Technological Determinism in Media Art

Armin Medosch

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Abstract

Technological determinism is the belief that science and technology are autonomous and the main force for change in society. It is neither new nor particularly original but has become an immensely powerful and largely orthodox view of the nature of social change in highly industrialised societies. In this paper I analyse the presence of technological determinism in general discourses about the relationship between social change and science and technology. I show that techno-determinist assumptions underlie developments in what is called technoscience, a term describing new practices in science and technology with particular relevancy for the related fields of genetic engineering and computer science. Those areas create a specific set of narratives, images and myths, which is called the techno-imaginary. The thesis of my paper is that the discourse on media art uncritically relies on many elements of the techno-imaginary. A specific type of media art, which is identifiable with people, institutions and a period in time, is particularly engaged with the tropes of the techno-imaginary. This strand, which I call high media art, successfully engaged in institution building by using techno-determinist language. It achieved its goals but was short lived, because it was built on false theoretical premises. It made wrong predictions about the future of a 'telematic society' and a 'telematic consciousness'; and it missed the chance to build the foundations of a theory of media art because it was and is contaminated by the false assumptions behind technological determinism.

Keywords: technological determinism, media art, techno-utopianism, artificial intelligence, artificial life, cybernetics, art, progress, critical theory

Introduction

Science and technology are widely understood to be the major, if not the only forces which cause social change. This opinion is called technological determinism. According to this view science and technology are autonomous, which means that they develop according to their own internal logic only. Once new technologies have been invented and are released into the world they have an irresistible impact on the social world. This implies that history is largely a result of the impact of new technologies. By denying the importance of other social forces such as politics and the economy human agency is effectively cancelled as a factor in the shaping of history.

In the field of art a new domain has been developed which is variously called media art, digital art or just new media. This field has deeper historical roots but has gained major significance only over the past 25 years. Within this area, which is very diverse and comprises a variety of practices and approaches, a particular discourse has become dominant. I call it 'high media art'. Its ascendancy started in the 1980s and peaked by the mid 1990s. Its proponents used specific narrative strategies which were highly successful in drawing attention to the field and building institutions devoted exclusively to high media art. That discourse on high media art claimed a radical break with the past and a transgression of all other art forms. It took the material basis of its practice, the use of new media technologies and in particular the computer, as major justification for its claims. It presented itself as an avant-garde, not unlike the classical avant-garde of the 1920s, which employed high-technology to create a new aesthetics. This new aesthetics was tied into postmodern theories as well as the idea of a three-dimensional cyberspace, and it borrowed freely from the myths of computer science. Artists produced works which uncritically repeated the narrative strategies of artifical intelligence and artificial life. The techno-imaginary of the 'closed world' (Edwards 1996), developed at a time when America fought ideoligical battles with its nuclear enemy, the Soviet Union, still provides the principles of our own imaginary futures (Barbrook 2005). The media theory of McLuhan, hardened into an ideology, McLuhanism, provides the intellectual framework for high media art in the mid-1990s combined with the fashionable thesises of postmodernism about the immateriality of the world.

The discourse of high media art was successful in institution building but compromised by technological determinism. I will show that technological determinism in high media art isn't just a question of interpretation or opinion but foundational for the field, as a major influence on the creation of works and the theories which came with it. Instead of taking a critical position high media art only illustrates science and technology and glorifies the aesthetics and ideology of technoscience.

Methodology

The thesis, which I present in this paper, is based on a literature review which includes relevant theoretical areas, histories of media art, catalogues, articles, web sites and discussions on mailing lists. It is also based on my own experience of 20 years of working in the field as an artist, curator, critique and theorist. My own close involvement in the field over a long period of time is my main motivation for this work with which I hope to explore and analyse some major theoretic deficiencies. As a practitioner I have acquired knowledge of the practice, of the actual making and doing, which is rarely reflected in theoretic texts which are only based on the analysis of other texts. I hope to be able to bring the theory and the practice more closely together. Although the focus of this paper is primarily a critique my aim is to open up, through this critique, possibilities for further work.

My analysis of the field is influenced methodologically by *The Field of Cultural Production* by Pierre Bourdieu (1993). He presents his approach as an alternative to two positions which were dominant at the time of writing, structuralism and post structuralism on one hand, and Marxist inspired critical theory on the other. According to Bourdieu structuralism's and critical theory's ways of reading works mutually exclude each other (Bourdieu 1993, 177). (Post)Structuralism favours an internal reading of works, critical theory an external reading. Bourdieu describes structuralism as "more powerful" (ibid., 178), yet criticises it for stripping the reading of the work off any "references to the social or economic conditions of its production (ibid., 178)." External analysis, in contrast, "directly links these works to the social characteristics (the social origins) of their authors or of the groups for whom they were really or potentially destined and whose expectations they are intended to meet (ibid., 180)." The weakness of this approach is, according to Bourdieu, that "understanding the work means understanding the world view of the social group that is supposed to have expressed itself through the artist acting as a sort of medium." In other words, the author is seen as a ventriloquist for his own social background and supposed 'class interest'. But this approach fails to provide means of understanding the structure of the work, its subtleties and poetic motions which are, "the prerequisite for the fulfilling of its function? (ibid., 181)"

Bourdieu claims he can overcome the deficiencies of both poststructuralism and critical theory by applying the theory of the field, a "relational or structural mode of thought to the social space of the producers (ibid., 181)." Different fields are characterised by positions and position taking, by writings and writers, art works and artists who are involved in a struggle to carve out their own niche within a specific area. The field is the complete space of all possible positions that can be taken yet only certain positions will be manifest at a certain time and this will always happen in

relation to the other positions taken. Any artistic field is always the site of a struggle between the two principles of hierarchisation: the heteronomous principle, favourable to those who dominate the field economically and politically (e.g. 'bourgeois art') and the autonomous principle (e.g. 'art for art's sake') (ibid., 39).

A key concept in Bourdieu's theory is contained in the term 'symbolic capital'. Paradoxically, in avant-garde movements of literature or art, those who show the least interest in outward signs of success such as awards, titles and money, accumulate the highest amount of 'symbolic capital'. They receive strong support from a closely-knit group of followers, often other artists or professional insiders (curators, critics). This results in the 'non-economy' of autonomous art. The economic and the symbolic hierarchies cannot be directly mapped onto each other. The poorest, most obscure artists are the most famous ones. If they get successful too quickly, they run danger of loosing their reputation as being relevant, cutting-edge, fresh, and innovative. Bourdieu loosely groups artists according to this perception. There are successful artists who cater to the tastes of the dominant social group. They have money, wealth, but no symbolic capital. There is the consecrated avant-garde, an avant-garde which is already partly absorbed by the system, which has its critics, its recognised names. They are in danger of being seen as selling out. New artists will come and attack their perceived dominance. Only this latest group, by being seen as staying outside heteronomic power structures, is attributed the highest symbolic capital. It acts in a field of 'restricted' cultural production which has hardly any audience and very little quantifiably measurable impact, yet this group is seen as the true avant-garde.[1]

Bourdieu's description of the 'game' of cultural production clearly has some limitations insofar as it may perfectly describe the French literary and artistic avant-garde of the 19th and 20th century but might not be universally applicable. For instance, the notion of popular culture with its own subcultures and avant-garde is not reflected properly in Bourdieu's theory. Bourdieu's approach is useful but cannot be adopted blindly. Therefore I use other theoretical frameworks in addition to Bourdieu, in particular science studies and critical theory.

1 The term avant-garde is taken from military language, explains Ernst Gombrich, and was probably first used in art discussions by Désiré Laverdan in 1845 (cf. Gombrich 1971/1987, 96); the term has also been used in a less emphatic way by Saint Simon (cf. Gombrich 1971/1987, footnote 30).

Chapter One: Theoretical Discourse Analysis

Technological Determinism

Technological determinism is hardly ever formulated as a clearly stated theoretical position but has nevertheless become "an immensely powerful and now largely orthodox view of the nature of social change (Williams 1974, 13)." According to this opinion science and technology are autonomous, their development follows an inherent logic and is independent of influences from society. Science and technology are the main forces that shape social change, therefore history is determined by technological development. Paul N. Edwards calls it the "billiard ball theory of scientifically induced change" (Edwards 1996). According to this metaphor technology impacts on society like a billiard ball and whirls everything around. Social change is conceptualized in a very particular way, namely as a causal relationship between technology, as the origin of the force for change, and society, as its target. Society is the passive receiver of an 'impact' and has no agency in the process. The 'impact of science' is presented as something completely unavoidable, like a force of nature. In this model, science and society are completely separated. Scientists, locked away in citadels of knowledge, conduct research entirely uninfluenced by society. Scientific research is a disinterested pursuit of truth which follows its own internal dynamics only. Scientific progress is based on the strict application of the scientific method alone. New technologies are applications of scientific knowledge - applied science - put to work in the world. The effects of technology are seen as the primary mechanism that shapes history. These are the core believes behind what is called the strong version of technological determinism. It is the content of statements such as that the computer created the information society; or that the steam engine brought about industrial society. In social struggles about new technologies often the opponents also adhere to the belief of techno-determinism, when they vent their anger at a particular technology because they think it is intrinsically bad.

There are a number of weaker versions of technological determinism. In those versions, technologies are seen as symptoms of society, as effects rather than as causes. The development of technologies is still seen as largely autonomous, but the impact is less deterministic. Technologies are perceived as being 'instruments' only, they are neither intrinsically good nor bad, they are only neutral tools. Any ethical questions would arise depending on the way of use or abuse of those instruments. As we cannot know which use society will make of a particular technology, unintended consequences might occur, and we cannot predict in which way exactly technology will shape society.

Technological determinism has become a very powerful concept because it is often accepted

without further thought and it shapes the views of experts and non-experts, of scientists, engineers, politicians, business executives, advertisers and people on the streets. It is supported by the belief in the authority of science and by the joined together narratives of modernist progress and capitalist economic growth. Technological determinism is behind assumptions such as that technological progress is the key to greater prosperity, wealth and security. Technology will solve a wide range of human and social problems. For instance, government administrations believe that the implementation of CCTV surveillance systems will help to prevent crime and contribute to the upkeep of public order. In TV advertisements the ability of gadgets such as the mobile phones is praised to win new friends or find a lover. Yoghurts are advertised as containing a 'scientifically proven formula' to make you slimmer, healthier and more attractive. This emphasis on technology as the harbinger of hope to solve all kinds of social problems is reflected in the way governments have created technology impact assessment centres since the 1970s. The direction of this type of research ignores the possibility that the assumptions behind the basic formula, technology as cause and effect, might be wrong. The real nature of the relationship between technology and society poses some of the most difficult and most unresolved historical and philosophical questions (Williams 1974, 9-14).

Scientific Determinism

The concept of determinism in science has different meanings. It does not relate to the question if science determines society but to another complex of questions. Is matter organised in such a way that deterministic processes can be observed? And can science formulate descriptions or models of those processes which form objective laws of nature? In this sense, science must believe in determinism to a degree, otherwise it could not conduct its activity. "Determinism came down from the skies to earth", wrote Gaston Bachelard (Bachelard 1934/1988, 101). As a psychologist, he reflected on how the scientific spirit formed, and came to the conclusion that the observation of planets and stars was essential in the historic shaping of a scientific mindset. Whereas life on earth is messy and unpredictable, the observation of regular bodies moving in predictable ways enables to shape the expectation that objective laws of nature exist which can be understood and formulated with the help of mathematics and geometry (Bachelard 1934/1988). In the long run, this enabled the development of an exact science by Descartes and Newton. Until recently histories of science presented the development of modern science from there on as an unbroken continuity to more clarity, preciseness and abstraction. But it can also be argued that regarding the being or ontology of the world and the epistemology, the theory of knowledge that we have about it, at the beginning of the scientific project some crucial design decisions have been made. The gap between subject and object, which the ancient Greeks had already thought about, started to be conceptualized in a much more polarized way than ever before. Descartes distinguished between res extensa and res cogitans. The subject has no direct access to the things that exist. Access exists only through the

faculty of reasoning. Philosophical interest turns to the subject, to consciousness, to the possibility of cognition and human rationality (Weber 2003, 27). Nature is turned into an object of cognition, in other words, science 'invents' nature as its object. It is incredibly successful in doing so and science gains ever more knowledge about it. But at the same time the divide between human cognition and the world gets bigger. The more we know about it, nature gets ever stranger to us. Nature is the non-self, the outside, the 'other'. Nature becomes conceptualized as lifeless, dead and abstract matter (ibid., 31). As science uses ever more abstract tools and methods it becomes 'constructivist'. This particular way of conceptualizing nature in science which arguably started with Renaissance opened the door to all kinds of ways of intrumentalising and operationalising it. In a movement which should become more fully understood only recently, science emancipates itself from nature and starts inventing or constructing it. But this process of the emancipation of science is slow and takes hundreds of years. The philosophical debates surrounding this process culminate in logical positivism. In the 1920s and 1930s members of the Vienna Circle tried to achieve two main things. They wanted to purge theories of knowledge from meta-physics and make philosophy a scientific way of speaking about the world. This in turn should help to guide science to become more rigidly defined and therefore more objective. Those theoretical goals led to an increased focus on formalized theories of language, logic and mathematic. Philosophical questioning of logical operators should help to find the universal logic of the world. Logical positivism had many important results and is a complex philosophical school but appearantly makes one major false inference. The logic of the operation of the human mind is projected on nature (Bachelard 1934/1988, Weber 2003). This false inference, also called the 'cultural fallacy', continues as mainstream model of understanding to-day and is where the scientific meaning and the social meaning of determinism meet.

By saying that science is the only source of objective knowledge it becomes transcendent to society. This is not religious transcendentalism but means that scientific forms of knowledge transcend the *historicity* of creating knowledge and theories about knowledge. What is once objectively true must always - and everywhere - remain so. There is a philosophical tension between the objectivity of scientific discovery and personal and political freedom within human societies. Early 'natural philosophy', as science was called in Renaissance, freed humans from the dogmatic truth of the church. But this freedom would hundreds of years later found to be threatened by science becoming a dogma itself, a repressive ideology. According to critical theory and science studies the invention of a new concept of nature by science opens the door for its instrumentalisation. The scientific project of gaining knowledge about the 'laws of nature' means to put nature at our disposal, to operationalize and functionalize it. And rational mastery of the forces of nature implies social mastery, the dominance of one social group over another one (Marcuse 1964/1994). The absolute character of scientific knowledge weighs down from sky on the life of people on earth.

Logical positivism gained a defining influence on the philosophy of science in Britain and the USA after WWII. Moreover, the positivists deep engagement with logic and formal thinking contributed to the newly emerging disciplines of computer science and cybernetics. At the same time science had to open up to the possibility of increased indeterminacy, after Heisenberg's discovery of an objective indeterminacy on the level of matter. Ideas of a mechanistic universe have been put aside with quantum theory. Since then, the main questions in the epistemology of science concern relationships between determinacy and indeterminacy (Bachelard 1934/1988).

The Critique of Technological and Scientific Determinism

Critical Theory

Critical Theory is inspired by the analytical method which Karl Marx developed when writing Das Kapital, but went further than Marx and could even turn against him (cf. Cox et all 2004, 8). Marx has shown that technologies are embodiments of social relationships (Marx 1957). In capitalist societies technologies, far from being neutral, are developed with specific social relationships in mind. Critical theory, inspired by Marx, sees the technology that we have as a specific type of technology developed under a capitalist economy (Marcuse 1964/1994). According to Herbert Marcuse an ideology of dominance was intrinsic to the development of the scientific worldview from the beginning. Each techno-social system introduced over the last 150 years, the railway, electricity, cars and highways, created "ideology embodied in the production process (Marcuse 1964/1994, 114)." It reorganised the strata of society according to the original vision contained in the design. Marcuse believed that political represssion is not so much a function of ideology but a function of an apparatus which uses people without them being able to see behind the machinery and overcome its heteronomic tendency. Heteronomy, as opposed to autonomy, means that people's lives are determined by outside factors beyond their control.

In capitalism, technological progress is specifically set against the negotiating powers of workers. New inventions are designed to rationalize production and to increase worker's productivity in order to maximize profit. By investing into better machines, workers are submitted to a dialectical process of deskilling and reskilling. Marx analysed this tendency correctly even though he observed industrial capitalism in its very early phase. Since the days of Marx, the rationalization of labour continued, culminating in the Fordist factory, and ultimately in fully automated factories. Rationalization is not only carried out by investment into better machines but also by scientific management, also known as Taylorism. In the late 20th century with the help of the computer also other areas of human labour, not just physical work, can be replaced by machines. Ever more sophisticated forms of technological and organisational dominance are developed. The computerized workplace of today's white collar workers is an individualized electronic version of

Benham's prison, with cameras, key-stroke measurement and computerized clocks which submit each worker to a complete system of surveillance and efficiency controls.

A second insight by Marx, which was also made productive by critical theory, concerns the fetishisation of commodities. By basing the exchange value solely on money the human labour that goes into the production of goods is hidden. The labour, equals human life-times, is not visible in the product anymore. Hiding the origins of commodities enables them being fetishized. The world appears as a world of shiny things, of decontextualized consumer products which nowadays appear all dancing and singing in TV adverts. Marx's insights about commodity fetishism and technologies as embodiments of social relationships has been of defining influence on both critical theory and a branch of science studies called the social shaping of technologies (SST).[2]

The social shaping of technology is a line of inquiry that asks why and how nature is made operational in specific ways serving particular interests. SST forces us to rethink what we mean when we speak about technology. Technology is never just technical but combines what is possible in terms of the engineering techniques of a time and what is desireable in a certain socio-historic context. Technologies do not just exist as technical artefacts but imply certain forms of social organisation which they help to create and maintain and on which they also depend. Therefore we should better think of technologies as techno-social artefacts. Those artefacts are not merely things - dead objects - but results of and constituitive for social relationships.
The development of technology and capitalism in a mutually dependend interplay has gone on over a considerably long period of time. Techno-social artefacts have been created layer upon layer. Because we have become accustomed to live with and inside techno-social systems created by capitalism, we tend to forget that they are man-made and contingent.[3] Because they have shaped our habitat for such a long time, we see them as a sort of second nature; it is SST's task to unentangle the social content of technologies (MacKenzkie and Wajcman 1985).

Because in capitalism the work of people is hidden behind fetishised commodities this task has become so hard. The ideology of technological determinism masks the social content of technology and naturalises both technological progress and the capitalist economy. Therefore, as Edward Yoxen wrote, it needs acts of "ideological excavation" to unmask the content of fetishised

2 The phrase 'social shaping' should not mislead to think that technology is entirely socially determined - in a kind of reversal of technological determinism. There are aspects of technology which are based on properties of matter which cannot be interpreted away by sociological interpretation.
3 Contingent means that specific decisions have been taken by people in specific circumstances and that everything could have unfolded also in a different way. In SST publications it has been shown that the invention of the light bulb per se would not have made the world a brighter place. It was Edison's ambition to electrify the USA and create a business empire, helped by powerful friends from the financial elites. Electrification itself was the project that they pursued, which involved damns, power stations, generators, and high-voltage power lines, a whole system which had to be newly built and which promised enormous financial gains (MacKenzie and Wajcman 1985).

technologies (Yoxen 1986). The ideologisation of the technologisation of society might already have lead to a dependency on those technocratically controlled systems. We are not 'ruled' by technology, but it can easily appear as if nobody is in control of the system any more. This is another understanding of the 'autonomisation of science' (Castoriadis 1978/1983). Science is not by definition autonomous, because it was somehow magically separated from society, but because we have it let become so. This suits the interests of dominant social groups. If history is guided by the powerful structural dynamics of technology, no one in particular can be blamed. Faceless and nameless buerocrats and technocrats who can easily be replaced organise technoscientific progress. The result for the majority of the people on the world is that we live under heteronomic conditions. We are not autonomous, capable of making meaningful decisions which will decide our fate, but exposed to the self-propelled progress of technoscience. The real driving motive behind the expansion of technoscience is "the unlimited expansion of rational mastery" (Castoriadis 1997, 236). This means that everything that can be produced will be produced (Yoxen 1986, 106). At the heart of our fascination with the products of technoscience lies commodity fetishism and economic growth.[4]

Science Studies

Critical theory has shown that science and technology progress in a particular way because they did not develop in an empty social space but specifically as capitalist science and technology. Science studies, coming originally from a different angle, arrives at a similar result.

Science as the source of objective knowledge and the scientific method as guarantor of the validity of scientific findings were deconstructed after WWII by philosophers and historians of science. Thomas Kuhn (1962/1996) ignored text book claims about what science was doing in theory and looked instead at the actual practice. He showed that science did not just accumulate knowledge in a steady or incremental process but that new scientific theories were 'revolutionary'. In the process of paradigm change from an older scientific paradigm to a new one, old theories had to be abandoned and 'facts' had to be placed within a new theoretic framework. This process was social insofar as it needed persuasion to establish a new paradigm and not just pure 'facts'. Kuhn also showed that scientific facts are actually not separable from theories. A single fact does not make sense at all without being placed in context by a theory. Sometimes facts are simply ignored if they don't fit the dominant theory of a time (Kuhn 1962/1996). Paul Feyerabend (1975/1993) took this further by showing that there was no scientific method common to all sciences. According to him, in science 'anything goes'. Scientists are not always following a rational method but are tinkering and using trial and error. Because there was no such thing as a universal scientific method which

4 Behind the dream of AI lingers a fantasy of obedient machinic slaves; nanotechnology imagines armies of molecular sized robots which make capitalism's dirty work. The unlimited expansion of rational mastery employs nature as an always willing maid which cleans up the mess left behind by us (cf. Weber 2003).

guaranteed the objectivity of scientific findings it was wrong to give the natural sciences such a priviliged role in society. The western concepts of reason and rationality served to suppress other forms of knowledge and were used in a hegemonic discourse about the superiority of western science and the social system that supported it (Feyerabend 1987, 185).

Kuhn and Feyerabend are intellectual predecessors of a relatively young discipline in the social sciences, science studies. Scientists and their practice became object of study for anthropologists, psychologists, sociologists and historians. Science studies at worst explain scientific enterprises in sociological terms, in a sort of reversal of technological into sociological determinism. At best, science studies reveal new insights about the constructedness of knowledge and the social shaping of technologies. In the work of Haraway (1985, 1997), and Latour (1999), science becomes recognised as a historical activity by certain actors, including humans and non-humans who are engaged in a network of relationships.

Critical theory and science studies have shown the basic assumptions behind technological determinism to be wrong. The relationship between technology and society is not a one way street. New technologies do not fall from sky like meteorites. The society and the technology are not categorically separated but connected by multiple ties and knots (Latour 1999). Therefore the assumption is also wrong that history is merely the result of an impact of technology on society. Humans do have an agency in the making of their own history. Although this seems to be theoretically clear for everyone taking a closer look at the subject, the situation appears to be nevertheless confused. Whenever we turn on television or read a newspaper, we will hear and read things such as that the internet is bringing about a new society or that this or that technology has this or that effect. Despite the theoretical findings of critical theory and science studies techno-deterministic interpretations of science and technology are stronger than ever in society.

McLuhan and McLuhanism

This might be due to the influence of Marshal McLuhan who is generally credited as being one of the most, if not the most influential thinker on the influence of (new) media on society in the 20th century. The theory about media and social change which he developed, influenced by Harold Innis, is epitomised by the slogan "the medium is the message". According to McLuhan the way we think is determined by the proportionate relationship of the senses - the sense ratio. He believed that all technologies were extensions of us. As tools such as the knife or the axe were extensions of our body and limbs, media technologies were extensions of our senses and central nervous system.[5]

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5 The 'prosthesis theory' is not unique to McLuhan. According to Ernst Mach, we should look at Kapp, E., Grundlinien einer Philosophie der Technik. Braunschweig 1877 (cf. Mach 1926/2002, 146).

The introduction of a new medium which favours a particular sense was of profound influence on the patterns of perception and the way we thought. Each new medium signifies a break boundary in human history and history can be presented as a sequence of a few large chapters - from oral culture to script, to print, to electronic culture. When we moved from an oral culture to a culture based on script we exchanged an 'ear for an eye'. With writing we left behind magic and the tribal world. But only with the printing press literacy could fully develop. Modern western society is a direct result of the influence of the printing press which favours the visual sense: "Civilisation is based on literacy because literacy is a uniform processing of a culture by a visual sense extended in space and time by the alphabet (McLuhan 1964/1965, 86)." Literacy is made responsible for the homogenisation of western societies; it created the preconditions for getting people used to the clock; and it *automatically* led to the violent birth of nation states competing for military and industrial hegemony. From the printing press it was a logical step (a logic inherent to the technology itself) to the Fordist factory, the defining technology of modern society.

But then in McLuhan's history of civilisation, at first unnoticed, with the advent of the telegraph and electric light, then more visibly with the invention of wireless telegraphy, radio and television, the 'electric age' began. The sense ratio once more changed. We exchanged an 'eye for an ear' because electronic media foster an oral culture, and accordingly we moved forward into the past of a tribal society living in a global village.

> The implosive (compressional) character of the electric technology plays the disk or film of Western man backward, into the heart of tribal darkness, or into what Joseph Conrad called "the Africa within". The instant character of electric information movement does not enlarge, but involves, the family of man in the cohesive state of village living. (McLuhan 1964/1965, 111)

Because the sounds and images of radio and television are directly played over extensions of our central nervous system, McLuhan claims that in the electric age we cannot keep the distanced attitude of the literary man.

> When information moves at the speed of signals in the central nervous system, man is confronted with the obsolescence of all earlier forms of acceleration, such as road and rail. What emerges is a total field of inclusive awareness. The old patterns of psychic and social adjustment become irrelevant. (McLuhan 1964/1965, 104)

This 'total field of inclusive awareness' forces us to be compassionate about things that happen to people in faraway countries. The world shrinks into a global village where everybody cares for each other. McLuhan was understood to say[6] that with electronic media the world would automatically become a better place.

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[6] McLuhan wasn't all positive about the influence of new media. The 'electric age' might be one of shrunk distances and a direct interdependence of every one and everything, but he believed that the transition would also cause havoc and mayhem because the nature of change was not understood by societies. And in private McLuhan was even less enthusiastic. "As a devout catholic he believed that there were no technological fixes for the problems of the world (Barbrook 2005, Chapter 2, 8)." "In a letter to a priest friend he even suggests the new media might be the work of the devil (ibid., Footnote 42)."

> Our speed-up today is not a slow explosion outward from centre to margins but an instant implosion and an interfusion of space and functions. Our specialist and fragmented civilization of center-margin structure is suddenly experiencing an instantaneous reassembling of all its mechanized bits into an organic whole. This is the new world of the global village. (McLuhan 1964/1965, 93)

In McLuhan's theory, the influence of (new) media is total, immediate, all-encompassing and irreversible. This meant that humans were absolved from responsibility for their actions. They were not actors in a historic process which involves decisions of free will, but they were allegedly merely subject to the technological force for change. The impact of new media is also independent of the content played over those media. Because new media change the sense ratio automatically our way of thinking changes.
Raymond Williams (1974) describes McLuhan's theories as so "ludicrous as to raise a further question" (Williams 1974, 128).

> The physical fact of instant transmission, as a technical possibility, has been uncritically raised to a social fact, without any pause to notice that virtually all such transmission is at once selected and controlled by existing social authorities. (Williams 1974, 128)

Williams criticises that in McLuhan’s theory "all media operations are in effect de-socialised; they are simply physical events in an abstract sensorium (ibid., 127)." The apparent sophistication in McLuhan's approach is that he pays tribute to the specificity of media and their characteristics. But he does so on the basis of excluding all other factors such as social, cultural, political or ethical decisions made by people who by their very nature would be open to scrutiny and questioning. Whereas the initial formulation that the medium is the message is a simple formalism "the subsequent formulation - 'the medium is the massage' - is a direct and functioning ideology (Williams 1974, 127)."

Williams, in 1974, said that McLuhan's particular rhetoric was unlikely to last long. But because this particular ideological representation of technology was coming from the most powerful nation state of the world, it would have its successors (ibid. 128). Richard Barbrook (2005) set out to explore that path. In *Imaginary Futures* (2005) he shows how McLuhan inspired a discourse which has still a lasting influence. According to Barbrook, in 1964 the 'Commission on the year 2000', also known as Bell commission, tried to formulate a plausible alternative to 'cybernetic communism'. America was still reeling from the Sputnik shock, when the Soviet Union was first capable of sending a communication satellite into orbit. As the Cold War logic locked the nuclear enemies into an arms race, any hot war was not winnable. Therefore the only way of winning the war was by showing that America had the better ideology, that it 'owned' the future. The Bell commission took McLuhan's ideas and re-rendered them in a more rationally sounding way. It created an ideology of McLuhanism which was purged from the more eccentric aspects of its originator. McLuhanism is McLuhan without the caveats, hardened into an ideology which makes

media technologies the ultimately determinant factor in history. As America presents itself as the hotspot of technological creativity it makes a firm claim on ownership of the future (Barbrook 2005).

At the time when the Bell Commission formulated its thesis, The US military was pouring huge resources into artificial intelligence (AI) research. J.C.R Licklider initiated a concerted effort of academic research into computer science funded, largely, by the military. One of the many research programmes funded by Licklider led to the invention of the internet. Other research areas included interaction with a computer via a graphical user interface using first a light-pen, then a mouse, video conferencing and early forms of virtual reality. As Barbrook argues, the military origins of the net and many advancements in computer science are well known, but usually brushed aside as insignificant, thereby obscuring the fact that the imaginary future of the 1960s was still the imaginary future of today. McLuhanism, a theory which was fetishised because it had de-linked itself from its origins, promised the glorious future of a post-industrial information society (Barbrook 2005).

The seed was picked up by various successful books, starting a frenzy of futuristic writing. Because the theory was fetishised, it could be adapted to the goals of other factions such as the neoliberal right and the left. Remixed versions of McLuhanism appeared in the 1990s to explain why, a) in the neoliberal version the net would automatically create a future with less government and more wealth for all, b) in the leftist version the net would automatically bring a more democratic and egalitarian future. Neither of the fractions doubted the principle thesis which said that the future was determined by technoscientific progress. Cold War thinking, updated and remixed, still dominates the thinking about the future in 2005 (Barbrook 2005).

Technoscience

Technoscience starts when towards the last third of the 19th century a more systematic production of knowledge begins. The state and large industries start to conduct research shaped by their own objectives. This means that the conduct of science gets increasingly influenced by the state and by industry, but also that the latter two become increasingly dependent on science. Technocapitalism is the social form of technoscience. This is of profound influence on the methods, content, research areas as well as the institutionalisation and the management of technosciences themselves (Weber 2003, 124). The most prominent example is the influence which the military won over technoscientific progress, especially during and after WW2. Weber assumes that "the new form of production of knowledge within the (military-) industrial practices of technoscience has defined the image of post-industrial society in an irreversible way and continues to do so [trans.A.M.]" (Weber 2003, 130). Central for the understanding of technoscience is the fusion of technology and science

as well as the development of Big Science. Large projects such as the splitting of the atom or the identification of the 'genetic code' make the patronage of the state and large corporations indispensable, as well as the collaboration of many scientists from different disciplines and across the borders of nation states.

Contemporary technosciences have abandoned the 'correspondence theory' of science which demands a truthful representation of nature. Technoscienes instead construct their objects of study, they produce artefacts and hybrids in the laboratory (or on the computer) and then examine them. This method of constructivism is constituitive for the methodology of technoscience as well as for its understanding of nature (Weber 2003, 132). Over the course of the 20th century technoscience develops a radically new understanding of nature, of mind and of what is life. Natural systems of order and architectures which had been seen as unchangeable become historicised and open for modification. The dynamisation and historisation of the concept of nature implies that nature is becoming dynamic and self-organising. As cognition is increasingly recognized as being constructed, nature itself is also understood as an organising and constructing entity (Weber 2003).

This shift is not marked by a break with the modernistic past, but by a radicalisation of some of its tendencies (Weber 2003, 136). It keeps some of modernism's epistemological foundations, which were used by science but not made explicit (tinkering, purposeful manipulation), but it takes them to the extreme and makes them more visible. Technoscience continues the logic of modern science by keeping a distanced relationship to nature, which is founded on a deep distrust of the possibility of gaining direct knowledge of nature and world. As Jutta Weber (2003) puts it, science can only explain how things work, not why and what for. Science does not answer ontological questions, because it is based on a deep ontological split in its very foundation (the cognitive subject vs. lifeless matter). This would not be a problem if the experimental and constructivist character of science was generally acknowledged, as an activity of humans under given socio-historic circumstances. Under such premises science cannot be expected to give answers which are eternally and universally true. This should be seen as a liberation of science from political demands, not as a weakening of its epistemological foundations (Latour 1999). But unfortunately science carries the historic baggage of objectivity and therefore technoscience turns into a battle ground over social power.

There is a strong tension between the changed ontological foundation of technoscience and its continued naturalising rhetoric about nature. According to the representational strategy of technoscience nature has become a generalised formal system for processing algorithms and information. Nature has turned into a giant universal computer which transforms information, which is immaterial and free of context (Weber 2003, 220). Nature is also a genetic engineer who is so friendly to self-organise and deliver new methods, metaphors and possibilities (Weber 2003,

150). Instead of making it clear that this marks a fundamental ontological shift, technoscience sticks to naive concepts of realism and hides behind veils of mystification. Even though nature is no longer its object, strictly speaking, just its material, it nevertheless still uses nature as important legitimising and ideological entity. To the outside world technoscience presents itself as the science of old, involved in a disinterested pursuit of truth. Technoscience does only what nature always has done, the apologists of technoscience say. Technoscience, by creating new disciplines such as artificial intelligence (AI) and artificial life (AL) does nothing else but applying the 'principles of life' in artefacts. This is possible because 'in principle' organisms function like that flexible chameleon computer. The organising, saving, modifying and re-disseminating of information are being declared to be life's indispensable characteristics, characteristics which are fortunately shared by computers. In a tricky mimetic movement the specific qualities of the universal calculating machine and its software applications become essential characteristics of life (Weber 2003, 176).

So, a reversal of principles happens, nature gets naturalised, reified, nailed down by technoscience. Value free and objectively science has to say what is the nature of nature, the nature of man, the nature of woman, and by doing so, our place in the world gets objectively determined. The narrative strategies of naturalism, biologism and positivism can be seen as 'manuals' how to declare nature to become the only foundation for norms and values (Weber 2003, p.40) - but of course this is nature as analysed, segmented, augmented, sliced and stitched together by reductionist and male dominated science. As many feminist studies of science have shown, biologism has served to legitimise the hierarchical structuring of gender relations (cf. Haraway 1985, 1996, Weber 2003). Naturalising strategies turn social relationships into matters of objective truth.

The Paradigm of Information Theory and Cybernetics

The re-interpretation of the concepts of nature, mind and life was made possible by the development and convergence of the paradigms of cybernetics, information theory and computer science. Alan Turing formulated the theory of the universal symbolic processing machine - the theoretic principles behind the computer. Of special significance is the separation of hardware and software. One and the same apparatus (mechanical and electronical) can be used to process any kind of algorithm. This introduces the new category of trans-classic machines. Earlier, machines could essentially only perform tasks they were specifically made for. The trans-classic machine can perform any operation that can be formulated as an algorithm. Claude Shannon, aided by Warren Weaver, formulated a mathematical theory of information which separated the content of communication from its carrier medium. Shannon was explicitely only concerned with the optimisation of the transmission of data via electronic networks, independently of the content of the data. Nevertheless Shannon's model was extended into a general model of communication.

Shannon's model contained an element of feedback which allowed for error correction. Aspects of two-way communication involving feedback mechanisms within machines, animals and humans also were of central concern to Norbert Wiener's cybernetic theory. At around the same time biology turned its focus to the molecule, following the reductionist strategy of science, yet also recognising properties of living things as *systems* understood according to the cybernetic paradigm (Weber 2003).

The cross-fertilisation of those theories led to a new understanding of life as patterns of information (code) independent of the carrier medium (matter, hardware, the body). Life was no longer thought to be a property of matter but one of structure, a pattern of information, represented in the genetic code. During the second half of the 20th century technoscience rewrote body as text, used the metaphor of the immune-*system* and re-invented the self as (genetic) code (Weber 2003, 196-202). A key concept in the construction of this new paradigm are 'cellular automata', an idea of John von Neumann, inspired by an earlier text by Turing. Those are 'finite state machines' based on an on-off logic. Von Neumann took also inspiration from work by Warren McCulloch and Walter Pitts (Weber 2003, 160-196). They tried to develop a mathematical model for nerve functions and interpreted neurons in the brain according to an on-off logic. In the 1940s von Neumann tried to develop a computer model (on paper) which could simulate a biological neural network. Decades later, with progess in computing power and new programming techniques his concept could finally be realized. In the 1980s von Neumann's cellular automata, advances in neuroscience and computing (parallel processing) inspired 'connectionism' - a brain-computer analogy based on an assumed analogy between the network of neurons in the brain and the interaction of cellular automata in parallel processing computers - so called neural networks (Turkle 1995).[7]

Artificial Intelligence

Another key development was the attempt to create a computer based artificial intelligence (AI). Since the late 1950s AI tried to construct machines which were intelligent, whereby a limited notion of intelligence was applied which prioritized symbolic operations and logical thought (Edwards 1996). Major funding for this project came from the US military. Following a 'closed worlds' logic of containment during the climactic years of the Cold War, the military tried to eliminate the slow and error prone human factor from decision making in fully automated and closely corresponding weapon systems involving early detection radar systems (SAGE) and nuclear retaliation capabilities by intercontinental ballistic missiles (Edwards 1996). The project of AI had the not so insignificant side effect of channeling massive financial resources into nascent computer sciences and build ever faster supercomputers (ibid.).

The project of AI was of significant influence on areas it came in touch with. Psychology, which until the 1950s had been dominated by behaviourism, now dared to turn its attention to internal states of mind. A new type of psychology was invented, which described inner states in terms of rules and logic - cognitive science. According to Sherry Turkle computer science was its 'sustaining myth' (Turkle 1996, 128). A sustaining myth is not an explicit part of a theory but an unacknowledged assumption which is called upon in representative strategies. To serve the specific needs of AI, the discipline of linguistics was reshaped as computer linguistics (Edwards 1996). As the objectives of scientific disciplines were redefined and new sciences were created the understanding of the human mind was fundamentally reshaped. Thinking became an act of information processing. The act of creating an 'intelligent' computer implied that intelligence was a function of computation. Joseph Weizenbaum, a professor in the Department of Engineering and Computer Science at the MIT, became the first prominent critic of the mechanistic approach to concepts such as mind, intelligence and consciousness. As a rather lone voice in the 1960s within the computer science community his criticism of the trivialisation of life was of no big effect.

Artificial Life (AL) and emergent AI

AL and the closely related field of emergent artificial intelligence (AI) were developed in the 1980s through combined theoretical and practical efforts in computer science, cybernetics and biology rebranded as life science. The cybernetic paradigm had made possible the parallelisation of non-organic and organic systems as open and changeable systems. Both, organic and non-organic systems can be conceptualized as consisting of variable components whose properties can be formulated according to communication- and information-theoretical models. "This makes not only possible the technologisation of the living but also the making seem alife of technology [trans.A.M.] (Weber 2003, 139)." When life basically can be described as a pattern of information - the genetic 'code' -, then information can also be seen as alife (Yoxen 1986, Weber 2003).

Under this basic premise the new disciplines of emergent AI and artificial life (AL) were developed. Using new programming techniques such as genetic algorithms,[8] life-like phenomena were simulated inside computers. Some scientists such as Richard A Langton and Tom Ray stand for a 'strong' approach in AL (Turkle 1995, Reichle 2005). They do not interprete replicating pieces of code as reasonable simulations of life but as living beings in the literal sense. A similar trend is observable in so called bottom-up robotics (Steels 1999, Brooks 2002) whereby robots are

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7 Some scientists took von Neumann's concept further and saw cellular automata as the foundational structure from which everything in the universe is built up (cf. Hayles 1999).

[8] Genetic algorithms are computer programs which replicate and who develop in a digital environment which submits them to a Darwinian 'fitness' test. Mutations of code are self-selected according to their adequacy to a given task.

programmed to develop forms of *emergent* behaviour. Emergence is a key concept in AL and the related area of emergent AI. It means that systems are capable of arriving at a higher level of organisation spontaneously. That qualitative leap can not be programmed into systems from the top-down but can only *emerge* from the interaction of individual pieces of code known as 'agents' in a bottom-up way. Those software agents - strings of code that represent relatively simple actions and behaviours - are called autonomous agents. They have been designed by a programmer initually but equipped with ways of 'learning' their future interactions are not predictable. Emergent behaviour can be simulated in digital systems and also in robot systems conceptualized as embodied AL (Turkle 1995, Steels 1999, Brooks 2002, Weber 2003).

The paradigm of emergent AI projected an image of computer science which was capable of simulating human creativity and spontaneity (Turkle 1996, 132). This concept of programs capable of learning was of a defining influence on cognitive sciences, neurobiology and connectionism. Within a few years it grew from an obscure cult into becoming the mainstream (ibid., 133). "AI borrowed freely from the languages of biology and parenting. [...] it presented programs as though they were white mice that might or might not learn to run their mace" (ibid., 133). As Turkle sums it up, "there had been a passage through the looking glass". (ibid., 133) Old-style AI had tried to teach the computer how to think. The organisation of the human mind, as the scientists understood it, had been the model they tried to implement in algorithm. The new paradigm of emergent AI, connectionism and AL understood the brain already as a computational activity, albeit with the added complexity of emergent behaviour and the capability of self-organisation. Now the terrain was open for applying the new model to organic life. By combining parts of DNA from different species scientists are creating new life-forms in the laboratory. Because life is reduced to a 'genetic code', this code is by definition variable, it can be 're-written'.

The Techno-Imaginary

Technoscience is more than the activity of researchers doing their work. It is also projecting an image of itself to key audiences and the public at large. This discourse, inspired by science, but going beyond it, uses narrative strategies aimed at persuading the world that its actions are not only justified but necessary. It uses scientific findings, popular science, visual means (computer graphics, animations) and sensational announcements to shape the image of technoscience. All elements of this discourse together, and the sort of images and intellectual representations it creates, are referred to as the techno-imaginary.

According to the feminist and leftist critique of technoscience (Haraway 1996, Weber 2003) apocalypse and salvation are the two stabilizing opposite poles in the representational politics of technoscience. The techno-imaginary relies for its propagation on threats and promises, reminiscent

of the old story of unfortunate Dr.Frankenstein (Shelley 1818/1992). The techno-imaginary routinely breaks through the boundaries between reality and (science) fiction. By doing so it creates and upholds the aura of uncanny nature. But because of the omnipotent power of technoscience and the unpredictability of socio-technical processes society has become uncanny too (Weber 2003, 146). We are not only all cyborgs now (Haraway 1985), it becomes increasingly a survival technique to be able to determine who is a 100% percent android and who is not (Bladerunner 1982, quoted by Turkle 1995).

Technoscience claims to be doing nothing but its job, but is actually massively involved in representational politics, not only with its practices and interventions but also its promises. According to Haraway, the promises of technoscience make its main social importance. "It does not matter if they ever get realized, what matters is that those ideas always remain alive in the timezone of unbelievable promises (Weber 2003, 144)." Actually, it is better if those promises never get realized, so that the expectation can be kept alive. The prophecies of technoscience about the future already shape the present. And, as Richard Barbrook points out, current activies in technoscience and related discourses in academic writing and the press are shaped by the techno-imaginary of the past (Barbrook 2005).

Some of the more extreme threats and promises of technoscience's need to be seen in the light of this strategy of the unfulfilled prophecy. The techno-imaginary projects futures in a grey zone between science and science fiction. Biologists in search of the 'secret of life' promise to slow down the ageing process so that the life-span could extend to hundreds of years and potentially, immortality. The robotics scientist Hans Moravec has predicted that robot intelligence would soon overtake human intelligence and render human life meaningless unless we decide to become robots, or cyborgs, too (Moravec 1998). The same author also wishes to upload himself to a main frame computer and continue a life freed from the fetters of bodily existence, not unsimilar to his collegue Marvin Minsky, who, like other cyber-Platonists, suggests that the body is only a burdon without which we would do better. Tom Ray's Tierra project was already mentioned. Here, small bits of code forming an 'information ecology' competing for resources inside a computer's RAM (rapid access memory), are considered to be new forms of life. Those proposals are easily dismissible as fantasmagories, yet they serve an important function within the discourse of the techno-imaginary by diverting the attention from the mainstream discourse of technoscience, which, on closer looks, tries to appear more rational yet is based on similar fundamental shifts in the understanding of the being of nature and humans.

Chapter Two: What is Media Art?

When I reviewed the literature on media art, it became apparent that there is a problem with finding systems of classification, of categorisation and even a clear definition of the art form. Despite a 25 year history of media art, and some would say it's much longer, this work is only just beginning.[9] "The terminology for technological art forms has always been extremely fluid" says Christiane Paul (2003). According to her, 'digital art' has first been called computer art, then multimedia art and is now subsumed under the umbrella term 'new media art' (Paul 2003, 7). Other words which have been used to refer to the field as a whole or to sub-genres of it are: electronic art, art & technology, video art, software art, net art, generative art, information art, virtual reality art, game art, tele/robotics art, hypermedia, hypertext, interactive installation. Potentially this list could be much longer. The choice of different terms for more or less the same thing often betrays a preference for a certain flavour: someone is speaking historically situated and from a specific theoretic or artistic perspective - Bourdieu's position taking. For instance, while some artists are happy being labelled as net artists, others prefer to talk about telematic art, whereby the latter appears to give the field more gravity.[10]

Most classification schemes are based on the technology used - e.g. video art, or net art -, and few attempts have been made to categorise media art forms according to motives, topoi or other aesthetic categories and principles. Stephen Wilson favours an encyclopaedic approach in *Information Arts* (Wilson 2002), the most comprehensive book about media art to this date. Lamenting the "deficiency of categorisation" he claims the impossibility of doing the complexity of multi-layered media art works any justice by any system of categories as the reason why he categorised works according to the technologies which they make use of. In doing so, he arrives at no less than 81 different technologies which structure his 8 chapters over slightly more than 900 pages. What is the trouble with classification? Is it that the field is still so new that any classification would run danger of "setting up predefined limits for approaching and understanding an art form" (Paul, 2003, 8)? Or is it because technology is constantly under development with an "unprecedented speed" (ibid., 7)? As difficult as classification is the task of providing a definition.

> One of the basic but crucial distinctions made here is that between art that uses digital technologies as a *tool* for the creation of traditional art objects - such as photograph, print, sculpture, or music -

9 Classification systems have been addressed on the mailing list CRUMB (2005). The ZKM in collaboration with other institution has launched media art net, a sprawling attempt of identifying histories, terms and definitions (Media Art Net 2005).

10 Telematic combines the Greek telos with automatic - tele-matic.

> and art that employs these technologies as its very own *medium*, being produced, stored, and presented exclusively in the digital format and making use of its interactive and participatory features. (Paul 2003, 8)

I would tentatively add to Christiane Paul's definition that many works of media art contain an element of self-referentiality; that they are not just 'using' a medium but also questioning and challenging its boundaries; that they try to make implicit or explicit statements about properties of media technologies and thereby raise questions about the intersections of science, technology and culture. Such a definition points to a qualitative difference in the understanding of media art. The medium in this definition of media art is not just a carrier of content but formative for the creation of meaning. Technology and culture are not seen as categorically separated but understood to be intricately linked. However, such a definition of media art can not be assumed to be universally shared. In this paper I will use the term media art not in a prescriptive way but as an umbrella term, as a widely used convention, by and large synonymous with other terms such as digital art.

In *The Language of New Media* (2001) Lev Manovich analysis "the language of new media by putting it within the history of modern visual and media cultures"(ibid. 8). Manovich's methodology, which he calls a 'materialistic' approach, deserves our attention. It enables him to avoid the usual troubles with definition and classification. Taking inspiration from computer sciences, he uses a model of layers to advance "from the material foundations of new media to its forms" (ibid., 9). This approach seems to be productive insofar as it allows speaking about forms without losing touch with the material reality. However, there are reasons why the model of understanding new media cannot be fully recommended. One is the lack of distinction between mainstream new media artefacts and the works of avant-garde new media artists; the second reason is the use of cinema as the "key conceptual lens" through which to look at new media (ibid., 9). Both things I would consider as open to further discussion and not as foregone conclusions.

> What has come to be termed variously "digital art", "computer art" or "electronic art" stands at the intersections of vectors of three historic forces: engineering (in particular computer science), transnational commodity capitalism and the traditional "fine arts". [..] Digital media artists are attempting to deal aesthetically with a technology which is the technology of power in our culture, both paradigmatically and economically. (Penny 1996, 127)

To this list of Simon Penny (above) I would add two fields: the culture industry (Adorno 1991), now re-branded as the creative industry, and socio-political movements. The field of media art cannot be understood without asking which connections media art has with other fields in society. As Penny's choice of words suggests those 'forces' do have a strong influence on the field and sometimes it looks as if the combined power of those influences is so overwhelming that a core of media art is hard to identify. My personal position in this regard is that it is important to acknowledge those contextual links, yet to insist that media art is not reducible to the contextual relations it has. The field has historically always struggled to define its boundaries. Those boundary

struggles are very revealing about the differentiation process of the field in relation to the art system, the overall political economy, the computer and telecommunications industry, the creative industries and political activism. Any more extensive mapping of the field would have to consider those relationships instead of trying to define an 'essence' of media art.

It is not a diffuse 'essence' of media art which justifies it to speak of it as a separate field but the existence of a system of institutions which are more or less exclusively concerned with it. Institutionally media art is characterised by the existence of two types of institutions. On one hand there are large festivals, such as Ars Electronica, since 1979 held in Linz, Austria, and large brick-and-mortar institutions such as the ZKM in Karlsruhe, which attract major funding, organise big exhibitions and produce heavy catalogues. On the other hand there are many small institutions, sometimes called 'self-institutions'[11] - so called media labs or hack labs - which have been thriving over the last 10 years, forming an alternative or 'unstable' field (Druckrey 2005) with increasingly world-wide connections and a more decentralised and networked approach. Whereas the large institutions face typical pressures for legitimisation such as demands to be instrumental in regional development, the world-wide network of small institutions often lives on shoe-string budgets mostly provided by state funding agencies. Some activities are not funded at all or are rather self-funded - made possible by the energy and work of participants. According to Bourdieu this area could be called a field of restricted production. Economically it is insignificant but discursively it is important. I am not trying to construct a binary opposition between two types of institutions and acknowledge the existence of many medium sized institutions and a lively transfer between the fields. However, it is important to state that there is an institutionalised field and that it is not homogenous but heterogeneous.

The Re-Writing of History

Because media art is in a precarious position in its relations to the art system, the computer industry and mass media, it experiences a strong pressure for legitimisation. This is reflected in the tendency of writing histories of media art where history in general is seen through media art's own lenses. There are two tendencies in this regard, which often appear in tandem in the same book or text. One is to mix the history of media or image technologies with the history of media art. The history of media, from painting to photography, telegraphy, film, radio, TV and computer, is called upon, with its sheer industrial weight, to justify media art or a specific position within it (Manovich 1996, 2001). The second narrative strategy is to link media art with well known and highly regarded art movements. Two particular moments stand out, the high-point of classical modernity with Futurism, Cubism, Dadaism, etc., and the revolutionary phase of art when it liberated itself from

[11] cf. discussions on the mailing list of the University of Openness (2005).

the image and the object in the 1960s with Fluxus, happenings and conceptual art (Weibel 1991, Paul 2003, Manovich 2001).

Histories of media art are put into a trajectory of the genealogy of media technologies rather than art history. In *The Automation of Sight: From Photography to Computer Vision*, Lev Manovich (1996), draws a direct line from the invention of perspective to computer generated images. He also places this trajectory within a history of automation. "By automating perspectival imaging, digital computers completed the process which began in the Renaissance (Manovich 1996, 231)." But, as Manovich points out, the inventor of the algorithm which makes perspectival rendering on computers possible, Lawrence G.Roberts, had a 'more daring goal' in mind than creating a tool for art. The computer should not only be able to render but also to 'understand' 3-D images (through pattern recognition). Thus, the project of 3-D computer generated images was a part of the project of AI in the context of the Cold War. Yet Manovich portrays this in an euphemistic language, presenting computer vision as "the culmination of at least two histories, each a century long" (ibid., 233), the history of mechanical devices designed to aid human perception, and the history of automata. Manovich does mention that the history of automation is situated in the context of rationalisation in the industrial process and that the Czech word Robot means forced labour, yet he does not spell out what this means.[12] Instead he celebrates 3-D imaging as technology's inevitable progress. Siegfried Zielinski comments on this frequently encountered narrative strategy:

> With the big genealogies of telematic, for instance from the antique metallic speaking pipe to the telephone, from Aineias' water telegraph to integrated world-wide data services, with cinema archaeology from the cave paintings in Lascaux to immersive 3D-kino-theatre or computer history from the medieval mechanical calculation machines of Wilhelm Schickard to the universal Turing machine specifically one thing is ennobled: the idea of unstoppable, quasi-natural technological progress. [trans.A.M.] (Zielinski 2002, 11)

'Unstoppable, quasi-natural technological progress' is just another description of technological determinism. With this narrative strategy the arrival of the new is not only made to look inevitable as a result of technical progress, the same strategy reassures also that nothing really ever changes. Everything has already been there, somehow, embryonic, in a pre-digital form, which means that basically we have been culturally the same. A teleology of the digital is constructed which is technically progressive and culturally conservative.

The history of media as told by Manovich appears to contain only unbroken continuity. For him, the Jacquard loom is a kind of predecessor of the computer because it could be 'programmed' to produce different ornaments using punctured strips. In typical technological deterministic thinking the logic of progress is at work, while human actors are sidelined. Lewis Mumford sees the

12 The production of large quantities of consumer goods using the assembly line was named Fordism, after its inventor, Henry Ford. Fordism stands synonymous for the political economy in the first half of the 20th century (cf. chapter 1).

Jacquard loom in a different light. According to Mumford aesthetic demands motivated the invention of the 'programmable' Jacquard loom - it were the complex patterns fashionable at the time which necessitated its invention (Trögemann and Viehoff 2005). Where Mumford sees human motivation, Manovich sees a 'logic' at work: from Daguerreotype and the Differential Engine (Babbage) to cinematograph, radar, television and computer, with the side-streams of the Hollerith machine, telegraphy, radio waves and wireless telegraphy. Yet Manovich never looses a word about where all those inventions come from. There is always a ’logic’, a 'trajectory', some intrinsic reasons at work, why technology progresses in this or that way. Thus, technological progress becomes naturalised. Taking this to its final consequence, technological progress would be motivated by a teleology of which computer based (new) media appear as the provisional end point.

Zielinski demands that we should not continue to find the old confirmed in the new (Zielinski 2002, 11). In those readings, history turns into a promise of continuity, a celebration of progression. He thinks that this is boring as well as paralysing for the work of the media-archaeologist. He demands instead to find the new in the old, to let ourselves be surprised and not just look for confirmation of what we already know. As a counter-strategy Zielinski proposes the concept of a 'deep time of media' in the form of a un-archaeology (ibid., 13) which opens up spaces for the imagination. Too quickly we tend to orient ourselves toward a new 'master medium' after which all symbolic systems have to be re-arranged, until the next master medium arrives (ibid., 17).

Lev Manovich claims that the aesthetic principles at work in new media culture have been developed by Russian and German avant-garde film makers in the 1920s.

> A hundred years after cinema's birth, cinematic ways of seeing the world, of structuring time, of narrating a story, of linking one experience to the next, have become the basic means by which computer users access and interact with all cultural data. (Manovich 2001, 78 -79)

In particular Dziga Vertov's film *The Man with a Movie Camera* (1929) can be used as *the* guide to the understanding of the language of new media. In order to give the aesthetics of cinema such a privileged role in its influence on new media, he has to neutralise the key counter-argument, namely that computers are interactive. According to Manovich it is a non-statement to say that computers are interactive - they are so by their very nature (Manovich 2001, 55). He says that he would offer only qualified notions of interactivity, and that in principle all art forms are interactive (ibid., 56). With this conceptualisation he basically kills interactivity as a category specific to media art. In order to cement his key thesis that computer based media can be seen through the lens of 1920s avant-garde movies he introduces an extensive genealogy of the screen.

> VR, telepresence, and interactivity are made possible by the recent technology of the digital computer. However, they are made real by a much older technology, the screen. (Manovich 2001, 94)

Only by dismissing interactivity and by making the screen the central component of new media art,

he can say that Russian avant-garde cinema has laid the foundations for media art. Thus, a seemingly progressive position is turned into a conservative one. Manovich appears to suggest that aesthetic innovation ended 80 years ago whereas we now move forward in making more perfect technically what Vertov *et al* have achieved then. The revolutionary methods (in the 1920s) of montage, of zooms and pans, of the liberated and accelerated kino-eye have become menu functions in Photoshop. American software engineers are providing the public with drop-down menu access to the aesthetic innovations of the 1920s.

Geoffrey Batchen criticises Manovich for using cinema as the key conceptual lens through which to address the language of new media, ignoring the histories of photography and telegraphy (Batchen 2004). The use of 35mm discarded movie film by Zuse, the German inventor of the computer, is evidence enough for Manovich to see "all existing media translated into numerical data accessible for the computer (Manovich 2001, 12)."

> But the plausibility of this particular historical metaphor depends on two particular claims: 1. that computing and photo-media have no interaction until the 1930s, and 2. that cinema is the key to any understanding of the forms and development of new media. (Batchen 2004, 27)

In his own account Batchen shows how closely the histories of the computer, photography and telegraphy were interwoven, partly because inventors such as William Fox Henry Talbot and Charles Babbage on one hand, and Samuel Morse and Louis Daguerre were in close contact with each other. According to Batchen four "inter-related technologies and their conceptual apparatuses - photography, mechanical weaving, computing and photo-mechanical printing" were first conceived around 1800 and need to be understood in the context of modernity, which means "capitalism, industrialisation, colonialism, patriarchy (ibid., 36)." It is important to note that Babbage and his assistant Ada Lovelace saw the computer as "a cultural artefact that enabled nature (and therefore God) to represent itself in the form of mathematical equations" (ibid., 37). That means that Babbage's calculating machines were seen as proof of the existence of God. Batchen concludes that any single 'conceptual lens' is inadequate and therefore also any linear chronology. He demands "a more complex rendition of the relations of past and present," "a three-dimensional network of connections," a history "thick" with unpredictability which faces up to the "political challenge" about the way how history is written (ibid., 44).

Peter Weibel claims "Futurism, Cubism, Cubofuturism, Suprematism, Dadaism, Surrealism, etc." to be conceptual precursors of media art (Weibel 1984, screen 6). New art forms emerging after WW2 such as "action painting, Fluxus, Happening, Pop Art, Kinetism, Op-Art, Ambiente, Arte Povera, actions, performances, etc.," (ibid.) are enlisted to the cause of preparing the ground for the 'liberated' digital image.
Isabelle Graw (1998) complains that in the frequent comparisons between media art and Futurism, Dada, Fluxus, Mail Art, etc. the 'similarities' are left without further explanations. Art forms as

distinct as Informel and the raster-technique in pop art all 'tacitly' share the characteristics of the digital image, in Weibel's history, where everything is thrown together into the primordial soup of the digital. Everything that has been relevant in art since 1910 is bundled into a narration which culminates in media art.

Christiane Paul presents a slightly different trajectory. She claims that "the notion of interactivity and 'virtuality' in art were explored early on by artists such as Marcel Duchamp and László Moholy-Nagy in relation to objects and their optical effects (Paul 2003, 13)." According to Paul, Duchamp's work was "extremely influential in the realm of digital art" because of the "shift from object to concept" (ibid., 13). Paul formulates a genealogy of digital art slightly different from Weibel's or Manovich's, emphasising the influence of Duchamp via OULIPO, a French literary group, to Fluxus and conceptual art. The conceptual 'link' here is that Dadaists, the OULIPO writers and Fluxus artists frequently created art works which were based on the execution of a set of instructions and/or rules, which can be compared to computer algorithms, which are, conceptually speaking, nothing else but sequences of instructions carried out in loops (ibid., 13). This view is supported by Peter Suchin who argues that the art of the 1960s, "institutionalised under the collective heading of 'Conceptual Art' and its legacies [...] is a key determinant of today's new media art practices." (Suchin 2004, 67)

Other conceptual links between contemporary media art and art movements in the past focus on the exhibition Cybernetic Serendipity, at the ICA, London 1968, (Paul 2003, 18), as well as on the exhibition 'Software Art', curated by Jack Burnham in 1970. Younger artists who are now using the term 'software art' for their own work are claiming Burnham's show as a conceptual predecessor (Goriunova and Shulgin 2003). However, there is no continuity between the surge in cybernetic art in the late 1960s and the reappearance of the 'cyber' paradigm in the 1980s. There is even less continuity between Burnham's Software Art show which remains an early and isolated example from which there can be traced no continuous line toward software art in 2005. Thus, when such long jumps are being made, it is reasonable to assume that a desire for historic legitimisation is at work. Such moves can also be seen as following the logic that Bourdieu describes in *Principles for a Sociology of Cultural Works*:

> In the struggles within each genre which oppose the consecrated avant-garde to the new avant-garde, the latter is compelled to question the very foundation of the genre through a return to sources and to the purity of its origins. (Bourdieu 1993, 187)

The quest for historic legitimacy raises some interesting points. The giants of the modern avant-garde appear in media art's rear-view mirror, together with the now equally safe and institutionally consecrated avant-garde of the 1960s. But how valid are those links? Is there really any direct connection from Duchamp's work to present day net art? The claimed conceptual similarities are, it appears, identified with the benefit of hindsight. So, why are writers such as Weibel, Manovich and

Paul so keen on quoting high-art references such as Vertov and Duchamp, rather than, for example, the larger context of visual culture under intensified conditions of industrial production in the 1920s? The suspicion arises that media art needs to give itself added historic depth. Compared to the western fine arts tradition, which dates itself back at least 2500 years, media art is just a recent blip on the screen (Fuller 2003). In the struggle for establishing itself as a field, it reaches for the big guns of art history and the history of media.

Themes and Positions

Participatory vs. Totalitarian Utopianism

Despite that there are obviously problems with history writing, I want to present a short overview of themes and positions which have been taken in a 'deep' history of media art. The most obvious theme is the notion of techno-utopianism. Hereby I differentiate between a totalitarian techno-utopianism and a more participatory or democratic form of utopianism.

Futurism, Suprematism and Constructivism formulated a programme of techno-utopianism which demanded that artists should use science and technology to help create the utopian society populated by the new man. Humanity reinvents itself based on the powers of science and technology. Art is carrying the banner of an utopianism which is totalitarian. The poetic writing of Khlebnikov about radio which becomes 'the heart and brain of the future society' (Khlebnikov 1921/2005) is characterised by a one-size-fits-all solution. Similar sentiments and totalitarian leanings are contained in the radio manifesto by Marinetti and Masnata (1933/1992).[13]

The high point of modern art was also the high point of modernity. Connecting new communications media with a utopian vision of society was not exclusive to art but prevalent in societies both sides of the Atlantic. Between 1900 and 1939 techno-utopianism was a common strand independently of the political ideology. While the Russians supported communism and Marinetti supported Mussolini, other techno-utopians such as Marconi and Edison built monopolistic business empires. In *Not Just Another Wireless Utopia* I have compared the different utopian visions competing at around 1900 and how they relate to the utopianism surrounding the internet and mobile telephony (Medosch 2004). Linking media with utopian social ideas is not unique to the 20th century. Richard Barbrook traces the political roots of media totalitarianism in the name of media freedom back to the French Revolution. The Jacobean's idea of media freedom was that the revolutionary elite needs to tightly control all media (in those days the press) because unfortunately the masses are not yet able to act in their own best interest. Media need to be controlled and exert an educating influence until the people are educated enough so that censorship

13 On the notion of totalitarianism in early radio art, see Whitehead (2005).

restrictions can be relinquished (Barbrook 1995).

In Germany, in the late 1920s and early 1930s, the playwright/theorist Bertolt Brecht and the theorist Walter Benjamin formulated, probably in a response to both the totalitarian utopianism of the Futurists and Constructivists, and the rise of the Nazi party to power, a more participatory model of techno-utopianism. Brecht demanded that each radio receiver should also become a transmitter. Brecht's ideas, formulated in a number of short texts, are now subsumed under the term Brecht's 'radio theory' (Brecht 1932/2005), a notion which has been popularised by the German writer Hans Magnus Enzensberger (Enzensberger 1996, 64). Walter Benjamin wrote about the *The Work of Art in the Age of Mechanical Reproduction* (Benjamin 1936/1992), a text which has been of lasting influence on media art till today, even though wildly opposing conclusions have been drawn from it (cf. Cox *et al.* 2004). His explicit goal is to introduce concepts into art theory which can not be abused by fascism. Of similar relevance is Benjamin's text *The Author as Producer* (Benjamin 1934/1999) where he demands, following the example of Russian Constructivists, that artists go into (industrial) production. Instead of focusing solely on producing great works artists should put all their energy into enabling others to become producers too.

We can distinguish between a media utopianism which is totalitarian (Futurists, Constructivists, Free Marketeers) and a media utopianism which is more egalitarian and participatory, a sort of democratic communism (Brecht, Benjamin). Brecht and Benjamin stand for the idea that communication media do not just automatically trigger but need to be used purposefully to facilitate social change as part of an explicit programme of social engineering. Both traditions of techno-utopianism, the totalitarian and the democratic one, have left a legacy in media art which can be felt till today.

The relationship between classical avant-garde and media art is specifically alive in the area of audio and radio art. If one wants to do so, a genealogy can be constructed which links Russolo's Intonarumori (Russolo 1916) and Awraamow's concert for steam pipes, machine guns, and ship signals in Baku, 1922 (Zielinski 2002) with emerging new media practice in audio and radio art in the 1980s and 1990s.

Media Art Trajectories

Brecht's and Benjamin's participatory ideas became influential in the 1960s via art movements such as Fluxus and Happening. Nam June Paik, influenced by John Cage, developed a participatory model of media art in the 1960s.

> While Cage allows the musicians and the ambient sounds to modify and co-create his pieces to a substantial extent, Paik builds an interactive installation from which sounds emerge without any

> compositional guidelines only when the visitors intervene. Comparably, Paik adopts the receptive-analytical strategy of Cage's 1951 composition for radio sets and transfers it to television, but then takes a decisive further step from participatory reception to creative intervention by the public. (Daniels 2004)

In the 1960s Paik experimented with TV sets, CCTV and portable video equipment. Paik formulates the requirement that artists should have influence on and even control of television, influenced by McLuhan and the idea of a 'video common market' (Paik 1974). In the 1970s Paik realised ever more complex satellite events, in a McLuhanesque celebration of the global village, which culminated in *Good Morning Mr.Orwell*, Paris 1984 (Media Art Net 2005). Documenta 6 in 1977 was the first documenta[14] with a very high part of video works, and a television live performance involving Paik, Beuys and Douglas Davis (Gidney 1984). After a dip in the 1970s, the participatory paradigm was rediscovered by the Art+Telecommunications group in the early 1980s (Grundmann, ed. 1984) with projects such as *La plissure du Texte* (Ascott 1981) and *Wiencouver I -IV* (Adrian X, 1979 - 1983); Bob Adrian X, Roy Ascott, Tom Sherman and others explored the experimental spaces offered by early data networks, slowscan TV and video phone (Grundmann, ed. 1984); similar experiments happen in France and Brazil (Kac 1992); participatory utopianism is also an important aspect of the work of TV and radio artists such as Van Gogh TV, Rabotnik Radio, Subcom and Paper Tiger TV in the 1980s; participatory media art would fully blossom finally in the 1990s with the rise of the internet and become the leading paradigm for the first time.

Another important strand is cybernetic art, starting in the 1950s and reaching a climax in the late 1960s (cf. Gere 2004), which engages directly with concepts coming from early computer science and cybernetics systems theory. In the 1950s artists inspired by cybernetics, such as Bense, Moles and Franke try to create an aesthetic theory based on information theory (Giannetti 2004). Roy Ascott, influenced by the cybernetic paradigm, but without access to a computer, starts to paint cybernetic images. One of his students, Steve Willats, starts to experiment with a social systems approach in art and continues this line of work till today. Pete Townshend, guitarist of The Who, destroys his instrument during the band's performances, influenced by Ascott and Gustav Metzger (Gere 2004, 58). But many of those attempts either fail or peter out. It shows to be impossible to create a formalised logical theory of aesthetics (Giannetti 2003). According to Charlie Gere "the late 1960s were both the zenith and the beginning of the end for both the widespread application of cybernetics in contemporary art, and for attempts to use the computer as an artistic medium (Gere 2004, 62)."

In the Bauhaus tradition stands lumino-kinetic art, represented for instance by the New Tendencies shows and group in Zagreb from 1961 onwards (Fritz 2004); in this genre computers are used sometimes for controlling light and sound environments; an early digital aesthetic was created, for

[14] Documenta is a very large exhibition of contemporary art, some say the world's biggest art show, held every five years in Kassel, Germany.

instance by using light bulbs as pixels. In the late 1960s lumino-kinetic art lost its cybernetic edge by being rebranded as 'Op Art' by commercial New York gallerists. Another central theme is the close collaboration between artists and engineers in an approach which focuses on objects, installations and machine performances. In the 1960s Experiments in Art and Technology (E.A.T.) had initiated collaborations between artists and engineers. After a slump in the 1970s this tradition re-emerges strongly in the 1980s with artists such as Eric Hobijn, Survival Research Laboratories or the Times Up collective in Linz. Building semi-autonomous robots and violent machines such as Hobijn's Dante Organ, this type of work had the aggressive aesthetics of machines out of control. The Soda group related to the tradition of E.A.T. in a more subtle way in London in the 1990s with room installations and sculptures, before leading members Lucy Kimbell and Neal White left the group, which now primarily acts as a commercial entity.

In the 1980s video art entered the museum. So called multi-channel works, combining the moving image of video with sculptural aspects in the way monitors were arranged, showed to be compatible with the values of the museum system, paving the way for artists such as Valie Export, Bruce Naumann, Bill Viola and Gary Hill to become canonized by the art system. Performance oriented works with video experienced a drop in the early 1980s, while large scale painting and neo-conceptual art dominated the art system. Multimedia was the keyword of the decade, in installations and a crossover between pop underground and media art performance, such as the work of Laurie Anderson (Paul 2003, 133). Other important concepts that need to be mentioned are appropriation and culture jamming techniques, successfully practised in a museum context by General Idea; feminist and other political activist strands of video art and community media activism. By the end of the 1980s media art had developed a wide variety of artistic practices. Many of those practices were politically oppositional and happened outside the art market.

Chapter Three: High Media Art

In the 1980s a particular type of media art started to gather momentum. The media art scene, for which the Ars Electronica Festival in Austria provided a platform, became increasingly international, with contributions from Japan, Brazil, Australia, Canada, the USA and Europe. Changes in the thematic orientation of the festival allow charting the rise of this new type of media art. In the early 1980s the festival presented itself as an odd mix with some pioneers of cybernetic art such as Herbert W. Franke and Otto Piene attending, but also spectacles aimed at winning over large audiences, musical concerts and even operatic productions in public space involving workers from a local steel factory. As Peter Weibel recalls, in those early years Ars Electronica had been almost everything it possibly could have been, "an Ars Metallica, an Ars Pneumatica, an Ars Pyrotechnica, only not an Ars Electronica (cf. Weibel 1999, 72)." This changed, according to Weibel, when he and Gottfried Hattinger gained more influence on the festival's direction from 1986 onwards. In 1987 Ars Electronica for the first time had a theme, *The Free Sound.* In 1989 networks became the festivals theme for the first time with *In the Network of Systems*. In 1992 Peter Weibel took sole responsibility for the festival's artistic direction and presented the scientific disciplines endophysics and nanotechnology as the festival's themes. In the following year the theme was *Artificial Life - Genetic Art* (cf. Weibel 1999, 72-74). By that time a certain type of media art, which I call high media art, was established as the leading paradigm.

In the decade between 1985 and 1995, high media art developed its forms, its milestone works and its narrative strategies, which altogether were successfully deployed in institution building. I call this form high media art for two main reasons, because it resonates with high-tech as well as with high-brow or high-cultural values. For the realisation of those works expensive and complex technology was used - which implies issues of accessibility, inclusiveness and structural dependencies. The works themselves usually presented themselves as clean, large scale productions in a sterile technological atmosphere. The dirt of the streets, so present in Gibson's *Neuromancer* (Gibson 1984), was rarely to be felt at high media art exhibitions. The digital aesthetics of high media art was compatible with the black cube inside the white cube of the museum: as viewers enter a darkened room with multiple projection screens they are made aware that they are entering the holy inner sanctum of a shrine to the digital; the same aesthetics is also compatible with corporate lobbies or boardrooms, with steel, glass and transparency. As the yet to be built institutions will cost a lot of money, the institutional projects have to be pitched at the highest level in industry and politics, and those circles need to get assured that they are getting value for money - high-tech, high-end art.

Examples of High Media Art

The Legible City

In *The Legible City* by Jeffrey Shaw (1988 -1991) the user rides on a home trainer bicycle and moves through a three-dimensional city of words and sentences projected in front of her. The architecture is based on real cityscapes whereby the size and shape of letters corresponds with the size and shape of buildings. In the Manhattan version (1989) the texts tell eight different stories, from ex-Mayor Koch to Donald Trump to a taxi driver. The piece is said to establish a direct connection between real and virtual city whereby "the textual component of the city literally translates characteristics of hypertext and hypermedia into an architecture where 'readers' construct their own narrative by choosing paths through the non-hierarchical text labyrinth (Paul 2003, 72)." This allegedly amounts to the city becoming an 'information architecture'. The smart choices of the artist make *The Legible City* a paradigmatic art work which illustrates post-modern theories about textuality and gives users a first hand experience of cyberspace.

In *The Legible City* the world is experienced as text, which is what post-modern philosophers have been saying all the time (Jameson 1991). The user/viewer experiences a type of virtual reality (VR) without being required to wear a head-mounted display, but nevertheless experiences a fly-through - the sort of experience which readers of Gibson's novel are already accustomed to; and the fly-through is not determined by the artist but the user can choose the direction by steering the bicycle. I have tried The Legible City when it was presented at Ars Electronica in 1989. It is a nice piece that carries nothing of the connotations of military-industrial VR; it is actually quite light-hearted and playful and, unlike many other things in the early days of high media art, it worked.

Artificial Life Art: Interactive Plant Growing

Christa Sommerer and Laurent Mignonnaeu created interfaces between the virtual and the real via a direct bodily and sensual experience for the user. In *Interactive Plant Growing* (Mignonneau and Sommerer 1992-1993) real plants are placed in front of a large projection screen. Users are invited to touch the plants with their hands. Sensors inside the plants measure the pressure of hands on the leaves and twigs and use this input as variables that trigger genetic algorithms which generate three dimensional simulated plants which are projected on the screen. The algorithms are based on so called L-Algorithms after by Aristid Lindenmyer and first implemented in computer code by Przemyslav Prunsinkiewicz. Sommerer and Mignonneau did not only use ready made software from computer science but had also own algorithms with "artificial regulators for growth and species differentiation" (Reichle 2005, 154). Although the artists do not claim to create artificial

life in any literal meaning, the work is generally seen as supportive to the artificial life (AL) paradigm.

Shown at Ars Electronic in 1993, which had the theme *Artificial Life - Genetic Art,* Sommerer and Mignonneau's *Interactive Plant Growing* was considered one of the most advaned works of art in this genre. They went on to create *Trans Plant* (1995-1996) and *Life Spacies* (1997), works which are variations on the theme of AL. *Trans Plant* was realized at the ATR - Advanced Telecommunications Research Laboratory - in Kyoto, where the artists hold a research residency, and was commissioned for the permanent collection of NTTICC, Tokyo (Reichle 2005). In this work the artists used a 3-D video-key technology which they had developed themselves and which they patented. As soon as the user enters the exhibition space an image of her within a three-dimensional jungle of virtual plants is created. Movements of the user influence the plant growth.

The works of Sommerer and Mignonneau are shown around the world and considered to be realising many demands of the paradigm of high media art. They do not create static objects but a framework for a processual exchange between viewer and art work. In most of their works, if there is no viewer, nothing happens at all. The result of the interaction appears to be indeterministic to a certain degree. AL algorithms formulate local rules of interaction so that the exact result cannot be predicted. However, whereas the growth of plants appears to be spontaneous, the extent to which the viewer can actually 'interact' with those virtual worlds is very limited. The framework has been entirely defined by the artists and the viewer/user is left with a few simple forms of physical interaction such as moving hands over a plant or moving the body in front of a screen. The 'message' of the work appears to be very similar to the message of the discipline of AL as a whole: the principles of life can be replicated in digital code. The major difference then is that the artists have developed more beautiful visuals than the scientists. Instead of challenging the naturalistic assumptions behind AL, artists lend their aesthetic skills to the illustration of science and thereby help to advertise the achievements of technoscientific progress.

Knowbotic Research

Into a similar category falls the work of the group Knowbotic Research. In *Simulation Room - Mosaic of Mobile Data Sounds* (1993) they created a space in which the real and the virtual world overlap. Software programs, so called autonomous agents, a.k.a. 'knowbots' are roaming the internet and return with pieces of sound which they find on the net. Knowbots is a term which originated from the discipline of emergent AI. The work plays with expectations created by the discourse on emergent or bottom-up AI. The user, with a single data-goggle in front of one eye - not a full head mounted display - can see clouds of simple graphical objects representing the software agents/knowbots and can, by interacting with them and in real space, trigger different

sounds. When I tried the work I was left to wonder what, if any effect my actions had on the sounds which I heard. The work, and the name of the group, perpetuates the myth of emergent AI, the paradigm of bottom-up AI which started to replace top-down old fashioned AI in the 1980s.

The artists seemed at no point to be concerned with the connotation of military intelligence contained in the term 'knowbot'. Later works such as *Dialogue With The Knowbotic South* (1994 - 1997) and *IO_Dencies* (1997 - 1999) employed similar technological set-ups yet related in a slightly more subtle way to the paradigm of emergent AI. *Dialogue With The Knowbotic South* (1994 - 1997) questioned the possibility of public participation in the scientific exploration of Antarctica which is entirely based on forms of perception realizable only with scientific instruments. IO_Dencies (1997 - 1999) tries to simulate the interaction of human and technological agents involved in decision making processes in urbanism. The work, technically and aesthetically well executed, seems to suggest that computer agents can have a significant role in the process of negotiating relationships of power in urban spaces. The actions of computer agents and human agents are set into an analogy.

Terravision

The Berlin based Art-Com, an interdisciplinary group of artists, architects and computer scientists created Terravision. The work employs the God-eye's view of the satellite and lets the user zoom in seamlessly from a satellite position down to street level by touching a large globe. Once arrived at street level the city is rendered in photo-realistic 3-D style and the viewer can fly through the city streets. It is the sort of tool the fiend in a James Bond movie would like to have at his head quarter. At the time when I saw the work in 1995 only the city centre of Berlin had been rendered. The work had been commissioned by DeTeBerkom, the research branch of Deutsche Telekom. Having a well paying customer had the advantage of enabling the group to maintain an expensive hardware infrastructure and paying members to develop the work. The disadvantage was that members of Art+Com had to go out and demo the work each time Deutsche Telekom needed to show to politicians and business partners how advanced it was.[15]

These have been just a few examples of works that form the paradigm of high-media art. Other, but similar work includes Paul Sermon's Telematic Vision (1992), Ulrike Gabriel with Terrain 01 (1993-1994) and Perceptual Arena (1993), as well as works by Agnes Hegedues and Masaki Fujihata (cf. Paul 2003, Giannetti 2004). All those works were produced on the highest production values, technically as well as aesthetically, which deserves professional respect. However, the

[15] In 1995 I organised the exhibition Telepolis in Luxembourg, where Art+Com participated showcasing Terravision for their corporate clients.

works not just coincidentially but knowingly reproduced the common places of computer science and lended themselves readily to be instrumentalised by the discourse on high media art.

Chapter Four: The Discourse of High Media Art

The advocates of high media art develop a discourse which has a specific social function which is to enable institution building and establish high media art as the paradigmatic art form of the so called information age. To this end, Gibsonian cyberspace, developments in computer science and its techno-imaginary and postmodernism philosophy are combined into a fighting rhetoric. A constitutive element in the language of high media art is the endorsement of the new ontologies which technoscience creates.

Cyberspace

> The mythology of cyberspace is a case study in narrative construction, it is an exclusively literary notion which does not describe any particular technology but has come to represent the entire digital phenomenon, from databases to *Lawnmowerman* to the World-Wide Web. Where is the "space" in cyberspace? One might regard it as a space only in the most abstract mathematical sense, but this image of a space in the popular imagination has much more to do with a kooky conflation of the pseudo-space of virtual reality with the new communications networks. Who ever heard of "telephonic space" or "postal space"? (Penny 1996, 129)

Neuromancer, first published in 1984, provides the paradigmatic image of a data space which is experienced as a three-dimensional space. According to N. Katherine Hayles the success of the cyberspace metaphor relies on two literary inventions. Gibson introduces a new concept of point of view. Traditionally in literature the point of view is the position from which a narrator tells a story which implies a physical presence, an embodied consciousness (Hayles 1996, 269). In cyberspace the p.o.v. does not look *at* a scene but moves *through* a scene. The consciousness of the narrator is separated from her physical presence. In order to make this work the data matrix must be transformed "into a landscape in which narratives can happen (ibid, 269)." The data matrix in mathematics is just an n-dimensional array. But Gibson conceptualises the matrix as a spatial array. "The pov is located in space, but it *exists* in time (ibid, 270). The p.o.v. itself has no spatial extension, but by moving through a spatialised landscape "the datascape is narrativized by the p.o.v.'s movement (ibid, 270)". The world of data becomes a 'space' in which human subjectivities can interact with each other and with artificial intelligences.

The technology which makes cyberspace 'real' is virtual reality. In the book *Virtual Reality* Howard Rheingold (1991) traces how cyberspace becomes a technological reality. It is a common place to say that those efforts were mainly financed by the US military and by NASA, and Rheingold leaves some ambiguity about the influence of Hollywood and the games industry, presenting the nascent virtual reality (VR) industry in the 1980s as a typical Californian mix of state funded military research and private-entrepreneurial entertainment industry - the reality-industrial complex (Rheingold 1991, 129 - 214). However, in 25 years of research the US Air Force funded the

development of a VR concept which became officially known as the Super Cockpit in 1986 (Rheingold 1991, 202) - and is to be considered as one, if not the most single influential research programme in the development of immersive VR. As a kind of generic set-up, VR is realised via a computer capable of rendering 3-D moving scenes in real-time; a head mounted display which projects stereoscopic scenes on screens close to the retina, or alternatively a CAVE, a dedicated space equipped with up to 6 projection screens optimised to give the illusion of complete immersion; and either a data glove or another device which allows the user to navigate. In the late 1980s and early 1990s VR becomes the paradigmatic technology in high media art and Jeffrey Shaw its central proponent. The immaterial 'virtual worlds' also correspond well with post-modern theories.

Postmodernism and Computers

Turkle (1995) argues that computers, in particular the paradigm of computers equipped with graphical user interfaces (GUIs) emerging in the 1980s, are the ideal machines to give substance to post-modern theories. Post-modernists have written about worlds without origins. According to those theories we were surrounded by simulacra, copies of things that no longer have originals.

> The post-modern world is a world without depth, a world of surface. If there is no underlying meaning, or a meaning we shall never know, post-modern theorists argue that the privileged way of knowing can only be through an exploration of surfaces. This makes social knowledge into something that we might navigate much as we explore the Macintosh screen and its multiple layers of files and applications. (Turkle 1995, 47-48)

With the interactive graphical interface of the Macintosh and Microsoft Windows the computer becomes the perfect match for post-modernism. The older paradigm of the computer was based on the large mainframe machine and the techno-imaginary of artificial intelligence. Mind was constructed "in terms of centralised structures and programmed rules" (ibid., 20). But now we are increasingly getting used to a culture of simulation. In the age of the personal computer "models embrace a post-modern aesthetic of complexity and decentring (ibid., 20)." When Lacan, Foucault, Derrida, Deleuze and Guattari wrote things such as that the self is an illusion and that "sexual congress is the exchange of signifiers" (ibid., 14), the theory appeared to be quite removed from the experience of lived reality. Because for most people "the unitary self is the most basic reality; [...] multiple and decentred theories have been slow to catch on" (ibid., 15). But in the computer-mediated world of the 1990s the self is experienced as multiple, fluid, fragmented - "and constituted in interaction with machine connections" (ibid., 15). In short, the PC with its GUI gives material expression to post-modern theories. While those theories once seemed highly abstract and living on thin air, computer based cultural forms such as simulation games or chat rooms, where we can easily change our gender identities or fake completely different personalities, enable us to reconfigure the understanding of self and the world along the lines of post-modern theories. Lev Manovich goes even so far to claim that theoretical post-modernism had been impossible without

the invention of Adobe Photoshop. The cut-and-paste aesthetics of Photoshop, which allows us to compose new images out of fragments of old ones, to apply filters and special effects, perfectly matches the content and aesthetics of post-modernism (Manovich 2001, 129-132).

Tabula Rasa: A Radical Break with the Past

In various texts about media art a genuine connection between high media art and the classical avant-garde is claimed (Manovich 2001, Paul 2003, Weibel 1994). Analysis suggests that similarities do indeed exist, but mainly in the shape of similar narrative strategies. High media art imitates high modernity's gesture of a radical break with the past.

Construction, technology and mathematics are the siblings of modern art. [trans.A.M.](Rodchenko 1921/1993)

According to the art historian Norbert M. Schmitz statements such as the one above cannot be taken at face value (Schmitz 2001). After the successful Bolshevist revolution in 1917 avant-garde artists claimed to break with the past and invent a new utopian art. Even though the artists aligned themselves with the goals of the revolution, they fought their battles primarily within the field of artistic production. The painter Rodchenko for instance explains retrospectively that, at around 1916, when he took part in the Futurist exhibition *Magazin* in St.Petersburg, he was "full of hatred" against what he called "right-wing" art (Rodchenko 1993, 18). When he and his colleagues enthusiastically celebrated the world of science, technology and industry, they primarily did so to provoke and defeat the art of the bourgeoisie. Schmitz points out that the Constructivist's "media materialism, which so strongly high-lights technological change, represents specifically one thing, an aesthetic programmatic, or an artistic strategy whose social function needs to be thrown more light on [trans.A.M.] (Schmitz 2001, 98)." Media art, by claiming a similar 'media materialism' as foundational for its practice, is pursuing a similar artistic strategy, but in a very different context.

According to Schmitz, classical modernity's self-legitimisation as modernity's only adequate reaction to the social process of modernisation should not be trusted. Instead, the difference between the aesthetic and the social-historical meaning should be made parameter of any analysis, because the field of artistic production and the actual development of industrialised societies cannot be mapped onto each other one-to-one. The development of an autonomous artistic subject was crucial for pushing through a specific understanding of art in modernity - in opposition to a utilitarian field of industrial mass production. The modern artist individual and the autonomous aesthetic are invented as a counter-strategy to the pressures of rationalisation and functionalisation. At the same time the aesthetical gained currency, as a reflex to the loss of all values in a crisis shaken society. "The aesthetics of the classical avant-garde only serves to confirm the romantic

concept of art which it tried to overcome with its fierce affront [trans.A.M.] (Schmitz 2001, 124)" In other words, the radical attitude of Constructivists with their fascination with the abstract and science and technology was actually deeply romantic and idealistic.[16]

> There is a terminological ambivalence because what we now call modern art in everyday language stands in marked distance to the technical-functional image worlds of industrial societies. This is obvious with new romantics such as expressionists and Kandinsky, but even the exaggerated affirmation and fetishisation of industrial technologies by Futurists and Productivists stands equally in contrast to the technological everyday of industrial civilisation. [...] The theory of classical modernity is useful only in a very limited way of giving foundations to the aesthetics of information society [trans.A.M.]. (Schmitz 2001, 116)

Malevich was inspired by deeply mystical ideas about the 'icona vera' which is totally incompatible with modernity's rationalistic programme. And Rodchenko completely rejected any figurative approach in painting and therefore deemed Malevich's black and white squares as conservative. Marinetti, who had visited St.Petersburg in 1914, was despised by the Constructivists because they considered him a bourgeois. "Writing theories in the system of Marinetti is not enough," Rodchenko said in 1921 (Rodchenko 1993, 47-50). The unqualified adaptation of classical modernity's programme into media art's pre-history glosses over distinctions which were important for artists at their time. Because the aesthetic programme was intricately linked to a political one, it seems to be inappropriate to separate them from each other and from the social-historic context. And, as Schmitz suggests, if media art really inherits modernity, it also inherits its debt (Schmitz 2001, 124).

Peter Weibel claims that "art created with technical media is radically different from all other art that existed before. Media art is a transformation, if not a transgression of the classical arts. [trans.A.M.] (Weibel 1991, 205)." Similar claims are very widespread (Giannetti 2004). The usual pattern is to say that because of the materiality of the media used the traditional categories in which art is discussed do not work anymore. The concept of authorship is abolished because the artwork is a result of interaction in an open system; the work is not an object but a process; the concept of originality does not apply because the work is technically reproducible (Giannetti 2003). Claiming a radical break with the past goes hand in hand with saying that all other art is obsolete.

> If we look at the influential aesthetics of the last two centuries then we recognise that they are all based on an ontology of the image, on a static concept of being, which a priori negates if not excludes the essence of media art, specifically the moving image, namely its dynamic, its immateriality and the way it is based on time. [trans.A.M.] (Weibel 1991, 205)

Here Weibel insinuates that art is still stuck with an inadequate idealism in the Kantian-Hegelian tradition. However, as leading art historians suggest, the concepts of truth and the sublime in art

16 How out of touch the Constructivists were with mainstream Russian society hit home brutally when Stalin came to power after Lenin's death in 1922. A few years later most of them ended up either in Gulag, dead or in enforced early retirement. Socialist Realism became the official art orthodoxy, a 'realism' which had to serve propagandistic goals.

were already in serious trouble in the midst of the 19th century. The categories which Weibel attacks are not categories of contemporary art in the late 20th century but of modern art in the 19th and early 20th century - and even then they were heavily disputed. Originality was part of the rhetoric of the socially marginalised artist torn between unconditional geniality (Delacroix) and radical romantic subjectivity (Kandinsky) (Schmitz 2001, 104). Being or any ontological claim to the truthfulness of the image was not claimed by western art since the Age of Enlightenment - and maybe even before. On the contrary, western art has a long history of instrumentalising the image, from religious art to consumer life-style advertisement in the 20th century (ibid., 106). The type of conceptual or neo-conceptual art *en vogue* today can hardly be what Weibel refers to. Remains the question from which 'old' art Weibel separates high-media art so vigorously.

> The new techno-aesthetics is one of the foundations, if not the central one, for all avant-garde movements in the art of the 20th century, which, at any rate, happened outside the art market and system. In the transgression of the borders of the classical art and the market the engine of the history of the avant-garde defines itself: transgression instead of transcendence.[trans.A.M.] (Weibel 1991, 223)

Weibel, at the cusp of institutional power, one year before he takes over Ars Electronica, postures as the rebel 'outside the art market'. The language of transgression might have been adequate for the classic avant-garde at the beginning of the 20th century. But nowadays it cannot be justified any more "with the innocent charm of the atmosphere of a new beginning [trans.A.M.] (Schmitz 2001, 103)" According to Schmitz the "topoi of classical modernity" are "adequacy of materiality" and "reflexivity of its own media technological condition". Because of changing technological circumstances the medium gained heightened importance and became the focus of resistance. "The legitimacy of radical claims was based on the changing technical conditions, be it affirmatively as a technological condition and uniqueness, or defensively as something specific to the old genre [trans.A.M.] (ibid., 119)." This beautifully reveals one of the main paradoxes of media art. The immaterial technologies which are said to render the category of the material obsolete makes the material the place of origin of its nullification. "The medium is the message is primarily the 'dernier cri' of formalism [trans.A.M.] (ibid., 120)."

> Electronic art moves art from an object-centred stage to a context- and observer-oriented one. In this way, it becomes a motor of change, from modernity to post-modernity, i.e., the transition from closed, decision-defined and complete systems to open, non-defined, and incomplete ones, from the world of necessity to a world of observer-driven variables, from mono-perspective to multiple perspective, from hegemony to pluralism, from text to context, from locality to non-locality, from totality to plurality, from objectivity to observer -relativity, from autonomy to co-variance, from the dictatorship of subjectivity to the immanent world of the machine. (Weibel 1996, 343)

It is worth noting that all those transitions, which at first sound emancipatory - e.g. 'from hegemony to pluralism' -, suddenly fall into the 'immanent world of the machine' as if this was a sort of natural teleology. Subjectivity is dictatorship from which the 'immanent world of the machine' liberates us. The digital angels come to liberate us from the analogue devils (Schmitz 2001). Weibel constructs

a parallelism between interactive art and post-modernism on the one hand, as the aesthetic and philosophic paradigm, and technoscience as the 'objective' scientific paradigm on the other hand. But the content of this 'philosophy' is commodity fetishism. The immanent world of the machine does not exist due to a miraculous capacity of auto-generation (or the ghost in the machine) but because it has been made by people. The easy ride on Shaw's bicycle glides over thousands of programmer's years who have made interactive 3-D graphics possible. The separation of labour 'immanent' to this process is shaping a class structure in society where the divide between rich and poor widens, maybe not despite but *because of* the promises of the information society. All of those transformations can only occur because media technology is taken as the privileged viewpoint. The single focus on media in an affirmative or defensive way was, according to Schmitz, always an aesthetic strategy to newly negotiate the position of the system of art, which was experienced as difficult.

> All speculation about any reality of media understood as ontological is just a continuation of strategies of legitimisation of classical modernity - for instance when the essence or substance of a digital art work should be defined out of the structure of the underlying programme [trans.A.M.].(ibid., 123)

According to Schmitz, any recourse to the definition of something 'media specific' represents an attempt of skipping the own historicity - in other words, the social background and foundations of art are hidden behind their nullification caused by the 'objectivity' of the material. I think that Schmitz goes too far in his assessment. Artists working with new media need to reflect on the condition of the medium. Following interpretations of critical theory, science studies and the social shaping of technology, technology is never just technical but has a social content. It could be understood to be the task of a critical media art to 'excavate' the social content of the technologies they work with. But high media art never positioned itself that way. Insofar Schmitz is right only regarding this particular strand and not the genre as a whole.

New Media Art and Progress

By making tabula rasa, traditional categories are abolished. Consequently, high-media art can only be judged by its own criteria. But those criteria seem to be neither aesthetic nor socio-political ones but technological only. The newness of the new media is the unique selling point of the new art form. In 1984 Peter Weibel proclaimed the 'liberated [digital; A.M.] image'.

> The digital image which allows one to intervene in each section of the picture surface as freely as the artist can in the canvas to form each portion of the picture as one wishes does not just emancipate the art apparatus from its torturous and constricting mechanics but also liberates our thinking in images par excellence from its many constraints. Thus the digital image is the first real foreboding of the "liberated image" like the digital sound of "liberated sound" the program of which was set down at the turn of the century." (Weibel 1984, screen 6)

In the same essay Weibel spends pages and pages on the troublesome details of how digital images can be made more naturalistic and how real-time rendering of realistic digital film would some day soon be achievable. Interestingly, Weibel's narration relies strongly on a very specific notion of

progress. Progress in digital art and progress in computer science are presented as one and the same thing. In the chapter on *Synthetic Realism and Its Discontents*, Lev Manovich (2001, 184 - 198), identifies "realism" as the "concept that inevitably accompanies the development and assimilation of 3-D computer graphics (Manovich 2001, 184)." In computer science and for Hollywood companies relying on it for the generation of 3-D special effects, realism is not simply a requirement but a dogma. The unlimited expansion of the mastery of illusion demands that complex structures such as hair, smoke, a tree's twigs and leaves moved by wind, etc. are realistically simulated on a machine. To achieve this sort of 'photo-realism', as the industry calls it, the research branch of physical computing has been developed. In physical computing the image of smoke emanating from fire, for instance, is not merely drawn by a skilful computer illustrator but simulated according to actual laws of physics. Manovich understands computer realism as a challenge which needs further investigation (ibid., 198).

In Art and Progress Ernst H. Gombrich (1971/1987) explains conflicting concepts of progress in art. In antique Greece the word for art and technique was the same - techne. The progress from archaic or 'primitive' forms to the classic Hellenistic period is presented as a steady improvement of techniques of mimesis, of art imitating nature. Once perfection is achieved decay sets in, because there is nowhere else to go. Vasari, the first art historian in Renaissance Italy, follows the same model, presenting the progression in styles from Giotto to Rafael, with whom perfection according to the classic ideal is once more achieved. But with the industrial revolution progress suddenly takes on a very different notion. Maybe science and technology progress in a linear way (as Kuhn and Feyerabend have shown, they don't), Gombrich suggests, but the artist's reaction is rather different. In reaction to a world where science and technology play an increasingly important role, romanticists demand to go back to the more primitive forms of medieval art. In the first half of the 19th century it looks as if the romantic reaction provides a certain 'logic' which sees a movement away from classic ideals towards increased realism. But in 1866 modernity is already developed far enough in society and art so that Emile Zola can say that it is an illusion that there is something like an absolute and eternal truth to the art work. Art is just another product of people who are "sweating out the beauty" of their works (Zola 1866, quoted by Gombrich 1971/1987, 108). In the age of modernity, Gombrich criticises, the historic sequence of styles becomes a dogma, and new styles are becoming obsolete before the paint has dried. The historic view on one style succeeding and replacing the next has obscured the view on what has really been going on in art in the 19th century. Gombrich concludes that the principle of progress has been inflicted on art. Instead of blindly following this external principle, art has the right to formulate its own goals *and* to question the legitimacy of scientific projects, because otherwise we became the puppets of an irresistible development (Gombrich 1971/1987, 107).

The Digital Ontology

High media art attacks 'old' art as stuck with an ontological definition of the image, but makes ontological statements itself. The ontological criterion of 'being digital' (Negroponte 1995) defines the art work.

> If it is the special feature and advantage of digital art that it is ideally suited for digitally depicting analogous processes in nature, if, in other words, a pictorial technique perfectly matches its object as digital scene simulation (the digital realistic simulation of 3-D objects and events in time) does, then this can only mean that the world itself is digitally organised, that everything analogous is also expressible in digital form. Thus digital art is becoming a more and more adequate expression of our world." (Weibel 1984)

The claim that 'the world itself' was 'digitally organised' belongs to the class of strong ontological statements. Weibel echoes Flusser's theory of 'digital apparition' (Flusser 1996) where he writes that there was no ontological difference between reality and technological images such as those created by virtual reality techniques. If the latter seem 'less real' then this was only a function of their lower resolution. Turning the attention to digital apparition has the benefit of making us recognise that reality is an apparition too. "What remains is that everything is digital, i.e. that everything has to be looked at as a more or less dense distribution of point elements, of bits (ibid., 244)." Therefore, what we call real, "are those areas, those curvatures and convexities, in which the particles are distributed more densely and in which potentialities realise themselves (ibid., 244)." As Flusser suggests, this parallelism of digital and real is "the digital world picture as it is being suggested to us by science (ibid., 244)." High media art falls in line with an explanation of the ontological status of the world provided by technoscience.

> Though it is difficult to pinpoint the dominant influences on our perceptions from among endophysics, micro-particle physics, chaos theory, quantum physics, genetic engineering, or the theory of complexity, it is obvious that we are above all ruled by developments in what is known as computational science. [...] It should thus surprise no one if our current perception of the human mind is that of a parallel processing network computer. (Weibel 1996, 348)

Serious biologists and neuroscientists such as Maturana and Varela say that, "the popular metaphor of calling the brain an 'information processing device' is not only ambiguous but patently wrong (Maturana and Varela 1987/1992, 169)." Weibel's pseudo-scientific claims that 'the world is digitally organised' and that the mind is 'a parallel processing network computer' fall into the category of the cultural fallacy. The cultural fallacy is a world-view which interprets nature along the lines of the leading technology of a time. Whereas for centuries the world was thought to run like a finely tuned clockwork - watch making being the then leading technology - the universe is now explained as a giant parallel processing supercomputer (cf. chapter 1).

The New Frontier

The digital ontology in the discourse on high media art allows differentiating the field from the fine arts. "Ultimately the object of these new scenarios consists of and depends on binary information (Weibel 1996, 349)." Only now the virtual worlds have already become reality. Weibel praises virtual reality art where "computer controlled junctions in the form of multisensorial interfaces" are deployed (ibid., 349). He appears to believe that the next stage, art on the net will would offer similar immersive 3-D experiences, "sheer immaterial art worlds floating (ibid., 349)." As further attributes he names that "the traditionally passive role of the observer in art is thus abolished […] (and) the interactive installation has undermined our traditional assumptions about the image as a static object (ibid., 349)." However, the same trajectory which differentiates media art from traditional fine arts also leads towards capitalism's new frontier. The consumption of the desire, the realisation of the promise of digital art, is always delayed to an unspecified future.

> The titillation of the audience with technological tools which never quite fulfil their promise seems to be (an unwelcome) part of our practice. How often does the viewer/user feel let-down? If only the interface were a little more fluid, if only more speed, greater resolution, better sensors...This "never quite fulfilling" is a property of the movement of the technology, the postponement of gratification serves to drive the unfulfilled to further consumption. Being subject to these libidinal desires, the artist finds him/herself an agent for promoting the same. (Penny 1996, 132 - 133)

As the promise lives in the time zone of unfulfilled prophecies, praising media art turns into an exercise of advertising high-end technologies. Peter Weibel believes that an even "newer telematic culture will evolve, as interactive television and global telepresence along the new global electronic superhighways and super information highways become possible (ibid., 349)." The super-highway metaphor was popularised by the then Vice-president Al Gore in 1992. Weibel advertises high-tech art as part of a high-tech future, broadly in tune with the Zeitgeist and the American ideology of McLuhanism (Barbrook 2005). Al Gore imagines the information super-highway to guarantee economic success and global hegemony. With the same revolutionary fervour with which Weibel joined the actions of Austrian avant-garde performance artists in the 1960s he now joins the 'digital revolution'. Like so many other rebels of '68 Weibel and his generation have become fervent capitalists, albeit of the Californian Ideology type (Barbrook and Cameron 1995). In tune with the 'ultimate vision' of technoscience, he looks forward to the direct brain-computer interface, a "bio-chip" linking the mind directly with the "digital universe" so that he finally can jack-in like Gibson’s data cowboys (Weibel 1966, 349).

"Precisely whose unfulfilled fantasies are embodied in this construction? There are echoes of very conventional western impulses: exploration, colonialism, the liberation from the fetters of the physical (Penny 1996, 133)." The technoscientific imaginary enables middle aged digital artists to "unpack heroic tales of transgression" and step out into the new frontier of cyberspace - the odyssey of the "nowhere-man" in search of a new "nowhere land". (Weber 2003, 105) In two

paradigmatic exhibitions curated by Jeffrey Shaw at the ZKM, New Foundland (1993) and New Foundland II (1995) the title itself signals already the notion of "a new territory of functional and aesthetic experience - a place of exploration, discoveries and inventions." (Shaw 1996) The pioneers of high-media art step out into the uncharted territory of the virtual continent which is soon due to be colonialised by Yahoo, eBay and America Online.

High Tech Spiritualism

In some instants the virtual continent harbours spiritual entities. Roy Ascott, a real 'pioneer' of cybernetic art, expects 'the advent of telematic consciousness.'

> The emergent faculty of cyberception, our artificially enhanced interactions of perception and cognition, involves the transpersonal technology of global networks and cybermedia. Cyberception not only implies a new body, new behaviours and new consciousness but a redefinition of how we might live together in the interspace between the virtual and the real. [...]
> The impact of telepresence, bionic diversity, distributed knowledge, collaborative creativity, and artificial life on our sense of self, our sense of what is "natural", what it is to be human, indeed of the status and legitimacy of "everyday reality" is more than most traditional discourses can bear. The breaking point however is not the death of culture or the incoherence of consciousness but the revitalisation of our whole state of being and a renewal of the conditions and construction of what we choose to call reality. (Ascott 1996, 183)

Noticable is the difference between the Ascott of 1984 (Grundmann ed. 1984) and of 1996 who is increasingly working with esoteric concepts. There are many religious motives in high tech spiritualism, not all Christian. A deeper study of religious motives in the discourses of the techno-imaginary is not the focus of this paper. However, ideas of a ghost in the machine or the idolatry of machinery are too many to be ignored. High-tech new age spiritualism is pervasive in discourses of technoscience such as AI and AL and is replicated in the works and words of some high media artists such as Roy Ascott.

> All in all I believe that this divine dimension raises the question of trandescendence, that is to say, the question of the Judeo-Christian God, for instance. People agree to say that it is rationality and science which have eliminated what is called magic and religion. But ultimately, the ironic outcome of this techno-scientific development is a renewed need for the idea of God. Many people question their religious identity today, not necessarily by thinking of converting to Judeism or to Islam: it's just that technologies seriously question the status of the human being. All technologies converge toward the same spot, they all lead to a deus ex machina, a machine-God. In a way, technologies have negated the transcendental God in order to invent the machine-God. However, those two gods raise similar questions. (Paul Virilio, quoted by Wilson 1996, 326)

Summary

The discourse on high media art creatively combines post-modernism with myths and metaphors from the repertoire of the techno-imaginary. Both celebrate the dematerialisation of the world. The world has become digital, so it is only logical that art needs to be digital too. This sits well within

the framework of McLuhanism which cancels history and the social forces involved, such as politics and the economy. The discourse on high media art ignores the conditions of its own creations. Nobody seems to be uncomfortable with the degree to which the artists are dependent on the computer industry and technology corporations such as Deutsche Telekom, NTT or Canon. Artists producing work at the highest technical and aesthetic level need to get supported by institutions. They need to accept high levels of separation of labour and bureaucratic management. To a degree, which would need to be established specifically for each work, the works are determined by the black box character of proprietary hard- and software, by the products of commercial software applications and by the skills of the actors involved. In a very direct way the art work is determined by the technologies used. Since in media art works form cannot be clearly separated from function, this is of major significance. It would be naive to assume that the institutionalised context does not have a bearing on the form and content of the art work (Mitchell 2003).

The discourses on high media art and postmodernism share a strong focus on information and immateriality. This is something they have in common with technosciene which conducts its own strategy of dematerialisation. High media art provides high class illustration to both post-modern ideas and concepts of computer science, and unconditionally accepts the premises on which those are built. It fails to take a critical position against ideologies of dominance embedded in those theories. As Jutta Weber (2003) argues, although most post-modern theories are civilization critical, they are unable to challenge the ideology of technological determinism inherent to technoscience. As Barbrook (2005) points out, information becomes fetishised in those theories. The two grand narratives of modernism, Adam Smith's liberalism and Marx's analysis of the capitalist political economy agree at least insofar as they see humans at the driving seat of history. Post-modern theories, by dismissing those grand narratives, are actually saying that history was a process without a human subject (Barbrook 2005). High media art takes a similar position by insisting on the ontological status of the work of art as being digital. The seemingly progressive digital aesthetic is socially and politically conservative. The discourse of high media art endorses a version of McLuhanism which has technological determinism at its core.

Conclusions

The narrative strategies of Weibel, Ascott *et al* succeeded in institution building. But ironically, after high-media art climaxed at around 1995, it soon lost its discoursive relevance. A new paradigm unfolded with the mass popularisation of the internet. The 'really existent' internet showed to be rather different from what the gurus of cybernetic art had imagined it to be. People learned to do their email, download a video or a song, but failed to encounter the ghost in the machine or telematic consciousness. The ordinaryness of life on the net took over. Actually, nobody ever really lived 'on' the net. We learned to step back and understand that our bodies are still real. The ZKM and Ars Electronica remain powerful institutions, but the new aesthetical strategies are now developed elsewhere. Socially and politically aware artists shape the discoursive agenda outside the institutional context provided by high-media art. Weibel, just like the software giant Microsoft, had misinterpreted the relevancy of the internet. Instead of glorification of the products of multinational corporations net artists high-light the participatory culture of the internet. Microsoft quickly developed its own browser software Internet Explorer. Weibel got the guest curator Benjamin Weill to curate the large scale exhibition net_condition in 1998 (Greene 2004). But the discoursive bandwaggon had already left the station. Digital artists joined new alliances with hackers developing free and open source software and a new discourse on art, activism and free or copyleft culture florished. High media art, by winning institutional power, lost its symbolic capital. The discourse of high media art, which had all chances to do so, had not generated foundations on which it was safe to build. As I hope to have shown, the ideology of technological determinism has prevented it from doing so. High media art with its high-tech visions has won a phyrric victory. At the same time the technologisation of society continues and a strong critical art movement dealing with issues surrounding technology and society is as urgently needed as ever.

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