.lambert@bbk.ac.uk.

Abstract

What is the relationship, if any, between art and technology? Over the last few centuries, artists and scientists have maintained a sometime turbulent relationship. Often emphasizing technology's penchant for infringing upon the natural world, artists have pointed towards the inherent dangers and pitfalls of industrialization. However, there have at times been periods of mutual understanding; times in which the products of advanced technology have themselves become either objects of art or have facilitated the artist's expressive abilities. Where are we now? Has the Art and Technology movement faded from view, or are we at the precipice of a new era of cooperation between art and science?

Keywords: visual arts, future studies, constructivism

The visual arts are often studied by historians of technology to determine when depictions of certain techniques, or concepts, filtered into visual culture. Lynn White Jr made some important observations on the contemporaneous rise of naturalism and observational science during the High Middle Ages, and also noted the iconography of "God the Master Craftsman" in Saxon religious art, leading to William Blake's famous image of the *Ancient of Days* with his compasses measuring out the universe (1). However the artistic understanding of science and technology, at least as overarching paradigms, is not straightforward and the depiction of a particular concept can be overlaid with symbolism beyond its original intention. Blake's image of the compass-bearing Creator was intended to show a cold and rational deity who used scientific process to create an oppressive reality. This was expressed in the poet's famous dictum "May God us keep / From Single vision & Newton's sleep" as he said in his Letter to Thomas Butt in 1802.[i]

As technology is often associated with the imposition of human will upon nature, and the exploitation of humanity this entails, there was much antagonism towards the emerging scientific vision and the ensuing industrialization during the nineteenth century by artists. One of the most eloquent champions of the Romantic cause of art against Modernity at the height of the Victorian era was John Ruskin, with his call to reject the industrial cities for places where nature was still unspoiled:

> This vision of an industrialised future can become a nightmare or a hallucination, as when Ruskin sees the emergence of a world lit entirely by gas lights because the light of the sun is hidden by factory smoke, or a world made of metal because the earth has become "the cast furnace of a ghastly engine." His great fear, then, is that nature will be totally destroyed by the (inhuman) actions of modern humanity (2).

However during the twentieth century, the visual arts engaged with technology and "progress" in the broad sense in various ways, from Marinetti's bold declaration of Italian Futurism in 1909 to Dan Flavin's highly meditative neon artworks; and a whole range of technologically-me-

diated artforms have arisen from photography to cinema to new media. Yet the artistic engagement with technology must necessarily be separated from any endorsement of the industrial society; quite the opposite in many cases, such as Jean Yves Tinguely, who used his frenetic kinetic sculptures made from salvaged parts as a way of critiquing the late industrial world. And just as our perception of and exposure to technology has shifted since the advent of personal computing devices made them ubiquitous from the 1980s onwards (especially in the form of games consoles and smart phones), so artists engaged with New Media have focused on the unintended and often negative consequences of the networked world.

The internet artists Thomson and Craighead recently produced an installation combining video documentary and geo-located websites, *Belief*. It examines "how information is distorted by its very dissemination online, but also how we individually might authenticate information as it comes into view when part of decentralised global communications networks". The artists have engaged with the web since its inception in the mid-1990s, and their concerns about the nature of information, dissemination and control are taken up by other contemporaries whose approach to the online medium combines fascination with its contents whilst at the same time evincing disaffection at its potentials for surveillance and data mining (3).

This is somewhat different to the polarized situation between the Arts and the Sciences that CP Snow gloomily observed at the end of the 1950s in his celebrated – or infamous – essay *The Two Cultures*, but equally it demonstrates that the utopian engagement with technology as an agent of positive social change has been overshadowed by the dystopian view of the near future. As a historian of Art and Technology, it is interesting to see how this shifting of emphasis is in itself a barometer of societal views on technological progress, and never as absolute or determinist as either its proponents or detractors might suggest. As Brian Winston observed in his 1987 essay on art and technology, *A Mirror for Brunelleschi*:

> The positive and negative visions of technological progress share many common assumptions. Both assume that modern technologies pose an unprecedented challenge to the arts; both accept the fact that technology is changing at an ever-faster pace; both see it as playing an increasingly important role in our lives (4).

There is certainly a danger that ascribing too-sweeping powers to technology to mould society, and placing too much emphasis on the mechanical rather than the intellectual or empathic forces that operate across cultures, can lead to an overly determinist or despairing view. From Lewis Mumford to Neil Postman and Alan Bloom, there is a strong American tradition of attempted retrenchment in the face of technological shifts; and McLuhan himself was no cheerleader for the "global village," a development he viewed with grave reservations.

Determinism can impact on the area of art and technology in other ways too. Just over a decade ago, painter David Hockney published a controversial text, *Secret Knowledge: Rediscovering the Lost Techniques of the Old Masters* that advanced the claim that much of the highly observed realism in Renaissance and Mannerist art was achieved using optical devices such as the *camera obscura*. Although based on both research and personal artistic experience, Hockney's thesis was seen to devalue not only the painterly achievements of the Old Masters but also to make their work a mere collection of daring optical effects (5). Actually, the book should be read in the light of Hockney's own engagement with technology that spans a range of devices from faxes to color photocopiers to the iPad; he approaches the Old Masters with the same pragmatism. Though he may well have cast his net too widely, he was keenly aware of the optical approach and its limitations:

> Hockney's main point [in his book] was a critique of the limitations of that kind of image-making. The "optical look," he now argued, had come into the world all the way back in the 15th century when painters began deploying single curved mirrors or lenses or prisms and surrendering to their perspectival imperatives. In that sense, the invention of photography in 1839 merely chemically fixed onto a surface (silver-plated copper at the outset, though presently paper) a way of seeing that had already held sway for centuries (6).

Although contemporary artists are largely wary of being overly enthusiastic about technology even when deploying it, there were several pivotal moments in the twentieth century when such enthusiasms were manifest. The aforementioned Futurists under Marinetti engaged with the explosive potentials of the machine at a time when automobiles and aeroplanes were only just entering the public consciousness; they represented an artistic frontier

to be crossed and as Marinetti famously declared "a roaring motor car which seems to run on machine-gun fire, is more beautiful than the *Victory of Samothrace*".[ii] But the initial surge of Futurism and its close contemporary Vorticism in the UK was rebuffed by the destruction of the First World War. In the 1920s there emerged a more sustained engagement with art and industry with the opening of the Bauhaus school of design, that built on the concepts of Russian Constructivism and was determined to use manufacturing processes to democratize high art and also drive social progress.

Walter Gropius's slogan "Art and technology – a new unity" helped define the Bauhaus from its inception in Weimar in 1923, although perhaps the artist who most embodied its aims was the Hungarian Laszlo Moholy-Nagy. His restless, but always carefully-considered, forays into new areas of design thinking and technological speculation produced some of the most original art of the early twentieth century; and yet this very breadth of work also makes him harder to pin down than better-known contemporaries. It was Moholy-Nagy who grasped the potentials offered by: "electricity, the gasoline and diesel engines, the airplane, motion pictures, color photography, radio, metallurgy, new alloys, plastics, laminated materials. . . ." (7). He experimented with machines to create light imagery; kinetic sculptures; new forms of photography; and importantly set down his thoughts in several extensive books detailing this work and other projects.

Moholy-Nagy also acted as a crucial bridge between Germany and America in the 1930s when, like his Bauhaus colleagues Gropius and Mies van der Rohe, he was forced to flee to the New World. Settling in Chicago, he was instrumental in opening the New Bauhaus in 1938 and after a false start caused by its initial backers, was able to continue this as the School of Design, which became the Institute of Design in 1945 and merged in 1949 with the Illinois Institute of Technology, where it continues to this day. The curriculum Moholy-Nagy produced for the New Bauhaus encoded his thinking on his tripartite version of Gropius's original concept: Art and technology and science. He wanted to give aspiring artists and designers a full experience of new areas, so he exposed them to both the established and experimental media of art, as they were in the 1940s:

- The domain of the artistic component of the curriculum was extended to the more technological arts, such as photography, film, and kinetic and light sculpture, and to nonvisual arts, such as music and poetry.

- To the two basic elements of the formula that Gropius made famous ("Art and Technology: a New Unity"), Moholy-Nagy added a third element: science. As a consequence, the curriculum included a series of courses in physical, life, human, and social sciences, the coordination of which was entrusted to Charles Morris from the Department of Philosophy at the University of Chicago (8).

Although he died all too early in 1946, Moholy-Nagy's integrated vision has heavily influenced design education and aspects of fine art teaching too. However, Moholy-Nagy was followed by Gyorgy Kepes (also a teacher at the New Bauhaus) who established the Centre for Advanced Visual Studies at MIT in 1967 with the idea of advancing artistic collaboration with advanced technology. Indeed, the 1960s were probably the high point of the Bauhaus-inspired art and technology collaborations, and the moment when optimism was highest for the emergence of a new form of technologically-mediated art.

One of the key drivers in this movement was Swedish engineer Billy Klüver, who was a member of technical staff at the Bell Telephone Laboratories in Murray Hill. From 1960 onwards, he began to collaborate with artists, beginning with Jean Tinguely and then Jasper Johns, Yvonne Rainer, Robert Rauschenberg, John Cage and Andy Warhol, providing them with technical advice on their installations. His work with Rauschenberg developed into an ongoing project to introduce artists to new technologies, and he was able to convince his superiors at Bell Labs to support their work. This resulted in a major event, "Nine Evenings: Theater and Technology" at the New York Armory in 1966. After more than a year of planning and generous support from Bell Labs, Klüver and Robert Rauschenberg launched the evening's performance on an unsuspecting audience of the great and the good patrons of the New York art world. The event was an ambitious staging of several performance pieces by 10 artists: Rauschenberg, John Cage, David Tudor, Yvonne Rainer, Deborah Hay, Robert Whitman, Steve Paxton, Alex Hay, Lucinda Childs and Öyvind Fahlström. All of these had significant technological input from Bell Labs scientists and depended on a range of sensors and mechanisms to function properly.

Unfortunately the sheer scale of "Nine Evenings" and the all-too-apparent fragility of its technology in a live setting meant that the show was widely perceived as a failure. The reports and interviews from 9 Evenings suggest there was a general interest in technologically-based artforms leading to much anticipation for the event. However Columnist John Brockman noted the one-sided nature of the supposed "collaboration" between artists and scientists:

It is in the [area of collaboration between artists and scientists] where [9 Evenings] seems to have run into trouble, as evidenced by the superficial and "effects"– oriented utilization of some of the equipment. [The problem may be] that the scientists had been limited by their instructions to stay in the background and just give the artists what they wanted. In this way, perhaps Billy Klüver's rather worshipful attitudes towards artists resulted in an illusory collaboration rather than a real one (9).

Yet the event generated much publicity for large-scale collaborations of this type, and shortly afterwards Klüver and Rauschenberg founded a non-profit group, Experiments in Art and Technology, to take the concept to more artists. This achieved notable success with the Pepsi Pavilion at the Osaka World's Fair in 1970 (10). By the end of the 1960s a number of seminal exhibitions and shows of technological artworks had taken place: "The Machine as Seen at the End of the Mechanical Age", curated by Pontus Hulten at MOMA from Nov 1968; "Cybernetic Serendipity" curated by Jasia Reichardt at the Institute of Contemporary Art in London, 1968; and the highly ambitious Art and Technology program at the Los Angeles County Museum of Art, 1967-71, under Maurice Tuchmann (11). Klüver believed not only that artists must gain access to technology, but that the engineer should be subordinate to the artist's approach:

> The artist cannot master technology and the engineer cannot become a full-time artist; but through their human interaction, new possibilities evolve. Not only may the artist's project evolve into more complicated uses of technology with the engineer develops but also the engineer may be pushed farther or in different directions because of the artist's needs (12).

Thus the artist is placed in the controlling position and the engineer, at worst, becomes a skilled functionary who executes the artist's concept. In these terms, there is nothing new about this relationship; it is the same as the architect and the builder, or the designer and the mechanic. It has even become the *modus operandi* of many contemporary artists, as explained in the book *Making Art Work* by Mike Smith of the Mike Smith Studio, which shows how the large-scale installations of the Young British Artists (YBAs) of the 1990s such as Damien Hirst were fabricated by the studio. Smith actively engaged with concepts suggested by these artists to ensure that they could be constructed, in a way not dissimilar to the role Klüver saw for the engineer in art. That said, Klüver was not simply positing the engineer purely as a fabricator, but rather as a guide to appropriate technological processes, an expert contributor. He also saw a degree of inevitability in the artistic use of technology, whatever its aim:

> It is not a question of what the artist *should* do, but what he *will* do with technology. Whether technology is good or bad, threatening or friendly, beautiful or ugly is irrelevant. The qualities and shapes of technology are not the proper concern of the artist (13).

Thus in Klüver's experiment, the artist directs and the engineer performs, or gets technology to perform. If one aspect is not "the proper concern" of the artist, then it should be handled by someone else. This stemmed from Külver's insistence that the artist must perforce operate in a very different way to the engineer:

> […] Art allows for discontinuities that science cannot tolerate. History must have presented us with the separateness of art and science for a reason (13).

Whilst Klüver was promoting his approach to Art and Technology in the USA, there were other approaches to new art technologies in different parts of the world, where the initial engagement with Art and Technology had a different basis and result. One of the main repositories of this movement is the "New Tendencies" series of conferences and exhibitions in Zagreb that took place between 1961 and 1973 (14). It made significant contributions to the theories of art and science engagement in Central Europe, despite the Cold War, because Yugoslavia acted as a meeting-place between the Western and Eastern blocs and a continuous tradition of Constructivist and Bauhaus thought had survived in this area of Europe.

The New Tendencies series was collated into a substantial exhibition in 2010 by the *Zentrum fur Kunstmedia* (ZKM) in Karlsruhe, Germany, which has a mission to preserve examples of media and video art. Thanks to the accompanying catalogue, which reproduces many articles from

the original conferences in English, it becomes apparent that New Tendencies supported the artist's progressive role as a radical innovator. Central to this vision was the deployment of contemporary materials and techniques; it was the artist's duty to engage with new technologies and understand them. Francois Molnar and Francois Morellet make this very clear in their paper of 1965, *For a Progressive Abstract Art*. The progressive tendency in art had to include the following (15):

- Confidence in rationality and logic as fundamentals
- Confidence in progress
- Mistrust of the cult of individualism
- Effort directed towards scientific research
- Use of modern materials
- Belief in experimental art

This approach was fundamental to New Tendencies and also permeated the first era of computer art as well. In her introduction to the Computer Section of the *Cybernetic Serendipity* catalogue, Jasia Reichardt stated that:

> … one cannot deny that the computer demonstrates a radical extension in art media and techniques. The possibilities inherent in the in the computer will do little to change those idioms of art which rely primarily on the dialogue between the artist, his ideas and the canvas. They will, however, increase the scope of art and contribute to its diversity (16).

This idea of technology increasing the scope art underpinned the experimental work of another Bell Labs artist, the American film-maker and computer art pioneer Stan Vanderbeek, who had a significant retrospective at the New York gallery Guild & Greyshkul in 2008. That exhibition was notable for restaging Vanderbeek's multiprojection films and his other multimedia artworks of the 1960s-70s. As one of the generation who passed through Black Mountain College in the 1950s, another place where Bauhaus concepts were disseminated in the USA, Vanderbeek was well-known in his own time but subsequently disappeared from view following his early death in 1984. He tends to feature in histories of film-making and media art as the originator of the term "expanded cinema" due to the prototype Moviedrome he constructed at Stony Point NY in 1964.

Vanderbeek proposed the Moviedrome as a true multimedia experience. He wanted people to see and hear multiple sources simultaneously, in the round. Inside, a combination of 16mm film projectors, slides, audio and other media were played to an audience who lay on the floor. In so doing, Vanderbeek deliberately escaped from the monolithic viewpoint of one screen and embodied something of McLuhan's ideas about the full-spectrum of broadcast media. However Vanderbeek also envisaged the Moviedrome as a node in an international system of satellite-broadcast visual content and image libraries; a network of Moviedromes around the globe relaying information to each other. In this he undoubtedly foresaw aspects of the Internet. It is not coincidental that he was also a pioneer of digital imagery in the late 1960s, working with Knowlton at Bell Labs. His BEFLIX films explored the computer's potentials for animation in this early period and he saw what could be achieved with digital media.

The Moviedrome remains his single best-known contribution to this history, along with his perceptive predictions about the need for interconnected libraries of images and media. Yet Vanderbeek's work is also crucial for understanding why the collaboration between art, industry and research labs emerged in the 1960s and why it is relevant even today. Vanderbeek on the artist's place:

> The artist must make use of the force of art, with its influence on human psychology, to communicate and to announce. He must find ways to come out of his isolation from his community. He must find ways to unite technology and the human condition (17).

Vanderbeek plays a significant linking role between the different types of "art and technology", and collaborated with many other important figures whilst still pursuing his own vision of an inherently technological artform appropriate to the age of interconnected media. Maybe it was this vision of an over-arching art that differentiated him from the EAT approach to art, which was perhaps more about engineers facilitating artists' concepts through the application of contemporary technologies. Vanderbeek was involved in the creation of partnerships, on a much more cohesive level than the Klüver top-down model, precisely because he had a broader view of technological art rather than art and technology as spectacle. He collab-

orated with Ken Knowlton at Bell Labs, and also found a particular niche at the Center for Advanced Visual Studies at MIT. Founder Gyorgy Kepes brought with him some of the European Bauhaus ethos of artistic experimentation with technology, and the structure and mission of CAVS suited Vanderbeek very well.

Here Vanderbeek was able to engage with new interface technologies that evidently appealed to him as an artist – see video – and also acted as a facilitator, bringing together previously disparate parts of the organization. This comes out very well in an article on him around 1970:

> 'One of my functions here at MIT,' said Vanderbeek 'is to bring people like [musician and mathematician Steve Smoliar and computer graphics student Mike Beeler] together into one group. We are tentatively calling it the Arts Lab. I am looking for a way to synchronize the visions and ideas of individuals with new tools we now have to improve and change our environment.'

Although Vanderbeek's perception of his role as a scientifically-engaged artist is far removed from Klüver's ideas, the last two lines chime with Klüver's vision of the artist stimulating technology with the collaborations. In this, it is fair to call him a visionary, even if he did not anticipate the problems involved in bringing artists and engineers together. Although *9 Evenings* was widely judged to be a failure, Klüver contended that it had fulfilled its experimental brief; and he perceptively identified several issues that might apply to artists who work with computers:

There are three elements fighting. The artists, the engineers and the audience. These three will have to come to some resolution (18).

End of the era in the USA

The "Art and Technology Period", if I might call it such, is usually bookended by Nine Evenings in 1966 at one end, and the Pepsi Pavilion in 1970 at the other, though more properly the exhibition "Software" at the Jewish Museum in NYC, or "Art and Technology" in Los Angeles in 1971, marks the end. The fading of Art & Tech dovetails with the Vietnam protests, the rise of the Green movement, and a shift towards a more conceptual art that preferred not to engage with cogs and wires. Burnham's piece *The Panacea That Failed* is the movement's epitaph. Anne Collins Goodyer, reviewing the failure of Maurice Tuchman's ambitious, artist-driven collaborative project "Art and Technology" at LA County Museum of Art, concluded that several factors conspired to bring such grand ambitions down:

> When 'Art and Technology' opened in May 1971 at LACMA, only 16 collaborations had come to fruition, although 76 artists were listed as 'participating'. Despite Tuchman's assertion that he was not simply interested in the creation of tangible products, the dearth of exhibitable pieces indicated a high percentage of failed collaborations. Of 76 artists, only 23 were able to secure real partnerships from industrial sponsors of the exhibition. Despite high hopes, much collaboration had dissolved due to mutual misunderstandings. John Chamberlain, for example, who undertook a residency at the RAND Corporation to create a conceptual work consisting of 'answers', encountered resistance from employees who supplied the following material: 'There is only one answer: You have a beautiful sense of color and a warped, trashy idea of what beauty and talent is'; 'The answer is to terminate Chamberlain' (19).

Certainly in America by the early 1970s, the Art and Technology movement in its original form disappeared from the limelight, and the crises that enveloped the US during the period favored the emergence of other art forms, not least video art, which although technologically-based had the huge advantage of portability and accessibility to a wider range of artists, especially through the support of TV art pioneer Howard Wise who founded the Electronic Arts Intermix in New York

In the intervening years, there have been many artists who have discovered the potentials of new technologies – the image of Andy Warhol digitally sketching Debbie Harry at the launch of the Commodore Amiga in 1986 is an striking example of this process. The integration of digital tools into artistic workflows, especially in the area of art photography, is now well-established: British radical stalwarts Gilbert and George have been using photomanipulation software to produce their famous montages for at least a decade (20).

However, the broader vision of the Moholy-Nagy and the tenacious proselytizing for art-science on a grand scale as espoused by Klüver and Rauschenberg seems to have faded into history. Clearly this is part of the post-Apollo Program, post-Dotcom Crash, recession-hit world in which we exist and one may not think that austerity is conducive to enthusiasm about art experiments. Yet times

of economic hardship are often catalysts to innovation; and similarly, new concepts can arise in the arts at such times as well. In the past decade, much has been rediscovered about the flourishing 1960s art and technology scene and I very much hope it inspires new collaborations in this area.

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Competing interests

The author declares that he has no competing interests.

Notes

i. See, Geoffrey Keynes (ed.), The Letters of William Blake, 1956.
ii. See, FT Marinetti's The Futurist Manifesto, 1909.
iii. The art-science journal *Leonardo*, founded by rocket scientist and artist Frank Malina in 1968, is still very active. See, http://www.leonardo.info/.

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