The Academy of the Senzez

SYNESTHETICS IN SCIENCE, ART, AND EDUCATION





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FRANS EVERS

Compiled and edited by VINCENT W.J. VAN GERVEN OEI

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SYN'ES'THET'ICS

n.

1. (used with a sing. verb)

a. The branch of esthetics (Eng. aesthetics) dealing with joint esthetics, the artistic effects resulting from bringing together esthetics from different disciplines in one work of art, often as a consequence of the use of new technologies

b. In Kantian philosophy esthetics is the branch of metaphysics concerned with the laws of perception. Synesthesia "is a term that refers to the transposition of sensory images or sensory attributes from one modality to the other"(*Marks*). The word synesthesia is composed of two elements: *syn* (with, together, alike, similarity) and *aesthesia* (to feel, perceive). In analogy we may describe synesthetics as "joint esthetics"

c. Synesthetics, synesthetic art, verbal synesthesia, and sensory synesthesia are all manifestations of a guiding perceptual principle: "the unity of the senses." According to ethnomusicologist Erich M. von Hornbostel this interrelatedness of the senses can be observed in daily life situations, in new media such as film as well as in the unity of the arts which was given from the origin (masked dance)

2. (used with a sing. verb) The study of the esthetics of visual music (*Castel*), Gesamtkunst (*Wagner, Kandinsky*), the art of relationships (*Mondrian, Moholy-Nagy*), synaesthetics and kinaesthetics: the way of all experience (*Youngblood*) as well as more recent forms of generative art, interactive art and mediated environments

3. (used with a sing. or pl. verb) A conception of what is artistically valid or beautiful: conceptual synesthetics (Cage)

4. (used with a sing. or pl. verb) An artistically beautiful or pleasing appearance: "They're looking for electric music theater, not for synesthetics" (*Raaijmakers*)

Editor's Note Frans Evers: From Researcher to Education Reformer Preface Introduction A Brief History of Synesthetics

SYNESTHETICS IN SCIENCE

1.1	Synesthetes	3
1.2	Definition of Synesthetics	7
1.3	Historic Interest in Synesthetics	8
1.3.1	Locke's Essay and "audition colorée"	10
1.3.2	Hornbostel: The Unity of the Senses	14
1.3.3	Marks: Synesthetic Dimensions and Cross-Modal Interactions	21
1.3.4	Cytowic: Neural Imaging Techniques	31
П	SYNESTHETICS IN ART	

11.0 11.0.1	Synesthetics: A New Esthetics for a New Era Pythagoras, Kircher, Newton, Castel	
11.1	Remediation – Painting Music: The Transformation of Sound and Music Into Moving Light and Color	49
11.1.1	Le Clavecin Oculaire, Paris, 1725	50
11.1.2	Abstract Cinema – Chromatic Music, Bologna, 1912	59
11.1.3	Lumia, New York, 1922; Farbenlichtspiele, Weimar, 1923	65
11.1.4	Der Absolute Film, Berlin, 1925	71
11.1.5	Komposition in Blau, Berlin, 1935	73
11.1.6	The Sensual Laboratory, London, 1967	83
11.2	Media-Interaction – Music Theater: The Synchronization of the Arts Versus the Juxtaposition of Media	87
11.2.1	Gesamtkunstwerk, Bayreuth, 1848	89
11.2.2	Mysterium, Moscow/Darjeeling, 1911	93
11.2.3	Der Gelbe Klang, Munich, 1912	96
11.2.4	Die Glückliche Hand, Vienna, 1913	100
11.2.5	Cabaret Voltaire, Zurich, 1916	103
11.2.6	Untitled Event, Black Mountain, 1952	109
11.2.7	8 Happenings in 6 Parts, New York City, 1959	117
11.2.8	Gaman, Utrecht, 1970	121

11.3	Media-Integration – Composing Mediated Architecture	125
11.3.1	Loïe Fuller's Electric Theater Paris 1900	126
11.3.2	Neo-Plastic Music and Light Projections in the	131
11.3.3	Promenoir, Paris, 1922 Tour Spatiodynamique, Cybernétique et Sonore, Saint-Cloud, 1955	135
11.3.4	Vortex Concerts, San Francisco, 1957	4
11.3.5	Poème électronique Brussels 1958	147
11.3.6	Exposition of Music – Electronic Television, Wuppertal, 1963	155
	SYNESTHETICS IN ART EDUCATION: THE INTERFACULTY, A CASE STUDY	
111.0	The Third Synasthetic Waye in Modern Art	165
111.1	The Interfaculty – A new Curriculum for Art, Science and Technology	171
	The Royal Academy of Art, 1682	173
111.1.2	The Royal Conservatoire, 1826	175
111.1.3	Dick Raaijmakers, NatLab, 1956-59; Studio voor	179
	Elektronische Muziek Rijksuniversiteit Utrecht, 1960;	
	Elektronische Studio Royal Conservatoire, 1966;	
	Institute of Sonology Utrecht -The Hague, 1966-86	
111.1.4	CAM Centrum voor Audiovisuele Media, 1987-89; Robotic	185
	Sculptures, 1988; Sonorous Origins: The Flying Rhomb, 1988	
	Book III – The New Media, a Homage to John Cage, 1988	191
	The Interfaculty Image and Sound, 1989	199
111.1./	The Interfaculty ArtScience, 2004	207
111.2	The Innovation Project: Media Arts and Music Theater –	213
	Composed Musical Space, Light and Color, Human Interfaces,	
.2.	The Academy of Light, 1993	219
111.2.2	Die Glückliche Hand – Geöffnet, 1993	227
111.2.3	Fort Klank, 1993	236
111.2.4	Mondrian's Promenoir, 1994	242
111.2.5	School for Soundmen, 1994	253
111.2.6	Scheuer im Haag, 1995	257
111.2.7	Sonic Acts – Festival of Sounds and Images, 1994–2003	267
	Appendix: Alessandro Romanini and Frans Evers:	271
	Art and Technology, a Multi-Century Dialogue	
	Bibliography	285
	Index	293
	Credits	299

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FRANS EVERS's **The Academy of the Senses** is a book wanting to be three books at once. A study of the scientific approaches to synesthesia, related to the psycho-physical research conducted by Evers during his studies at the university; an alternative art history of the twentieth century based on the double paradigm of Castel's **clavecin oculaire** and Wagner's **Gesamtkunstwerk**; and a full account of the genesis of the Interfaculty Image & Sound, which Evers headed from 1989 until 2007.

The range of subject matter, approaches, and writing styles—from "academic paper" to "autobiography"—might confuse the reader who is unfamiliar with the contagious enthusiasm that Evers had for his passion: art education. I have nonetheless decided largely to refrain from editing out "non-academic" phrasings or vocabulary. With Evers's argument in favor of the "unity of the senses" in mind, I would like to propose here the "unity of styles." Frans Evers was an experimental scientist, an artist, and an educational reformer all at the same time, and it would not do justice to him to privilege one particular writing style over the others.

Nevertheless, the reader should be informed that Evers, sometimes favored the esthetics of his argument over factual truth. An anecdote may illustrate the extent to which Frans's own "synes-thetic lifestyle" conflicted with the "distance" implied by scientific rigor. When confronted with a factual account of the genesis of the **Poème électronique** (see section II.3.5) at a conference, he told the speaker to go sit in the grass of the place where the Pavilion once stood; then he might be able to feel what the **Poème** was truly about.

The long history of the text that lies before you stretches from Evers's studies at the University of Amsterdam as a researcher in the field of experimental psychology, to his lecture series The Language of Image and Sound at the Gemeentemuseum in The Hague, to his Synesthesia courses at the Interfaculty Image & Sound, and to the unfinished research for his dissertation under the heading Synesthetics at the Academy of the Creative and Performing Arts at Leiden University under the supervision of Remko Scha and Frans de Ruiter.

The most recent versions of parts of the manuscript date back to June 2009, and other material has been gathered from manuscripts dating from 2008, 2007, and even as far back as 2004. I have reorganized the material along the lines indicated by Evers in his final table of contents, even though the first part in particular had to be restructured extensively. Part II, and to a lesser extent part III, have been largely included as is. There were several sections that Evers was unable to complete. These include a discussion of Eisenstein's concept of "vertical montage"; "synesthetic cinema" from Los Angeles during the I970s; a description of the Pepsi Pavilion designed by Experiments in Art and Technology and Billy Klüver for Expo '70 in Osaka; and a historical overview of the Bauhaus, from its inception in Weimar until the New Bauhaus in Chicago. However, most of these subjects are all referenced and discussed in other sections of the book.

The Academy of the Senses is more a "source book," a work of inspiration, than a rigid account of historical facts. That it may inspire the reader to search for further knowledge in both the cold realm of facts and the warm environment of synesthetic experience, which, as this book shows, do not contradict, but complement each other.

Vincent W.J. van Gerven Oei Tirana 2011

VINCENT W.J. VAN GERVEN OEI studied composition, linguistics, conceptual art, and philosophy. He translated Dick Raaijmakers's Method (Eindhoven: Onomatopee, 2009) and The Destructive Character (Eindhoven: Onomatopee, 2011) into English, and published Follow Us or Die (New York: Atropos Press, 2009) in collaboration with artist Jonas Staal. Van Gerven Oei teaches philosophy at the University of New York in Tirana and art theory at the Royal Academy of Arts in The Hague. www.vangervenoei.com

IT REMAINS A QUESTION if Frans Evers ever planned to become an instructor in the field of art education. His scientific interests and his need to change what was around him were the main motives that eventually lead him to education. He became primarily an education reformer and only secondarily a teacher. Frans loved taking new initiatives and shaping them into an organizationally lasting form, which is something that can only be done with the right blend of combativeness and idealism. Naturally, these traits were characteristic of him.

As a psychologist Frans focused his research on synesthesia. Additionally, he had gained experience with music and sound by participating on synthesizer in the experimental improvisation group Roy G. Biv. Thanks to a Fullbright scholarship, Frans got the opportunity to do research at Yale University where he collaborated with Lawrence Marks at the John B. Pierce Laboratory. Frans Evers wanted to continue this research at the Sonology department of the Royal Conservatoire in The Hague.

However, in the 1980s the educational climate within the Dutch conservatories was not yet suitable for research. In collaboration with Dick Raaijmakers, Frans started an adventure as an education reformer. Like a juggler, he knew how to perfectly balance a number of factors. The innovation and upscaling within higher professional education, in which the conservatory and the art academy of The Hague would merge into one institution, was one of those factors. As a result, new forms of collaboration became possible. Together with the Gemeentemuseum in The Hague, Frans started organizing lectures on interdisciplinarity in the arts. The Sonology department needed to expand with respect to content, which led to the initiative to found the Interfaculty Image and Sound. The Interfaculty would develop into one of the first courses in the Netherlands in which a collaboration between music and fine art was truly realized on an educational level.

In his education reforms, Frans always organized both a new form of education and a platform to present the results. It was an obvious step to start a festival like Sonic Acts in collaboration with Paradiso in Amsterdam in 1994. In addition to other big projects, this was the place where students, former students, and instructors could realize their ideas in combination with work by other artists. This immediately set the norm for what innovative art should be.

When discussions started about a more intensive collaboration with Leiden University, Frans was one of the parties involved. At the same time he also took the initiative to rename the Interfaculty Image and Sound to ArtScience in an effort to create more room for research within the course and create a climate that he himself had missed in the late I980s.

Frans's career was really an investigation into interdisciplinarity in the arts. This means that he had an interest in the moments when artists would veer off the beaten path of their discipline. Frans had a strong urge to see things from a surprising angle as an outsider .

The result of the education of the Interfaculty was often experimental. The only way to test this kind of work was by showing it to a general public. Within the Interfaculty, Frans made a point of finding a platform for a larger audience when possible. To realize interdisciplinarity, collaboration is inevitable, and that was the reason for the big projects in which students and instructors worked together and the emphasis on team-teaching. Consequently, students and teachers got involved with each other's work. As a result, Frans always paid a lot of attention to

the way in which students functioned in the different collaborations. For Frans every student was a strictly individual story. Only through that approach could students fill in their education in their own unique way and could the sprouting of a new academism be avoided. This approach could only be realized through a strong idealism and enthusiasm. Frans was always looking for the right combination of humor and intent to conspire. The department had to manifest itself as a respectable institution in the field of art education while at the same time planning its moves cunningly, like in guerrilla warfare, to create disruptions within the official institutes. Especially the latter could cause Frans to suddenly change his attitude from a scholarly instructor to a critical activist. What is most important is that Frans Evers payed attention to every idea and every dream and treated all of them with the necessary respect.

Michael van Hoogenhuyze Amsterdam, 2011

MICHAEL VAN HOOGENHUYZE is an art historian who initially taught at the Academy in Utrecht, but later for many years at the Royal Academy in The Hague. In 1993 he was invited by Frans Evers to teach at the Interfaculty Image & Sound, where he contributed to many collective projects until 2011. He developed many ideas on the genius loci and thought processes in art, worked as a dramaturge for theater productions and has a passion for thinkers who dare to propose a systems of the world, such as Athanasius Kircher, David Humbert de Superville and Dick Raaijmakers.

MY INTEREST in the (connected) roles of the different senses in modern art was first aroused in 1961, when I visited the exhibition **Bewogen Beweging** (Moving Motion) in the Stedelijk Museum in Amsterdam. Having already visited quite a number of museums and art galleries by the age of twelve, I had not expected that an art exhibition could make me as happy as this one did. However, **Bewogen Beweging**, an exhibition about the origins of kinetic art, managed to do so because of the vitality and vibrancy of the exhibited art works, and the extraordinary enthusiasm they aroused in the visitors.

Although I do not remember any of the exhibited works, I can still hear the excited murmuring of the crowd in the usually silent halls of the museum. Back then it was already evident that there was something "in the air." A few years ago Dick Raaijmakers got hold of a copy of the exhibition catalogue (Huttén 1961) and gave it to me as a birthday gift. I was very surprised to learn that, at a young age, I had already been confronted with many of the art works I studied later from printed and audiovisual sources, such as Viking Eggeling's Symphonie Diagonale, Alexander Calder's Mobile Composition, Roy Ascott's Change Painting, Nicolas Schöffer's Spatiodynamiques, Jean Tinguely's Concert for 7 Images, etc.

My scientific and artistic research in the fields of color, sound, and modern art began twelve years later in 1973 when I met painter Robin Deirkauf. He showed me some sketches for PHASE 3, a concept he had developed for a multimedia event in which musicians were challenged to play sonic transformations of the colors, forms, and textures of nine of his monumental paintings. The collaboration with Deirkauf resulted in the founding of our electronic music group ROY G. BIV, and also influenced my psychology studies at the University of Amsterdam.

Though at the time I was specializing in Developmental Psychology, I expanded my research into Experimental Psychology, hoping to find theoretical explanations for the affective responses to color. The extant literature indicated that I) highly saturated colors are recognized and memorized faster than less saturated colors; 2) young children pay attention to light colors (yellow, white, pink, and red) much longer than to dark ones (brown, black, blue, green, and violet); 3) after age six there is an overall agreement, regardless of sex and race, in color preference: blue is the most preferred color, followed by red, green, violet, orange, and yellow; and 4) relations between colors (hues or color tones) and affective connotations vary strongly among individuals; the highest correlations are found for the associations between red—passion (75%), green—nature (62%), and blue—trust (49%), whereas there is much lower correlation for orange—fun (36%), purple—deceit (34%) and yellow—jealousy (28%) (Evers, 1978).

At one point, while studying the psychological theories and experiments on color perception and color cognition, my interest was especially drawn to some old French and German studies discussing the multi-sensory aspects of color perception. During the last decades of the nineteenth century, a growing number of studies had been published on the perceptual phenom-

FRANS EVERS (1948–2010) received his master's degree in psychology in 1978. He became an instructor at the Sweelinck Conservatorium van Amsterdam in 1980. From 1986 onward Frans was active at the Royal Conservatorie in The Hague where he developed into an education reformer and became the driving force behind the founding of the the Interfaculty Image and Sound in 1989. On his initiative the Interfaculty Image and Sound was rechristened to ArtScience in 2001. Frans Evers passed away in January 2010.

enon of audition colorée (colored hearing), first described by the Bavarian physician Dr. Georg Sachs in his thesis Auditio Colorata (Sachs 1812).

For Sachs it was natural to experience color sensations while listening to music and speech. He had been wondering whether these experiences might have resulted from his genetic condition of being an albino, as if the lack of skin pigment was compensated for by his inner color vision; for many decades it was thought that **audition colorée** was the expression of some kind of physical disorder. However, after many physicians had conducted patient surveys, it turned out that a small but substantial number of people existed who did not suffer from any physical deficiencies, yet whose perception of music, vowels, written letters, numbers, and word series (especially the names of the weekdays and months) were colored.

Subsequent studies showed that cross-modal relations were not restricted to auditory and visual experiences, but that taste, smell, or touch sensations were occasionally mixed with sensations belonging to other sense modalities. Hence the phenomenon later became known as synesthesia (Greek, from syn "together" and aisthēsis "perception"). Synesthesia is the experience of one sense being felt by another; the senses merge and the borders that separate the senses disappear.

Shortly after earning my MA degree in psychology in 1979, I applied for a grant to conduct my first laboratory research on, what I called, experimental synesthesia. I was allowed to conduct this research at the Psychologisch Laboratorium of the University of Amsterdam with the support of Nico Frijda and supervised by Theo Schaap. My experiment was a replication study of Karl Zietz's experiment on the influence of simultaneously presented sound on the perception of colored after-images (Zietz 1931). I did not find the same significant changes in the perception of hue (color tone) as Zietz had found on the basis of a qualitative analysis of his subjects' responses, although my quantitative results showed that the lightness of the after-image colors was significantly enhanced by the simultaneously presented sounds (Evers 1982). Upon presenting my results to Frijda's faculty, I explained my original motive for the study of synesthetic phenomena with some early examples of the interest of modern artists in the synesthetic correspondences between the senses. Two staff members, the dance critic Luuk Utrecht and the photographer/filmmaker/ author Emiel van Moerkerken, referred to some avant-garde artists who had experimented in the fields of light, dance, and animated film. Utrecht told me about the American actress Loïe Fuller and her innovative contributions to the fields of dance and stage-lighting around 1900, and Van Moerkerken informed me about the film animation experiments of the German experimental film avant-garde of the 1920s and 1930s.

In 1983, I was invited by Leon van Noorden to present my research on experimental synesthesia to the members of the Working Society on Music Perception, one of the research committees of the ZWO (Netherlands Organization for Scientific Research). After the lecture I was contacted by psycho-acoustician Stan Tempelaars and composer/filmmaker Frits Weiland, who were managing the Institute of Sonology in Utrecht. They told me that the students of the International Sonology Course would be interested in learning more about my approach, not only out of a scientific interest, but also in answer to their needs to develop new audiovisual concepts for their multimedia compositions. Tempelaars also informed me about the plans to move the Institute of Sonology to The Hague, where it would become part of the Royal Conservatoire. He wanted me to teach there as soon as the Institute had relocated.

The next year I was awarded a Fulbright grant, which allowed me to continue my research with the psycho-physicist Lawrence E. Marks, a specialist in the field of cross-modal perception, at the John B. Pierce Laboratory, a research lab affiliated with Yale University in New Haven. Marks was the author of the book The Unity of the Senses: Interrelations Among the Modalities, in which he reviewed the literature on synesthesia, his psychophysical experiments on cross-modal perception and their reflection in language and poetry in the form of synesthetic metaphors. I contributed to his research program by providing supportive evidence on the hypothesized functional sensory interactions regarding the perception and recognition of the pitch and loudness of sounds. Pitch and loudness not only interacted with visual lightness and brightness, but, as was shown in my experiment, they also seemed to interact with the sharpness or roundedness of visual shapes (Marks 1987).

In 1985 I started teaching as a guest lecturer at the Royal Conservatoire where, one year later, I was offered a three-year part-time research position at the new Sonology Department. This is where I met composer Dick Raaijmakers, who expressed his interest in my approach to the synesthetic aspects of the perception and creation of electronic music and art. We discussed the laboratory experiments and scientific research on the cross-modal interactions between sound and light, and Raaijmakers recommended that I re-direct my research from scientific to artistic experimentation and art production, by initiating experimental forms of multimedia art education. In this way we challenged the students to discover their own synesthetic creativity and develop new compositional approaches to multimedia art.

As a result of the conversations between Raaijmakers and myself, new audiovisual courses were developed in the fields of film, video, and the digital synthesis and processing of image and sound. This was the beginning of a close collaboration, inaugurated by our common initiative to found the Center for Audiovisual Media (CAM), for which we combined our lecture series into the new course Phenomenology and Psychology of Image and Sound. Two years later we expanded this course with contributions from linguist Doro Franck and art historian Hans Locher and renamed it The Language of Image and Sound. Locher considered the course to be the "heart beat" of the four-year Aula Lecture Series in the Gemeentemuseum in The Hague, and the "core course" of the museum's new educational program. As a complementary creative activity to the theoretical and analytical Aula Lecture Series, we organized a program of concerts and performances to present multimedia art forms. Initially, the Sunday mornings programs of this Laboratory of Plastic Sound attracted dozens of interested citizens of The Hague. But following the museum's continuing failures to cope with the technical complexities required by the invited multimedia artists, we decided to close the lab and invite the artists to comment on their work verbally, as integrated illustrations of the themes of the Aula Lecture Series.

Although the urgent need to innovate art education was theoretically answered by offering the lecture series, it did not respond to the students' need for a practice-based approach to the creation of audiovisual art works. In order to confront students with the new challenges of creating new multimedia art forms, we needed to incorporate original forms of collective team-teaching and collective study projects into the new educational program.

The first large-scale collective project I produced with Raaijmakers was called **Book III—The New Media**, which was realized during John Cage's two-week visit to the Royal Conservatoire in 1988 (see III..5). The project was a meta-composition consisting of a number of widely different sub-

xx

projects, such as the Good Food project, the Sound Walk project, the Sonorous Origins lecture, the Mushroom reception, and the multimedia event Music for the Five Senses. It involved about sixty teachers, students, and artists from outside the Conservatoire. During the following years we realized many collective projects based on Raaijmakers's "open form" method, which he introduced as a creative method to de-construct original artistic concepts created by avant-garde artists, re-composing them from elementary operations such as repetition, acceleration, deceleration, mirroring, morphing, etc., by using all sorts of "proto-electronic," electronic, and digital technology, presenting the result as a new form of "electric music theater."

I contributed to these plans by proposing to focus on avant-garde works and concepts of Schoenberg, Mondrian, and Moholy-Nagy, which demanded a specifically synesthetic approach to the composition of sound, color, light, and space. The development of the four-year Interfaculty Image & Sound curriculum and the collective projects were permanently discussed in all possible configurations with Doro Franck and Robin Deirkauf, video artist Kasper van der Horst, filmmaker Babeth van Loo, audio artist Horst Rickels, percussionist and theater director Paul Koek, theater scientist Jan Zoet, art historian Michael van Hoogenhuyze, sound artist Edwin van der Heide, filmmaker and light artist Joost Rekveld, conceptual artist Taco Stolk, and all other (guest) teachers, and students.

Many artists whose kinetic and, sometimes, synesthetic art had been exhibited at Bewogen Beweging, or whose ideas were described in the exhibition's catalogue became inspiring examples for the teachers and the teaching at the Interfaculty Image & Sound. The courses often referred to the pioneers of kinetic and synesthetic art, the Futurist F. T. Marinetti's typovisual poetry; the absolute films created by Viking Eggeling and Hans Richter, Thomas Wilfred's, László Moholy-Nagy's and Nicolas Schöffer's light art; Mondrian's Neo-Plastic music; and the open form approach to art by American avant-gardists Marcel Duchamp, John Cage, Allan Kaprow, and Robert Rauschenberg.

Two of the artists that exhibited in **Bewogen Beweging**, Gustav Metzger and Roy Ascott, subsequently participated in some of the Interfaculty's projects. In 1993, Gustav Metzger gave a demonstration of the "liquid light show" he had created in the 1960s, during the manifestation The **Academy of Light**, which was organized by the Interfaculty and the Gemeentemuseum in The Hague as part of the **International Schoenberg-Kandinsky Symposium**. In 2001, Roy Ascott was invited to present his ideas on connecting art and science in **interactive art** at the conference **The Art of Programming** during the Sonic Acts Festival, a festival that the Interfaculty has produced with Paradiso in Amsterdam since 1994.

It has been a privilege to conduct my scientific experiments and artistic research in highly prestigious scientific and cultural environments. The real joy, however, was not so much aroused by working in these places, but resulted primarily from the opportunity to work with artists who expressed a special sense for appreciating the enjoyment of the sensory and emotional wealth of synesthetic experiences in daily life.

> Frans Evers Amsterdam, 2009

THIS BOOK has been written for a new generation of artists and decision makers in the world of art who care for the orientation in the arts where art and technology meet. After having worked for more than twenty-five years in the innovation of art education, I would like to communicate my experiences and thoughts regarding a fascinating arts practice that László Moholy-Nagy called the art of "vision in relationships." In 1946 Moholy-Nagy described the origins of this new orientation, as it had become visible in the visual arts, in his posthumously published book *Vision in Motion*, as actually being a search for creating an art of relationships.

The abstract arts, the Neo-Plasticists, suprematists, and constructivists discovered that in the efforts of the cubists not so much the representation of objects and the description of their motion was the most important feature, but the visual force and emotional wealth of relationships, the constructive potential of the visual dimensions... This development of the visual arts from fixed perspective to the "vision in motion" is vision in relationships. The fixed viewpoint, the isolated handling of problems as a norm is rejected and replaced by a flexible approach, by seeing matters in a constantly moving field of mutual relationships. It is the clue to all the changes that took or will take place in the sciences as well in philosophy, including education and all other fields, in fact in our whole civilization. (Moholy-Nagy 1969)

This book may be read as an alternative art history of the twentieth century focusing on the relations between the arts and new forms of art resulting from the artist's developing interest in electric and electronic technology. As I will show, this interest has developed into a fundamental extension of the traditional multidisciplinary art forms—dance, theater, and opera—with art forms based on new technologies and techniques, ranging from light, film, electronic sound and video, to digital multimedia and virtual reality. In the age when culture at large became enriched by electric lighting in public and private places, and new forms of entertainment such as cinema, pop music, disco, and computer games, artistic experiments with new technologies resulted in new art forms.

Modern art is known for its revolutionary, innovative qualities. In the fields of the fine arts abstract and constructivist imagery started to compete successfully with representational figuration and symbolist imagery. In music atonal, formal, and electronic approaches to composition opened new musical and sonic perspectives. These revolutions, and their parallels in the fields of dance, theater, and literature have been described in detail by art historians, musicologists, and scholars of dance, theater, and literature. Despite the depth reached in understanding the innovations that took place within the domains of each separate discipline, hardly any attention has been given to an equally important artistic revolution that reshaped the arts in the twentieth century: the "de-bordering" of the artistic disciplines.

One of the most peculiar characteristics of modern art has been the recurring efforts made by avantgarde artists to dissolve the boundaries between the different artistic disciplines. Upon reviewing the development of the arts during the twentieth century, we can see that many artists proposed new concepts for art works that brought together elements formerly belonging to separate artistic domains to interact in multi-, inter- and meta-disciplinary works of art. Challenged by new technologies, theses artists

les mots et les couleurs ne sont choses pareilles. ni les yeux ne sont les oreilles.

JEAN DE LA FONTAINE

proposed new esthetic concepts to unite the arts by creating new transformations and configurations. Music and painting came together in light art and experimental film, whereas all art forms were invited to play a role in total theater concepts and total art events. This merger has enriched the artistic lexicon of the twentieth century with new lemmas such as color music, visual music, light art, abstract cinema, event, environment, happening, synesthetic cinema, performance, installation, intermedia, music video, sound sculpture, soundscape, digital visuals, etcetera.

In this publication I will argue that these subjects and the new artistic directions they represent deserve a more central position in the discourse of the arts, including a more proactive attitude from the side of cultural decision makers and art educators to support art exploring new materials, new creative methods, and new esthetic experiences. Psychological, psycho-physical, ethnomusicological, linguistic, and neuroscientific studies of synesthetic relations in perception and cognition have shown that the senses are interrelated and that these interrelations find an expression in synesthetic metaphors in daily language and poetry. Contrarily, hardly any study has been published on the role of synesthesia in the work of modern artists trying to establish new relationships between sound, light, color, motion, and space. For art educators and art students it is very difficult to get a full picture of the relevance of this *creative synesthesia* and its connection with the emergence of new technologies as co-defining characteristics of contemporary art.

In perfect concord with the historic specialization of the arts, the organization of art education has followed the historic separation and differentiation of the arts. Fine arts academies were founded for visual artists, theater schools for actors, music schools and conservatoires for musicians, etc. With the emergence of digital media this situation is slowly changing. For a few years now, specialized courses for media arts have been offered by many institutions of higher art education. Most of these courses, however, are discipline-based, which means that they are almost exclusively devoted to the visual aspect of the work, as they are created and presented in the context of the traditional visual arts education. Only rarely are sonic, performative, or environmental aspects given as much attention as the visual aspect. One of the consequences of this situation is that theoretical aspects of the curriculum are dominated by art theories reigning in the visual domain.

In my opinion, the art curriculum should instead be innovated according to a new art canon that is based on a multidisciplinary esthetics —synesthetics— in contrast to the ideal of a fundamentally categorical esthetics; namely, that ultimate artistic quality can only be reached within each separate medium.

This ideal has ruled the view of most art historians since the playwright Gotthold Lessing stressed the differences between poetic and pictorial expression in *Laocoön or on the Borders of Painting and Poetry* (Lessing 1766). Lessing questioned the saying "ut pictura poesis" (as is painting, so is poetry), which had been the Renaissance expression that unified the expressive qualities of the arts. In this essay, he treated the sculpture from the point of view of a philosopher of esthetics. He intended to use the sculpture of Laocoön and his sons as a case study in defining the difference between visual arts and literature. Literature was absorbed in time, and expressed through conventional signs (e.g. letters and words) that had no meaning in themselves. In the visual arts, on the other hand, the dimension of time hardly existed, and the means of representation were similar to the things that they represented. Thus literature could describe horrible things without using horrible words, whereas the representational arts could only represent the horrible by showing us the horrible. Because that would not produce a noble work of art but one that would put us in much the same distress as Laocoön, producers of visual

Fig. 2. Titel page of Louis-Bertrand Castel's

L'Optique des Couleurs, 1740.

Fig. 1, Laocoön and His Sons, Ist cent, BC.



L'OPTIQUE DES COULEURS. Fondée fur les limples Obfervations, & roundée fur les limples Obfervations, de rounde fur-tour à la pratique de la Peinture, de la Teinture & des autres Arts Colorifles. Par le R. P. CASTEL, Jefuite.

A PARIS, Chiez BRIASSON, rec Suint-Jacques, à la Science.

M. D.C.C. X E. Ans Approbation & Privilege du Roy. representations tend to tone down the unpleasant features. That is the reason, according to Lessing, that Laocoön is not roaring like a bull; his jaw is tightly constricted in a position that would enable him to utter only a low groan. Painting and poetry expressed different meanings for Lessing, because they were expressed in the different dimensions of respectively space and time. But in fact, Lessing has done little more than develop the lines of the French fabulist Jean de la Fontaine: "Les mots et les couleurs ne sont choses pareilles/ Ni les yeux ne sont les oreilles" (Words and colors are not the same type of things/ And neither are the eyes and ears).

Almost a century later this point of view was expressed again by the psychologist Rudolf Arnheim in his text *A New Laocoön: Artistic Composites and the Talking Film* from 1938 (Arnheim 1957) and by the art historian Clement Greenberg in his text *The Newer Laokoon* from 1940 (Greenberg 1958), in which he rejected the idea of the paragon—the old notion that painting was supposed to express some form of poetic meaning—in favor of the autonomy of the painting's own pictorial meaning. In this essay, Greenberg argued for a view that defended the quality of a work of art by the degree of specificity of that art form's medium. With this position the *raison d'être* of the arts was based on the artist's capacity to explore the expressive means of each medium. For Greenberg, it was abstract painting that had reached the highest degree of purity since it had freed itself completely from literary symbolism and the illusion of the depth by focusing its expression on the materiality of the paint and the flatness of the canvas. Abstract painting therefore became what is still called the ultimate "autonomous art," free from the wish to imitate nature.

Although Greenberg recognized the exemplary role of the autonomy of music in this development toward non-referential meaning in visual art, as Wassily Kandinsky had proclaimed this in his groundbreaking theoretical work *Concerning the Spiritual in Art* (1910), he refused to recognize "the other side of the coin." In his essay *On Stage Composition*, published in the almanac *Der Blaue Reiter* (1912), Kandinsky had not only written that all art forms have their own language and means, but also that all art forms have something closed and pure in themselves, and that they differed in all outer aspects, sounds, color, words. However, in addition to these differences he stressed the equality of the "inner identity" or "inner sound" of these outwardly different phenomena, to which he devoted his stage composition *Yellow Sound* (1912, see II.2.3) and the publication *Sounds*, an album containing a few dozens handprinted prose poems accompanied by colored and black-and white woodcuts.

Contrary to the views of Lessing's, Arnheim's, and Greenberg, the arts, after successfully developing in the directions of their ultimately distinguishing qualities—monochrome paintings and composed silence—, simultaneously became reoriented to the other art forms during the second half of the twentieth century. This was shown by John Cage's 4'33", an artistic answer to Robert Rauschenberg's *White Paintings*. First, this new tendency was expressed by the invention of multidisciplinary and multi-sensory events and happenings. Second, it was shown by a growing interest of artists in new, electronic technologies that required a synesthetic approach to multimedia composition. It is this synesthetic approach that we will concern ourselves with.

The three parts of this publication relate to the respective spheres of perceiving, making, and learning. This implies that our attention will be successively focused on scientific perceptual theories, on artistic concepts in the field of art and technology, and on the creation of a learning environment for a new generation of artists who want to develop themselves in a general approach to art and esthetics, instead of devoting themselves to any of the usual directions of disciplinary specialization. The aim of the book is to stimulate the further innovation of the arts and of art education in a synesthetic way. Fig. 3. Robert Rauschenberg, White Painting (Seven Panel), 1951.

Fig. 4. Performance of Alexander Scriabin's **Prometheus**, New York, 1915.





Fig. 5. Thomas Wilfred and the clavilux.

The Academy of the Senses offers a multidimensional perceptual and creative view, based on a unitary theory of the senses and on actual ways in which artists have been, and are, trying to (re-)compose a unity of the arts proceeding from modern concepts and technological means.

Part I, *Synesthetics in Science*, consists of a survey of the scientific theories and the experiments on synesthesia and cross-modal perception. Scientific research has essentially concentrated on three perceptual and cognitive phenomena: 1) constitutional, sensory synesthesia in synesthetic individuals who report involuntary synesthetic experiences, in which the perception of sounds, letters, numbers, etc. evoke mental images of certain colors and visual shapes or abstract patterns; 2) the use of synesthetic metaphors in language and poetry; and 3) the structural and functional synesthetic relations between the sense modalities as they were demonstrated in matching experiments and reaction-time studies. Despite their phenomenal difference it has been demonstrated that all three types of intermodal relations express correlated sensory dimensions or attributes. Moreover, psychophysical experiments have shown a number of significant correlations between auditory and visual dimensions.

In Part II, Synesthetics in Art, I intend to show that the wish to create new synesthetic experiences has been a prominent ideal shared by many avant-garde artists of the twentieth century. This part describes both the way in which creative synesthesia has played a role in the development of the arts and some of the most original contributions to this development, starting with Louis-Bertrand Castel's proposal to create a new art, *musique muette*, by developing a *clavecin oculaire* (ocular harpsichord/harpsichord for the eye). In addition to the generative relation between the art forms of music and painting, the emergence of interaction between all the arts was expressed by Wagner when he predicted that the Gesamtkunstwerk, the total artwork, consisting of music, text, acting, painting, and stage effects, would determine the future of the arts. This part will conclude with the largest domain of synesthetic composition, namely architectural environments.

Throughout Part II, I will discuss a great number of artists who have created artworks by using and further developing Castel's and Wagner's ideas. Artists have had many different reasons for wishing to create a synesthetic dimension in their art. For Charles Baudelaire and many other nineteenth century writers, synesthetic metaphors were an ideal way to express the Romantic notion of the unity of natural phenomena in their novels, essays, and poems. For Alexander Scriabin and Wassily Kandinsky the synesthetic dimension was a way to reach a spiritual state of mind. Arnold Schoenberg used colors and a *Crescendo des Lichts und des Sturmes* (light and storm crescendo) to "create sounds for the eye" in his colored "drama with music" *Die Glückliche Hand*. Piet Mondrian wanted to create Neo-Plastic music by using red, yellow, and blue tones, and black, grey, and white non-tones (noise sounds) by electronically generated "sound coups," and proposed the juxtaposition of this Neo-Plastic music with abstract colored light projections. Work by abstract filmmakers like Oskar Fischinger and light artists like Thomas Wilfred can be considered as expressions of the "color music movement" (Klein 1930; Moritz 1986). John Cage's attraction to theater and circus, which he showed in *Untitled Event* and in *HPSCHD*, was based on his aim to create enjoyment produced by "the multiplicity of visual and audible events."

Part III, *Synesthetics in Art Education*, deals with the question of how art education has reacted to the growing need to develop creative synesthesia in response to the emergence of multimedia technology and the need to develop multi-, inter-, and meta-disciplinary creative skills. I will briefly introduce how creative synesthesia played a role in the legendary Bauhaus in Germany and in the less widely known Black Mountain College in the US. While these two art schools may be considered as prime examples

of educational innovation in the arts, characteristic of the first phase (1911-1933) and second phase of modern art (1947-1973), the founding of the Interfaculty Image & Sound may be considered as one of the first innovative educational responses to the third phase of modern art, which started around 1982. This part also features some detailed descriptions of the Interfaculty's large collective projects. From 1989 till 2006 about thirty collective projects were realized by the faculty in collaboration with students, guest lecturers and professionals in the fields of sound reproduction, stage light, and production. In the descriptions sketches are given of the artistic working climate characteristic of these projects, while capturing the new words and phrases constituting the new language created at the Interfaculty Image & Sound.

- PYTHAGORAS (550 BC) Legend has it that Pythagoras, while watching blacksmiths at work, noticed the correspondence between the pitches of the sounds produced by the hammers and their sizes and weights. Upon this synesthetic observation he started experimenting with varying the lengths of strings, finding that harmonious, consonant chords and intervals result from string length proportions which are defined by whole numbers.
- KIRCHER (I650) Synesthetic mechanism connecting the "cylindrus phonotacticus" playing Musica Pythagorica with four kinetic sculptures depicting the blacksmiths observed by Pythagoras
- NEWTON (I704) Synesthetic harmony: the color spectrum is divided in a way comparable to the musical scale. "It involves something about the harmony of colors... perhaps analogous to the concordances of sound."
- CASTEL (1725) Synesthetic philosophy based on the dream of creating a music for the eye. Originally called **musique muette** to be created with an ocular harpsichord, the concept evolved into the 20th century light art and film art movements: color music and visual music.
- BAUDELAIRE (1846) The synesthetic correspondences between color, sounds and odors is described in Baudelaire's essay De la Couleur. The essay refers directly to the literary works of E.T.A. Hoffmann who introduced synesthetic metaphor in the German Romantic literature of the early 19th century.

- WAGNER (1848) Synesthetic approach to composition in which all arts contribute to a total work of art in order to serve a political aim. For Wagner this was the contribution of Nordic mythology to the history of Europe.
- FULLER (1892) Synesthetic relation between physical movement on stage and theater lighting. Fuller was the first artist using the strong effects of electric stage light and the power of color and slide projections by magic lanterns for her dance acts.
- SCRIABIN (1911) Synesthetic composition of music and colored light. The first attempt to introduce a new musical instrument, the "Tastiera per Luce," a color keyboard, together with a color score to enhance effect of the tonality changes of the music of Prometheus: The Poem of Fire. This piece was supposed to become the overture of his never realized project Mysterium, in which all the senses of the audience would be involved.
- MARINETTI (1912) Synesthetic poetry and typography based on the destruction of the syntax by treating the page as a pictorial field: words are printed in shapes and directions expressing their synesthetic connotations.
- CORRA AND GINNA (1912) Synesthetic music-light and film experiments. Starting from Castel's one-to-one correspondence between note and color, Corra and Ginna finally created a cinematographic form of **musique muette**, based on spatial color and light effects.
- KANDINSKY (1912) Synesthetic esthetics based on the synesthetic relations between sound, color, form and light. Kandinsky wanted to base painting on a musical approach. The arts should

aim to express their respective "inner sounds." In The Monumental Theater the arts should be juxtaposed to create contrast (I - I = 2), instead of adding to each other's effect by repetition of the movement (I + I = 2).

- SCHOENBERG (1913) In his Drama mit Musik, Die Glückliche Hand, Schoenberg wanted to create "sounds for the eye" by using intense colored light plays determining the development of the piece. The Light and Storm Crescendo was composed as parallel synesthetic movements of musical sound color and colored stage light.
- BALL (1916) Dada was founded in Zurich to bring together poets, musicians and visual artists to celebrate their freedom of expression in a time of war. In their "Sturm-Soirées" held in the Cabaret Voltaire by Ball the sounds and air movements created by electric fans were used to clean the air from the poisonous words of the politicians to give room to the simultaneous reading of poetry in different languages, which was accompanied by all sorts of music and stage acts.
- DIEBOLD (1916) A few months after Cabaret Voltaire was opened in Zurich, the local newspaper the Neue Zürcher Zeitung published three articles, entitled "Expressionismus und Kino" (Expressionism and Cinema). Diebold called for "a new use of cinema by serious artists who would have to use the best techniques and accumulated wisdom of painting, sculpture, dance and music to create fine and perfect art works (preferably abstract in nature) in controlled time and space."
- RUTTMANN (1921) Ruttmann's first silent abstract film **Opus I** premiered in Berlin, accompanied by music by Max Bütting, the musical director of the

radical artist movement the November Gruppe.

- MONDRIAN (1922) Mondrian proposed creating Neo-Plastic music by using electrical sound colors corresponding to the primary visual colors and non-colors and to the horizontal and vertical organization he used in his Neo-Plastic paintings. He envisioned a new concert hall, a **promenoir**, where this music would alternate with abstract colored light projections.
- WILFRED (1922) With his Clavilux, Wilfred created Lumia, the art of light. The patterns and movements of his musique muette were composed by using analogies with musical melody, harmony, rhythm and tempo.
- HIRSCHFELD-MACK (1927) In his Colored Light Plays, consisting of colored shadow plays accompanied by piano improvisations, he rejected Castel's one-to-one relationship between colors and tones, Instead Hirschfeld-Mack related the changing intensities of the lights to the use of high, low and middle pitch registers on the piano.

KLEIN (1931) Color Music

YOUNGBLOOD (1970) Synaesthetic Cinema

MORITZ (1986) Abstract Film and Color Music

SYNESTHETICS IN SCIENCE

I.I SYNESTHETES

1.2 DEFINITION OF SYNESTHESIA

I.3 HISTORIC INTEREST IN SYNESTHESIA I.3.1 LOCKE'S ESSAY AND AUDITION COLORÉE I.5.2 HORNBOSTEL: THE UNITY OF THE SENSES I.3.3 MARKS: SYNESTHETIC DIMENSIONS AND CROSS-MODAL INTERACTIONS I.3.4 CYTOWIC: NEURAL IMAGING TECHNIQUES

SYNESTHETES

SYNESTHETES are people who claim that they experience sensory stimulation in such a way that in their minds mental impressions are evoked that extend to the perceptual qualities of other sensory domains. For instance, when they listen to the sounds of speech or music, they "see" the sounds of the voice and the movement of the musical instruments as colorful visual images. The sounds are heard as holistic sensory impressions consisting of both aural and visual qualities. The visual imagery may appear as momentary glimpses or as enduring moving patterns of color. It is experienced as a visual correlate, or as an integral transformation, of the sounds.

Half of the synesthetes have multiple synesthesia. In addition to other forms of synesthesia they may experience visual-auditory sensory synesthesia in which colors are aroused by reading numbers and letters or in connection to words expressing cyclic time units such as the days of the week and the months of the year. The experienced colors often have a very specific, complex appearance. For instance, Tuesday may be a yellow square with grey borders; the number 5 may be greenish-blue surrounded by a gray border; the sounds of the piano may appear as multicolored ribbons with silvery edges against a deep purple background, etc. It is often reported that the colors cannot be compared to the colors as they are seen with the eye when looking at painted or printed color samples. As a product of the mind, they may share their "unreal" appearance with colors such as those that may be experienced in dreams or in psychedelic states of mind.

In a conversation with Claude Samuel in 1967, the French composer Olivier Messiaen, comparing the Swiss artist Charles Blanc-Gatti's synesthesia with that of his own, employed the term synopsia to describe their respective synesthetic conditions. He probably derived the term from Blanc-Gatti himself: "that strange disease which Blanc-Gatti... called 'synopsia'." Messiaen characterized Blanc-Gatti's colored-hearing synesthesia as physiological and his own as more inward. In Messiaen's view, Blanc-Gatti possessed "a synaesthesia in its most commonly occurring form: a spontaneous association of the senses of seeing and hearing." In other words, the painter actually saw colors and shapes when he heard music.¹ Conversely, Messiaen described his hearing of color as not involving what he saw in the physical world but what he saw inwardly: when reading or hearing a score, he visualized corresponding color phenomena.²

In 2005, Sean A. Day published a record of nearly forty distinctly different types of synesthesia from 738 cases, of which 529 (72%) were female and 209 (28%) were male. Of 733 cases, 371 (51%) had multiple synesthesia. The types of synesthesia found for the first

In the later conversations with Claude Samuel in 1986, "physiological synesthesia" (synesthésie physiologique), not synopsia, is used to describe Blanc-Gatti's colored hearing.

² See Samuel 1967, 15-17; and Samuel 2003, 40-1. For the quotations, see Rössler 1986, 43.

that strange disease which Blanc-Gatti... called 'synopsia.'

time in the 738 case reports are "smelling flavors" (taste > smells), "smelling temperature flux" (temperatures > smells), "tasting temperature flux" (temperatures > tastes), and "feeling temperature flux" (temperatures > touch) (see table I). All types recorded in the study fall under the category of strong synesthesia, which is "characterized by a vivid image in one sensory modality in response to stimulation in another one." Weak synesthesia, generally understood as the synesthetic metaphors in daily language and poetry, and defined by Martino and Marks as "cross-sensory correspondences expressed through language, perceptual similarity, and perceptual interactions during information processing" (Martino and Marks 2001), will be discussed at length below.

In addition to the studies made by scientists in their laboratories, synesthetes increasingly publish their own reports on the internet of their strong synesthetic experiences and discuss them with their fellow synesthetes. Many of these accounts may be found on internet forums and especially on the specialized website Synesthetes Speak for Themselves.³ Although synesthetes share many phenomenal experiences, it is quite impressive to learn how each individual experiences synesthesia in his or her very own way. To quote a few testimonies:

It is a black background with dim fading lights, and with every different guitar chord that is struck, a curved colorful line just shoots up my mind, all different colors. Like fireworks! (Carmen)

I've seen music and sounds for as long as I can remember. Musical instruments all have unique images. A typical image of an instrument playing a melody is a band of color moving to the right, bending up and down with the notes. (Jerry)

I perceive each tone for itself, for each additional instrument, and they kind of pile up. Every melody is a kind of immaterial "being" (I do not see it in its shape, howeverfeel would be a more appropriate word, but even this one is not really correct) and that moves in the rhythm—rolling about softly or hard and moving quickly etc. It goes without saying that they have some consistency and color. Some tones cause very clear sensations on the skin, especially on the arms. Music is a place. (Christine)

When I was a child, I already argued with my sister because she obviously had the wrong colors for her letters and numbers. My A was blue and hers was red. We never would have thought that others did not see everything in color. But at some time we started to wonder—our brothers had no colors—typical for boys. With this statement the whole matter was settled for us. (Gunthild)

Very often, though not always, when I read out numbers (e.g. telephone numbers) or do cross word puzzles, I feel an oval, soft object like it is filled with jelly, which I think might be a balloon, not totally filled with air. At the attempt to touch this object with both of my hands, the sensation disappears at once. (Siegfried)

It was fascinating to read about synesthesia. I thought I was alone in the universe with my weird associations. I think I have pretty strong color-sound synesthesia; I find that it can be a good mnemonic device but also a real pain sometimes. For instance: Grand

GRAPHEMES > COLORS	= 517/778	= 66.5%
CYCLIC TIME UNITS > COLORS	= 177/778	= 22.8%
MUSICAL SOUNDS > COLORS	= 144/778	= 18.5%
GENERAL SOUNDS > COLORS	= 113/778	= 14.5%
PHONEMES > COLORS	= 77/778	= 9.9%
MUSICAL NOTES > COLORS	= 75/778	= 9.6%
SMELLS > COLORS	= 53/778	= 6.8%
TASTES > COLORS	= 51/778	= 6.6%
PAIN > COLORS	= 45/778	= 5.8%
PERSONALITIES > COLORS	= 43/778	= 5.5%
TOUCH > COLORS	= 31/778	= 4.0%
TEMPERATURES > COLORS	= 19/778	= 2.4%
ORGASM > COLORS	= 8/778	= 1.0%
EMOTIONS > COLORS	= 8/778	= 1.0%
KINETICS > SOUNDS	= 3/778	= 0.4%
MUSICAL NOTES > TASTES	= 1/778	= 0.1%
PERSONALITIES > SMELLS	= 3/778	= 0.4%
PERSONALITIES > TOUCH	= 1/778	= 0.1%
SMELLS > SOUNDS	= 4/778	= 0.5%
SMELLS > TASTES	= 1/778	= 0.1%
SMELLS > TEMPERATURES	= 1/778	= 0.1%
SMELLS > TOUCH	= 5/778	= 0.6%
SOUNDS > KINETICS	= 4/778	= 0.5%
SOUNDS > SMELLS	= 14/778	= 1.8%
SOUND > TASTES	= 48/778	= 6.2%
SOUND > TEMPERATURES	= 4/778	= 0.5%
SOUND > TOUCH	= 31/778	= 4.0%
TASTES > SOUNDS	= 1/778	= 0.1%
TASTES > TEMPERATURES	= 1/778	= 0.1%
TASTES > TOUCH	= 4/778	= 0.5%
TEMPERATURES > SOUNDS	= 1/778	= 0.1%
TOUCH > SMELL	= 2/778	= 0.3%
TOUCH > SOUNDS	= 3/778	= 0.4%
TOUCH > TASTES	= 5/778	= 0.6%
TOUCH > TEMPERATURES	= 1/778	= 0.1%
VISION > SMELLS	= 8/778	= 1.0%
VISION > SOUNDS	= 12/778	= 1.5%
VISION > TASTES	= 16/778	= 2.1%
VISION > TEMPERATURES	= 2/778	= 0.3%
VISION > TOUCH	= 8/778	= 1.0%

Table I. TYPES OF SYNESTHESIA ACCORDING TO SEAN A. DAY (2005)

Central is a very similar color to the number 34 (an orangish ochre), and Penn Station is a very similar color to the number 42 (a dark blue). But in New York, Grand Central station is on 42nd Street and Penn Station is on 34th. I've gotten mixed up and gone to the other address at least three times. (Anon.)

To get a full picture of how synesthesia plays a role in the childhood and adult years of a synesthete, it is worth reading Patricia Duffy's book *Blue Cats and Chartreuse Kittens* (2001). The book is not only rich in detail about synesthesia and the life of a synesthete, but it also describes Duffy's engagement in the American Synesthesia Association (ASA), which she founded together with the synesthetic artist Carol Steen in 1999.

The ASA was inspired by the International Synesthesia Association (ISA), founded in the UK in 1995 by the researchers Simon Baron-Cohen and John Harrisson at Cambridge University. Both associations have held regular meetings in which synesthetes and scientists meet and mix with equal status, among them the synesthetes Greta Berman, Carol Steen, Sarah Piekur, and Patricia Duffy, the scientists Lawrence Marks, Eric Odgaard, Noam Sagiv, Peter Grosschenbacher, Gail Martino, Vilayanur Ramachandran, and the film and video artists Sheri Wills and Carrie Shultz.

One conference attendee remarked that she had never in her life seen so many individualistic people gathered in one place. It could be that synesthetes who have chosen to explore their offbeat perceptions and researchers who have chosen to buck convention by making this traditionally marginal topic their main focus of study are of a particularly individualistic turn of mind. Duffy herself raised the question of whether this kind of meeting of scientists and the subjects they study, may become a model for other study-of-humanbehavior conferences.

Whether this will be the case or not, it is nevertheless remarkable that these examples have already resulted in more similar initiatives in many countries. Permanent discussions among synesthetes and researchers can be found on the many websites on the subject, which are quite easy to find. Their number is so rapidly expanding that it may be wise to first refer to the site of the Belgian Synesthesia Association, maintained by the Belgian artist Hugo Heyrman that categorizes the different subjects of interest with great precision and taste.

DEFINITION OF SYNESTHESIA

WHEN IT COMES to the question of how to define synesthesia, we have to find a common denominator for four phenomenologically different types of synesthesia: a) constitutional synesthesia; b) cross-modal synesthesia; c) verbal synesthesia; and d) creative synesthesia.

This is an attempt to do so:

SYNESTHESIA IS THE PERCEPTUAL-COGNITIVE CONDITION IN WHICH INTER-MODAL RELATIONS ARE INVOLUNTARILY EXPERIENCED AS A CHARACTERISTIC ASPECT OF PERCEPTION OR AS A VOLUNTARY EXPRESSION OF THE UNITY OF THE SENSES IN THE FORM OF A CREATIVE ACT USING LANGUAGE, AUDIOVIS-UAL IMAGERY OR ANY OTHER COMBINATION OF MEDIA.

Constitutional and cross-modal synesthesia are forms of involuntary ("strong") synesthesia. Verbal and creative synesthesia are forms of voluntary ("weak") synesthesia. Despite their phenomenological differences, the different types seem to be linked by underlying structural correspondences and functional interactions. In all forms of synesthesia correlations and interactions can be observed between different perceptual dimensions, such as between auditory pitch and loudness, with visual brightness, lightness, and sharpnessroundedness of visual form.

⁴ http://www.doctorhugo.org/synaesthesia/

HISTORICAL INTEREST IN SYNESTHESIA

THE FIRST SCIENTIFIC DESCRIPTIONS of synesthetic phenomena date from around 1700. Since that time, there have been disputes whether these experiences have added to a better understanding of the world or whether they should be considered idiosyncratic freak occurences. Historically, the first period of scientific interest in synesthesia was marked by the influence of the newly founded discipline of experimental psychology on the study of sensory phenomena. The need to develop new methods to study human consciousness and human behavior was felt first by Wilhelm Wundt (1874), Gustav Fechner (1876), and Francis Galton (1883), who introduced the notions of objective observation, the use of statistical analysis, and the method of laboratory experimentation. Ever since Marks's psychophysical experiments (see below) on cross-modal perception and Cytowic's neurological studies of the brain functioning of synesthetes, the subject has become popular among a younger generation of scientists, who recently developed reliable tests to identify people who claim to be synesthetes by using modern PET-scan technology to study the brain areas involved in synesthetic processes.

However, despite this explosion of new research on constitutional, strong synesthesia, there has still been much less attention to the structural and functional aspects of verbal expressions of weak synesthesia or forms of mediated synesthesia as produced by artists. As yet, there is a complete lack of studies in which the questions concerning cross-modal perception are extrapolated to questions regarding what possibilities synesthetic media offer to develop audiovisual literacy. A few years ago, new research programs started in the fields of visualization and sonification technology that study mediated perception for the advancement of medical diagnostic technology. It is not hard to foresee that these studies will also produce questions and answers about how these two technologies may be connected in an optimal way to use them for diagnostic purposes, and how this knowledge will be used to further develop the technology of synesthetic media and the challenge of creating artistic forms of tele-synesthesia (Heyrman 1996). To give an idea of how synesthetic terminology and related issues have developed, table 2 shows a timeline of the emergence of synesthetic terminology in science since 1694.

Sounds may be experienced as being flat, cool, colorful, dark, sharp, rounded, or rough. Colors may be experienced as being warm, cold, soft, or loud. The light of the moon or the sun may be described as whispering, murmuring, or roaring. And smells may be bright or dark, light, heavy, or sharp. For musicians and artists, sensory experiences are not defined by the borders of the sense modalities. Often their vitality and "flavor" result from interactions between the inter- or supermodal dimensions triggered in perception and the imagination. When we read the expression "the whispering moonlight" in the Indian epos *Mahabharata* or, in Homer's *Odyssey*, "the honey-like voices of the Sirens," we immediately understand what kind of feelings and action tendencies the authors of these words want to evoke in us. In science, however, these cross-modal metaphors have been suspect for a long time, since they did not fit in one of the basic notions of empiricism as published by John Locke in 1694 in his *Essay concerning Human Understanding* (1979).

YEAR	SCIENTIST	SYNESTHETIC EXPRESSIONS
1694	Locke	"The scarlet sound of a trumpet"
1812	Sachs	Auditio colorata
1848	Cornaz	Hyperchromatopsie
1864	Chabalier	Pseudochromesthésie
1873	Nüssbaumer	Objective sensation
1874	Wundt	Doppelempfindung
1876	Fechner	Farbenhören
1881	Bleuler & Lehmann	Helligkeitsgesetz
1882	Pedrono	Phonopsie
1883	Galton	Color associations and number forms
1885	Rochas	Neural irradiation theory
1892	Millet	Synesthésie
1893	Flournoy	Des Phénomènes de Synopsie
1894	Colman	Synaesthesia
1925	Hornbostel	Die Einheit der Sinne
1925-36	Anschütz	Color-Tone Congresses
1927	Argeländer	Synesthetic factor in perception
1929	Köhler	"Maluma" and "Takete"
1931	Zietz	Tones influence colored after-images
1934	Werner	Physiognomic perception
1934	Hartshorne	The central role of color in perception
1934-42	Karwoski et. al.	Synesthetic thinking
1957	Osgood	The measurement of meaning
1975-05	Marks	Cross-modal perception and metaphors
1979-05	Evers	Creative synesthesia
1989	Cytowic	The role of the lymbic system
1995	Paulescu et. al.	The role of the cortex
1995	Baron Cohen	International Synaesthesia Association
1996	Hevrman	Tele-Synesthesia
1997	Grosschenbacher	Constitutional synesthesia
2001	Duffie	How synesthetes color their worlds
2001	Harrison	The creation of a synesthetic dimension in art

Table 2. THE EMERGENCE OF SYNESTHETIC TERMINOLOGY SINCE 1694

LOCKE'S ESSAY AND AUDITION COLORÉE I.3.I

IN 1694, the British empirical philosopher John Locke published his *Essay Concerning Human Understanding*. In Book III, section 11, he wrote of a blind man who apprehended the color scarlet by comparing it to the sound of a trumpet. For Locke this synesthetic metaphor cannot communicate anything meaningful.

"For, to hope to produce an idea of light or color by a sound, however formed, is to expect that sounds should be visible, or colors audible; and to make the ears do the office of all the other senses. Which is all one as to say, that we might taste, smell, and see by the ears: a sort of philosophy worthy only of Sancho Panza, who had the faculty to see Dulcinea by hearsay. And therefore he that has not before received into his mind, by the proper inlet, the simple idea which any word stands for, can never come to know the signification of that word by any other words or sounds whatsoever, put together according to any rules of definition. The only way is, by applying to his senses the proper object; and so producing that idea in him, for which he has learned the name already. A studious blind man, who had mightily beat his head about visible objects, and made use of the explication of his books and friends, to understand those names of light and colors which often came in his way, bragged one day that he now understood what scarlet signified. Upon which, his friend demanded what scarlet was? The blind man answered, it was like the sound of a trumpet. Just such an understanding of the name of any other simple idea will he have, who hopes to get it only from a definition, or other words made use of to explain it." (Locke 1797, Book III, Ch. 4, section II)

This blind man was Professor Nicholas Saunderson (1682-1739), who held the Lucasian Chair (Newton's chair, more recently held by Stephen Hawking) at the Cambridge Mathematics Department from 1711 to 1739. Saunderson had been blind since a year after his birth and had been familiar with the sounds of music because he had been playing the flute during all of his lifetime.

For Locke, to describe the sound of a musical instrument in terms of sensory qualities belonging to another sensory domain could in no way add to the understanding of the sound. According to his philosophy, the senses ought to be viewed as separately operating modalities—hearing, seeing, smelling, tasting, and touching—each communicating sense-specific information that can only be understood by studying the characteristics of each separate sense organ. Locke's empirical philosophy had a tremendous influence on the development of science in the eighteenth and nineteenth century and on the leading paradigm of the "specificity of physical energies." It stressed the differences between the different kinds of sensory receptors, though completely dismissed the meaning of sensory blending in favor of a purely categorical knowledge based on a supposed autonomy of sensory specific qualities.

Despite Locke's philosophy, it has slowly but convincingly become evident in the last three hundred years that sensation, perception, and cognition are ruled by integrative crossmodal transformations playing important roles in processes of perception, feeling, understanding, and creative behavior. One of the problems of Locke's theory was that the notion of the total autonomy of the different sense organs—independent of the question of whether this is true autonomy or not—may be biased by the reductionist nature of the scientific method itself, which is basically interested in the reduction of complex phenomena to a small number of relatively isolated phenomena and simple variables. This may be one of the reasons why it took a relatively long time before this theory became seriously attacked. However, whatever reasons may have caused the long wait for a more complete theory on sensory functioning, nothing could have prevented the fact that in the course of the nineteenth century increasing amounts of evidence emerged for the existence, at least in the cases of synesthesia, of fixed and stable relations between the senses.

The first treatise in which a synesthete himself reported on his experiences was published by G.T.L. Sachs in 1812 in Erlangen, entitled *Historia naturalis duorum leucaethiopum auctoris ipsius et soriris eius* (The natural history of two albinos, the author himself and his sister). According to Kevin Dann, both siblings had

highly specific, invariable color sensations associated with vowels, consonants, musical notes, sounds of instruments, numbers, names of cities, days of the week, dates, periods of history, and the stages of human life and saw the colors any time whenever they heard, saw, or though of any of these sounds or concepts. (Dann 1998)

During the nineteenth century synesthesia used to be referred to as *audition colorée* (colored hearing), after the Latin term used by Sachs, *Auditio Colorata*. Henceforth, the subject was studied on a wide scale during the last decades of the nineteenth century.

As an introduction to the discussion of these scientific facts and findings, let's first consider the way scientists thought, and think, about the way the senses operate. In 1838, the German physiologist Johannes Müller led the foundation of the science of physiology with his *Handbuch der Physiologie des Menschen* (Handbook of Human Physiology) in which he states that the senses work on the basis of receptors that respond uniquely, or in some unique combination, to stimulation by different kinds of energies. This means that "the qualities of experience are determined by the receptors ... and that this 'coding' of information is conveyed all the way to the cerebral cortex." Müller also states that "perception is not the conduction to our consciousness of a quality or circumstance outside of our body, but the conduction to our consciousness of a quality or circumstance of our nerves which has been caused by an external event." (Multer 1838). Each nerve can only respond to stimuli in a specific way; therefore our knowledge of the world reflects the structure of our nervous system. In 1826, Müller also published *Über die phantastischen Gesichtserscheinungen* (On Visual Hallucination). Noticing that when he was falling asleep, he could sometimes see imaginary people and things, he tried to manipulate these figures in a series of rigorous self-experiments. His work showed that the visual system is an active and not a passive recorder of external events. Unfortunately, the coffee-drinking and sleep-deprivation that these experiments demanded led to his first mental collapse.

At the same time, synesthesia and the "correspondences" between the senses became a favorite subject of poets in Germany and France, such as E.T.A. Hoffmann, Charles Baudelaire, Théophile Gautier, Arthur Rimbaud, Edgar Allen Poe, Mary Shelley, and Oscar Wilde. They expressed their synesthetic experiences and imagery using synesthetic metaphors and themes, as in Baudelaire's poem "Les Correspondances" which expresses the "unity of nature," a favorite subject in the Romantic epoch.

All sense impressions were transposed sharply upward, be it by alcohol or drugs. Colors, sounds, and scents melted and glowed together in an orgy of synesthesia. That too had its lighter side; it is still amusing to recall the "coat in C sharp minor with the E major colored collar" that was Johannes Kreisler's everyday habit of mind. This fashion, too, had worldwide success and successors, from America (Poe) to England (Wilde) by way of France (Gautier, Rimbaud, and especially Baudelaire, whose own theory of sensory correspondence was avowedly related to the Paris production of Richard Wagner's opera *Tannhäuser*). It is only a step from the Venusberg to Bliss (*A Colour Symphony*) and Schoenberg (*Die Glückliche Hand*, where color has a notated part to play, see III.22).

Müller's type of personal engagement with the subject matter became less prominent with the introduction of the new scientific method of standardized questionnaires. From these, physicians concluded that colored hearing was not related to any kind of physical or psychological disorder. The underlying mechanism, however, could not be explained using the accepted scientific view of those days. This view was ruled by the notion of the specificity of the physical energies underlying the differentiation of the senses; the eye only being susceptible to light waves, the ear being only sensitive to the motion of the molecules of the air, smell susceptible to the chemical composition of the molecules, etc. Most of the case studies in those days showed that synesthetic experiences had an idiosyncratic component, but that they also expressed a more general tendency. Each person seemed to have his personal synesthetic "code"; hardly any commonality among synesthetes could be found concerning the relation between the color tones and the vowels, the numbers, etc.

There was, however, one exception: a common rule that seemed to hold especially true for people who experienced colors related to hearing the sounds of vowels. In 1881, Bleuler and Lehmann stated that, although they had not found general relations between vowels and the hue of the colors, they had noticed that high-pitched vowels aroused lighter colors than low-pitched vowel sounds did. From this, they concluded that the relation between the senses might be ruled by a *Helligkeitsgesetz* (law of brightness).

Most of this early scientific research investigated conditions such as *hyperchromatopsie* (Perroud 1863), *Doppelempfindung* (double sensation; Wundt 1874), *synopsie* (Flournoy 1893), and *chromaesthesia* (Calkins 1893). Noticing the severely disorganized case studies

written by medical doctors on *audition colorée*, Wundt, Fechner, and Galton proposed to use the method of the classified questionnaire to get a better idea of the amount of synesthetes and of the varieties of the condition. Their call for a more scientific approach was answered during the Congrès International de Psychologie Physiologique in 1890, where the conclusion was reached that the term *audition colorée* was too restricted to cover all reported intersensory connections.

During the congress a committee was installed to study the question of terminology, and some time later it was generally agreed that 'synopsia' would be a better overall term than *audition colorée* (Flournoy 1893), since very often, although not always, some form of visual imagery was involved in synesthetic experiences, whatever other sensory organ served as the primary source of the sensation. Most researchers ignored this conclusion and continued to write about colored hearing using their own idiosyncratic terminology. However, after Calkins's publication in the American Journal of Psychology in 1895, entitled *Synaesthesia*, this word started to replace all the other terms, and it was generally accepted by the scientific world by the end of the 1920s.

Despite the growing knowledge about the individuals gifted with this exceptionally enriched form of perception—or should we say: vivid form of imagination?—, hardly any progress had been made to explain these synesthetic phenomena theoretically. Although in 1885 Rochas had proposed his *neural irradiation* theory, there were almost no advances in solving questions such as what parts of the brain were involved in creating synesthetic connections.

HORNBOSTEL: THE UNITY OF THE SENSES I.3.2

IN 1925 LOCKE'S PARADIGM was contested for the first time by the ethnomusicologist Erich M. von Hornbostel in his essay *Die Einheit der Sinne* (The Unity of the Senses). Contrary to Locke's reasoning, Hornbostel had observed that, in daily life as well as in the controlled conditions of the scientific laboratory, the understanding of sensory phenomena is partly, but substantially, based on intermodal qualities that are common to many of the different sense modalities. In Hornbostel's view a musical experience may be generated by visual movement, whereas auditory and olfactory sense impressions may be meaningfully expressed by the shared visual dimension of "brightness" or "lightness."

Hornbostel, who created the first scientific classification of musical instruments together with Curt Sachs (1914), published his perceptual theory in the German music journal Melos. A few years later it was translated into English and published in *Psyche* in 1927. Hornbostel's essay starts with the rhetorical question of whether there could be music for the deaf. "A dancer had a dance, 'The Lily.' Her humanity vanished in the high waving chalice of her veil, a deep violet faded away in spirals, a dazzling white rose up expanding indefinitely. The noises of the suburban music-hall could not spoil this pure music" (Hornbostel 1925).

After this poetic *cri de coeur* Hornbostel asked himself: "Figurative speech? Transferred meaning? I do not pretend to have seen tones or heard colors. I am not deaf, and am fairly musical; I know what is really meant by 'music,' and was thinking of this very meaning." (Hornbostel 1925) These questions came to mind when he was attending a popular imitation of a colored light dance in a local variety theater. According to his description the questions were raised in him by one of the imitators of Loïe Fuller, an American actress who was the first artist experimenting with the effects of electric light on stage. Fuller's *Serpentine Dance* (fig. 6), based on the light effects and movements of a huge, semi-transparent silk robe, premiered in 1891 in New York City (see II.3.1). Unfortunately, we do not know where Hornbostel saw one of these imitators, but because of the way he described what he had seen, we can hardly doubt that it was one of the many anonymous imitators of Loïe Fuller's "pre-cinematic" performance (Brannigan 2003).

For Hornbostel it was less important who had caused the reason for his inquiry than the questions themselves. To answer these he postulated a unifying aspect of perception "a sensuous which is not limited to one single sense" (Hornbostel 1925) for which he argued that "it matters little through which sense I realize that in the dark I have blundered into a pigsty." He continued by giving some examples of the way in which different aspects of this



Fig. 6. Loïe Fuller's Serpentine Dance.

I SYNESTHETICS IN SCIENCE

"sensuous" are described in language. For example, in French the verb *sentir*, means to smell, to touch, and to feel alltogether, and in German the word *hell* (bright) was originally used to denote the brightness of a sound, but this meaning became transferred to the area of vision. Since then it has also been used to express the brightness of a light.

For Germans this use of "bright" now seems "transferred," so natural was its carrying over to light. Nevertheless, everybody knows what "brightness" of sound means – not something corresponding to light, but the same thing (Hornbostel 1925).

It is not only in these words that the unity of the senses is expressed but also in the sound of speech itself:

The sound (of speech) paints—and paints more than mere sound. The sense of hollow sounds (like m, mb) is "dull, dark, bitter, blunt, heavy, dense, thick, big, full, round, swelling, deep, tired," and much more, but all this in one. And now think of the opposites, "bright, sharp, light, blank," and so forth—how strange it would be for these to say that they were "umb" together! (Hornbostel 1925)

For Hornbostel the most outstanding unifying perceptual attribute is brightness. To illustrate this point, he asks readers to participate in a thought-experiment in which they are asked to match the pitch of a tone with the brightness of a piece of grey paper. In Hornbostel's theory, brightness is the area where eye and ear meet. He rejects color-tone correspondences such as those expressed by Scriabin, who accompanied his *Prometheus* by colors (see II.2.2).

Strange! It is just where eye and ear differ, that their connection has been sought. For color, like pitch, changes with the wavelength: a fact which misled the physicists. (In reality there is a difference at this very point: brightness in hearing depends on frequency, while brightness in sight depends on amplitude.) (ibid.)

Regarding "colors... ascribed to vowels" (in the article he never uses the word synesthesia) he makes a similar observation. "I saw mother and daughter arguing furiously: 'E is red!' 'No, yellow!' But to both it seemed bright, clear, and sharp" (ibid.). Brightness is the most important intersensory dimension, together with a number of universal sensory dimensions that correspond to the poles of this central one: dark-light, rough-smooth, soft-hard, dull-sharp, heavy-light, warm-cold.

Messages communicated by language can be either taken in by the ear or by the eye. Or, when one is blind and had the luck to learn the Braille script, one may use the sense of touch to read a text. How easy is it to switch between listening and reading? When it comes to the perception of movement we enter another characteristic of the super-sensuous that is not limited to one single sense. Hornbostel:

There are super-sensuous sense-perceptions. Movement can be seen, heard, or touched. It is not necessary, however—as every cinema-goer knows—that it should actually take place. An "apparent" movement, indistinguishable from a real movement springs forth from two pictures, sounds, or skin touches following one another at the right spatial





Fig. 7. Devil dance mask, Galle, Sri Lanka, 1929.



Fig. 8. Tibetan thangka painting of the Mandala of Vajravarahi, 14th cent.

Fig. 9. According to the Chinese Sung tradition the audiovisual law (Ho Tu, or "Yellow River Map") was delivered to the world as a diagram, brought up dripping from the river, in the mouth of a dragon-horse. (From the Kangxi encyclopedia, cited in Eisenstein 1970)



Μ	IUSICAL DIMENSION	VISUAL DIMENSION	% CONSISTENC
tr	eble-bass	light-dark	.98
		up-down	.98
		small-large	.97
		thin-thick	.94
		distinct-blurred	.76
		angular-rounded	.74
fa	st-slow	light-dark	.97
		thin-thick	.96
		moving-stationary	.94
		small-large	.85
		distinct-blurred	.64
m	ajor-minor	distinct-blurred	.96
		light-dark	.96
		moving-stationary	.94
		thin-thick	.82
lo	oud-soft	large-small	.92
		near-far	.92
		angular-rounded	.83
		thick-thin	.72
		dark-light	.81
m	elody-harmony	light-dark	.87
		thin-thick	.83
		near-far	.82
		distinct-blurred	.82
		figure-background	.80
		moving-stationary	.78
		angular-rounded	.78
		small-large	.75

Table 3. RELATIONSHIPS COMMONLY OBSERVED IN THE PHOTISMS OF PHOTISTIC VISUALIZERS WITH THE CORRESPONDING CONSISTENCIES OF THE GROUP POLARITY TEST (KARWOSKI, ODBERT, AND OSGOOD 1942) and temporal intervals. Now, under certain circumstances, there are apparent movements, communicated through the eye, the ear, or the sense of touch, which, however possess none of the qualities of the seen, heard, or touched—indeed, nothing of any sensuous sphere. (ibid.)

With "movement" we describe terms such as "it moves us," "it touches us," "it carries us away," "movements of feeling," and the "course of thinking." Compare this with the "movement of the air" or the "course of a race." As with brightness, these expressions are no metaphors, but rather they express what they are: movements! For all these reasons, and a few more, Hornbostel concludes:

To sum up: what is essential in the sensuous-perceptible is not that which separates the senses from one another, but that which unites them; unites them among themselves; unites them with the entire (even with the non-sensuous) experience in ourselves; and with all the external world that there is to be experienced. (ibid.)

After three hundred years of scientific inquiry it seems inevitable to come to the conclusion that Hornbostel's paradigm of *The Unity of the Senses* is needed to comprehend the way we experience the world. Certainly, this does not mean that modality-specific knowledge cannot contribute to an understanding of the world, but it does say that to understand human experience we have to admit that sensory impressions are mixing and mingling in meaningful ways.

Hornbostel assumes that this intersensory unity must have been original: both in the original functioning of perception, which in the course of development became differentiated, as well as in the original art forms such as the mask dance (see fig7), which later unfolded into the variety of the several arts.

In the mask-dance, music and painting, sculpture and poetry, are not yet separated from one another; colors and forms are still drawn into the sounding whirl of human action and its cosmic meaning. (ibid.)

At this point Hornbostel is supported by one of his fellow ethnomusicologists, Marius Schneider, who studied the oldest forms of music in different cultures. According to Schneider these first mask dances were cultivated imitative responses to the sounds of animals, who were not only regarded as life-threatening beings or as potential food, but who were also worshipped as the bringers of light (Schneider 1979). Schneider coined the term "soundlight" to describe the last period of the night during which the birds start to raise their voices, shortly before the early daylight breaks the darkness of the night. While listening to the sounds during this "blue hour" (Lowry 1947), early men held the sounds produced by the animals responsible for the creation of the light of the new day. Additionally, we may easily imagine that this primitive sense of unity was not only expressed in the mask-dance, but also in the so-called cosmograms, the prehistoric landmarks in the form of stone configurations that were placed according to the movements of the sun, the planets, and the stars, in calendars, sand-paintings, mandalas, philosophical correspondence tables, and scientific diagrams and synoptic tables that combine the directions of the wind, musical sounds, colors, elements, seasons, emotions, temperaments, etc. in a unifying system of relations. According to the film director Sergei Eisenstein this way of thinking is a widely spread cross-cultural phenomenon, examples of which may be found on all continents. He urges film makers to study this phenomenon carefully to develop a feeling for creating "the film sense," the potential possibilities of the synchronization of image and sound, and "vertical," audiovisual montage (Eisenstein 1970; see fig. 9).

Hornbostel's call for a holistic reorientation of the study of the senses was enthusiastically embraced by a number of researchers who started to carry out experiments on how the senses were related. Scholars like Georg Anschütz (1925, 1926). Annelies Argelander (1927) and Heinz Werner (1934, 1940) collected data regarding how the connectedness of the senses were experienced by synesthetes, children, primitive people, and artists. This resulted in three conferences in Hamburg, the *Farbe-Ton-Kongresse* (color-tone congresses), at which the implications of this way of perceiving and thinking was discussed by scientists and demonstrated by artists, among whom we find Ludwig Hirschfeld-Mack, László Moholy-Nagy, and Oskar Fischinger (Anschütz, 1927, 1931, 1936).

In the same period in America, a research program was started based on studies by Riggs and Karwoski (1934), Karwoski and Odbert (1938), Odbert, Karwoski, and Eckerson (1942), and Karwoski, Odbert, and Osgood (1942), which included results supporting Hornbostel's view. Not only visual brightness but also the size and the shape of the "photisms," the mental images experienced by synesthetes, seem to vary according to the pitches of musical sounds. High and quickly played notes evoke bright, small, and angular photisms, whereas low or slowly played tone sequences induce darker, larger, and more rounded visual imagery (Karwoski and Odbert, 1938). These researchers also concluded that non-synesthetic individuals would probably match the same auditory-visual qualities when asked to indicate visual responses to musical phrases. According to them, there is not much difference in how synesthetes and non-synesthetes align these correspondences. This was also concluded by Karwoski, Odbert, and Osgood (1942), who asked non-synesthetic subjects to judge musical fragments on a verbal bipolarity test, a simple forerunner of the semantic differential technique that was later developed by Osgood, Suci, and Tannenbaum (1957) to measure the meaning of words. The verbal judgments of the musical fragments are completely in line with the reports of synesthetes, showing strong and consistent correlations between the visual descriptions and the musical dimensions of the judged musical fragments (see table 3).

Despite this, Hornbostel's theory hardly influenced the dominant scientific view, which kept on studying the senses as relatively autonomous separate mechanisms. Nonetheless, as early as in 1945, the French philosopher Maurice Merleau-Ponty wrote in his *Phénoménologie de la Perception (Phenomenology of Perception)*:

Synesthetic perception is the rule, and we are unaware of it only because scientific knowledge shifts the centre of gravity of experience, so that we have unlearned how to see, hear, and generally speaking, feel, in order to deduce, from our bodily organization and the world as the physicist conceives it, what we are to see, hear and feel. (Merleau-Ponty 2002)

MARKS: SYNESTHETIC DIMENSIONS AND CROSS-MODAL INTERACTIONS

1.3.3

DESPITE THE PROMISING RESULTS of the experimental forms of synesthetic thinking by the people around Karwoski, research on synesthesia abruptly stopped after WWII. For reasons that still have to be clarified, the American Psychological Association banned the term *synesthesia* from the index of the Psychological Abstracts in 1946.⁵ Nevertheless, starting with the experiments studying "cross-modal perception," as he called his interest in synesthetic phenomena, the psycho-physicist Lawrence E. Marks collected new experimental evidence in the late 1960s and early 1970s that turned out to support Hornbostel's theory.

Marks's matching experiments show that there are striking parallels between the ways synesthetes experience relations between the sounds of speech and music and the colored imagery that is evoked by the auditory sense, and the ways non-synesthetes relate sounds and lights when they are asked to match them within the setting of laboratory experiments (Marks 1974). Despite the highly idiosyncratic character of the experiences of the synesthetes, Marks's analysis convincingly shows that synesthesia does not consist of random associations between isolated phenomena or qualities in two sensory domains, but rather expresses correlated dimensions or attributes (Marks 1975).

On what grounds does Marks conclude that these correlations are fundamental to the normal perceptual and cognitive systems of humans? To Marks all theories of synesthesia are theories of mediation.

Sensations or sensory dimensions linked to one another must be linked by something. We may call that link a learned association – a psychological entity, perhaps with overtones of neural basis. We may call the link a physiological response – a neural, muscular, or other physiological entity of actual or mythological state. Or, by response we may mean some tidbit of behavior, again either actual and measurable or covert and mythical. Finally, we may call the link cognitive, by which we mean none of the above, or all of them. To say the link is cognitive, empty though that statement may seem, is foremost to propose that the plane of explanation should be psychological. Moreover, to say that the link is cognitive implies that synesthesia is involved in thought, in knowledge, in the way the world is represented in consciousness. (Marks 1975)

⁵ A notable exception is Charles Osgood's work who managed to continue the study of synesthetic metaphors in his "semantic differential studies," which he developed in order to measure connotative aspects of meaning in language.



Fig. 10. Relation of brightness of colors of photisms to the pitch of vowels as experienced by synesthetes as reported in thirty-eight questionnaires and case studies on colored hearing synesthesia. (Marks 1975)



Fig. 11. Matching of auditory pitch and visual brightness by non-synesthetic subjects. (Marks 1974)

In 1978, Marks collected these first findings, which were based on his investigation of commonalities in "sensory synesthesia" ("strong" synesthesia) and "verbal synesthesia" ("weak" synesthesia), in his publication *The Unity of The Senses: Interrelations Among The Modalities*.

In an impressive psycho-physical research program, Marks continued to study the interrelations among the modalities, showing structural cross-modal equivalences as well as functional cross-modal interactions of dimensions of sensory experience. The structural equivalence was studied in a series of matching experiments in which non-synesthetic subjects were asked to set the frequency of a simple tone to different gray surfaces. The results showed that the subjects generally agreed that increasing auditory pitch accompanies increasing surface brightness (see fig. 10). Similar results were found when subjects were asked to set the loudness level of a tone to match it to different grey values (Marks 1974). However, not only when sensory stimuli are matched this equivalence appears, but also when verbal synesthetic metaphors are judged by sensory means. By setting the brightness level of a light and the loudness of a tone, a similar equivalence can be shown (Marks 1982a).

A confirmation of Bleuler and Lehmann's (1881) law of brightness was found in dozens of questionnaires and reports of individual case studies published between 1876 and 1952, which described a great variety of synesthetic experiences. In almost forty studies vowel-color synesthesia was reported by over four hundred synesthetes. In 1975, Marks analyzed these data by calculating the probability of synesthetic color responses to vowel sounds. The results showed that high-sounding vowels like /e/ and /i/ induced brighter colored photisms than did the lower pitched vowels /u/, /o/, and /a/, which usually evoked dark colors. Ordered from low to high pitch, the results showed that /u/ was usually considered black, brown, or blue, that /o/ tended to be perceived as black or red, that /a/ aroused the colors red or blue, and that /e/ and /i/ tended to be yellow or white. When separately looking at the non-chromatic colors black, gray, and white evoked by the vowels, Marks (1975) could demonstrate an almost perfect correlation between the pitch of the vowels (ordered according to the rising pitch of the vowel's second formant) and the increasing brightness of the invoked achromatic colors (see fig. II).

Marks continued by investigating weak synesthesia. Synesthetic metaphors like "cool jazz," "loud colors," "bitter cold," etc. are frequently used in the English and German Romantic poetry and in the French poetry of the middle of the nineteenth century. The writer and composer E.T.A. Hoffmann in particular often made use of synesthetic metaphors that spring from musical experience. A famous description by him in the following passage:

It isn't so much in the dream, but especially during the drowsy state that precedes sleep – and after I have listened long to music – that I experience an agreement among colors, sounds and odors. It seems as though all of them have sprung form the same mysterious ray of light and then have to unite in a miraculous concert. The fragrance of dark red carnations, above all else, has a magical effect on me. I automatically sink into deep musings, after which I notice as if from a distance, the crescending and fading low sound of the basset horn.



Fig. 12. Average judgements of pitch versus corresponding judgements of brightness (filled circles) or lightness (open circles) of auditorily presented color names. (Marks 1982b)

Fig. 13. Increase and decrease of number of mistakes depending on synesthetic "correct" combination of pitch and visual shapes in a discrimination task. (Marks 1987)



FREQUENCY (Hz)

Fig.14. Interaction of the pitch of sounds with angularity of visual

shapes in a discrimination task. (Marks 1987)



This passage is quoted by Baudelaire in his essay De la Couleur (On Color) from 1846 (1889) and comes back in adapted form in the poem "Les Correspondances" (Correspondences) from the collection Les Fleurs du Mal (Flowers of Evil) from 1857, in which he describes the conversation between the senses:

Like long-held echoes, blending somewhere else into one deep and shadowy unison as limitless as darkness and as day, the sounds, the scents, the colors correspond. (Baudelaire 1982)

Perceiving what Baudelaire calls the universal analogy is, according to him, a characteristic of the highest form of intelligence because only imagination is capable of fathoming the correspondences. Baudelaire was a member of Le Club des Haschischins, even though he insisted that the drug only intensified those correspondences that already exist in the normal state. For Baudelaire it went without saying that these analogies were based on a natural given: sounds conceal themselves in colors, and colors contain music. This is nothing but natural, and the brain of every poet, in its normal and healthy state, understands these analogies with ease. Still, it was the effect of hashish that intensified the experienced unity, as another member of the club, Théophile Gautier, admitted when he described how listening to Weber's music affected him in the drugged state:

The notes quivered with such power, that they entered my breast like luminous arrows; the air being played seemed to come out of my very being; my fingers rambled over a nonexistent keyboard; the sounds gushed out blue and red, in electric sparks; Weber's soul had been reincarnated in me. (Gautier 1846)

Paradoxically, the Romantic, transcendental impulse to expand consciousness was bound to find its expression in language, which is ultimately rooted in sensory experience. A way to escape from this dilemma was using synesthetic metaphor by creating inventive combinations of the different sense impressions. Despite their intended critical reaction to the dominance of the senses as it had been heralded by rational empiricism, the Romanticists had chosen to play a game with the senses by combining them and mixing them up in all kinds of unusual configurations in the hope of describing sensory experiences with an uncommon, transcendental flavor.

Since Marks noted that most of the synesthetic metaphors used by these poets to express cross-modal equivalences resembled the experiences of synesthetes as well as the responses of non-synesthetes in cross-modal experiments, he decided to subject a number of synesthetic metaphors to experimental investigation in order to find out how "normal" subjects interpret the sensory information depicted by synesthetic metaphors in poetry. For this experiment he selected ten lines of Romantic poetry (see table 4) and asked the subjects to adjust the brightness of a white light and the loudness of a tone (1000 Hz) to express the level of intensity of the synesthetic phrase. As Marks expected, a strong association was found between the brightness settings and the loudness settings, implying a perceptual equivalence in terms of intensity (see fig. 15).

- A. the murmur of the gray twilight (Edgar Allen Poe)
- B. the sound of coming darkness (Edgar Allen Poe)
- C. the quiet-colored end of evening (Robert Browning)
- D. sunset hovers like the sound of golden horns (Edwin Arlington Robinson)
- E. the world lay luminous; every petal and cobweb trembled music (Conrad Aiken)
- F. a soft yet glowing light, like lulled music (Shelley)
- G. music, sister of sunrise, smiled as dawn (Swinburne)
- H. music suddenly opened like a luminous book (Conrad Aiken)
- I. the notes entered my breast like luminous arrows (Théophile Gautier)
- J. music bright as the soul of light (Swinburne)
- K. the silver needle note of a fife (Joseph Auslander)
- L. thy voice is loud as, when night is bare, the moon rains out her beams (Shelley)
- M. bright sound of battle, loud light of thunder (Swinburne)
- N. sunlight above roars like a vast sea (Conrad Aiken)
- O. the dawn comes up like thunder (Rudyard Kipling)

Table 4. SYNESTHETIC SOUND-LIGHT METAPHORS FROM POETRY EXAMINED BY MARKS (1982a)*



SOUND - DECIBELS SPL

Fig. 15. Average settings of luminance (brightness) and sound pressure (loudness) to each of 15 sound-light metaphors from poetry as listed in Table 4. The linear relationship expresses a synesthetic correspondence between brightness and loudness. (Marks 1982a)

Although brightness and loudness both add to intensity, a further study that considered a wider range of synesthetic metaphors showed that pitch and brightness are even more closely connected and that this relation applies more generally to different sorts of visual brightnesses, including reflecting surface lightness. The ways in which people evaluate synesthetic metaphors emulate the characteristics of synesthesia in perception and synesthesia in language. Both may emanate from the same source: from a phenomenological similarity in the make up of sensory experiences of different modalities (Marks 1982b).

This, however, does not imply that all synesthetic metaphors are always, and at all ages, evenly understood. Many of these metaphors are comprehended from a young age, although there are two notable exceptions. For young children up to eleven years old, the relation between pitch and size is not evident; additionally, the expression "warm and cold colors" is not understood by everyone until after the age of eighteen (Marks, Hammeal, and Bornstein 1987). This means that, although there may be underlying, equivalent structures in the make-up of the sense mechanisms, learning factors also play a role in giving meaning to cross-modal correspondences. It may take a while before children have experienced in their environment that large objects create lower sounds than small ones do, and the same may hold true for experiencing the warmth of colors. One may therefore conclude that the cross-modal mechanisms allow for synesthetic perception and thought, but that these mechanisms do not operate in a fully automatic way from the beginning, and that they may be shaped according to age and personality characteristics.

In general, the understanding of synesthetic metaphor in language grows with age while experiencing constitutional, sensory synesthesia has a tendency to weaken with age. Cognitive factors evidently play a role in the way the cross-modal mechanisms come to life in different phenomenological forms, varying from strong constitutional synesthesia to the weaker forms of verbal synesthesia. It is noteworthy that also within the genuine synesthetic condition cognitive structuring plays an important role. Beside letters and numbers, synesthetes often experience specific colors or color combinations related to the days of the week or to the months of the year. These relations are often experienced in the form of mental diagrams like bands, ribbons, or staircases. Since color names, letters, days, months, numbers, etc., are all learned between four and seven years old, and synesthetes often recall having their experience since these ages, one wonders in what way memorization strategies, like making rows and series, play a role in the formation of the fixed correspondences that are characteristic of the perceptual synesthetic experience.

On the other hand, we may question whether it is possible to trace the characteristics of rudimentary sensory mechanisms in the way non-synesthetic individuals experience cross-modal equivalence. Is it possible to show that, along with the structural equivalences between the senses that were found in studies with synesthetes as well as with non-synesthetes, there are basic functional mechanisms that are not dependent on conscious activity or verbal mediation?

To study this question Marks designed a series of experiments based on the so-called Stroop-effect (see fig.16): when for example the word green is printed in red ink and the word red in green people find it harder to recognize and name the color than when the word is printed in the color it refers to. This is shown by the longer reaction times and a growth

RED GREEN Fig. 16. The Stroop effect







Fig. 17. The visual shapes used by Köhler to represent the nonsense words "maluma" and "takete." (Köhler 1947)

of the number of mistakes in deciding when the offered combination is incorrect instead of correct.

Marks presented two types of visual stimuli in a series of experiments, each of them appearing in two modes, one rectangle that was either dim or bright, and one that was either black or white. They were presented simultaneously with sounds of varying pitch (low-high), and varying loudness (soft-hard). All stimuli were generated by a Commodore 64 microprocessor system that not only produced the visual and auditory stimuli, but also measured the response times in milliseconds. Audiovisual pairs were presented in random combinations. The subjects were instructed to press one of two keys as soon as the criterion stimulus was recognized. The criterion stimulus could be any of the rectangles or sounds. Marks conducted many experiments to investigate possible interactions between all the conditions, for instance, pitch and lightness or brightness, or loudness and lightness or brightness. The criterion stimulus was presented simultaneously with the accessory stimulus because this was supposed to have a predictable influence on the reaction time. He expected synesthetically corresponding accessory stimuli to speed up discrimination time as opposed to non-synesthetic combinations, which were supposed to slow them down.

All of these predictions were confirmed except for the loudness-lightness combination, which did not interact significantly. Marks also added an experiment to investigate whether the influence of pitch was absolute or relative. By varying frequencies he found that the influence of pitch on the reaction time in lightness discrimination rests on a sizable contextual component. This may justify the conclusion that intersensory interaction is based largely on relative rather than absolute values.

When Marks worked on this series of experiments in 1986, he invited me to assist him by carrying out some of them, challenging me to come up with my own experiment. During my time at the John B. Pierce Laboratory, I had learned that investigating my special fascination for color as an inter-sensory dimension was problematic since all colors bring their own brightness. This makes it difficult to decide whether brightness or hue is involved in any inter-sensory effect to be found in an experiment. I had also experienced this while replicating Karl Zietz's experiment. He had indicated that the hues of colored afterimages were influenced depending on whether they were judged in a silent condition, or while listening to ambient sound (Zietz 1931).

In my replication of this study no spectral shift in hue could be observed, but a significant increase in brightness of the appearance of the afterimages was found, especially in the dark blue afterimages (Evers 1982). It is possible to equalize the brightness of colors in order to produce colors that only differ in hue or color tone, although the color loses so much of its saturation that the phenomenological vividness of the pure and intense color sensation is lost. When we imagine colors by their names, we think of their intrinsic brightnesses, which may be easily described in terms of attributed pitch (Marks 1982b, see fig. 10). However, if we equalized the colors in brightness value, they would all look like weak shades of gray.

For these reasons, I redirected my interest toward the supposed intersensory role of visual shapes. My attention had especially been drawn to an observation made by the Gestalt psychologist Wolfgang Köhler in 1929 regarding the association of visual shapes with the sounds of two nonsense words, "maluma" and "takete" (see fig. 17). According to Köhler a majority of people associated a sharp-edged, angular shape with the word takete, and associated a globular, rounded shape with the word maluma (Köhler 1947). Since the high pitched vowels and consonants /t/, /k/, and /e/ were associated synesthetically with an angular form and the low pitched sounds /m/, /l/, /a/, and /u/ with a rounded form, cross-modal similarity between shape or form on the one hand (sharp versus rounded) and pitch on the other (high- pitched versus low- pitched vowels and consonants) seemed to be at work here.

A correspondence like this is also found in synesthetic perception in which it is often noted that high-pitched sounds arouse sharp and jagged visual images, whereas, in contrast, low-pitched tones evoke smooth, rounded ones (Karwoski and Odbert 1938). In addition to this supportive evidence, a similar pitch-shape correspondence was found by Willmann (1944), who asked composition students to write musical pieces for various visual themes. Furthermore, when we think of common language we can point to the French expression *aigu*, meaning sharp for high-pitched sounds. For the experiment I worked on with Marks, reversed U-shaped and V-shaped forms were drawn in high-resolution graphics on the screen of a monitor and presented simultaneously with either a low (220 Hz) or a high (360 Hz) tone. As expected, the discrimination time was shorter when the pointed shape was combined with the high pitched sound and when the rounded shape was accompanied by the low sound as the accessory stimulus, whereas response times were longer when nonsynesthetic combinations were presented (see fig. 14). The number of mistakes also interacted significantly in the predicted way: more mistakes were made when incorrect combinations were presented, whereas the number of mistakes was reduced when the combinations were synesthetically correct (Marks, 1987 see fig. 13).

When I met Marks in 1984 to discuss our common interest in synesthetic phenomena, hardly any other scientist shared an interest in this subject. But after he put the subject of synesthesia back on the agenda of psycho-phycisists and psychologists, several neuroscientists started research projects to find out more about the physiological mechanisms involved in synesthesia. Modern imaging technologies have been used to trace neural activity in the brain of synesthetes to find out what parts of the brain are activated when a synesthete experiences his photisms. Today, some dozens of scientists worldwide are studying synesthetic phenomena from different points of view. Since Richard Cytowic published his book *Synesthesia: A Union of The Senses* (Cytowic 1989), a new generation of neuroscientists has been studying synesthesia from a holistic point of view.

CYTOWIC: NEURAL IMAGING TECHNIQUES I.3.4

CYTOWIC (1989) analyzed cerebral blood flow data obtained by neural imaging taken during synesthetic episodes. He concluded that during such episodes activity in the cortex is reduced, whereas the limbic system and especially the hippocampus show increases in activity. Cytowic concluded that strong synesthesia depends on the activity of the lower parts of the brain, the limbic areas, at the cost of the higher, more cognitive operations of the cortex. This view corresponds with theories that hold a relative lack of differentiation in the nervous system responsible for synesthesia.

However, Cytowic's observations contradict the research findings of Paulescu et al. (1995), who used another imaging technology, PET scans, to observe brain activity in six synesthetic women with word-color synesthesia and compared the outcomes with the scans of six control participants. Their study showed that, in addition to activating the language area, which was found in all subjects, in synesthetic subjects the visual associative areas were also activated, whereas there were no effects found in the lower visual areas. Although the primary visual cortex did not show increased activation, they found co-activation in the regions of the cortex where language is processed and in those where visual features are integrated. Another study (Schiltz et al. 1999), which used scalp electrodes to measure electric potential origination in the cerebral cortex, showed that activity in the frontal cortex was inhibited during synesthetic episodes, suggesting that frontal-lobe inhibition may produce distractibility with synesthesia being the consequence.

Despite the different conclusions, it may be possible that all these studies reflect some of the possible physiological mechanisms involved in synesthesia. Considering the phenomenological complexity of constitutional synesthesia and the role language plays in weak synesthesia, it is quite probable that a number of physiologically distinct processes may be held responsible for the great variety of inter-sensory connections (Marks 2000). However tentative a conclusion like this may be, it may already give us a better understanding of the working of the senses than does the nineteenth-century notion of irradiation or the notion of short-circuits between sensory-receptive regions of the brain as researched by Rochas (1885) and Clavière (1898); both studies were based on the supposedly rigid separations of the senses that were characteristic of the dominant paradigm of that time.

Does this all mean that the paradigm shift as it was proposed by Hornbostel has been generally accepted by now? No, certainly not. One should, however, not be surprised when the growing interest of scientists and artists in perceptual and creative synesthesia may

result in new maps and charts that consider sensory commonalities, together with common meta-sensory pathways, to be part of a systemic balancing system that is an important basis of our sensory system. Presently, several dozens of research groups in the US, Canada, and the UK are studying synesthetic behavior from different angles of interest. Objective tests to see whether a person has strong word-color synesthesia have been developed on the basis of the Stroop effect, whereas personality tests have shown that synesthetes are basically normal people, showing only a modest relationship between vividness of synesthesia and level of "absorption." Absorption is the tendency to involve oneself greatly in perception, ideation, and, especially, imaginative experiences. Since constitutional synesthesia runs in families, some scientists think that the condition may have a genetic basis and that it will not take long before the synesthetic gene will be identified.

We have so far pointed to three phenomenologically distinguishable modes of synesthesia: 1) the synesthetic imagery experienced by a constitutional synesthesia; 2) the commonly understood verbal synesthesia as it is expressed by synesthetic metaphor in language; and 3) the synesthetic responses provoked in cross-modal laboratory experiments. To arrive at a complete picture of synesthetic mental processes it is important to be aware that synesthetic metaphors are the result of verbalized synesthetic experiences, but that in synesthetic cognition, language is not the only modus operandi. Although synesthetic poetry and synesthetic painting have been described in detail, attention to synesthetic concepts in the form of mediated visual, auditory or audiovisual imagery has been rare. All new technologies—light, film, electronic sounds, images, algorithms—have inspired artists to compose new relations between the arts and to evoke new synesthetic experiences in an audience. To get a full picture of this fourth mode of synesthesia, mediated synesthesia, we have to leave the scientific laboratory and start an adventurous search into the world of experimental multimedia art.

SYNESTHETICS IN ART

11.0

SYNESTHETICS: A NEW ESTHETICS FOR A NEW ERA

II.I

REMEDIATION – PAINTING MUSIC: THE TRANSFORMATION OF SOUND AND MUSIC INTO MOVING LIGHT AND COLOR

LE CLAVECIN OCULAIRE PARIS 1725

ABSTRACT CINEMA – CHROMATIC MUSIC BOLOGNA 1912

11.1.3

LUMIA, NEW YORK, 1922, AND FARBENLICHTSPIELE WEIMAR 1923

II.1.4 DER ABSOLUTE FILM BERLIN 1925

II.I.5 KOMPOSITION IN BLAU BERLIN 1935

II.I.6 THE SENSUAL LABORATORY LONDON 1967

11.2

MEDIA-INTERACTION – MUSIC THEATER: THE SYNCHRONIZATION OF THE ARTS

GESAMTKUNSTWERK BAYREUTH 1848

II.2.2 MYSTERIUM MOSCOW/DARJEELING 1911

11.2.3

DER GELBE KLANG MUNICH 1912

11.2.4

DIE GLÜCKLICHE HAND VIENNA 1913

11.2.5

CABARET VOLTAIRE ZURICH 1916

11.2.6

UNTITLED EVENT BLACK MOUNTAIN 1952

11.2.7

18 HAPPENINGS IN 6 PARTS NEW YORK 1959

II.2.8 GAMAN UTRECHT 1970

11.3

MEDIA-INTEGRATION – COMPOSING MEDIATED ARCHITECTURE AND ENVIRONMENTS II.3.1 LOIE FULLER'S ELECTRIC THEATER PARIS 1900 II.3.2 NEO-PLASTIC MUSIC AND LIGHT PROJECTIONS IN THE PROMENOIR PARIS 1922 II.3.3 TOUR SPATIODYNAMIQUE, CYBERNETIQUE ET SONORE SAINT-CLOUD 1955 II.3.4 VORTEX CONCERTS SAN FRANCISCO 1957

II.3.5

LE POEME ELECTRONIQUE BRUSSELS 1958

II.3.6 EXPOSITION OF MUSIC – ELECTRONIC TELEVISION WUPPERTAL 1963

SYNESTHESTICS: A NEW ESTHETICS FOR A NEW ERA

SYNESTHETICS departs from the science lab and enters the art studio, where the different modes of artistic experimentation with electric and electronic media like light, film, kinetics, sound, video, and computers are explored. The shift of focus from a theoretical discussion of synesthesia to the inquiry into the sensory qualities themselves and mediated synesthesia is often undertaken by artists drawn to the challenges of multimedia composition. The new media have left their marks in the arts by generating new relations, not only between the senses, but also between the artists and the disciplines they represent.

Two "grand ideas" often lie at the basis of multimedia concepts. Historically, both forms of creative synesthesia have a musical origin despite a difference in aim and scope. In 1725, Louis-Bertrand Castel thought about the possibility of a new art form, *musique muette*: painting in the form of musically moving colored light. Using today's terminology we can recognize Castel's idea as a primordial form of generative thinking. After almost a century of experimentation with color organs, this idea came of age in the early twentieth century in the form of visual music, which was aimed at, and rather impressively realized by, the new light art. Examples include Thomas Wilfred's *Lumia* and Ludwig Hirschfeld-Mack's *Farbenlichtspiele*, as well as the "absolute" films of experimental filmmakers such as Walther Ruttmann, Viking Eggeling, Oskar Fischinger, and the creators of synesthetic cinema in the 1950s and 60s.

The other great, recurrent idea on relating art forms is the *Gesamtkunstwerk*, a term coined by Richard Wagner in 1848 in a call to all the arts to interact with each other and co-create one total work of art. *Gesamtkunstwerk* can be conceived of as an early form of collaborative and interactive art, an idea which seems to be reinvented by almost each new generation of artists.

This chapter first deals with how synesthetic thinking played a role in the minds of Pythagoras, Athanasius Kircher, Isaac Newton, and Castel. After this introduction, the two forms of creative synesthesia based on the paradigms of Castel's *musique muette* and Wagner's *Gesamtkunstwerk*, are described in chapters II.1 and II.2. Chapter II.3 deals with the integration of different media within the domain of architecture.

In all three sections, a broad overview is sketched of how the respective ideas affected the emergence of multimedia art forms during the twentieth century. This emergence was provoked by technological innovation and the artists' interest in developing experimental

Why doesn't one make ocular harpsichords, as one makes harpsichords for the ear...
concepts that were often based on synesthetic ideas. When studying these experiments, I noticed that, despite the intentions of the modernist artists to make a revolutionary break with the esthetic ideals and traditions of the past, many modernist ideas seemed to be rooted in antiquity and in the utopian Romantic ideals of creating a new universal culture based on what Piet Mondrian called a "spiritual-physical" unity.

In the twentieth century, many artists studied Eastern philosophies such as Tibetan Buddhism and Zen as well as the popular translations of these ideas into theosophy and anthroposophy. Interestingly enough, this interest in metaphysics mingled with their interest in the new physics, quantum-mechanics, and, especially, the notion of the fourth dimension. As a result, they did not want to use symbols that referred to "another" world anymore. Instead, they tried to communicate the spiritual value of the physical energies, the materials, and the media they used by using and combining light, color, sound, movement, and speed in order to create new space-time experiences. The power of their art was that the senses were directly hit by the beauty of physical reality revealed by reducing it to its primary sensory qualities and by the mathematical parameters they used in their compositions. No symbols, no stories, no other world, but a real world created and designed with steel, glass, electric light, and new media. The man-made world designed as a total work of art: a *Gesamtkunstwerk*.

Despite the reactionary trend of postmodernism in the 1980s and 90s, and with digital technology coming of age in this period, some of the basic principles from the first stages of modernism returned in contemporary art. Art created with the aid of computer technology can take many different physical forms. For instance, composed moving neon, fluorescent light, light emitting diodes, digital visuals, digital sound and sound systems, and computer designed "liquid" or "fluid" architecture. The potential of generative art and interactive art has challenged today's artists to use their creative synesthesia to create new forms of multimedia art.

PYTHAGORAS KIRCHER NEWTON CASTEL

BEFORE DEALING WITH the developments sketched above, I would like to discuss some examples of creative synesthesia *avant la lettre*. One of the oldest stories that describes synesthetic thinking is Pythagoras's discovery of the mathematical proportions of musical intervals, which he noticed while watching blacksmiths hammering in a forge. While carefully listening to the sounds and observing their cause, he noticed the relation between the size of the hammers and the sounds they produced. The big and heavy hammers seemed to produce lower, louder sounds compared to sounds produced by the smaller and lighter hammers, which sounded higher and much less loud.

This synesthetic audiovisual observation, made by focusing his attention on both the hearing mode and the visual mode of perception, formed the basis of Pythagoras's research into musical proportions and the working of musical instruments. By experimenting with a monochord (see fig. 18) he concluded that the relationship between the physical characteristics of sound-producing media and the resulting perception of pitch can be expressed mathematically. The weight and the size of hammers and bells, and the length of strings and flutes cause the specific pitches of the sounds they produce. Pythagoras's synesthetic observations, thoughts, and experiments thus laid the groundwork for the understanding of musical harmony. He discovered that the relations between harmonic tones can be expressed by whole numbers.

The title page of the *Musurgia Universalis*, an encyclopedic work on music in which Athanasius Kircher described and visualized an unusually wide range of musical and acoustical subjects (Kircher 1650), shows a picture representing Pythagoras listening to the blacksmiths (see fig. 19). Interestingly, in the *Musurgia Universalis* another picture that depicts the story of the blacksmiths is shown. It is in the section in which Kircher describes the automatic, water-powered organs of the Italian Renaissance (see fig. 20). The invention of these organs dates back to at least the old Romans. During the Renaissance it became fashionable to connect such a "cylindrus phonotacticus" to kinetic sculptures that contained symbolic mythological characters. For example, in an organ at Villa Aldobrandi in Tivoli, the scene consisted of a cave in which the satyr Pan plays his flute accompanied by the cuckoo's call and the rooster's crow. In another organ depicted by Kircher (no reference is given to where it could be found), the cylinder was connected to a kinetic scene in which the musical piece *Musica Pythagorica* was accompanied by the figures of four blacksmiths moving their hammers up and down, with their patron Vulcan watching them and praising their work.

⁶ A simple string instrument consisting of a single string stretched over a sound box [Ed.]

When Louis-Bertrand Castel invented his *clavecin oculaire* in 1725, he admitted that he had been inspired by the machines sketched by Kircher and by Newton's writings on the relation between color and music. Isaac Newton had published his book Opticks, or A Treatise of the Refractions, Inflections & Colours of Light in London in 1704. In this work Newton described his *experimentum crucis*, in which he showed that white light is composed of a mix of colors that can be shown in isolation when a ray of white light shines through a prism. The resulting color spectrum shows a limited number of colors that cannot be broken down further. Newton called them "light's least parts." When this spectrum of colors is led through another prism, which is placed upside down, the colors reunite in a ray of white light.

For Newton, this was proof that white light consists of a mix of indivisible colors and that these become visible when light hits an object. If the object is a mirror, only the white ray itself is reflected. However, if the object is a prism, a triangular piece of glass, the white light is refracted, causing the white ray to split into an array of colors known as the color spectrum, a band of colors showing the same order of colors as can be seen in a rainbow (see fig. 2)). What colors can be seen when one watches the spectrum carefully? Newton left the answer to this question to an assistant "whose eves for distinguishing colors were more critical than mine" and who helped him carry out the experiment. While Newton drew the perimeter of the spectrum on a piece of paper, his anonymous assistant drew lines across the spectrum to distinguish the different colors: red, orange, yellow, green, blue, indigo, and violet. Each of these colors has a characteristic bandwidth: red, yellow, green, and blue occupy much more space in the spectrum than orange, indigo, and violet.

As the history of physical science has shown, Newton's experimentum crucis has had an enormous influence on the theory of light. For Newton, light consisted of material particles, corpuscles with different sizes. In his view, reddish colors consisted of heavier particles than bluish colors. Newton's theory contradicted that of his contemporary, the Dutch scientist Christian Huygens, who concluded that light has the properties of vibrations, or waves. In retrospect, one may wonder why Newton chose to oppose Huygens's wave theory, since his comparison of the spectrum with a musical scale was not simply a matter of metaphor, but a relationship that he described in mathematical detail. Even though the former's theory was accepted exclusively for a long time, the two theories were reconciled in the beginning of the twentieth century by the introduction of the concept of the photon as the basic constituent of light, having the characteristics of both particles and waves.

Newton concluded that the different observations corresponded enough to bring him to the synesthetic notion that the division of the color spectrum is similar to a musical scale. Considering Newton's main concern of demonstrating that the universe is based on material principles that follow the laws of mechanics, it is guite surprising to observe that, completely against his fundamental material and corpuscular beliefs, he tried to bring his theory of light and color into accordance with the age-old comparisons between musical scales and colors. According to the German psychologist Albert Wellek, these comparisons can already be found in the Indian Vedas and in Chinese, Persian, and Arabic theoretical works on music (Wettek 1935). Aristotle, Vitruvius, Simonides, and Horace, as well as the Renaissance authors Leonardo da Vinci, Leone Battista Alberti, and Gerolamo Cardano

⁷ A reconstruction of Musica Pythagorica can be found on the website of the Swedish expert on automatic, water powered organs, Christopher Nöring: http://web.telia.com/~ul3l0llll/kircher/sid3.html.

Fig. 18. Monochord from Musurgia Universalis.





(fragment) 1650. Bottom left, Pythagoras holding a plate with his theorem, pointing to the scene with the hammering blacksmiths

Fig. 19. Title page from Athanasius Kircher's Musurgia Universalis,

Fig. 20. Luca Biagi's water-powered organ from the Quirinal Palace, Rome, 1598. Top left, the hammering blacksmiths.



wrote about the relation between color and music. Kepler, Kircher, and many of Newton's contemporaries were also familiar with this idea. Newton compared the color spectrum to a musical scale since it is as if the violet end of the spectrum tends to form an octave relationship with the color red. He writes:

[N]ot only because it agrees with the phenomena very well, but also perhaps because it involves something about the harmonies of colours (such as painters are not altogether unacquainted with, but which I have not yet sufficiently studied) perhaps analogous to the concordances of sounds. It will even appear more probable by noting the affinity existing between the outermost purple and red, the extremities of the colours, such as is found between the ends of the octave (which can in a way be considered as unisons). (Newton, cited by Shapiro 1984)

In one of his letters he even compared the sounding vibrations of the air to the "properties of the aetherial":

As the harmony and discord of sounds proceed from the properties of aetherial vibrations, so may the harmony of certain colours... and the discord of others... proceed from the properties of the aetherial. And possibly color may be distinguished into its principal degrees, red, orange, yellow, green, blue, indigo and deep violet on the same ground, that sound within an eighth is graduated into tones. (Newton, cited in Turnbull et al. 1984)

In Proposition VI of his *Opticks* from 1704, Newton describes the consequence of this synesthetic comparison by using a circular visualization of the tone scale as the basis for his arrangement of the color spectrum in the form of a color circle (Newton 1952). According to art historian John Gage (1993), the influential color circle in *Opticks* (see fig. 23) was in fact adapted from the diagram of the tempered diatonic octave published by Descartes in his *Compendium Musicae*, written in 1618 (see fig. 22).

Newton's representation of the spectral colors in a color circle proved to be a crucial step in the development of today's three-dimensional spatial color model since it definitely outdated the traditional, one-dimensional ordering of colors along a straight line. Since antiquity, colors were ordered based on their brightness value on a straight line between white and black: white, yellow, red, green, blue, violet, black. Colors were thought to be mixes of lightness and darkness. Newton, however, concluded that colors are phenomena created by the refraction of light and that they could be ordered based on their hue or color tone according to the organization of color spectrum. This could be represented in a two-dimensional geometric model: the color circle.

Despite the fact that the painters' color models were based on pigments, and not on the colors of light, they accepted the color circle as a better basis for ordering colors than the straight line. As did the English entomologist Moses Harris (1776), who restructured Newton's model according to the insight that all colors of the light spectrum could be mixed by combinations of pigments in the primary colors: red, yellow, and blue. In 1779, Wünch was further able to demonstrate that all colors of light could be formed on the basis of mixing three primary colors of light.

Fig. 21. The setup for the decomposition, recomposition, and decomposition of white light into the spectrum. from Newton's Opticks.



Fig. 22. The diagram of tempered diatonic octave from Descartes' Compendium Musicae



Fig. 23. Color circle from Newton's Opticks (Book I, Part II, Proposition VI, Problem 2).



From a conceptual point of view, it is interesting to follow the development of the scientific visual organization of color from a one-dimensional model (Aristotle's straight line) to a two-dimensional one (Newton's circle), and finally arriving at three-dimensional models. Some examples of three-dimensional models include: Philipp Otto Runge's "globe" (1810), Michel Eugène Chevreul's "hemisphere" (1839), Ogden Rood's "double cone" (1879), Albert H. Munsell's "color sphere" (1905), William Oswald's "color solid" (1916), and the modern "xyz-model" of the Commission Internationale d'Eclairage (1931). The history of the development of color models represents the growing insight that color is a multidimensional perceptual phenomenon. Owing to Newton's synesthetic comparison of the intervals of the spectral colors to Descartes's musical intervals, an important step was made in developing our present knowledge of the multidimensional nature of color and color perception.

Inspired by the descriptions of the correspondences between sound, music, light, and color in Kircher's *Musurgia Universalis* (1650) and by Newton's *Opticks* from 1704, the French Jesuit Louis-Bertrand Castel published his legendary synesthetic idea of creating *musique muette*, a new art form that later became known as "visual music" or "color music," and the way he imagined to realize this was by his invention the *clavecin oculaire*. Castel is a good example of someone who, although not being a constitutional synesthete himself, used synesthetic thinking to create a new form of experience by a play of projected color and light that moved according to music. Castel used his creative synesthesia to express his scientific objections against the empiricist scientific climate of his time and the dominant role of mathematics as the ultimate way of comprehension. In his eyes, this was a threat to all forms of understanding based on sensory and verbal analogies and on metaphors.

Castel thought that it must be possible to make sound visible and to give the eyes the same pleasures that music gives to the ears. In 1725, he published the first article of a series in the Mercure de France, entitled "Clavecin pour les yeux, ou l'art de Peindre les sons & toutes sortes de Pièces de Musique" (Harpsichord for the eye, or the art of painting sounds and all sorts of musical pieces). Noting that the comparison between sound and light had quite a long history, Castel concluded that nobody had pushed this comparison further than Kircher, who stated that:

1) sound is diffused all about, like light in straight lines; 2) when it encounters impenetrable bodies, it is reflected; 3) it reflects in straight lines, as does light; 4) if the bodies that it encounters are penetrable it passes through them, suffering, like light, a refraction that alters its path; 5) light, on encountering a concave body, is reflected to a single point where it joins in a burning focus while sound, on encountering a concave body, unites in a resonating focus as well, that is to say, an echo; 6) for seeing over long distances, telescopes or binoculars are used, as megaphones and speaking-trumpets are used, as there are ear-trumpets to distinguishing minute objects, microscopes are used, as there are ear-trumpets to distinguish minute and almost inarticulate sounds. (Castel 1725)

For Castel, the main value of following "our German" Kircher was in showing the power and potency of thinking in analogies.

Why not, I say, follow the thread of this analogy? Why doesn't one make ocular harpsichords, as one makes harpsichords for the ear... it is to Kircher that I owe the birth of such a pleasant idea. I read his Musurgia two years ago. I found in it a section stating that if at the time of a beautiful concert we could see the air agitated by all the various vibrations that the voices and the instruments excited, we would be astonished to see strewn there the most vivid and best assorted colors. It was one of those ideas that I call the seeds of discovery. (ibid.)

It is not just the physical analogies that convinced Castel of the potential of his invention. He added another parallel on a higher degree of commonality between light and sound to Kircher's arguments by comparing the affections (affects) that light and sound are capable of arousing. "Light modified makes colors while sound modified makes tones. Blended colors form painting and blended tones form music." For Castel the analogy between light and sound extended to the analogies between colors and tones, and between painting and music.

Consult the painters, listen to their talk, read their books; without ceasing they speak of the tones and half tones of painting, of the ornamentation of colors, of the harmony of colors. On the other hand, listen to a group of musicians talk. I mean those who know how to talk and who have some knowledge of belles-lettres and of the fine arts. They will tell you that such and such a piece is well designed, that the melody has its figures, that the dissonances must be nuanced so that their mixture with the consonances imitates the chiaroscuro and a thousand other similar things that must, if you please, be regarded as matters of fact, being matters of feeling founded on the most simple and constant experiences. (ibid.)

Although Castel himself used many synesthetic metaphors to argue in favor of a synesthetic connection between sound and light, he was aware neither Kircher nor he himself could prove this. Even though Kircher had discovered the link between light and sound, he, according to Castel, had left it to others to find the precise proof of it. As Castel couldn't do so himself, he turned to "the famous Englishman Mr. Newton who verified the right sense of smell and sentiment of Kircher: the fact is certain: colors have their precise tones, which follow among themselves the same proportions as do the tones of music."

Thus, all in their own way, Pythagoras, Kircher, Newton, and Castel used synesthetic perception, synesthetic thinking, and synesthetic creation to understand and express, by geometrical analogies and numerical proportions, the relations between sound, music, light, color, and size. In the following sections I will describe how synesthetic thinking and creative synesthesia have contributed to the innovation of art in the 20th century. Synesthetic approaches to theater and cinema, synesthetically designed events, happenings, environments, and performances and, most recently, synesthetic visuals, which have become characteristic of the dance culture, are all a result of this contribution. The same holds for the new forms of audiovisual tele-synesthesia as expressed by net artists, who have been using the internet as their artistic medium since the middle of the last decade of the twentieth century.

The rise of creative synesthesia came from a deeply felt wish among artists to create new art forms that used the artistic possibilities offered by new technologies. These technologies enabled artists to create new synesthetic experiences as, for instance, expressed by the development of the concept of what Eisenstein called the "film sense" (Eisenstein 1970). In the near future, it can be expected that the development of the film sense will receive a strong impulse from the emerging desire to produce an intense sensation of audiovisual tele-presence. By creating new integrative configurations of telecommunications media, all kinds of people will be enabled to become co-authors of new forms of multimedia communication and environments on a worldwide scale.

REMEDIATION_PAINTING MUSIC: THE TRANSFORMATION OF SOUND AND MUSIC INTO MOVING LIGHT AND COLOR

"Nearly every one who has imagined an art of colour-music has laboured under the delusion that he was the first in the territory. and that he was blazing a track through an entirely unknown and unexplored region."

(KLEIN 1930)

LE CLAVECIN OCULAIRE PARIS 1725

THE IMPORTANCE OF LOUIS-BERTRAND CASTEL's idea of building an ocular harpsichord that would enable the "painting of sounds" was in the philosophical consequences of drawn from analogical thinking rather than in its actual materialization. He thought it was important that the idea continuously triggered new questions. Some of the questions Castel started to ask himself were: "What happens when colors are organized in temporal order? What will moving colors look like? How can colors be made as volatile as sounds?" Castel came up with examples from nature, such as the evanescent plumage of birds (e.g. the peacock) and the changing colors of the chameleon. Asking himself who would profit most from his ideas, he concluded that the art of painting would have the most advantage from the idea of the harpsichord. "The *clavecin*," he stated, "is a great Painter's School, where the secrets of color combinations and the *clair obscur* can be studied, and where one can learn to talk intelligently about tones and differences and harmonies of colors in a way that demonstrates taste as well as feeling." (Castel 1725)

When it came to concrete descriptions of his *clavecin oculaire*, Castel was hesitant to give details. He left it to the builders of musical instruments, the *luthiers*, to create an ocular harpsichord according to his outlines because he considered himself only as the architect of the idea. Castel's idea actually attracted wide attention and discussion, including comments by some of the great men of his time: Montesquieu, Voltaire, Diderot, and Rousseau, to name only a few. From their reactions one can conclude that the reception of the idea was characterized by controversy; despite a few positive reactions, most authors criticized Castel for being too vague in his descriptions of the actual instrument:

What is a clavecin? It is a set of stretched strings that sound in their lengths, and in their thickness, a certain harmonic proportion. They are sounded by means of a little tangent that picks them, producing the different tones and chords of the music. Now the colors follow the same harmonic proportion. Let us take as many of them as needed to form a complete keyboard and dispose them in such a manner that by applying the fingers in a certain way, they will appear in the same order and the same combination as the corresponding sounds do to their own touches. When I mean dispose, I mean only that they should be exposed to the air, not actually placed on a canvas since it is necessary that one color should be able to appear without the other, or with such others as the player may bring forth. (Castel 1725)

After reading many of Castel's own texts and many later articles about the ocular harpsichord, one certainly has to agree that it is often not clear whether Castel wanted to create a visual form of music that only consisted of moving visual colors, or whether these were to be presented in relation to actually sounding music. Only by a close reading of his first article does it become clear that originally he intended to transform music into a purely visual experience: musique muette, music for the eye. Since nobody at that time had ever seen artificially created moving colors, for most people it must have been quite hard, if not completely impossible, to understand what Castel imagined.

Under the pressure of Castel's critics, who asked him for a demonstration of his "painted sounds," he started to think about building a prototype of the ocular harpsichord. Interestingly, from that moment onward his experiments went into the direction of constructing an ocular harpsichord as an expanded musical instrument consisting of a keyboard that, when played, produces musical sounds as well as moving colors. Although his original idea had been based on a complete transformation of audible music into visual music, his actual experiments resulted in audiovisual performances consisting of a play of moving colors that were generated by the musical sounds.

When thinking about how to build the *clavecin oculaire*, Castel first thought of the peep boxes in the streets of Paris that showed views of all kinds of curiosities and rarities through a glass. By pulling little strings, different scenes were shown, like villages, castles, battles, etc. Similarly, he wanted colors to appear and disappear in combinations and chords, in harmony, corresponding precisely to musical harmony. The colors could therefore be given a certain vivacity and lightness that they never would never have on an immobile and inanimate canvas. After almost ten years of experimentation, Castel was able to present the first working model on December 21, 1734, the commemoration day of St. Thomas the Apostle,

to whom I consecrated it with the caption Nisi videro, non credam [Unless I'll see it, I won't believe it]. The movement of sound consists in causing the sound to be heard during an instant more or less long, and then making it be silent in order to hear a new sound, and after that a third, etc. The movement of color consists in making appear and disappear, according to the fingers placed over a keyboard, one color and then another, and whatever order of colors one wishes. Now that much is discovered, finished and perfected. (Castel 1735)

This quote is from a letter to Montesquieu in which Castel explains that he was forced to make "the first model, which you have seen." From the description, one may conclude that, by that time, Castel had given up the idea of a mute music; in 1725 he had already expressed some doubts regarding the mono- or multimedia character of his idea, which had then developed into a literal *musique muette*; music was no longer part of the picture. This time, his description seems to leave no doubt that he finally chose for moving colors related to actually sounding music. There is also evidence that Castel continuously reworked the concept and elaborated on his model. In 1738 he was severely criticized by Voltaire for not grasping the spirit of this century, which asked for more than reasoning in analogies, i.e. experimentation (Voltaire 1738).

From some eyewitness descriptions we can conclude that Castel took this criticism quite seriously and continuously experimented with the materialization of his concept. This is at least suggested by the 1739 testimony written in Hamburg by the composer Georg Philipp Telemann after he had visited Castel's residency in Paris. Telemann (1739) described an *Augen-Orgel* (ocular organ) and included an anonymous letter from which one may conclude that an organ was used instead of a harpsichord and that lanterns were used for the lighting. This experimentation with lanterns was confirmed by Castel in a letter to Montesquieu:

You have seen my lanterns, tuned by color degrees and light degrees... With lanterns wonderful effects can be produced using glasses, horn, nettings, taffetas, oiled or rather varnished sheets of paper, especially when the lanterns are made as mobile as mine are. (Castel 1739)

In the same year the poem "Stances sur le merveilleux Clavecin Oculaire" (Stanzas about the amazing ocular harpsichord) was published in the Mercure de France by a certain M. Descazeaux in which the line "What rapid course of shades! What accord in differences! For my charmed eyes, what a voice!" (Descazeaux 1739) proves that Castel was indeed making progress. Not only in the execution of his idea, but also in its reception.

In 1740 Castel published the book *L'Optique des Couleurs*, in which he gave additional details about the way he related colors to tones. In this work he distanced himself from Newton's approach, which was based on a correlation of colors to the seven tones of the diatonic scale. Since Castel needed twelve shades of color to pair with the twelve keys of the harpsichord or organ keyboard, he chose twelve colors to match the twelve tones and semi-tones of the chromatic scale: blue to correspond to *C*, celadon to *C*-sharp, green to D, olive to D-sharp, yellow to E, *aurore* to F, orange to F-sharp, red to G, *cramoisin* to G-sharp, violet to A, *agathe* to A-sharp, and *violant* to B. His choice was based on connecting the tones of the major triad (C, E, G) to the painter's primary colors blue, yellow, and red.

More importantly, however, than this dodecatonic division of colors within the octave, Castel now declared that his system was founded on the distribution of light as in chiaroscuro. It covered the full range of the three octaves of the harpsichord keyboard. The colors within the octave returned three times in different brightness values, ranging from a darkly colored octave (low tones), to an octave with saturated colors (middle tones), to a third one consisting of bright colors (high-pitched tones). However, Castel not only wanted to describe the exact relations between colors and tones. He clearly had more fun describing the way the clavecin might grow into a completely new type of spectacle. Such a spectacle would reduce the visual embarrassment that is often experienced during musical concerts, by creating a visual focus for the process of audition. To achieve such effects, many more means could be used than a simple system of tone-color relations. For example,

one could make the colors themselves from true jewels... the greens emeralds, the reds garnets, rubies, carbuncles, etc. And what brilliance and luster would such a spectacle bring to light in every part, sparkling like the stars, with jacinth followed by amethysts, then rubies, etc., by the light of torches in an apartment furnished with mirrors? It would be an infinitely brilliant object, a sort of immobile decoration where everything would be varied. But what would it be if animated and given a type of life through movement, a regular, measured, harmonic, and lively movement? It would be charming, an enchantment, a glory, a paradise! (Castel 1739)

Castel described even more fantastic possibilities:

One could make a play of all sorts of figures, human and angelic, animals, flying creatures, reptiles, fishes, four-footed beasts, even geometric figures. One could, by a simple play, demonstrate all the concords of the Euclidian elements. One could make a play of fantastic figures, of hippogryphs, of centaurs, etc., of allegorical figures, muses, drvads, naiads, etc. Or one could make a play of flowers, taking the rose for the color rose, the coxcomb for the purple, the violet for the violet, jonguils for the yellow, marigolds for the gold, so arranged that each stroke of the hand of the keyboard would represent a flower-bed, and the result of playing would be a moving diversity of animated flower-beds... Who would doubt then, that in place of a simple color one could place an assortment of colors, and even a complete picture, a landscape, a historic scene, a scene from comedy or tragedy, something grotesque, marionettes on a string, and other things... If all of Paris used the color clavecin, to the number of 800,000, one could, without much exercise of invention and imagination, make them so that there were not two that resembled each other, and that without costing more than making them alike. I should never finish if I undertook to exhaust all the styles, the designs of the new clavecin that one might wish to have made. (ibid.)

Although Castel continued his experiments, as evidenced by a series of letters to his pupil Count de Maillebois dating from 1752 (Franssen 1991), he developed some resentment toward audiences. The public had refused to understand his idea on a philosophical level, leaving him to adjust and readjust his concept to the taste of the public. In addition to all the criticism Castel encountered from Voltaire, Rousseau, and Diderot, the latter, by bringing a deaf-mute friend to a demonstration at Castel's place, tested Castel's claim that his harpsichord could bring the pleasure of music to the deaf. Interestingly, Diderot related that his friend believed Castel was also a deaf-mute and that his harpsichord was the instrument by which he communicated with other men; he also thought that each shade of color represented a letter of the alphabet and that by touching the keys rapidly he combined these letters into words and phrases and that, in fact, he spoke in colors. For this reason Diderot's interest in the instrument won over his skepticism, and in 1753 he published an article about it in the third part of the *Encyclopédie*, the great scientific monument of the Enlightenment.

On the January 1, 1755, two years before his death, Castel's harpsichord was played in front of a crowd of two hundred applauding people. Although he hardly gave any technical details, Castel reported that the instrument included colored glass windows illuminated from within by a hundred wax candles. He admitted that "this was not even a sketch, a beginning of it, so far was it from being perfect" (Castel 1755).

Yet Castel's idea has survived his death until today. According to Albert Wellek, the harpsichord was discussed in 1742 by the Imperial Academy of St. Petersburg after one of its members, Georg Wolfgang Krafft, had received a letter from Paris reporting that Castel had replaced the colored strips with a painting containing colored crystals, to create a version of the harpsichord in "modo theatri comici" (Wellek 1935). In 1743 the German Johann Krüger responded to Krafft's critical discussion of the instrument by creating a completely new design for it. The design was based on the simultaneous representation of chords and involved projecting concentric circles of colors in one spot on a screen. Krüger's design connected wires to each key of the harpsichord, which, when pressed down, opened windows to let in color-filtered candlelight. The light was focused by a system of mirrors and lenses that projected the concentric circles of color on a wall or screen. The outer circles corresponded to low tones and the central circles represented higher pitches (Krüger 1743, see fig. 24).

Along with this development there is the story of Castel's anonymous English assistant who, a few months before Castel's death, published the leaflet Explanation of the Ocular Harpsichord (Anon. 1757) in which he gave a description of the instrument he built in London according to Castel's ideas. According to the description, the instrument consisted of a rectangular box, measuring about 170x100x60 cm and placed on top of a regular harpsichord. On the frontside it had fifty elliptical windows of transparent enamel, lit by five hundred candles. Unfortunately, a handwritten comment by the original owner states that, for some unknown reason, no performance was given to demonstrate the instrument's qualities. However, a few years after Castel's death testimonies continued to be published about the different forms the clavecin had taken.

In 1766, Alexandre Savérien wrote that the instrument was made up of a table on which a kind of theater is set up, complete with decorations. In front of the theater is a keyboard whose keys are connected to the decorations. When a key is pressed, no sound is heard, but a color is seen in such a way that chords of colors are formed just like chords of notes (Savérien 1774). Here, Castel's original concept of *musique muette* returns once more.

The painter Antoine-Marin Lemierre gave his testimony, in the form of a poem, of another version of Castel's invention in which colored ribbons played a central role (Lemierre 1774):

He places on a buffet the silvery instrument, Where the ingenious art of a mobile hand Questions the ebony and harmonic ivory; At the end of each key a long elastic cord Answers to the ribbons, folded one over the other, And as the hand, by varying the notes Knows how to compose the sounds coming from the strings, High above each strip opens up, unfolds, And purple, green, orange and blue, Return to the eye their movement and their play.

Also in 1766, a toy version of the ocular harpsichord was presented by Guillaume-Germain Guyot in a catalogue containing all kinds of "recreations based on scientific experiments to amuse family and friends" (Guyot 1769, see fig. 26). According to philosopher Maarten Franssen it consisted of a cardboard cylinder with a candle inside, placed in a square box with eight rectangular openings cut out of its front, corresponding to the seven tones of the diatonic scale, including the octave. The cylinder could be rotated by hand in such a way *Fig. 24.* Johann Krüger's design for the ocular harpsichord, 1743.



Fig. 25. Brewster's Kaleidoscope, 1819.



Fig. 26. Guyot's design for musique oculaire, 1769

that it spiraled upward at the same time. For a certain tune the cylinder could be provided with matching holes covered with colored paper, such that, if the cylinder was rotated at the same speed as the melody, the rectangular openings would show the right colors (Franssen 1991).

Even many years after his death, Castel's book L'*Optique des Couleurs* was well read throughout Europe: in Germany, Italy, Russia, England, and even in the US. In 1789, a musician who spied for the House of Nassau, Anton Scheuer, used Castel's idea to propose a musical composition system based on the rotation of color discs (see III.2.6). In 1816, David Brewster invented the kaleidoscope of which 200,000 were sold in London and Paris with-in three months. In 1819, Brewster published a treatise on the variety of principles that could result in variations on the kaleidoscope, explicitly referring to Castel's invention:

Those who have been in the habit of using a correct Kaleidoscope, furnished with proper objects, will have no hesitation in admitting that this instrument realizes, in the fullest manner, the formerly chimerical idea of an ocular harpsichord. The combinations of the fine forms, and ever-varying tints that it presents in succession, to the eye, have already been found, by experience, to communicate to those who have a taste for this kind of beauty, a pleasure as intense and as permanent as that which the finest ear derives from musical sounds. (Brewster 1819)

The mass production of kaleidoscopes has not stopped ever since, and every now and then new principles are invented.

In 1844, D.D. Jameson described a liquid light organ that used bottles with colored fluids lit by oil lamps. In 1877, Bainbridge Bishop patented the first color organ in the US. Unfortunately all three of his color organs, including the first electric one, were lost in fires, though it is possible to find a detailed description of the last one in his book *A Souvenir of the Color Organ* (Bishop 1893). In England, the painter Alexander Wallace Rimington patented his color organ in 1893, presented it in 1895, and published his theory and experiments in the field of what he called *The Art of Mobile Colour* (1912).

Castel's *L'Optique des Couleurs* also found its way to Italy, where the Futurists Bruno Corra and Arnaldo Ginna experimented with a *clavecin oculaire* by creating a chromatic piano. They concluded that the best way to realize the idea was by using hand-colored film images (Corra, 1912). In Russia, Alexander Scriabin asked his friend Alexander Moser to design a colored-light instrument, the *Luce*. It played an outstanding role in the symphony *Prometheus* (1912), that premiered in New York in 1915 with a sophisticated color keyboard and projection system developed by General Electric.

During the twentieth century the idea of the color organ and visual music was further developed in many directions. In the US during the 1910-1920s, Mary Hallock-Greenewalt and Thomas Wilfred developed color music light shows with their color organs, the *sarabet* and the *clavilux* respectively, in the spirit of Castel's original *musique muette*. Wilfred also foresaw the possibility of a completely autonomous art of light (Wilfred 1947, 1948). In Europe, at the Bauhaus, László Moholy-Nagy, Kurt Schwerdtfeger, and Ludwig Hirschfeld-Mack experimented with light sculptures and colored light performances. At the same time, the filmmakers Viking Eggeling, Walther Ruttmann, and Oskar Fischinger



Fig. 27. Alexander Wallace Rimington's keyboard color organ at the artist's studio.



Fig. 28. Mary Hallock-Greenewalt seated at the **Sarabet**.

began their experiments with animated abstract film. After World War II, kinetic sculptors like Nicolas Schöffer and filmmakers like Jordan Belson and Harry Smith continued this research. John Whitney started to create animated films with the help of analogue and digital computers. The 1960s saw the development of liquid light shows in relation to the newly established pop music. In 1977, a color organ played a central role in Steven Spielberg's feature film *Close Encounters of the Third Kind*, where it functioned as a synesthetic medium to communicate nonverbally between humans and creatures from outer space.

Today, new, music related light and imagery is created in the form of light shows in all kinds of musical and theatrical contexts, in the music videos shown by the likes of MTV and TMF since the early 1980s, and in the form of visuals produced by VJs (video jock-eys) to accompany the rhythms of the whole spectrum of dance music. However, the fact that, in addition to these examples, it is still possible to create completely new synesthetic experiences is proven by visual musicians such as Paul Friedlander and Edwin van der Heide who, each in their own way, recently created new interpretations of the concepts of *musique muette* and color music by concentrating on the sculptural and architectural potency of the synesthetic ideas that were first described almost three hundred years ago by Louis-Bertrand Castel.

ABSTRACT CINEMA CHROMATIC MUSIC BOLOGNA 1912

11.1.2

THE EPOCH of the great modern art movements began with a series of manifestos written by a group of Italian artists. On February 20, 1909, the first manifesto was published under the abbreviated title *Le Futurisme* on the front page of the Parisian newspaper *Le Figaro*. Its author was the Italian poet Filippo Tomasso Marinetti. The full title of the manifesto is *Manifesto del Futurismo* (translated as *The Founding and Manifesto of Futurism*, 2006). It is the first of over thirty texts about the future of art, most of them published between 1909 and 1918. During this period Marinetti gathered a group of artists around him with whom he started a collective that communicated its intentions by means of art works and printed publications developing by a new type of theatrical performance. The Futurist manifesto was a wake-up call to a new generation of artists, challenging them to turn their backs on the past and to base their work on the phenomena of modern life.

Marinetti strongly criticized the Neo-Classical and Neo-Gothic architectural styles of the late nineteenth century and called for the destruction of museums, conservatories, and antique shops, which still dominated Italian culture and art. Instead, he favored embracing the world that was the result of the drastic changes from the previous two decades, dominated now by electricity, machines, trains, automobiles, airplanes, etc., producing a completely new phenomenon: speed.

We intend to sing the love of danger, the habit of energy and fearlessness... Courage, audacity, and revolt will be essential elements of our poetry... Up to now literature has exalted pensive immobility, ecstasy, and sleep. We intend to exalt aggressive action, a feverish insomnia, the racer's stride, the mortal leap, the punch and the slap... We affirm that the world's magnificence has been enriched by a new beauty: the beauty of speed. (Marinetti 1909)

Marinetti first contemplated calling his art movement *Electricismo*, although he ultimately decided on *Futurism*. The publication of the manifesto in a French newspaper had a substantial effect. Artists began writing about their own work and art in general first with the publication of the almanac *Der Blaue Reiter* (1912) in Germany, followed by the Dutch magazine *De Stijl* (1917-1932), and the German Bauhaus (1919) with its *Bauhaus Books* (1926-1931). The Futurist manifestos also immediately influenced a number of Russian artists, who first adopted the word Futurism, but later rejected the name and changed it to *Constructivism*. After meeting Marinetti personally, they did not want to be identified with

his aggressive style. While the Dutch and German collective publications developed as truly international forums in which artistic ideas and opinions were exchanged and resulted in supranational if somewhat Nordic, esthetic styles, the Futurist manifestos maintained a distinctive Italian signature. This despite their unmistakable, albeit restricted, effect on the European art world and even on some painters in America, like Marcel Duchamp and the painters belonging to the art movements of "Synchronism" and "Vorticism."

The manifestos touch upon literature, music, dance, performance, painting, architecture, and film, in addition to almost all aspects of daily life, including clothing, food, smells, lust, and war (Appolonio 1973). Notwithstanding the great variety of subjects, some major areas of experimentation can be distinguished. Besides his role as the leader of Futurism, Marinetti's personal contribution to the innovation of art was in the fields of poetry and typography. His work was based on the aim to free the power of the word through the destruction of syntax, liberating the words from the sentence and treating them as independent graphic images. He freely distributed separate words over a page, using different sizes, typefaces, colors, italics, weights, and directions to intensify the expression of each of them. By doing so, his poems read like optic synesthetic collages. They often have strong acoustic suggestions, through the frequent use of onomatopoeia and the arrangement of the direction and shape of the words and letters in such a way that they visually suggest rising pitch or increasing loudness of the sound, as with speech.

Marinetti admitted he was not the first poet to use this idea. The Symbolist poet Stéphane Mallarmé had used it earlier in his poem "Un coup de dés jamais n'abolira le hasard" (A Throw of the Dice Will Never Abolish Chance) from 1890 in which he deconstructed syntax by freely distributing words and phrases over a page to express the simultaneity of conflicting emotions. Marinetti developed this idea in all of his poetry and typography and, by doing so, popularized typo-visual poetry. He inspired a huge number of poets, ranging from his contemporaries Apollinaire, Paul van Ostaijen, and Theo van Doesburg—who called his poems *woordbeeldingen* (word pictures)—to another generation of poets, who connected the idea to Pierre Schaeffer's concept of *musique concrète* (concrete music), resulting in a new poetry movement around 1950, concrete poetry (Crommelin 1971).

In their paintings and photography, the Futurists studied electric light and color, as in Giacomo Balla's work *Street Lamp* (1909), and movement and speed, as in Balla's *Dog at a Leash* (1912) and *Abstract Speed* (1913), Gino Severini's *Sea = Dancer* (1914), and Umberto Boccioni's *Dynamism of a Man's Head* (1914). They often used synesthetic transformations of sounds or smells in their pictures.

Of special interest are Bruno Corra and Arnaldo Ginna's experiments with colored light, published in Corra's report *Abstract Cinema*—Chromatic Music (1912), in which he described their synesthetic investigations into creating moving colored harmonies and chromatic themes by establishing simultaneous and successive relationships between colored lights. They initially selected four equidistant gradations in each of the seven colors of Newton's spectrum and created a range of almost four octaves by connecting the twenty-eight keys of a keyboard to electric bulbs in these colors. Using this approach, with a few necessary modifications, they were able to play the colors of a Venetian barcarolle by Mendelssohn, a rondo by Chopin, and a Mozart sonata. However, they were not satisfied



MARINETTI, perolibero. - Montagne + Vallate + Strade × Joffre

Fig. 29. F.T. Marinetti's Futurist poem "MONTAGE + VALLATE + STRADE × JOFFRE." 1915.

Fig. 30. Intonarumori, Luigi Russolo and Hugo Piatti, 1914





Fig. 31. Giacomo Balla, Abstract Speed + Sound (Velocità astratta + rumore), 1913-14.

with the result as they were unable to create the desired light intensity. When they used more powerful bulbs, the heat caused them to discolor within a few days, so that they were forced to repaint them.

Since Corra and Ginna wanted to create "numerous and overpowering effects like those of the large orchestras," they moved to cinematography, hoping for better results. In order to achieve a "harmonious and gradual development of the chromatic themes," they started by removing the rotating shutter from the projector, and experimented with modifications to the projection screen. It was only when they painted the correct length of colored bars directly onto the celluloid—each bar as long as the space between four perforations in the film, corresponding to one film frame and one complete rotation of the shutter—that the colors fused perfectly and they were satisfied with the results. To arrive at the desired spatial effect, they decided to remove all furniture from the studio, to paint it completely white, and to dress in white drapes. At this point Corra wrote between brackets:

Incidentally: once chromatic music is established, be it our work or that of others, a fashion will follow encouraging the well-dressed spectator to go to the theatre of color, dressed in white. Tailors can get to work on it now. (Corra, 1912)

Interestingly enough, in 2002, the Sensation White dance event attracted 35,000 visitors to the Amsterdam Arena, who all followed the dress code to wear only white. This optimized the reflection of the light-effects and enabled the VJs to project their visuals directly onto the audience. Corra's futuristic anticipation of such a phenomenon was thus affirmed rather convincingly. Much more important, however, is the fact that Corra and Ginna's synesthetic experiments concerned not just a step in the evolution of Castel's ocular harpsichord, which was soon continued by Scriabin, but that they made the first step toward a visual music by means of the new medium of film.

The Futurists proved to understand the challenges of technology in another way as well, although their experiments in the field of music were rather primitive and naïve at first. The earliest work started with Luigi Russolo's contribution to the understanding that noise must be considered a completely new musical entity that can be generated and manipulated in a controlled manner, making it a medium readily available to composers. Russolo described his ideas in The Art of Noises (1913), a doctrine that, in his opinion, could serve as the theoretical model of the new sounds that were to be incorporated into the world of music. He designed a serious classification of noise-sounds, dividing them into six groups: explosions, whistles, whispers, crackles, percussive noises, and voices of animals and men, each consisting of about as many subcategories. Based on this classification he began building instruments, the so-called *intonarumori*, to play intoned noises. He developed a new graphic notation for them and wrote four pieces for the premiere in Milan in 1914: Awakening of a City, Meeting of Cars and Aeroplanes, Dining on the Terrace of The Casino and Skirmish in the Oasis. These, along with his later pieces, were written in a traditional musical style and were played by traditional instruments to which the intonarumori were added as sound effects. Russolo traveled to Paris to give a concert with his intonarumori in 1921. Piet Mondrian attended the concert, and it aroused in his imagination the idea of a Neo-Plastic music to be realized in the future with the help of, as yet, unbuilt electric musical instruments. This new music, featuring sounds and noises combined with projections of colored lights, would be presented in a new type of concert hall without a stage—a *promenoir*—in which the audience would be allowed to move around freely (Mondrian, 1922b; and 10.2.4).

The concerts with the *intonarumori* became an integral part of the *serate futuriste*, the Futurist evenings that attracted large audiences in theaters all over Italy. These were performances consisting of theatrical elements, the so-called *Theater of Synthesis*, for which dozens of sketches were written, futurist paintings were displayed, and discussions of a political nature were held. Such events often ended in riots and fights between the performers and the audience, interventions by the police, and even arrests and nights in jail (Tisdall and Bozzolla 1977). In 1917, Giacomo Balla, who had designed some of the more abstract theater syntheses, collaborated with Dhiaghilev, producer and artistic director of the Ballets Russes, on a performance of Stravinsky's ballet piece Fireworks. Balla had already experimented with replacing actors by colored objects, and for this piece he proposed to further extend the drama of objects into a drama of geometry. For the Fireworks performance in Teatro Costanzi in Rome, Balla designed a number of standing and hanging shapes consisting of painted coverings of wood-framed prisms, pyramids, domes, and spiral forms, all of which could be illuminated from the outside and from within. For the five-minute piece he designed 49 combinations and sequences of light and color that followed the moods of the music, resulting in the spatial movement of the lighted objects that replaced the movement of the dancers' bodies by the movement of colored solids and lights.

Revolutions tend to eat their own children. Such was the case after the Russian Revolution, when Stalin's regime criminalized the Constructivist and Suprematist artists who had given the Revolution its radical artistic face. The Italian Futurists suffered a similar fate. They praised the beauty of war, and most of them consequently signed up for the army. During World War I some of them were killed and others, like Russolo, were seriously wounded. After the war, the politician Benito Mussolini expressed his great sympathy for his old friend Marinetti and the way in which he and the Futurists fought for the Italian identity and for the innovation of poetry, which "inspired him with a new sense of the ocean and the machine." However, by the time Marinetti wrote his *Futuristic Cookbook* in 1932 (1989), in which Mussolini's approval of Futurism was cited, Mussolini had already replaced the Futurist rhetoric with his own Fascist war cry for a pompous and Neo-Classical style that had nothing to do with the artistic progressiveness of the Futurists. Not only were the Futurist artists who had survived the war quite bitter, but the movement had now acquired the image of a forerunner of fascism, an image from which it, unfortunately, would never be able to free itself.

Nonetheless, the consequences of their work had far reaching artistic effects. Some characteristics of their stage performances returned in the Dada performances in Cabaret Voltaire and in the theatrical events and happenings of the American avant-garde of the 1950s, which, subsequently picked up by European artists, resulted in the intercontinental Fluxus movement. Moreover, Russolo's work in particular has had an enormous effect on the musical thinking of many composers, including George Antheil, Edgar Varèse, John Cage, and Pierre Schaeffer. Each in their own way has contributed to what Varèse called the liberation of sound, a phrase that might be expressed in another way as: the liberation of music from a limited understanding of the potential of sound as a new artistic medium (Kahn 1999).

LUMIA NEW YORK 1922 FARBENLICHTSPIELE WEIMAR 1923

11.1.3

TWO YEARS AFTER the inauguration of the first issue of the *De Stijl* magazine in the Netherlands in 1919, the architect Walter Gropius opened the Staatliches Bauhaus in Weimar, a new art academy directed toward teaching the next generation of artists a new approach to painting and sculpture by introducing the concept of design. Gropius's method was centered on new types of pictorial and plastic qualities to be applied in an architectural context. It was based on functional principles and modern materials such as concrete, steel, glass, and lighting technology. This new architecture rejected sculptural ornamentation and it required a new type of design for the interior and furniture to go with the functional exterior of modern buildings.

Gropius called for artists who desired to improve their creative abilities to become designers of high quality industrial products. Significantly, in the same year in France the journal *l'Esprit Nouveau* appeared, directed toward developing architecture as an independent art form. While the architect Le Corbusier, one of the contributors to the journal, wanted to upgrade architecture to the level of free art, Gropius had a more relativistic attitude to the arts. He asked artists to give up the autonomy of painting and sculpture in order to become a part of the monumental scale of architecture. He hoped to encourage the development of a new type of artists that could serve as architects' assistants or designers who could replace the traditional craftsmen. Through the Bauhaus, a word that explicitly refers to the Medieval *Bauhütte* (in which cathedral architects worked closely with the craftsmen), Gropius endeavored to attract *Meisters* (masters) to teach the *Gesellen* (fellows). Lyonel Feininger, Johannes Itten, Wassily Kandinsky, Paul Klee, Josef Albers, László Moholy-Nagy, and many other outstanding artists joined the Bauhaus to work as teachers along these lines.

Gropius systematically underestimated the reactions of conservative politicians, who expressed strong opposition to his approach from the beginning. In 1925, this opposition led to the closure of the Bauhaus in Weimar, and, although hard to believe, a year later the German Democratic Party asked the German government to initiate a policy against one of the most basic elements of the esthetics of modernism: the straight line.





Fig. 32. Hirschfeld-Mack, **Farbenlichtspiele** (reconstruction 1999).

Fig. 33. Hirschfeld-Mack and a collaborator in front of the **Farbenlichtspiele** machine (1923).

Fig. 34. Sketch for Farbensonatine II Rot (1963-64).

Fig. 35. László Moholy-Nagy, Light Space Modulator (1930). A mela mela lingung permitter a ingene

The party suggested that the high unemployment among traditional artisans and craftsmen was caused by the introduction of the straight line to architecture and furniture design, and sought subsidized commissions for unemployed craftsmen so that the present fashion will change. (Van Doesburg 1926)

Despite the strong reactionary forces opposing modernism politically, the Bauhaus reopened its doors in a new building in Dessau in 1926, aided by more progressive politicians from Berlin. However, this period lasted only a few years because in 1933 the Bauhaus was forced to close its doors forever, at least in Germany where all modern art was considered *entartete Kunst* (degenerate art) at that time. When the Bauhaus was founded in 1919, nobody foresaw that a year later the frustrated painter Adolf Hitler would become a member of the National Socialist German Worker's Party in Munich, where he designed the Swastika as a first contribution to the propaganda machine of the party. The Swastika flag became the symbol of a reactionary social movement that aimed to replace the modernist lifestyle with a mythological history in which Germany was fated to become the leading nation of Europe. Within this program, modernist art was seen as a degeneration of the classical arts on which Germany's greatness was built.

When the Bauhaus began its courses, Gropius and his teachers were focused on developing new forms of architecture and design to cope with the enormous housing problem Germany faced after World War I. They wanted to solve the problem through rational and industrialized building processes, for which they developed an esthetic style suitable for mass production and reproduction. Despite the rather archaic and strict teaching structure set up by Gropius, the Bauhaus also stimulated experiments that were not purely functional, especially under the influence of Kandinsky and Klee. They were more concerned with studying the synesthetic potential of abstract color and form as pictorial visualizations of music and sound than with the strict aim of functional and industrial applications. There was room for all sorts of theatrical experimentation, stimulated mainly by Oskar Schlemmer, who developed the *Triadisches Ballett* (Triadic Ballet) in 1922, which was the first in a series of theater experiments based on choreographies for grotesque, solid costumes that only allowed the performers to move in very simple choreographies.

Another famous work is Kandinsky's stage design, consisting of monumental paintings, for Modest Mussorgsky's music *Pictures at an Exhibition*. Since the Bauhaus was not equipped to handle the production aspects of theater productions, the theatrical experiments were later transformed into Dada-esque soirées, theatrical parties with thematic dress codes and live performances of the Bauhaus-Kappelle (Bauhaus Orchestra), which played lighthearted jazz and dance music.

Along with these experiments, some Bauhaus teachers and students concentrated on the study of moving light. Some examples include moving abstract light plays, such as Kurt Schwerdtfeger and Ludwig Hirschfeld-Mack's *Farbenlichtspiele* (Colored Light Plays) and Moholy-Nagy's *Partiturskizze zu einer Mechanischen Exzentrik* (Sketch of a Score for a Mechanical Eccentric), and the kinetic sculpture *Licht Raum Modulator* (Light Space Modulator). All these works were experiments in the projection of light and color, sometimes intended as independent light plays, sometimes synesthetically related to musical sound. In Hirschfeld-Mack's two *Farben Sonatinen* (Color Sonatinas), light, color, and



Fig. 36. Thomas Wilfred's Opus 9I, The Firebird (1934).



Fig. 37. Thomas Wilfred, performance on the clavilux. (From Popular Mechanics magazine, 1924)

form are manipulated in a projection set-up in which performers change color filters and the intensities of a number of light sources. These beams of light produce patterns on a screen by moving stencils, matrices, pieces of perforated wood, etc. Hirschfeld-Mack was aware of Castel's heritage, although he explicitly criticized Castel's one-to-one correspondence of notes and colors as the basis of the relationship between music and color. Instead, as the basic correspondence between light and music, Hirscheld-Mack chose three lightintensity levels that he related globally to the low-, middle-, and high-pitch registers of his piano accompaniment (Hirschfeld-Mack 1927).

The first light plays were developed during Kandinsky's course on color, where Schwerdtfeger and Hirschfeld-Mack wanted to test Kandinsky's abstract theory on the subject by creating a situation where the colors could actually move. Kandinsky's theory stated that yellow suggests an outward, centrifugal movement, whereas blue suggests an inward, centripetal movement. Schwerdtfeger's *Reflected Colored Light Plays* were shown during the first Bauhaus Exposition in 1923, but he did not develop them further. Hirschfeld-Mack, however, continued to work on his *Colored Light Plays* even after he left the Bauhaus, following its closure in 1925. In this year, his performance was part of the program *Der Absolute Film in Berlin* (see ILL4). In 1927, his *Farbenlichtspiele* were presented at Anschütz's Farbe-Ton-Kongresse in Hamburg. Subsequently, he gave many performances all over Germany and Austria.

Moholy-Nagy's work on light followed a different road, leading to kinetic sculpture. Moholy-Nagy was one of the most active Bauhaus teachers; he worked in many directions, especially those related to photography, typography, and print (he designed and produced the Bauhaus Books). His main fascination, however, was with the question of how to use modern technology in an optimally artistic way. Moholy-Nagy was less interested in the reproduction capacity of photography, but rather used photography and photographic paper to create a new type of image with his photogram studies. Similarly, he designed a sound alphabet based on photoelectric scanning of graphic drawings. He also experimented with motion and light.

His *Sketch of a Score for a Mechanical Eccentric* was intended as a kind of kinetic object-theater. Notated with great precision, it consisted solely of the mechanical motion of diverse metals and colored forms that moved in all directions within the frame of a mini-theater, combined with light and sound effects. A performance would undoubtedly express the spirit of the machine age, though no evidence has been found as to whether Moholy-Nagy ever realized it himself.⁸ One of the most spectacular masterpieces of Moholy-Nagy is his *Light Space Modulator* (1925). Created as the subject of an abstract film, this work is a rotating metal sculpture lit by 150 lamps in different patterns that loop every two minutes. At the Bauhaus there was hardly any knowledge of film technology, however, so Moholy-Nagy had to wait some years before producing the film. In 1928 Moholy-Nagy left the Bauhaus, two years after Hirschfeld-Mack, together with Gropius and the former student Marcel Breuer, designer of the famous Bauhaus chair that is still popular today. Moholy-Nagy's film Lichtspiel, *Schwartz-Weiss-Grau* (Light Play, Black-White-Gray) was finally shot and released in 1930.

⁸ The reconstruction in the I988 edition of Ars Electronica was a delightful demonstration of the playful power of mechanical technology presented in a context dominated by the much "colder" appearance of the digital art of the late twentieth century.

At the same time, substantial progress was also made in light art in America, where Mary Hallock-Greenewalt began her experiments in 1906 and where the idea was popularized by the Scientific American articles of 1914 and 1915 on the color organs of Rimington and Scriabin, respectively. It was Thomas Wilfred who profited the most from the broadly aroused interest in this new art form. Wilfred was born in Denmark, where he began experimenting with simple colored light projection, and went to Paris to study painting, earning his living by singing folk songs and playing the lute. During his studies he demonstrated his colored light experiments to his painting teacher, but received a negative response. He was called up for army duty in 1914, shortly after being invited to sing at the English court; in 1916 he emigrated to the US. In New York Wilfred met the architect Claude Bragdon, who had a strong inclination toward theosophical ideas, including the metaphysical interpretations of synesthetic relationships among music, color, and light. To study these ideas and their ornamental application in architecture, Bragdon had built an atelier on Long Island and he invited Wilfred to use it in order to start working out his ideas on the art of light. Wilfred finished the first version of his *clavilux* in 1919, but it would take him another three years to refine the light controller and to create a number of compositions before he gave his first public performance at the Neighborhood Playhouse in New York City.

He designed and patented a new type of slidable key controller for the *clavilux*, graduated in grooves from 0 to 100 and arranged in tiers like the manual of a pipe organ (Jewell 1935). Although they were based on a structural organization of time analogous to musical compositional principles, Wilfred preferred to perform them according to Castel's original idea of creating a strictly visual form of *musique muette*. Contrary to Wilfred's own expectations—being a singer he knew how difficult audiences could be—the *clavilux* premiere was quite a success. He then toured many American cities with his *Lumia* recitals, as he called his art form. A European tour in 1925 took him to London, Copenhagen, Zurich, and Paris, among other cities. Wilfred performed in Paris at the *Exposition des Arts Décoratifs*, at which Art Déco was launched. Art Déco was a new fashion in the arts, produced as a reaction to the purism of the modernist movement. It consisted of a more theatrical lifestyle, based on the revival of illusionary decorations, against which the modernists had so strongly fought. But modernism was not yet finished because in Berlin, in the same year, another new form of modern art, synesthetic cinema, was introduced in the program *Der Absolute Film* (1925).

DER ABSOLUTE FILM[°] BERLIN 1925

FOLLOWING THE FIRST ABSTRACT FILM EXPERIMENTS of Corra and Ginna in 1912, during the years 1916 to 1925 some artists started to create an independent form of cinema that was not based on representation, but on the characteristics of the medium itself: "abstract cinema" (Bernhard Diebold), "color music" (Klein 1931; Moritz 1986). Dutch art critic Menno ter Braak spoke of a true "musique des images" (music of images) as he called this approach to establish "de absolute film" (the absolute film) (Ter Braak 1931). The first two decades of cinematography were marked by the fate that befalls the early years of all new media: the phase of imitating the form and content of previous media, a process nowadays referred to as "remediation." This process often takes a few years, sometimes even decades, before the essential characteristics and potential of a new medium are captured fully by artists and designers. Fifty years later media theorist Gene Youngblood would refer to this period as the *paleocybernetic* origin of "synesthetic cinema" (Youngblood 1970).

The new artistic experiments in this direction continued the search for creating moving visual imagery based on a musical approach, as Castel had been dreaming of two hundred years earlier, albeit this time not in the form of color organs or light organs, but by developing techniques of film animation. For these pioneers it was essential to investigate the possibilities of film. Not to represent reality, but as a means to investigate the essence of the film medium itself, which is to create a series of still images that, when filmed and subsequently projected, suggest continuous visual motion by the perceptual illusion of apparent motion. To distinguish themselves from the filmmakers who created films in a narrative style, resembling the principles of theatre plays, these filmmakers called their approach to film: *Absolute Film*.

From today's point of view, this period may be considered as the pioneering stage of a new tradition in film that was first described as visual music by Diebold and later became known as "color music." This term was used later by William Moritz (Oskar Fischinger's biographer) for all experiments with light and film that contributed to the realization of Castel's dream (Moritz, 1986). For Youngblood, the value of this synesthetic cinema was its expression of the intention to create a "truly cinematographic language" that, from the end of the 1950s, was expanded into the aim to create "intermedia environments"—the "way of all experience."

Interestingly, it was a theater critic who called for a full-blown realization of this new art form based on a musically inspired cinematic approach. From September 1916, a few

⁹ The editors would like to thank Cindy Keefer for pointing out several errors in the original text of sections II.1.4, II.1.5, and II.3.4. Naturally the editors remain responsible for any remaining inaccuracies.



Fig. 38. Filmstill from Oskar Fischinger's Kreise (1933).



Fig. 39/40. Filmstills from Walther Ruttmann's Opus I (1921) and Opus II (1923).

months after Cabaret Voltaire opened its doors in Zurich, until 1921, Diebold wrote a series of articles entitled "Expressionismus und Kino" (Expressionism and Cinema), first in the Neue Zürcher Zeitung, and later in the Frankfurter Zeitung. The articles called for

a new blending of the fine arts, music, dance, and cinema, or rather a new use of cinema by serious artists who would have to use the best techniques and accumulated wisdom of painting, sculpture, dance, and music to create fine and perfect art works (preferably abstract in nature) in controlled time and space. (Diebold 1916a; see also Diebold 1916b and 1916c, and Moritz 1974)

Viking Eggeling and Hans Richter responded to Diebold's call, leaving Zurich and Dada for Berlin to begin experimenting with filming painted scrolls. They didn't know, however, that at that time Walther Ruttmann had already started to master film animation by developing a "trick-console" to speed up the work on his first abstract film, *Lichtspiel Opus I*. Ruttmann, who had a musical background as cellist, had become a successful painter before he became dissatisfied with the static nature of painting. In his essay "Malerei mit Zeit" (Painting with Time) he proposed a new form of cinema:

An art for the eye which distinguishes itself from painting while it presents itself in time (like music)... This will bring forth a completely new, until now only latently present type of artist, standing somewhere in the middle between painting and music. (Goergen 1989)

Ruttmann hand-painted the film images on his animation table using a single frame technique: "cinematic illusion and rhythmic development engendered from the slight shift of graphic copy between frames through adjustments in camera distance or light design and through permutations of color" (Brinckmann 1997). Although the film was created in Munich, the premiere of Opus I was held in 1921 in Berlin, accompanied by music by Max Bütting, the musical director of the radical artist movement the November Gruppe. Soon after, the film was shown in Frankfurt, where Diebold introduced Oskar Fischinger to Ruttmann. Fischinger, who had been trained as an engineer, offered Ruttmann support by offering him one of his recent inventions, an automated animation machine. Ruttmann bought one, but he did not use it for his own films, and instead of Ruttmann it was Fischinger who made use of the wax-slicing machine for some of his own first abstract film experiments. Fischinger had met Diebold in the Vereinigung von Freunden der Literatur (Society of Friends of Literature) as they had shared an interest in theater. For this society Fischinger prepared a number of lectures about theater plays, for which he designed graphic scores that represented the development of the emotional dynamics of the play in a scroll-like chart. Fischinger was born too late to compete with others for claiming to have created the first abstract film. But as we will see later, with his lifelong experimentation in this field and with the production of over forty semiabstract and completely abstract films, he was to be the first great master of this new art form, and he had an enormous influence on hundreds of filmmakers.

Despite—or perhaps due to—the enormous amount of written documentation on the first abstract filmmakers, it is difficult to know for sure in what order the different achievements in abstract film actually appeared. There are at least two reasons for this. First, there has been substantial rivalry in claims to having taken the first and most important steps, as

II SYNESTHETICS IN ART

Corra and Ginna's film is lost. Second, the suppression of some of these avant-garde artists by the Nazis, leading to the emigration of many to the UK and the US, resulted in the destruction of source materials like printed program notes, brochures, and newspaper clips.

Historians have the difficult task of reconstructing the period many decades after the facts took place. Ruttmann's essay "Malerei mit Zeit" (Painting in Time) is sometimes said to have been written in 1917, whereas other sources mention 1919 or 1920. Unfortunately, dozens of contradicting statements of this kind can be found. In the US, Wilfred claimed that he had started his experiments on "the art of light" in 1905 (Frankenstein 1938), but only after Mary Hallock-Greenewalt published her own claim that she had started her experiments in 1906 (Klein 1930). In this competition, the inventors of these numerous light controlling devices went so far as to meet over twenty times in court to fight over the rights of each other's patents, with a fanaticism that sharply contrasts with the intended serenity of their work. Yet another major example of this childish play with dates is demonstrated by the fact that Richter's Film ist Rhythmus was renamed Rhythmus 21 to suggest that the premiere occurred in 1921, the same year as Ruttmann's Lichtspiel Opus I. Since there are so many publications about the different contributors to abstract film and light art and since they refer to so many different event dates, it is only safe to conclude that some of the artists involved wanted to place themselves in the forefront of the movement.

The program Der Absolute Film, from 1925, brought together a number of abstract and semiabstract films of German and French-American origin and a demonstration of Hirschfeld-Mack's Colored Light Plays. The screenings of Ruttmann's Opus II, III, and IV, Eggeling's Symphonie Diagonale, Richter's Film ist Rhythmus, Fernand Léger's Images Mobiles, and René Clair and Francis Picabia's Entr'acte received a mixed reception from the audience. Viewers were accustomed to mainstream, theater-oriented feature films. A great number of people left their seats quite noisily, the remaining part of the audience reacted with overwhelming enthusiasm. The press reactions were equally diverse, arousing the curiosity of so many people who missed it that a second viewing was organized in Hanover a few days later.

On the one hand, *The Absolute Film* may be considered the beginning of a completely new artistic approach to film (leading immediately after WWII to the start of the Art in Cinema program in San Francisco), but, on the other hand, it was the beginning of the end of a period that was characterized by the collective efforts of artists to innovate the arts. Absolute or abstract film is based on the ability of the film medium to create what we would nowadays call virtual reality rather than on using the medium to represent the recorded images of visual reality. The movements of actors are replaced by a new type of protagonist: movements of abstract imagery, consisting of pure color, changing light intensities, simple line configurations, geometrical patterns, textures, etc. In addition to purely abstract films, The Absolute Film program also included two films that hardly used any hand-painted, animated pictures, but instead made use of isolated, deconstructed fragments of recorded images manipulated by double exposure or by rhythmic montage techniques. These were Images Mobiles and Entr'acte, both produced in Paris by artists still carrying the Dada spirit or devoting themselves to the new movement of Surrealism.











Fig.43. Fernand Léger, Ballet Mécanique (1924)

Fig. 42. Walther Ruttmann Opus I (1921).

The stories of *Images Mobiles* and *Entr'acte* are even more complex than the confusion surrounding the supposed dates of the making of the first abstract film. The intricacy of *Entr'acte* (1924) is caused mainly by the nature of its collective creation by a number of quite different artists. René Clair, Francis Picabia, Eric Satie, Marcel Duchamp, Man Ray, and a lot of other artists contributed to the film as actor or co-author of the scenario. It is clear that the film was the result of a commission from Rolf de Maré, the director of the Swedish Ballets, to Picabia to choreograph the new ballet *Relâche*. Picabia designed a stage set consisting of a wall of car headlights and proposed to show a film in the entr'acte between the first and the second part of the ballet. René Clair was asked to create the film and Satie was asked to write the music. Other artists were asked to contribute to the concept or to act in the film. The only thing Picabia insisted on was that the whole piece should have a provocative, rather than a serious undertone. The audience, for example, was asked to wear dark sunglasses, expressing the artistic climate of Paris in those days. Despite this absurdist basis, Clair knew how to juggle cinematic effects like slowing down and accelerating tempo, using short cuts, double exposure, décadrage, and so forth (De Haas 1996).

The authorship of *Images Mobiles* is even more confusing than that of *Entr'acte*. There are two completely different views on the genesis of this film, both to be found in *L'Art du Mouvement*, which describes the cinematographic collection of the French National Museum of Modern Art (Bouhours 1996). As it turns out, the story reflects one of the legendary French-American controversies about claims on originality. Nowadays *Images Mobiles*, or *Ballet Mécanique* as it later was renamed, is presented as a work of the artist Fernand Léger. However, according to William Moritz's contribution to *L'Art du Mouvement*, Léger's role was actually restricted to finding funding to edit the footage that was shot by the American artists Dudley Murphy and Man Ray, who had initiated the project together. It is quite likely that this view is correct since Léger was a painter who had no experience with photography or film at all. Moritz suggests that it was the American poet Ezra Pound who introduced Murphy and Ray to Léger, and it might have also been Pound who approached American composer George Antheil, also belonging to the Parisian inner art circle, to write music for the film.

Whatever may have happened, it is certain that the communication between the American and French artists was a highly complex business. Upon hearing that Pound had approached Léger, Man Ray insisted that his name was to be left out of the project (Moritz1996). To make things even more complicated, after Antheil was asked to write the music, he claimed that he had already been working on the piece for quite some time, welcoming the film as the best way to illustrate his composition. Antheil was already focused on the future of music; his *Manifest der Musico-Mechanico (Manifesto of Musico-Mechanico)* had been printed in the August 1924 edition of *De Stijl*, in which a German version of the text appears, dated Berlin 1922. Regardless, the film *Images Mobiles* was presented in Berlin without Antheil's music. One of the reasons may have been that Antheil's score took twenty-four minutes to perform, whereas the duration of the film was only twelve minutes. Another problem was that Antheil's score required sixteen player pianos, to guarantee the highest possible speed and loudness of the music, but at the time it was not yet possible to synchronize the player pianos.

The piece was played a few times with one player piano and without the film projection in some Paris Salons. Afterwards, Antheil rewrote the piece in 1926, and later that year it premiered at the Champs Elysées Theater. The performance created a scandal particularly because the propeller, which was used as a siren, almost blew the audience out of their seats. As a reaction, umbrellas were opened, which created a storm of rumor comparable only to the premiere of Stravinsky's *Rite of Spring* eleven years earlier. Antheil was very pleased with this reaction since in Paris scandal usually guaranteed success, and successful it became indeed.

A year later, however, the piece was performed in Carnegie Hall in New York, where it was received with sarcasm and laughter. One of the reasons was that it took such a long time to warm up the propeller, that the siren only started after the piece was over. Antheil felt so embarrassed that he withdrew from center stage, and continued his career as a composer of film music in Hollywood.

Fig. 44. Filmstill from Oskar Fischinger's Komposition in Blau (1935).

KOMPOSITION IN BLAU BERLIN 1935

DESPITE THE ENORMOUS VITALITY caused by Diebold's call for a new blending of the fine arts, music, dance and cinema, and the enthusiasm shown by many artists connected to Dadaism, De Stijl, and Surrealism, the energy seemed to fade following the program *Der Absolute Film* for a number of reasons. Eggeling, who had collaborated intensely with Richter, died shortly after the premiere of his only film. Richter, like Ruttmann, gave up the basic principles of abstract film to develop a film style based on the montage of recorded images, which he favored over the laborious work of the frame-to-frame shooting of thousands of hand painted images; 5,000 drawings were needed for three minutes of film! Abstract film in its purest form did not seem to become the "basso continuo" of the innovation of the arts, as Diebold had hoped it to be.

Nevertheless, in subsequent years the development of abstract film reached an even higher level than the early experiments anticipated, thanks to the immense powers of Oskar Fischinger, whose exceptional personality united a great variety of interests and skills. Fischinger followed a technical training in his youth, after which he worked as a draftsman, and developed himself from that to a tool designer and engineer. Besides practicing his technical skills, he was also quite interested in the arts, especially in theater and music, and studied physical science subjects such as Einstein's relativity theory as well as more speculative theories on the fourth dimension. He was also impressed by the theosophical notion of color music, but developed his own approach. Like the other artists who thought that their abstract colors and forms could play a role in upgrading the spiritual functioning of man's mental capacity, Fischinger aspired to a similar artistic effect. He realized that this nonmaterial aim could only be achieved through the knowledge of materials and by mastering the techniques of the films he dreamt of.

Fischinger's experiments began around 1920 with the construction of a labor-saving animation machine in which a number of differently colored wax plates were laid on top of each other and molded into blocks. The machine consisted of a slicing mechanism synchronized with a camera that took a one-frame shot of the end of the block each time a slice of wax was cut off. He sold a license to use the machine to Walther Ruttmann, and with the money he built his first home animation studio in Munich. The results from his own experiments with the wax machine were shown in connection to the performances of Alexander László, whose *Farblichtmusik* (Color Light Music) consisted of a traditional piano recital combined with projected light from his color organ, painted slides, and Fischinger's film experiments. Despite the financial problems he faced, he continued to experiment in

his studio with multiple projections of wax films, cutout animation (Orgelstäbe, Spirale), colored liquids (Stromlinien), and his silhouette animation techniques Seelische Konstruktionen (Spiritual Constructions). In 1927, he decided to leave Munich and walked to Berlin. He founded a new studio, and Fritz Lang hired him a short time after as a special effects animator for the film Frau Im Mond (Woman in the Moon). His contract lasted for a couple of years, but in 1929 Fischinger elected to devote himself completely to his abstract black and white studies, earning money through some incidental commercial commissions.

By this time, soundtrack technology had been introduced, allowing Fischinger to release his films with soundtracks. They consisted of the same musical recordings he used during the production process for deriving the timing and the direction of movement and form. Although Fischinger believed in the reality of a *musique muette*, he was aware that ordinary film audiences had great difficulty viewing moving abstract images that did not communicate any form of referential meaning. Like Wilfred, he was convinced that moving colored light had an esthetic value of its own as a form of purely visual communication.

In 1932, Fischinger started a series of synesthetic experiments based on drawing graphic representations of sound that were photographed directly onto the soundtrack of a film. This idea occurred to him as he lay in bed with a sunburn-induced fever and heard his wife Elfriede drop a key on the tiles in the hallway. He immediately knew which key she had dropped and started to think about the peculiar fact that every object has its own sound contained in its material substance, weight, and shape. He then began redrawing the graphical patterns of the film soundtracks he had been using for some time, discovering the patterns for ordinary musical tones, timbres, textual qualities, and the vowels of speech. Fischinger then experimented with drawings of abstract design and ornaments to hear what inner sound (to use Kandinsky's expression) they contained. Through this method he discovered that one of the patterns often used in silent cartoons to represent the ringing of a bell-drawing concentric circles- produces a buzzing sound when directly printed on the soundtrack. Fischinger tried to attract funds to start a research program on synthetic sound, but was unable to find support. Later, in the US, he communicated these experiences to composers John Cage and Edgar Varèse,¹⁰ both of whom used Fischinger's insights regarding sound as an important element in their approaches to composition in the 1950s and 60s. He decided to leave the elaboration of synthetic sound to others because he believed it to be too time-consuming to fully develop compositional skills.

His films became popular world-wide and attracted large audiences in Berlin, Amsterdam, and Munich, and he considered it a priority to start experimenting with color-on-film technology, which was almost ready for use. He began collaborating with the inventor of one of the early, experimental color processes, Bela Gaspar, with whom he perfected the camera and the printing mechanism, enabling him to release one of the first color films in Europe, Kreise (Circles) by the end of 1933. The film is the result of a commission from the Tolirag advertisement agency to promote the company. It is completely abstract, consisting of moving colored circles, ending with the ad message: "Tolirag reaches all circles." It was the first time the rights of a Fischinger film were sold for only one year after which the ad message was cut and the film sold to another company, Van Houten chocolate, also for the period of a year. After its commercial exploitation Fischinger removed the ad and continued to show the film as an independent work of abstract art.

¹⁰ Frans Evers's original source could not be recovered. [Ed.]

Fig. 45. Filmtill from Oskar Fischinger's Wax Experiments (1921-26).

Fig. 46. Examples of Fischinger's Ornament Ton (ornament sound) patterns (c. 1932)





Similarly he produced another one of his famous commercial films, *Muratti Greift Ein* (Muratti Shows Up), in which cigarettes walk, dance, march, and ice-skate to the music of Josef Bayer's ballet *Die Puppenfee* (The Doll-Fairy). The film was made using a wax-covered turntable on which cigarettes were placed with toothpicks, changing their position with each frame. Both films became extremely popular, raising enough money to allow Fischinger to continue working on films for his own pleasure. *Komposition in Blau* (Composition in Blue) was finished in 1935. With *Komposition in Blau* Fischinger presented himself as an independent filmmaker and based on the success of *Muratti Greift Ein* he received an invitation from Paramount to come to Hollywood. He decided to leave Germany, like the majority of the *entartete Künstler* (degenerate artists), and settled in Los Angeles in 1936.

Fischinger saved his life and that of his family by emigrating to the US; however, his artistic production stagnated. He was not able to find his place in the American film industry, dominated as it was by enormous studios. These studios were organized based on the production-line philosophy, marked by segmentation into specialist's domains; there was no place for an artist like Fischinger who was used to executing all tasks himself from the beginning to the end. His contract with Paramount ended prematurely and Fischinger turned to painting to overcome his frustrations. However, one idea returned to his mind over and over again: he had wanted to make a film based on Bach's orchestral work *Toccata and Fugue in D minor* as early as 1934. He was especially attracted to the version conducted by Leopold Stokowski, who also happened to work at Paramount Studios.

Shortly after discussing his proposal with Stokowski, the latter accidentally met Walt Disney in a restaurant (Chasins 1979) and discussed the idea with him. Disney responded with great enthusiasm; he aspired to make a film that would be appreciated by the art world and hoped to achieve this by collaborating with Stokowski. Fischinger began to work at Disney Studios, but had no idea that Disney did not believe in fully abstract imagery and that, in fact, he was preparing to launch the cartoon character Mickey Mouse by making him the leading character of the film Fantasia. Whenever Fischinger came up with abstract story board drawings the production overview committees often wanted to give them a realistic touch by introducing clouds in the background or by adding suggestive, semi-figurative images referring to the musical instruments that were heard.

Finally, Fischinger got so fed up with the opposing esthetics of Disney's staff and the way they ran the business that he withdrew from the project, returning again to the painter's easel, where he was completely free to picture what he wanted. Despite beeing able to finish a few other films, like Radio Dynamics, his influence on the arts mainly continued through personal contacts with a number of American artists, including the avant-garde composers Cage and Varèse, and the filmmakers John and James Whitney, Jordan Belson, and Harry Smith, and by contributing all of his work to the Art in Cinema series, held at the San Francisco Museum of Art in 1946. However, since there was hardly any money coming in through the rental of his films, he continued painting and produced a few hundred paintings before he died in 1967."

^{II} The following two websites feature recent information about the themes discussed the previous two sections http://www.centerforvisualmusic.org/Belson/, http://www.centerforvisualmusic.org/Fischinger/

THE SENSUAL LABORATORY LONDON 1967

IN THE EARLY 1960S, art students in England were confronted for the first time with a totally new approach to art education, initiated by Richard Hamilton and Victor Pasmore (Shanken 2003). Their approach was based on insights gained by the Bauhaus masters Itten and Klee as these were expressed by the statement:

Drawing is not only the outline and the modelling: It is the structure, the rhythm, the movement, the balance and proportion, the relation of every particular: the tone and the colouring.

During the 1940s and 50s, they had collaborated in summer schools to develop a basic course grounded on constructivist principles in art and design with the intention of making a truly constructive objective art. In 1954, Lawrence Gowing invited Hamilton and Pasmore to present their basic course in art and design at the University of Durham in Newcastle. One of their students, Roy Ascott, started his Ground Course at Ealing, to which he invited radical artists and intellectuals in a variety of disciplines. When Gustav Metzger was invited for a lecture, Pete Townshend, later the founder of The Who, was one of the students present. At that time Townshend had already turned to pop music and he recognized in Metzger's ideas on the esthetics of destruction a spirit he wanted to reflect in his musical performances. Townshend introduced the act of smashing his guitar into pieces at the end of his concerts, a much-imitated sign of protest and an outlet of the anger that was aroused in the young generation of the 1960s by the US Army's napalm and Agent Orange killings in Vietnam. The early 60s were characterized not only by the creation of new relationships between different art forms by artists, composers, and performers in open-art and anti-art works. Another aspect was the growing interest of artists to relate to pop culture, a trend that had recently been described as the new bond between pop and art music (Evers and Hiddink 1997). This tendency to use the experiences of the composers of so-called serious electronic music in the pop music studios aroused a shock effect in academia. Then as now, this was and is occasionally considered nothing more than a vulgarization of the classified notions of art and music (Boehmer 1997).

Pop art and pop music are keywords describing the tendency in art as well as in music to relate artistic expression to the new forms of popular mass culture, as they are particularly expressed by the new pop music and a new interest in the icons of industrialized society. In the visual arts this tendency finds its roots in the late 1950s with the work of Richard Hamilton, who incorporated the icons of industrial culture into his paintings. One of the







Figs. 47-50. Mark Boyle and Joan Hill during a performance of **Son et Lumiere** for **Bodily Fluids and Functions** (1966); black and white projection (1967); **Earth Air Fire and Water** (1966); burning slide (1966).

results of this was that many students at British art academies, Pete Townsend, John Lennon, and George Harrison among them, changed their career perspective from the fine arts to pop music. This trend continued with the careers of David Bowie, Brian Eno, and Brian Ferry, an art historian who founded the art rock group Roxy Music in the early seventies.

Interestingly, a new imagery was added to rock and pop in the mid-sixties. The experiments of Metzger and Marc Boyle with a completely new type of stage light effect for pop concerts resulted in so-called *Liquid Light Shows*. In 1963, Metzger presented the first results of his experiments with nylon in between the glass plates of a slide. Once the slide had been placed in the projector, Metzger added a drop of acid upon which the nylon started to dissolve, slowly at first, but accelerating until the nylon suddenly disappeared completely. With light from the projector no longer filtered by the nylon, the moment was experienced as a sudden flash of intense light. Metzger subsequently replaced the nylon with crystals, resulting in his *Art of Liquid Crystals*, which he used in the light shows accompanying the concerts of Cream, The Who, and The Move in 1966.

1966 is also the year in which Marc Boyle and Joan Hills began their synesthetic experiments with slides and film after becoming fascinated by the beauty of an accidentally burned slide. Boyle learned how to burn the slides when in the projector and, following this discovery, he began to study moving slide projections, similarly to Metzger, through chemical reactions and microscopic life and the use of a micro-projector. After some performances with live avant-garde music, played for example by Cornelius Cardew, Boyle recorded and presented the sounds of the processes themselves using contact microphones and amplifiers.

In the course of four years Boyle created an extensive *Son et Lumière* program for three aspects of natural and organic life: one for the elements *Earth, Air, Fire, and Water*, one for *Insects, Reptiles, and Water Creatures*, and one for *Bodily Fluids and Functions*. In 1966, these programs were presented in Liverpool, Bristol, London, and Amsterdam, and they were included in Metzger's *Destruction in Art* Symposium where Metzger introduced pop musician John Lennon and Fluxus artist Yoko Ono to each other for the first time.¹² By 1967, Boyle was presenting light shows in the underground dance club UFO, where bands like The Soft Machine and Pink Floyd alternated with theatrical acts, folk and jazz ensembles, and recordings of Bach's music. Boyle was especially attracted to the music of The Soft Machine, and became a regular contributor to their concerts on their tours with Jimi Hendrix through Europe, the US, and Canada.

Although the movements in the slide shows were not at all synchronized to the music performance, without exception the audience experienced an intimate synesthetic relationship between the movement of the music and the projected light. In his study of Boyle's work the art historian Hans Locher speculated on the way this worked:

The explanation of the "synchronization" is probably that the music of The Soft Machine, like the projected images, forms an irregular flow with unexpected interruptions and explosions, like swiftly passing clouds continually suggesting new meanings and relationships, both music and light show being so tenaciously complex and laminar that at any moment there are sounds and images supporting each other, clashing with each other, or responding like an echo. (Locher 1978)

¹² Metzger referred to this in a personal conversation with the author.

MEDIA-INTERACTION— MUSIC THEATER: THE SYNCHRONIZATION OF THE ARTS VERSUS THE JUXTAPOSITION OF MEDIA

11.2

"LET US FIRST ATTEMPT to trace the theoretic path upon which Modern Art must march forward to redemption from her present lonely, misprised station, and toward the widest understanding of general public Life. That this redemption can only become possible by the practical intermediation of public Life, will then appear self-evident. We have seen that Plastic Art can only attain creative strength by going to her work in unison with artistic Man, and not with men who purpose mere utility. Artistic Man can only fully content himself by uniting every branch of Art into the common Artwork: in every segregation of his artistic faculties he is unfree, not fully that which he has power to be; whereas in the common Artwork he is free, and fully that which he has power to be. The true endeavour of Art is therefore all-embracing; each unit who is inspired with a true art-instinct develops to the highest his own particular faculties, not for the glory of these special faculties, but for the glory of general Manhood in Art. The highest conjoint work of art is the Drama: it can only be at hand in all its possible fulness, when in it each separate branch of art is at hand in its own utmost fulness. The true Drama is only conceivable as proceeding from a common urge of every art toward the most direct appeal to a common public. In this Drama, each separate art can only bare its utmost secret to their common public through a mutual parleying with the other arts; for the purpose of each separate branch of art can only be fully attained by the reciprocal agreement and co-operation of all the branches in their common message. Architecture can set before herself no higher task than to frame for a fellowship of artists, who in their own persons portray the life of Man, the special surroundings necessary for the display of the Human Artwork. Only that edifice is built according to Necessity, which answers most befittingly an aim of man; the highest aim of man is the artistic aim; the highest artistic aim—the Drama. In buildings reared for daily use, the builder has only to answer to the lowest aim of men: beauty is therein a luxury. In buildings reared for luxury, he has to satisfy an unnecessary and unnatural need: his

The true Drama is only conceivable as proceeding from a common urge of every art toward the most direct appeal to a common public.

fashioning therefore is capricious, unproductive, and unlovely. On the other hand, in the construction of that edifice whose every part shall answer to a common and artistic aim alone,—thus in the building of the Theatre, the master-builder needs only to comport himself as artist, to keep a single eve upon the art-work. In a perfect theatrical edifice, Art's need alone gives law and measure, down even to the smallest detail. This need is twofold, that of giving and that of receiving, which reciprocally pervade and condition one another. The Scene has firstly to comply with all the conditions of "space" imposed by the joint (gemeinsam) dramatic action to be displayed thereon: but secondly, it has to fulfil those conditions in the sense of bringing this dramatic action to the eye and ear of the spectator in intelligible fashion. In the arrangement of the space for the spectators, the need for optic and acoustic understanding of the artwork will give the necessary law, which can only be observed by a union of beauty and fitness in the proportions; for the demand of the collective (gemeinsam) audience is the demand for the artwork, to whose comprehension it must be distinctly led by everything that meets the eye. Thus the spectator transplants himself upon the stage, by means of all his visual and aural faculties; while the performer becomes an artist only by complete absorption into the public." (Wagner 1911)

GESAMTKUNSTWERK BAYREUTH 1848

A FEW DECADES before technology led to artistic experimentation with electric light as a connecting esthetic force (first in the form of stage lighting related to theater and dance and later in the form of projection of abstract films and independent light art). music took the lead in a major synesthetic effort to connect and unify the different art, forms in one total art work, the *Gesamtkunstwerk*. In 1848, Richard Wagner published an article entitled "Das Kunstwerk der Zukunft" (The Artwork of the Future), in which he declared that none of the arts could be renewed separately. This did not only hold for the visual arts, but also for dance, instrumental music, and poetry. Since they had reached their highest level of development, their experiences could be renewed in the *Gesamtkunstwerk*, the drama. This statement could not be clearer. Halfway through the nineteenth century all art forms had been developed *in utero* and were at their peak. Why not bring all arts together in one building so as to enjoy the virtuosity of all different expressions simultaneously? In Wagner's view, the *Gesamtkunstwerk* was bound to be the crown of European civilization, the jewels of which were shaped and colored according to Nordic mythology and lit by the medieval legend of the search for the Holy Grail.

In 1876, Wagner's major dream was fulfilled. Thanks to a generous gift from King Ludwig II of Bavaria, the newly built *Festspielhaus* was opened in Bayreuth in order to immerse its audience in Wagner's operas over and over again. *Der Fliegende Holländer, Lohengrin, Der Ring des Nibelungen, Die Meistersinger von Nürnberg, Parsifal...* The twentieth century and World War I were still a long way away. In architecture, Neo-Classicist and Neo-Gothic styles prevailed. Although the European face already bore some severe scars, the great and mighty past was still displayed as the paradigm for a future that would undoubtedly be even greater, more mythical, and more heroic.

And so there were artists who not just wanted to impress but, above all, wanted to overawe: an orchestra of more than a hundred musicians and numerous actors, singers, and dancers on stage with massive sceneries and ingenious theater techniques. The operas themselves took many hours, the *Ring* even lasted four days. To the present day the Festspielhaus in Bayreuth is loved and hated. It is a temple of tradition, a mecca of Nordic culture, but at the same time it is a monument to megalomaniacal egocentric thinking, in which art is organized as a medieval court. Music is King, and all the other arts play footmen. The audience is there to respectfully endure music as a show of political power. In the *Gesamtkunstwerk*, everyone knows their place, order prevails, everything has been calibrated. It is a machine where all the wheels turn the same way. In Bayreuth the music is the loudest, the highest, the lowest, the slowest, the quickest, and the longest. It is the all-out effort of coordinated virtuosity. It is the ideal music box, always playing the same tune, over and over again.

Wagner's concept of the Gesamtkunstwerk survived not only the nineteenth century, but also the twentieth century as it became the non plus ultra ideal, appealing to almost all future generations of composers and artists. It was embraced not only by established music ensembles and opera houses, but also welcomed by progressive and innovative artist collectives with all kinds of holistic intentions. Interestingly, even today the concept is still so attractive that the concept appeals not only to the literal followers of Wagner, like the composers of operas and music theater who hire famous theater directors, visual artists, or filmmakers to sex up their musical ideas, but is also highly attractive to artists who are fundamentally interested in a nonhierarchical collaborative approach to create new types of total art events. Even though these radicals reject Wagner's hierarchical concept, in which music is the absolute ruler of the other arts to form an oiled machine that can reach for the wanted esthetic effect simply through addition and repetition, the essence of the idea survives. The concept of the Gesamtkunstwerk is still in use as a general expression of the ideal of artistic collaboration to create art works based on a collectively composed fusion of different artistic forms by using a huge range of conceptual, social, and technological means and interpretations of the all-embracing aim of realizing some kind of poly-modal artistic unity in diversity. Since so many artists and groups of artists have been influenced by the idea of the Gesamtkunstwerk, it is hardly possible to fully describe its influence. Nevertheless, we can distinguish three periods that used the idea as a cohesive force and a motive in the programs of a great diversity of artists.

The first period is marked by a number of individual and collective efforts to innovate the arts during the early decades of Modernism (Häni et al. 1983): Italian Futurism (1909-1922), the Russian Ballets (1909-1929), the German/Russian group *Der Blaue Reiter* (1912), Russian Futurism and Constructivism (1913-1935), the Swiss Dada (1916-1922), the Dutch *De Stijl* (1917-1932), and the German Bauhaus (1919-1933).

The second period began when Europe's creative forces were ideologically and physically threatened by the German Nazi regime, causing huge numbers of leading artists and scientists to emigrate from Germany to the UK and the US. European and American forms of Modernism became integrated into the artistic experiments at Black Mountain College (1933-1957) and at the Chicago Bauhaus. This phase ended in a completely different approach to uniting different forms of artistic expression in the anti-art movement Fluxus (1959-1970) in which American and European artists collaborated intensively by creating open forms that involved composers, performers, and audiences in the co-creation of events, happenings, environments, performances, and videotapes. This period has been well described by Adrian Henri in his work *Total Art* (1974) and by Roselee Goldberg in Performance Art (1990). The last part of this period is marked by the start of the conceptual art movement of the late 1960s and early 1970s (Héman et al. 2002).

Finally, there was a third period that, in its early stage, ran parallel to the second period, gaining momentum when the electronic arts movement surpassed the boundaries of elec-

tronic music and video. This happened when digital multimedia technology was introduced in the 1970s and 80s, which has started to blossom in recent years (Packer and Jordan 2001) and which has lead to the new artistic concepts of interactive art and generative art.

Although never apprehended by Wagner himself, all forms of art have faced a struggle with their identity during the decades after he published his ideas on the future of art. On the one hand artists from all disciplines—music, poetry, dance, painting, and theater—started to look for a fundamental innovation of their disciplinary canons that had been built and refined over the course of almost half a millennium. On the other hand, many artists began to reach beyond the boundaries of their respective disciplines in search of new, synesthetic connections and alliances with other forms of art.

The main implication of this complex situation was that it initiated the development of a fundamentally meta-disciplinary attitude that is needed to be able to learn and understand the full scope of artistic development during the last century. Part of one's attention should focus on the development within each of the concerned disciplines, and another part should focus on the evolving relationships between the disciplines. The first should be directed toward the development of the vocabulary, syntax, and grammar within the respective different artistic disciplines, enabling one to both view new directions within the perspective of their traditional canons and to learn to understand in what way they fundamentally departed from the traditional perspective. The second perspective is based on the innovation of the arts by creating relations between different artistic disciplines or by exceeding the boundaries between them. Synesthetic dimensions in art are created by developing new artistic media, such as light art, abstract cinema, visual music, color music, Neo-Plastic music, events, happenings, environments, performances, video, installations, visuals, interactive art, generative art, multimedia art, net art, etc.



Fig. 51. Temple for the celebration of Mysterium, from Alexander Scriabin's sketchbooks

MYSTERIUM MOSCOW/DARJEELING 1911 II.2.2

ACCORDING TO ALEXANDER SCRIABIN, it is not a social or political revolution but an artistic revolution that will cause a real change of society. Scriabin strongly believed in the transcendent possibilities of music and saw it as his own revolutionary task to create a musical experience that would elevate the spiritual level of humankind. To achieve this, he envisioned a total artwork, *Mysterium*, intended to generate a total sensory experience by unifying sound, sight, aromas, and bodily movement. Scriabin's ideas were inspired by Wagner's *Gesamtkunstwerk* concept that he further elaborated under the influence of the idealist philosopher Vladimir Solovyov and according to Helena Blavatsky's theosophical ideas. The theosophical movement, based on a mix of different forms of Indian religious practices, aimed at the individual's spiritual development. It introduced the concept of the "aura" to the West: the spiritual "body" that can be developed by focusing awareness on the harmony of sounds, colors, smells, and emotional states. According to theosophy, such awareness is characteristic of a more unified spiritual condition than the regular state of the rational mind (Eberlein 1985).

To achieve a collective spiritual transformation, Scriabin sketched the outlines of a temple to be built in Darjeeling in India. The sketch consisted of a planetarium-like dome surrounded by water, creating an outside image of a full globe with twelve huge towers around it to symbolize the notes of the chromatic musical scale (see fig. 51). The dome was intended to house a few thousand visitors who would enjoy music by moving their bodies to its rhythm. Musicians and dancers were to move around in the space, whose atmosphere would be permanently transformed by changing the colored lights and the smells of burning incense. Despite its grotesque naïveté, it is interesting to note that this was the first proposal to completely remove the stage, giving the music a spatial effect and inviting the audience to participate in the execution of the work by encouraging them to add their own movements and voices to those of the dancers and musicians, a form of interactive art *avant la lettre*.

Scriabin worked for more than eight years on this project, but his death in 1915 prevented its actual realization. However, he was able to realize a part of his ideas in his symphony *Prometheus*, which was meant to constitute the first part of the *Mysterium*. In this symphony, which bears the subtitle "Poem of Fire," Scriabin worked out his ideas on the relation of music to colored light. He was familiar with Castel's book on color optics and the idea of the ocular harpsichord. His friend Alexander Moser created a simple model of the *tastiera per luce*, as Scriabin called his color keyboard. It consisted of twelve light bulbs

arranged in a circle and mounted on a piece of wood with simple push buttons. Scriabin incorporated the colors to be played into the score of Prometheus, indicating the color schemes that were to accompany the music played by the instruments of the orchestra, with the intention that the colors to be projected in such a way that the whole space is filled with changing colored light.

In addition to Scriabin's interest in the *Gesamtkunstwerk*, the metaphysical speculations of the theosophical movement, and the technical challenge of composing with colored lights, he was also attracted to recent scientific investigations into colored hearing and synesthesia. His own supposed synesthesia was examined by the British psychologist Charles Meyers when Scriabin visited London to attend the international premiere of *Prometheus* in 1914. According to this investigation, Scriabin's interest in the relation of music to color began in Paris, where he was attending a concert and sat next to the composer Nicolai Rimsky-Korsakov. Discussing the color of the piece, which was written in D major, Rimsky-Korsakov described it as golden, whereas it seemed yellow to Scriabin. Meyer's interview led him to the conclusion that Scriabin's synesthesia was based not so much on the color of a note or pitch, but more on the tonality of a series of tones. Any simultaneous combination of tones, produced in Scriabin a simple or composite color effect as it suggests one or several tonalities (Meyers 1914).

In the year of Scriabin's death *Prometheus* was performed in New York accompanied by a color organ developed by General Electric. The Scientific American described the instrument in an article entitled "Color Music: New Art Created With the Aid of Science, The Color Organ Used in Scriabin's Symphony *Prometheus*" (Plummer 1915), a follow-up to an article published a year earlier about Rimington's color organ (Sultivan 1914). Since 1990 Scriabin's music and his desire to build a light organ have been the subject of extensive investigation by the Amsterdam-based Scriabin Society. The cofounders of the Luce Project, pianist Håkon Austbø and Rob van de Poel, a specialist in the field of electro-instrumental multimedia concerts, have taken a marked interest. Van de Poel has developed a computercontrolled color-module synthesizer, using a special keyboard with a midi connection to the computer. This way, the *luce* player is able to perform live in concert, where he can react to the conductor's direction as musicians do. He can play staccato, portamento, crescendo, diminuendo, and vibrato, varying the hue, saturation, and intensity of the colors.

On the occasion of the in The Hague-based Residentie Orkest's ninetieth season in 1994, the equipment was used in a performance of *Prometheus* in which the light was projected on five projection screens, each measuring two meters wide and ten meters high. The result appeared impressive due to its monumental scale, although it was not clear why Austbø and Van de Poel ignored Scriabin's intention to create a spatial colored light effect. As with the projection system developed in 1915 by General Electric, theirs was also based on a number of semitransparent screens positioned behind each other in order to control the composed relations of the colors to each other; the composer's wish to relate the colors to three-dimensional space was again ignored.



Fig. 52. Alexander Scriabin, first page of the score of **Prometheus**: **The Poem of Fire** (1910). The top staff gives indications for **Tastiera per luce**.

DER GELBE KLANG MUNICH 1912 II.2.3

IN 1912, WASSILY KANDINSKY, Franz Marc, and August Macke published the almanac *Der Blaue Reiter* (The Blue Rider) in Munich (Kandinsky and Marc, 2004). It contained a number of articles devoted to new ideas about painting and music, the relations of music to text and colors, and new forms of theater and stage compositions. A shared aim to synthesize the arts was expressed, but contrary to the explicit political aims of the Futurists, the almanac reflected the desire for a spiritual change. Their aims were therefore more similar to those of Scriabin. All hoped to ultimately transform society by realizing the potential of the arts. Undoubtedly, Kandinsky, who had left his home in Russia and moved to Munich in 1896, was the motor of this movement. In the first decade of the 20th century Munich was the place to be, at least for some Russian artists who wanted to profit from the unusual intensity of artistic vibration caused by the young artists working in the new Jugendstil.

In 1911, Kandinsky finished his main theoretical work *Concerning the Spiritual in Art* (2009). in which he sketched a completely new future for painting. In this text, Kandinsky was completely in line with many of his contemporaries since photography and film had proven to be much more accurate media for representing visual reality. However, where the Cubists chose to integrate the different points of view from which objects may be seen, and the Futurists chose to express objects in motion, Kandinsky proposed to completely give up any representation or reference to objects at all. It was his aim to develop the art of painting toward complete abstract compositions of colors, forms, and lines in a manner he compared to the essentially non-referential nature of music. He declared that colors, shapes, and the directions and configurations of lines all have an intrinsic esthetic quality. Kandinsky called this their "inner sound," the resonance in their soul, which he compared to a resonating string. In his synesthetic art theory he elaborated on the colors of the sounds of musical instruments and on the inner relations of colors to movement, concluding that colors have an intrinsic dynamic power that is directed inward (blue), or outward (yellow).

Although Kandinsky was familiar with Helena Blavatsky's and Rudolf Steiner's theories on color and their supposed spiritual implications, he tried to develop his own point of view. Kandinsky thought more in line with Goethe's metaphorical and associative values of colors (Lindsay and Vergo 1994) and found evidence for this in an article by Dr. Freudenberg, who had published an empirical study on synesthesia (Hahl-Koch 1985). In *Concerning the Spir*- *itual in Art*, Kandinsky referred to this study, comparing his own way of associating colors with sounds and forms to one of Freudenberg's patients, who reported that the taste of a particular sauce always aroused in his imagination the color blue.

In the same year that Kandinsky's main work was published, he and Franz Marc founded the group *Der Blaue Reiter*, consisting of Gabrielle Münter, August Macke, Alexei Yavlensky, Paul Klee, Alfred Kubin, and themselves. In their first exhibition their works were presented together with some of Arnold Schoenberg's paintings. Kandinsky met Schoenberg in Vienna, after hearing his music at a concert in Munich in 1911 and writing him a letter, resulting in many personal meetings and a correspondence that lasted for over two decades. Kandinsky was primarily interested in Schoenberg's incorporation of dissonance into his music. He acknowledged this in his first letter to Schoenberg on January 18, 1911, calling it an innovative force in painting too: today's dissonance in painting and music would be merely the consonance of tomorrow (Hahl-Koch1984). Schoenberg, in turn, was quite impressed by Kandinsky's images and ideas, and wrote to him about his own activities as a painter and his interest in the expressive power of colors. They both agreed that the challenge for the arts was not so much to calculate rationally and construct new forms, but to create forms that express the inner sounds resonating in the soul (Kandinsky) or being shaped by unconscious instincts (Schoenberg).

The publication of Der Blaue Reiter contained texts by, among many others, Leonid Sabanevev on Alexander Scriabin's symphony Prometheus, Schoenberg on the relation between music and text, and by Wassily Kandinsky on his theater piece Der Gelbe Klang (The Yellow Sound) and his newly formulated rules for stage composition. These texts, each in their own way, expressed a desire to rethink the possible relations between the arts, proposing new ways to look at these relationships. Der Blaue Reiter forms a remarkable document of the spirit of the time, as it is an outstanding sign of a common need among artists to break away from the outdated canons of the arts and the principles that had been ruling them for almost five centuries. In his article "On Stage Composition" Kandinsky presented his ideas concerning the question of how to relate the arts in a monumental way by contrasting them with Wagner's approach to the *Gesamtkunstwerk*. He praised Wagner for his attempt to use the libretto as the organizing principle of the movement of the music and drama, even though he observed that in practice this idea did not work. He believed that the words of the text completely disappeared in the music, which had dominant role over all the actions performed on stage and creating a doubling of movements by the use of the leitmotiv, the musical characterization of the protagonists. This caused him to reject the simplicity of this musical technique, which is nothing more than a repetition of the same effect through different artistic means. In Kandinsky's opinion, this way of thinking had been inherent to the positivist spirit of the nineteenth century:

[P]eople thought: 2 is greater than 1, and thought to strengthen every effect by means of repetition. As regards the inner effect, however, the reverse may be true, and often 1 is greater than 2. Mathematically, 1 + 1 equals 2. Spiritually, 1 - 1 can equal 2. (Hahl-Koch 1984)

He meant that it is also possible to relate several art forms in a completely different way by

letting them play a role in opposition to each other, whether juxtaposed spatially or temporally. In this manner, the inner sound of each different art form can be respected optimally since each one resonates to another of the soul's strings. These two possibilities can be combined in endless variations. Although he did not use this terminology himself, it can be concluded that Kandinsky completed the theory of stage composition by introducing the idea of counterpoint to Wagner's notion of the harmony of stage composition.

In addition to his criticism of this simple effect of repetition of movement with different forms of expression, Kandinsky criticized Wagner for neglecting a third element that should be used with regard to music and drama. He stated that "the inner quality of movement can be expressed by using color and pictorial form (decoration) in combination, having an independent importance and... treated as a method with equal rights." This possibility was expressed by Kandinsky's own monumental stage composition Der Gelbe Klang, which he wrote in the period 1909-1912 with the young composer Thomas de Hartmann and which was published in Der Blaue Reiter. In this stage composition there are three elements that serve the inner value as external methods: 1) the musical sound and its movement; 2) the physical-psychical sound and its movement, expressed through people and objects; and 3) the colored tone and its movement (a special possibility for the stage). All three elements play equally important roles; they remain externally independent and are treated equally, i.e., they are subordinated to the inner goal. Music, for example, may be entirely pushed into the background or played offstage when the effect of the movement is expressive enough, and powerful musical collaboration would only weaken it. An increase in musical movement may correspond to a decrease of dance movement; in this way both movements (the positive and the negative) enhance their inner value. There are numerous combinations between these poles: collaboration and contrast. Graphically speaking, the three movements could run in entirely separate, externally independent directions (Lankheit 1974).

Since *Der Gelbe Klang* was never performed during Kandinsky's lifetime, it is hard to imagine if it would have been a success in his view and what the responses of the audience would have been. The piece is clearly a demonstration of his theory of stage composition. More than showing any linear development, the scenes consist of motions of the main characters—five giants, indistinct beings, a child, a man, people in flowing garbs, and people in tights—and a tenor and choir singing from behind the stage. These characters are to move around in a clearly prescribed way, and sometimes murmur or whisper vocals or pronounce a short sentence (e.g. "stone-hard dreams," "speaking rocks," "the heaven turns," "the flowers cover all," etc.). The musical fragments, which can be found in de Hartmann's archive in the Yale Library, suggest a style very close to the atonal music of Schoenberg, Berg, and Webern; its intentions were described in de Hartmann's contribution to *Der Blaue Reiter*, entitled *On Anarchy in Music*.

Der Gelbe Klang is still quite an intriguing concept because of the way electric stage light and colors were to be used as one of the dramaturgical means, despite Kandinsky's intentions partly remaining unclear. Around 1980, interpretations of *Der Gelbe Klang* were staged in Moscow and in New York. The attempted reconstruction according to the original intentions, by stage director Ian Strassfogel and musical director Günther Schüller in New York, seems to have demonstrated its value. Yet, in the words of John Rockwell, music critic for the New York Times:

[T]he trouble with this Yellow Sound, for all its worthiness as art-historical research, is that it lacks the juice of true theater. Munich before World War I pulsed with the excitement of youth; they didn't call it Jugendstil for nothing. For all the brilliance of the colors on the Marymount Manhattan stage, this Yellow Sound remained distant and pale. (Rockwell 1982)



Fig. 53. Performance of Kandinsky's The Yellow Sound (1912), Marymount Manhattan Theater New York, 1982.

DIE GLÜCKLICHE HAND VIENNA 1913 II.2.4

IN THE YEARS LEADING UP to the turn of the century, Schoenberg proved that Wagner's pessimism regarding a possible further development of intrinsic artistic qualities within the different art forms was unjustified. Ironically, it was in Wagner's own work that Schoenberg discovered an element he exploited with innovative consequences: Wagner's practice to employ free-floating pitches independent of the traditional rules of tonal harmony to intensify emotional effect. Years of experimentation with tonal independence ultimately led to Schoenberg's fame as the founder of atonal music, which was at first characterized by a completely anarchistic structure and a deep need for emotional expression.

In his *Harmonielebre* (Theory of Harmony) of 1911, Schoenberg described the first stages of his new insights into musical harmony and speculated about composing *Klangfarben-melodien* (melodies based on sound colors). The use of timbre in musical composition was not a novelty in itself since many compositions for symphony orchestra in the nineteenth century had already explored new techniques of orchestration. However, Schoenberg was the first composer to give sound color a place in music theory as an independent compositional parameter, along with melody, harmony, rhythm, and dynamics. Schoenberg was so enthusiastic about the fundamentally new possibilities of this that he concluded his *Harmonielehre* with a rather emotional call: "Sound-color melodies! What fine senses that may distinguish them, what high developed mind may be delighted by such subtle things! Who dares here to demand theory!" (Schoenberg 1911).

A few years later, however, Schoenberg brought his free atonality under control with the new rules of dodecaphony, the twelve-tone system that treats all notes in an equal, nonhierarchical manner. The new compositional possibilities transgressed the rules of the old tonal system, ruled by formalized relationships between tonic and dominant. The twelvetone system allotted each separate tone an equal musical value, an idea that would later be extended by serialism. Eventually, all musical parameters (such as pitch, dynamics, duration, and timbre) were treated similarly by organizing their values into rows that can be mirrored horizontally and vertically, repeated, accelerated, decelerated, delayed, and so on.

Although Schoenberg's work is primarily valued for the musical revolution he generated, his personal interests were not limited to the art of music; his interest in the arts was marked not only by a broad view, but also by his intensive activities as a painter. A third field of interest he explored in detail was the relationship between music and text, demonstrated by his contribution to *Der Blaue Reiter* and his experiments to develop new







Fig. 53. Arnold Schoenbergsketch for scene II of Die Glückliche Hand.

Fig. 54. Arnold Schoenbergsketch for scene I of **Die Glückliche Hand**.

Fig. 55. Arnold Schoenberg, sketch for his music drama Die Glückliche Hand, "The Man."

forms of music theater. His first theatrical pieces, *Erwartung* (1909) and *Die Glückliche Hand* (1911-1913), both expressed the deep pains of a lost love. In *Erwartung*, a new singing technique was introduced, *Sprechgesang* or speech-song, in which the singer moves between regular speech intonation and purely musical intonation. This technique was supremely developed in *Pierrot Lunaire* (1912).¹³ The media of the stage were experimented with in *Die Glückliche Hand*, which Schoenberg called a "drama with music." With the intent of creating "utmost unreality," he composed a work in which acting, stage design, color, lighting, and other dramatic concerns were treated as purely musical.

Schoenberg's method of composition has sometimes been criticized for being excessively rational, but this was never his intention; he always stressed the primacy of following heart over mind and trusting one's feelings when making compositional decisions. First adapted by his pupils Alban Berg and Anton Webern and later by the French composers Olivier Messiaen and Pierre Boulez, among others, Schoenberg's approach found its legacy in serialism, which proved to be especially helpful and effective when, at the end of the 1940s, composers were faced with the new possibilities of electronic technology. The completely new musical language of electronic music required a structural approach that was not based on instrumental qualities, but on a conceptual approach to the composition process.

¹⁵ During the International Symposium Schoenberg-Kandinsky, organized by the Municipal Museum of The Hague in collaboration with the the Interfaculty Image & Sound in 1993, Pierrot Lunaire was performed against the background of Kandinsky's paintings hanging in the museum. The symposium also featured a recomposition of Die Glückliche Hand by the teachers and students of the Interfaculty in the Royal Conservatoire's Schoenberg Auditorium. A synesthetic light and storm crescendo based on the composed relations between the accelerated sounds of a wind machine in combination with the moving sounds of musical instruments and a crescendo of colored lights played a central role in the expression of the emotions of the main character. The interpretation of this piece was based on Dick Raaijmakers's concepts of the "open form" and "recomposition." The aim was to create a piece of music theater adhering to Schoenberg's original intention to automate the piece since Schoenberg had hoped to realize the drama in the form of a hand-colored film accompanied by a new kind of automated piano produced by the Aeolian Organ Company (Stein 1958). Since Schoenberg's concept of fully automated music theater was never realized, it was a challenge to integrate the application of the new media, using modern means of visualization and sonification, with live performance on stage (see III.2.2).

CABARET VOLTAIRE ZURICH 1916

11.2.5

IN THE MIDST OF WORLD WAR I, while the Futurists and Schoenberg joined the army and Kandinsky returned to Russia to join the revolutionary artists in his home country, another group of artists made its way to Switzerland and founded a new art movement: Dada. Switzerland remained neutral during the war, attracting the poet Hugo Ball and his wife Emmy Hennings, who decided to leave Munich and take up residence in Zurich. There, at the beginning of 1916, Ball found an empty hall in the Meierei in the Spiegelgasse, run by the former Dutch sailor Jan Ephraim. Ball's wish was to create a meeting place for young artists, documented in the following words (published in the eponymous "Cabaret Voltaire" on June 15):

As I founded Cabaret Voltaire, I thought that in Switzerland I might find some young people just like me, who not only wanted to enjoy their independence but also wanted to document it. I went to mister Ephraim, the owner of the Meierei and said: Please, give me your dance hall. I want to make a cabaret. And I went to some acquaintances and begged them: Please give me a statue, a drawing, an engraving. I want to combine the cabaret with a small exposition... went to the friendly Zurich press and begged them: Bring your notebooks. There will be an international cabaret. We will make beautiful things. And they gave me statues and brought notebooks. So on February 5th we had a cabaret. (Ball 1916)

Cabaret Voltaire quickly attracted artists from all over Europe; from its very beginning the evenings were characterized by the typical style of Dada-esque theater. Simultaneous poetry readings in different languages, performances of Schoenberg's avant-garde music alternating with French and Danish chansons, a Balalaika orchestra, appearances by Laban's dancers, Russian folk song and dances, and negro-music (always executed with the big drum: "boom boom – drabatja mo gere drabtja mo bonoooooooooooo!") typified these evenings. The performers wore fancy dresses and masks and read manifestos calling for a new art, pointing to their ever-growing collection of paintings, drawings, and pictures brought and sent in by many of the great contemporary avant-garde masters (Kandinsky, Picasso, Arp, Marinetti, Picabia, Van Doesburg, Van Rees, Richter, Klee, Ernst, Kokoschka, Feininger, Modigliani, Prampolini, etc.). Ball described the documentation before it was published:

It will characterize the activities and interests of the cabaret, whose whole intention is aimed at remembering, surpassing the War and the native countries, the few independent people who live other ideals. The next goal of the artists which are here united is the publication of a Revue Internationale. The revue will appear in Zurich and go by the name of "DADA" ("DADA") Dada Dada Dada Dada. (Ball 1916)

Contrary to the formal esthetic aims of the Futurists and the international movement *De Stijl* (founded a year later in the Netherlands, also neutral during World War I), Dada can be considered the first art movement in which artists united on the negative principle of rejection. Ball wanted to celebrate the freedom of the artists gathered in Zurich rather than directly comment on the horrors experienced by the millions of people involved in the war. He was aware that art is an ineffective response to the cruelties of war, although he agreed with the Romanian poet Tristan Tzara, who became the leading force of the movement, that "transforming their commonly experienced resentment to the war and the ruling powers of the bourgeoisie, and their belief in the lack of meaning of life, into something sub-lime, was a worthy goal" (Ball 1916).

The Dada artists had no constructive intentions regarding formal artistic principles, but referred to the primal, naïve expressions of the young child. Compared to the Futurist evenings and the Theater of Synthesis, the Dadaist *Sturm-Soirées* (storm evenings) had no clear artistic direction nor were they intended to provoke the general audience. Yet in a penetrating way they unexpectedly expressed the ideal of the *Gesamtkunstwerk*, not as a composed whole, but as a totally improvised collective event created by diverse artists who more or less met by chance in a place that is not at war. Due to this desperate motivation, Dada went a step further than Marinetti's call for the free word, the *parole libere* attained by the destruction of the syntax of the sentence. Dada aimed at the destruction of the lexicon itself by breaking words into the syllable sounds of baby language. Speech was made meaningless, leaving only the joy of making hardly articulated primitive sounds. Dadaist poems in recitation result in multilingual cacophony. The music was atonal and the noises produced by kettledrums were absolutely not intended to extend or contribute to the musical lexicon, as Russolo had aimed for with his *intonarumori*.

The Dada performances during the *Sturm Soirées* were presented as *coups de théâtre*, where scenery was placed in the midst of the audience, using the subtle invention of blowing wind produced by electrical fans to clear the air both literally and symbolically. The sounds of the *Sturm Soirées* were intended to free the mind of the search for meaning in a world in which the air was poisoned by mustard gas and to express disgust toward the poisoning language used by war apologists. Not knowing that twenty-five years later an even stronger type of gas would be systematically used to destroy Jews, gypsies, and homosexuals alike, even further removing the concept of meaning from life, the Dada artists gathered in Cabaret Voltaire, the Corray Gallery, the Galerie Dada on Bahnhofstrasse, and a number of guild halls. There they expressed their joy and luck to have remained outside of the horrors of World War I. By using the parts of the artistic mind connected to infants and primitive people they created their elementary sound poetry, musical rhythms, and bizarre outfits.

Dada's intense effect on the art world declined shortly after 1919, although Dadaist meetings continued in many countries until the mid 1920s. Formally, the movement came to an end in 1922, when El Lissitzky, László Moholy-Nagy, and Theo van Doesburg organized the International Constructivists Congress in Weimar. Not knowing that Van Doesburg had also invited Hans Arp and Tristan Tzara, who tried to change the congress into an-



Fig. 56. Hugo Ball in "cubist costume" reciting his poem "Elefantenkarawane" at the Cabaret Voltaire (June 23, 1916).



Fig. 58. Picabia, Relâche (1924)

Fig. 57. "Dada 7" ("Dadaphone") edited by Tristan Tzara (Paris, 1920).



other Dada soirée, the young constructivist artists angrily left the congress, upon which Tzara declared the death of Dada, stating in 1922:

Dada is nothing. I broke away from Dada and from myself as soon as I understood the implications of "nothing"... Dada is not at all modern. It is more in the nature of a return to an almost Buddhist religion of indifference... Dada applies itself to everything, and yet it is nothing. Like everything in life Dada is useless. (Motherwell 1989)

As documented in Tzara's *Chronique Zurichoise* 1915-1919, NON PLUS ULTRA, the 9th and last Dada night in Zurich took place in the guildhall "Zur Kaufleuten" where about 1,500 people had gathered (Huelsenbeck 1920).

The strongest quality of the Dadaist movement was undoubtedly its international influence on artists all over Europe, leading to manifestations in Germany, Holland, Belgium, France, Italy, Czechoslovakia, Spain, Russia, and even the United States. In addition to the collective effort to create an artistic response to the surrounding disorder and chaos, the main consequence of Dadaism was that it created a common platform for individual artists with rather different aspirations regarding the way they wanted to develop their own, individual forms of art. The phrase "unity in diversity" clearly applies, unity standing for the shared value of the choice to live the life of an artist, and diversity standing for the individuality of independent artists and the choices they made to develop their own work. Accordingly, in the Dada movement we meet such diverse characters as Apollinaire, Dali, Duchamp, Eggeling, Ernst, Hennings, Ray, Schwitters, along with those mentioned above and countless unmentioned artists and participants alike. Artists and their different disciplines came together in the Dada movement, primarily to celebrate that in Zurich it was still possible to meet other artists and create improvised expressions in the form of cabaret-like stage acts and non-structured expositions. This was primarily to celebrate artistic freedom; no improvement of esthetic or formal artistic goals was aimed at, but instead, formal regression was encouraged to stimulate collective creative spontaneity. Yet this particular art scene was also the context in which new artistic concepts were created, resulting in two important artistic innovations.

First, two Dada artists, Viking Eggeling and Hans Richter, felt compelled to return to Berlin soon after they discussed the ideas published by the theatre critic Bernhard Diebold to take a fresh, synesthetic approach to cinematography. The challenge appeared in a series of three newspaper articles in the form of a feuilleton on the front pages of the *Neue Zürcher Zeitung* in September 1916, directly below the latest news on the war. Eggeling and Richter were so aroused that they decided to investigate this possibility immediately and started working in the direction of abstract cinema soon thereafter. Another reason the Dada story deserves attention is that many Dadaists became strongly inclined toward Surrealism. It is no wonder that some of them met a few years later in Paris when André Breton founded the Surrealist movement. In the context of Surrealism, a more Dadaist approach to the new cinema was launched by Man Ray, Dudley Murphy, René Clair, and Francis Picabia. Their semi-abstract films *Images Mobiles* (later renamed *Ballet Mécanique*) and *Entr'acte* premiered in 1925 in the program *Der Absolute Film* together with the first four absolute films by the pioneer Walther Ruttmann and abstract films by Eggeling and Richter (see IL14).

UNTITLED EVENT BLACK MOUNTAIN 1952

IN THE I920S substantial progress was made in the development of new musical instruments based on electrical sound production. Theremin produced his *termenvox* in 1919/20, Martenot invented the *ondes-martenot*, Trautwein developed his *trautonium* in 1928, and Hammond produced his *Hammond organ* in 1929. Despite the novelty of their sounds, the way the instruments were built testified of a musical approach that was still very close to the traditional musical concepts of melody and harmony. It took another two decades before new approaches to electric devices developed into instruments with fundamentally new compositional possibilities.

The first composer to actually realize an innovative piece of electroacoustic music was John Cage. Cage's merits as an artist are not restricted to his work as a composer of (electronic) music, but may be best described as those of a *meta-composer* as his work extends to many other forms of art and media.¹⁴ It was originally his intention to become a painter, but he decided early on in his career to concentrate on composition. Additionally he also developed as an author of many books, worked intensively for many years in modern dance, experimented with radio, tape-recorders, slide projections, and computer programs, developed new forms of opera, theater, and multimedia events, and finally also returned to his original interest in visual art during the last twenty years of his life. Through his allembracing creative synesthesia and his unorthodox attitude toward life, Cage is certainly one of the most outstanding artists of the second half of the twentieth century.

Cage demonstrated his remarkable character when he refused to finish his college education and chose his own ways to teach himself. In 1930, when he was eighteen, he left the US to travel through Europe and North Africa. In Paris, he became fascinated by architecture, and then by German, expressionist, and abstract art, and he read everything on the subjects he could get his hands on in the library. After Paris he traveled to Madrid, Berlin, Italy, North Africa, and Mallorca, where he began composing music on the basis of a complex mathematical system. After a year and a half he returned to the US and settled in Los Angeles, where he continued to compose, now based on text-related improvisations.

In 1932, with unemployment at its highest rate ever, Cage decided to invent a job for himself, teaching housewives about modern art and music. He admitted that he knew little about both subjects, but his enthusiasm still attracted a few dozen housewives to

¹⁴ In 1988 the Royal Conservatoire invited Cage for a three-week project in which composition students, instrumentalists, and artists met with Cage to discuss his artistic approach. During the project a great number of his works were performed, along with new works by students and teachers of the composition department and the audiovisual courses. One such new work was the result of the project Book III—The New Media, reminiscent of the approach and atmosphere of Cage's Untitled Event at Black Mountain College (see III.15).



Fig. 60. John Cage preparing a piano (c.1962)

follow his weekly one-hour class. To prepare his lectures, he spent each week studying in the Los Angeles Public Library, where he developed a special devotion to the paintings of Mondrian and the music of Schoenberg. At this time, Cage was accepted as a student of Richard Buhlig who was one of the first American pianists to play Schoenberg's music and who worked with Cage on musical structure and the importance of timing.

Cage later studied for some time with Adolf Weiss, who was Schoenberg's first American student in Germany in the years 1924-1927. Weiss developed a serial composition technique, translating numerical columns of figures into rows of notes, which may have influenced Cage's later work with numbers. Cage then managed to interest Henry Cowell in his compositions, and Cowell immediately recommended that Cage go study with Schoenberg himself, but first Cage traveled to New York. He became Cowell's student and assistant at the New School of Social Research for the following year, during which he learned mainly about non-Western music.

The pressure of the Nazi regime forced Schoenberg to leave Germany in 1934. After living in Boston for a few months, he decided to move to Los Angeles. In 1935, Cage approached Schoenberg to study composition and followed two courses, one in the summer and one in the fall. But the two did not get along very well. When Cage showed Schoenberg his *Quartets*, his first percussion piece, Schoenberg was not impressed and he told Cage that he had no feeling for harmony, which for Schoenberg was a critical compositional skill. Cage began to doubt his future as a composer and took up painting again, showing his work to the artist and art collector Galka Scheyer in 1936. Although Scheyer considered the artwork rather weak, she introduced Cage to Fischinger, who had just arrived in Los Angeles. Fischinger suggested that Cage could assist him on the film as his assistant, hoping that by acquainting him with the way his films were made, Cage might compose music for them.

Cage's job was to move bits of colored cardboard hung on wires, using a long pole and a chicken feather. When the cardboard was perfectly still, Fischinger would record a single frame. At one point during his work, Fischinger told Cage his theory of sound, stating that everything in the world has its own spirit that can be released by setting it into vibration (Cage 1991). This was literally an ear-opener for Cage: "I began hitting, rubbing everything, listening, and then writing percussion music, and playing it with friends." He began collecting all manner of sounding objects, solving a practical problem he had faced. Cage had written *Quartets* without specifying what percussion instruments were to be used. It was a study in rhythm and timing, and the instruments were not specified since he did not have the money to hire instrumentalists to perform the piece. Following Fischinger's suggestion he began touring local wrecking shops, buying brake drums, hubcaps, spring coils, etc. Cage rehearsed *Quartets* and the work *Trio*, which he wrote after Fischinger's advice, with a group of bookbinders he lived and worked with. Unfortunately, Fischinger never made a film that used *Trio* as its soundtrack.

Because of Cage's clumsiness his job as Fischinger's assistant ended rather abruptly and Cage started looking for new teaching jobs. He was invited by Bonny Bird, who had been working with Martha Graham, to do the piano accompaniment and write new music, for her modern dance classes at the Cornish School for the Performing and Visual Arts in Seattle. Cage moved to Seattle and met dancer Merce Cunningham, one of Bird's students.

The same year, in 1937, he wrote one of his most important essays, "The Future of Music: Credo." During his stay at Cornish he was able to do experiments in the school's radio station, where he investigated possible ways of applying of electrical technology to music.

Influenced by Marinetti's 1933 manifesto *Futurist Radiophonic Theater*, which anticipated the amplification of inaudible, or in Cage's words, "small sounds," he began researching these sounds by recording and playing them back on variable-speed turntables he found in the studio, producing siren-like glissandi. In his *Credo* lecture for the Seattle Arts Society he claimed that noise would become accepted as musical material and that ultimately electrical instruments would allow composers to produce any kind of sound, referring to Fischinger's photo-optical sound production on film soundtrack and other photo-electric and mechanical mediums for the synthetic production of music. His first achievements in this direction were staged in 1939 for a Seattle performance of Jean Cocteau's theater piece *Les mariés de la tour Eiffel* (Marriage on the Eiffel Tower). A six-minute piece consisting of prepared piano, cymbal, and two variable-speed turntables, it was broadcast from the Cornish School radio station to the nearby theater. In the same year, he completed his first electro-acoustical piece, *Imaginary Landscape No. 1.*

Two years later Moholy-Nagy contacted Cage. Following his emigration to the US in 1937, Moholy-Nagy had initiated *The New Bauhaus* and he asked Cage to add to his concept of total education by teaching a class in experimental music. Although the authorities, upon concluding that Moholy-Nagy's approach was too experimental, closed down *The New Bauhaus* in order to rename it as the *School of Design* a year later, Cage found a way to continue working in the school's studio on the *Imaginary Landscape* experiments. Cage produced *Imaginary Landscape No. 2* and *Imaginary Landscape No. 3* in 1942, for which new electronic devices, such as an audio-frequency oscillator, were used. Later that year, Peggy Guggenheim introduced Cage to Piet Mondrian, André Breton, and Marcel Duchamp in New York.

Cage expressed his awareness of the tragedy unfolding in Europe in his pieces *Credo* in US (1942) and *In the Name of the Holocaust* (1942), in which he articulated his satirical attitude to the new nationalist wave in the US while it prepared for war. Though happy that he was not drafted and that he avoided the cruelties of warfare, Cage experienced turmoil of a personal sort in these years. The breakdown of his marriage followed a few years of desperation due to his struggle to accept his affection for Merce Cunningham, who became his closest partner in life and work. The shock went so deep that he began to reconsider the meaning of music, which he had thought to be communication. Over the course of a few years Cage's notion changed, influenced by Gita Sarabai, who taught him the basics of Indian music, in which he recognized a similarity between its rhythmic aspect, *tala*, and his own fascination with structuring time. Sarabai also enlightened him about the Indian idea of the function of music, which is to quiet the mind so that the gods can enter it.

After this introduction to Eastern thinking, Cage attended the classes of Zen teacher D.T. Suzuki, learning about opening the ego to the universal presence of Mind or Self, and how to accommodate these influences instead of fighting them in order to keep control over one's situation through the ego. From Ananda Coomaraswamy he learned that the function of art is to imitate nature and its creative forces. These new views were expressed for
the first time in *Amores*, which had its premiere in the Museum of Modern Art in New York in 1943, performed by him on prepared piano with his former wife Xenia and his new partner Cunningham playing the percussion instruments. From then on, Cage produced a large series of works for prepared piano, including the most famous of the series, *Sonatas and Interludes* (1948), which premiered at Black Mountain College where Cage taught at regular intervals until 1953. Meanwhile, he created *Music of Changes*, based on chance operations following the rules of the I Ching, first performed by pianist David Tudor, who became one of the most dedicated performers of Cage's music.

Cage was the most outstanding cross-Atlantic artist, both in a geographical and a historical sense, because he connected himself personally to a great number of early avant-garde pioneers in the fields of music, painting, and film, to the young generation of American abstract expressionist painters and avant-garde composers, and to the new generation of European composers working in the fields of electronic music and *musique concrète*. Cage became primarily a composer of music, although his work extends to the other arts quite easily. He had a unique talent to organize time in a synesthetic way, to work out the compositional methods of chance operations, indeterminacy, and simultaneity (for example by using dance movements to generate musical sounds,) and organized his performances in such a way that along with their musical quality they always had to express visual quality as well.

To date, Cage is the master of creative synesthesia. Not only through his unique way of relating sounds, tones, noise, and silence within a musical piece by using the method of the "time bracket," but also through his contributions to almost all art forms, and by proposing completely new approaches to relating them while bringing to life a completely new form of performance, the "event," the forerunner of the happening. As a result of his work the three basic musical dimensions of melody, rhythm, and harmony have been replaced with duration, sound, and silence, placing the listener in the vertically structured space of synchrony – the "now." And, as we have to come to know in this century, time and space are interdependent (see Friedman 1998).

Cage loved to work with Cunningham on the relationship between music and dance in such a way that one is not subject to the other, but in which both are complementary to each other to such a degree that music can influence dance or dance can influence music. Through this approach, Cunningham was freed from the habits of Martha Graham, for whom dance always had to strictly follow music. This principle was not restricted to the relationship between music and dance since it is also characteristic of Cage's approach to film music, his theatrical experiments, and his attitude toward the musical score, which he considered a piece of graphic art itself as is shown by his collection of graphical scores in *Notations* (Cage 1968).

In 1947, he was asked by Marcel Duchamp to write music for his film experiment *Discs*, one of the most fascinating 3-D experiments in film animation, that forms a part of Hans Richter's film *Dreams That Money Can Buy*. For this, Cage composed a five-minute piece for prepared piano consisting of a rhythmic structure without any formal relation to the film except for the duration of both of them. However, when asked two years later to produce a twenty-minute soundtrack for Herbert Matter's film on the works of mobile creator



Fig. 61. Plan of operations for Black Mountain College.





Fig. 62. LP cover of John Cage's 27' (1977).

Fig. 63. Merce Cunningham and Elizabeth Jennerjahn, dance class (1948).

Alexander Calder, he took a completely different approach. As a part of this soundtrack, he recorded and edited the sounds in Calder's atelier in a way that unfortunately has not yet been analyzed thoroughly. It has been suggested that in this piece Cage applied Pierre Schaeffer's approach to *musique concrète* for the first time, an approach that Cage learned from Schaeffer in 1949, during his first visit to Paris after World War II.

1952 was an important year for Cage for a number of reasons, but especially because of two works, *Untitled Event* and 4'33", both created during his summer residence at Black Mountain College. *Untitled Event* has become famous for its revolutionary multimedia character and is widely recognized as having been the first happening, based on an open form approach in which the participants were allowed to contribute their own ideas or actions to the piece. This took place ten years before the open form became the most powerful tool of expression for the anti-art movement Fluxus and the political activists responding to the conservative nature of bourgeois culture in the early 1960s.

It is a paradox that 4'33", created almost at the same time, reflects an attitude almost completely opposite to the one behind *Untitled Event*. Despite their extremely different means, both works share the fundamental objective of shaking the audience in an astoundingly provocative way. Each piece reflects one of the basic forms of synesthetic thinking that earlier had been expressed by Castel in his concept of *musique muette* and by Wagner in his concept of the *Gesamtkunstwerk*, but both in quite unexpected ways.

Untitled Event was created within only a few hours between lunch and dinner during which different forms of artistic expression were brought together: recorded music, radio, prepared piano, dance, painting, film, slide projection, literature, and performance. The piece may be considered as the start of a new—interactive—stage in the development of the *Gesamtkunstwerk*, whereas 4'33'' may be viewed as an original contribution to the development of a generative relation between music and painting. 4'33'' is the result of four years of reflection on a number of Rauschenberg's remarks regarding his *White Paintings*.

Rauschenberg had explained to Cage that he had not wanted color to serve him because a canvas, mirroring the air and acting as a landing base for dust, shadows, and light reflection, is never empty (Revill 1992). These remarks encouraged Cage, who had already long wanted to use silence in a musical way without trivializing its effect, to compose 4'33'', a piece to open the minds of the listeners to the always existing environmental sounds that incidentally occur and to which one can listen with a musical attitude. Cage used the *I Ching, the Book of Changes*, to determine the time length of the three movements of silence that constituted the piece.

Both pieces are perfect illustrations of the two ways in which different art forms can be related. In *Untitled Event*, a *Gesamtkunstwerk* was created based on a Kandinsky-esque principle of juxtaposing different art forms within one piece and preventing the dominance of one art form over another, balancing durations through chance operations. 4'33'' expresses an original synesthetic equivalent of the white paint of Rauschenberg's canvasses, where the relationship between the color white and the sound of silence is not direct but indirect. The connection results from a tertium comparationt is that is formed by the context, the physical environment, which adds environmental noises to the silent stage

performance (David Tudor coming up, sitting quietly at the piano, and leaving the stage after four minutes and thirty-three seconds), or environmental light reflections to and dust on the white canvasses.

Despite the spontaneity involved, the approach to *Untitled Event* already had some institutional background at Black Mountain College since the *Light Sound Movement Workshop* had been established more than a year earlier by Betty and Pete Jennerjahn who were searching for a structural relationship of light, sound, and movement that was basically non-verbal (Harris 2002). Performances were developed using self-made percussion instruments, slide projections, and painted backdrops that sometimes extended into the large dining hall, resulting in a total environment where the improvised performances mixed with the regular actions of preparing a dinner table and having a meal together.

In the preparations and in the performance itself, Cage read aloud from *The Huang Po Doctrine of Universal Mind*, which had to contribute to the participant's openness to the things happening during the event, according to the energies present at the very moment of its creation. The only formal structure of *Untitled Event* was given by Cage, handing each participant a sheet with a time bracket that indicated at what point he or she was supposed to contribute to the action, and by the spatial arrangement in which everyone was to take a place or to move. The audience was seated in four triangular, inward facing blocks, rather in the shape of a Maltese cross. The action took place partly outside the seating area and partly in the aisles inside of it (Kirby and Schechner 1965). Spectators took their seats in the square arena forming four triangles created by diagonal aisles. Each spectator held a white cup that had previously been placed on their chair. White paintings by Robert Rauschenberg were hanging overhead. From a stepladder, Cage, in black suit and tie, read a text on "the relation of music to Zen Buddhism" and excerpts from Meister Eckhart. Then he performed a "composition with radio," following the pre-arranged "time brackets."

At the same time, Rauschenberg played old records on a hand-wound gramophone and David Tudor played a "prepared piano." Later, Tudor turned to two buckets, pouring water from one to the other while, placed in the audience, Charles Olson and Mary Caroline Richards read poetry. Cunningham and others danced through the aisles, chased by an excited dog, Rauschenberg, whose *White Paintings* were mounted to the ceiling, flashed "abstract slides" (created by colored gelatin sandwiched between the glass), and film clips projected onto the canvasses on the ceiling showed first the school cook, and then, as they gradually moved from the ceiling down the wall, the setting sun. In a corner, the composer Jay Watt played exotic musical instruments, and whistles blew, babies screamed, and coffee was served by four boys dressed in white (Goldberg 1990).

As Henri (1974) observed, with Cage's increasing use of chance as a compositional method and his intention to give the performers more and more freedom, his purely musical works became visual performances. Besides the incorporation of visual elements in his musical works, Cage had an explicit influence on the visual arts when he lectured at the New School of Social Research on Composition of Experimental Music in 1958. This class attracted Allan Kaprow, George Brecht, and Dick Higgins, where they absorbed Cage's ideas on the potential role of chance operations in the creation of art, applying them in the form of happenings.



Fig. 64. Kaprow prepares for I8 Happenings in 6 Parts (1959).

18 HAPPENINGS IN 6 PARTS NEW YORK 1959

DURING THE YEARS 1957-1959 many new relationships between artists based in the US and artists based in Europe were established, partly as a result of Cage's activities on both continents. These new relationships were expressed through the programming of the *Vortex Concerts* (see III.34) and through the creation of *Poème électronique* (see III.35). At the New School for Social Research in New York, Cage began teaching the course *Composition of Experimental Music*, a course in musical composition with technical, musicological, and philosophical aspects, open to those with or without previous training. He invited the painter Allan Kaprow to the course, who had been on a mushroom hunt together with him and their mutual friend George Brecht. The next year Cage met Nam June Paik during the *International Summer Course* in Darmstadt in Germany. Both meetings have had enduring effects on the arts and resulted in the first of a great number of happenings, the most famous approach to the arts of the 1960s, in which the European and American art worlds connected in a very lively way.

At the time Kaprow met Cage, he himself had just started teaching at Rutgers University in Newark. His own studies had been moving in two directions. He studied painting with the abstract expressionist painter Hans Hoffman and art history and the philosophy of art with Meyer Schapiro. As a painter, he sought ways to stretch the boundaries of modernism further than his predecessors and found inspiration in Piet Mondrian and Jackson Pollock. While studying Mondrian's paintings for his thesis, he discovered that when one looks at them for quite a long time the pictorial coherence of the composition dissolves, as if the different elements, the pure colors, and the straight lines, mutually destruct themselves to produce some sort of transcendent unity in the end. In addition to this intellectual interest in the perceptual effects of painting and in the role of the observer, in his own work Kaprow elaborated on Pollock's oeuvre, who in his action paintings attracted the viewer's attention to the action of painting itself. Kaprow continued this approach, developing a kind of action-collage techniques, which

were done as rapidly as possible by grasping up great hunks of varied matter: tinfoil, straw, canvas, photos, newspaper, etc. I also cut up pictures which I had made previously, and these counted as autobiographical fragments, as much as they were an intended formal arrangement. The straw, the tinfoil, occasional food, whatever it was, each of these had, increasingly, a meaning that was better embodied in the various nonpainterly material, than in paint. Their placement in the ritual of my own rapid action was an acting out of the drama of tin soldiers, stories and musical structures, that I once had tried to embody in paint alone. (Kaprow, cited by Kirby 1965) By doing so Kaprow separated action painting's action from the painting itself, and in a sense jumped right into life.

After exhibiting these action-collages in the form of panels, Kaprow stopped framing them in favor of creating environments in which the gallery was filled with all kinds of plastic, cellophane, and colored cloth hanging from the ceiling in layers softening the sparse lighting. The spaces had a rather mysterious atmosphere, with passageways so small that it was impossible to identify other visitors. The effect of suspense, however, immediately ended when one of the walls of the space became visible. Kaprow's response was to destroy the sense of bounded space by bringing in bells, marbles in tin cans, Japanese toys, and other tinkling objects, but this solution only increased the discord between his work and the gallery space. At this point he began attending Cage's Composition of Experimental Music class, where he discussed his experiences and asked Cage's advice on how to improve the quality of the sounds. Cage suggested he record the sounds of the toys (mechanical gorillas and cows, etc.) and to tape and manipulate them in order to give them a less recognizable identity. While experimenting with this advice, Kaprow found another solution to his problem and he began to involve the gallery visitors, giving them the opportunity to move things and to turn switches. In this way, observers were provided with an active role in shaping the space by influencing its lighting and the way it sounded. Elaborating on this, Kaprow began to score the involvement of visitors by handing out written instructions on how to co-compose the environment.

In Cage's class as well as in his own at Rutgers, Kaprow continued this kind of experimentation with the other students, each bringing in weekly contributions to the collective events that soon found their way to the outside world. George Brecht, Al Hansen, Dick Higgins, Toshi Ichiyana, Jackson MacLow, Richard Maxfield, and La Monte Young from Cage's class, and George Segal, Lucas Samaras, Roy Lichtenstein, and Robert Watts from Kaprow's class at Rutgers (Marter 1999) became involved in shaping the happening as a synesthetic intermedia event.

By the end of 1959, Cage's influence became palpable when, in October at the Reuben Gallery in New York Kaprow's first happening 18 Happenings in 6 Parts took place. Despite the connotation of the word happening, which is often understood as a completely unorganized event finding its shape by what occurs spontaneously. Kaprow's approach was actually controlled in many ways. The invitations were mailed envelopes containing some photographs, painted pieces of wood and paper, and cutout figures, with the information that some guests would also act. Plastic walls divided the loft gallery into three rooms, in which chairs were arranged in rows or circles, in such a way that the spectators in the three rooms could not see each other. Strings of colored lights and mirrors further articulated the different rooms. The program contained instructions and explained that the performance was divided into 6 parts, each consisting of one happening in each of the three rooms. At the ringing of a bell, usually at the beginning of a new part, the audience was asked to move to another room. Six performers carried out precisely prescribed movements, e.g. squeezing oranges and drinking the juice or declaiming notated words and verbal phrases, counting gestures as dancers and musicians do, all of which was rehearsed for two weeks. Slide and film projections were precisely timed, as were the moments of live painting, which on one occasion were done by Robert Rauschenberg and Jasper Johns. At odd intervals, mechanized music sounded or the light changed. Even the audience's response was controlled: "There will be no applause after each set, but you may applaud after the sixth set if you wish" (Meyer-Hermann, Perchuk, and Rosenthal 2008).

In the summer of 1958, Cage traveled to Europe to attend the *International Summer Course for New Music* in Darmstadt, where he met the leading European composers Pierre Boulez and Karlheinz Stockhausen with whom he exchanged new musical ideas. After meeting him there, the Korean student Nam June Paik became fascinated by Cage's approach to composition, by his openness to connecting music to other art forms, by the integration of environmental sound, radio, prepared pianos, and recorded sounds in his compositions, and by his application of Zen principles. Soon after, Paik started working at the WDR (Westdeutscher Rundfunk) studio in Cologne, where he met Stockhausen and many other young composers and found his way to the Cologne art world.

A few weeks after Kaprow's 18 Happenings in 6 Parts, Paik presented his first electroacoustic work Hommage à John Cage: Music for Tape Recorder and Piano at Galerie 22 in Düsseldorf. It was his first action-music piece, consisting of recorded and live music and performance. The first part began with the poet Helms standing on a ladder reading the score while unwinding the roll of toilet paper on which it was written. There were two pianos, one of which had no keys, some tape recorders, a toy car, a plastic locomotive, an egg, a bottle with a candle, and a music box. The audience was asked to step back and take caution. Then the tape recorders released the screaming of a number of young women, followed by a radio news broadcast. Paik threw the egg at the wall, activated the metronome and the music box, and played a Czerny Etude on the piano. During the second part, Paik ran around the room shouting in Korean, blew on the locomotive whistle, switched off the light, and lit the candle. The third part consisted of soft sounds matching the intensity of the candlelight. But the fourth part was an absolute "finale furioso" with Paik running around like a madman, attacking the piano with a kitchen knife, and finally throwing it on its back: "Pianoforte est morte." ("The piano is dead.")

Kaprow writes:

With the first Happening groups in New York, consisting of painters, the direct line of historical stimulation (usually conscious) seem to have been the Futurist manifestoes and noise concerts, Dada's chance experiments and occasional cabaret performances, Surrealist's interest in automatic drawing and poetry, and the extension of these into action painting. All focused in one way or another on the primacy of the irrational and/or the unconscious, on their effort upon undirected body responses, and on the elimination of pictorial and other professional skills as criteria of art. Thus the idea of art as "act" rather than esthetics was implicit by 1909 and explicit by 1946. Between this background and Cage, there was Bob Rauschenberg, who, as costume and set designer for Merce Cunningham's dance group, not only kept the painters aware of Cage's thought, but also suggested how the plastic arts can become part of a performance situation. In other words, our prime sources were visual, whatever non-visual outcome these led to. (Sandford 1995)

In another, even more acute way, George Brecht aimed to transpose and connect Cage's

idea of omnipresent sound to the world of vision by focusing the visual attention of the spectator to the sound and its source. For *Drip Music* (1959) he wrote the following performance score: "For single or multiple performance. A source of dripping water and an empty vessel are arranged so that the water falls into the vessel." Later Brecht explained: "I tried to develop the ideas that I'd had during Cage's course and that's where my 'events' came from. I wanted to make music that wouldn't be for the ears. Music isn't just what you hear or what you listen to, but everything that happens" (Brecht, cited by Martin 1978).

In an even more extreme manner, La Monte Young, another participant in Cage's class, examined the notion of synesthesia, reflecting on Cage's piece 4'33" as a reaction to Rauschenberg's *White Paintings*: "Isn't it wonderful if someone listens to something he is ordinarily supposed to look at?" In his own *Composition #5* (1960) Young attempted to reverse the audience's attention in just the opposite way, this time from vision to suggested audition:

Turn a butterfly (or any number of butterflies) loose in the performance area. When the composition is over, be sure to allow the butterfly to fly away outside. The composition may be any length, but if an unlimited amount of time is available, the doors and windows may be opened before the butterfly is turned loose and the composition may be considered finished when the butterfly flies away.

In an extraordinarily lucid study, David Dorris (1995) has shown that not only Cage's students but also many of the European artists who operated under the Fluxus flag were highly influenced by Zen, using language similar to that of Zen teaching. Such teaching is generally intended to show the boundaries of language and verbal understanding by means of paradoxes, while at the same time it uses questions to open a mode of knowing that reflects the path from cognition and verbal understanding to direct, unmediated perception. Dorris's study shows that the concepts of dozens of happenings, events, and Fluxus actions, which were usually printed on cards, can often be found in age-old Zen literature. About La Monte Young's *Composition #5* he wrote the following:

The beating wings of a butterfly surely do produce sound—and can thus, by traditional standards be appreciated as music—but this sound is certainly beyond the range of normal perception, in this case hearing, to reveal the totality of an object as it presents itself. The notion of a categorization or isolation of the senses, and consequently of the specific arts which are addressed to those isolated senses, comes under question. In order to understand an object in its totality, the perceiver must herself be perceiving as a totality. In a commentary to the sixteenth case of the Wumenguan (in Japanese, Mumonkan), a thirteenth century collection of koans, Wumen asks his reader: "Does sound come to the ear, or does the ear go to sound? Even if echoes and silence are both forgotten, when you reach this, how do you understand verbally? If you use your ear to listen, it will be hard to understand; only when you hear sound through your eyes you will be close. (Dorris 1995)

Isn't this exactly what Pythagoras did when he observed the sounds produced by the blacksmiths, which resulted in a synesthetic awareness of the relations between the pitches of the sounds, and the sizes and weight of the hammers producing them?

GAMAN UTRECHT 1970

THE INNOVATION OF THE ARTS during the last three decades of the twentieth century is much harder to describe than the earlier periods we have looked at. As we have seen, in the first phase of modern art, from 1910-1940, and in its second phase, from 1950-1970, the proposals to integrate the arts were quite radical and utopian, whereas the use of electric technology was clearly defined. The experimental forms of music theater, experimental film, radiophonic music, *musique concrète*, electronic music, happening, environment, performance, and video art were conceptually far removed from the mainstream forms of opera, feature film, instrumental music, and television, whereas the technology used was mainstream and part of mass culture. The new electric and electronic media—light, film, radio, sound, and TV—were investigated for their artistic potency to see if they could be used to innovate artistic concepts and forms.

Before 1970, there was a tendency among artists of different kinds, whether they were composers, choreographers, or visual artists, to study the possibility of giving equal rights to the different elements within and between the arts. Such an ideology was formulated at the dawn of the twentieth century, when the mass introduction of new technologies opened perspectives on a future world based on equal rights and the distribution of prosperity among the masses, as opposed to the earlier feudal social organization according to a structural hierarchy of class differences.

Within music, this tendency started with a democratization of the tone scale in which the differences between consonant an dissonant chords were abolished; rule-breaking atonal music that developed into dodecaphony and from there to serial music and new formal approaches based on chance operations and probability calculus. In the visual arts, figurative representation was followed by abstract imagery in which the relationships between color, form, light, movement, and space were studied from a new point of view. This led to a new interest in the action aspect of painting, followed by actions without paintings and even to interactions with spectators. A similar process in music caused a shift in interest from innovating the structural relationships between the notes of a written composition toward a change of roles between composers and performers, who were given active roles in codetermining the final form of a piece. All this resulted in some fundamental changes in what Dick Raaijmakers has called *slagorde*: the formation, battle array, or social order and relationships between the artwork and the audience (Raaijmakers 2009).

This process is often falsely called the dematerialization of art because it seems to give more attention to the production process than to the actual product. As Van Winkel (2002) has pointed out, this misunderstanding was created by Lucy Lippard in her book *The Dematerialization of the Art Object from 1966 to 1972*. Lippard misinterpreted the rise of conceptual art in those years as being mainly a process of dematerialization. However, as Van Winkel shows, the growing attention to the concept was part of a much broader awareness of the context in which art was produced. The conceptual artist was inspired not only by the political context of the time, with its utopian, anti-authoritarian idealism, but he or she was also deeply interested in the way in which the concept could be materialized. This was expressed by the particular choices made by the Arte Povera artists about which of the *objets trouvés* (found objects) they wanted to use in their art and which they did not, as well as by the use of new media, like neon, and choosing particular craftsmen who had the required skills to actually make neon objects.

In her analysis of this period, art historian Marga Bijvoet (1997) has convincingly argued that context was also the connecting force between two ostensibly different art movements that arose during the second half of the 1960s: the Art and Technology movement and the Earth Art and Environmental Art movements. Along with the sociopolitical and material contexts of new technologies, the environmental context was also integrated into the art object. Moreover, a relativist attitude was on the rise, creating the strange mix of social criticism, idealization of technology, and respect for the natural environment that was characteristic of the second half of the 1960s. Kaprow described this new artistic attitude in 1968: "It may be proposed that the social context and surroundings of art are more potent, more meaningful, more demanding of an artist's attention than the art itself! Put differently, it's not what artists touch that counts most. It's what they don't touch" (Kelly 2003).

This paradoxical spirit of seriousness and playfulness is palpable in the project *Gaman*, the work of Dutch composers Dick Raaijmakers and Misha Mengelberg. The single textual source pertaining to this project is a 1972 essay written by art historian Cor Blok. In 1969 the Commissie Vormingswerk (social education committee) of Utrecht University had asked Raaijmakers and Mengelberg for a work directed toward the enhancement of the spiritual well-being of society that would stimulate public creativity by breaking socially established patterns. In response to this typical end-of-the-60s lingo, the composers proposed an all-inclusive music theater piece, *Gaman*, contrasting a contextual project, *Agriculture*, to be realized in connection with the social and urban infrastructure of the city of Utrecht.

Gaman is an old German word for joy, which may be associated with the English word game, the Indonesian musical instrument gamelan, the Jazz encouragement "Go man," gamma in its Dutch or French meaning of tone or color scale, and the chemical term amalgam. Taking the assignment seriously, the composers drafted a plan that, if realized, would have affected the social behavior of many people and the look of public spaces in Utrecht. To arrive at this massive effect would have required half a year, during which actions, demonstrations, theater pieces, films, and happenings would have been organized in the public domain using sand and earth as basic materials. Two campaigns would have been organized, one based on the bourgeois appeal to contribute to the social community, the other campaign was to stress the opportunity to contribute to a collective art activity in which the "dirty" earth would be transubstantiated into art.

In December 1969, the citizens of Utrecht were to be asked to donate a bucket of earth dug up from their gardens, or for those without a garden a flowerpot filled with earth, requesting that the sand be brought to a central place where a tablet was to be placed to memorialize this contribution to the innovation of the city. This would promote social coherence and civic solidarity according to the wishes of the commissioners. In January, the earth was to be transported to the University's Transitorium, a hall measuring 10x8x5 m, where it would cover the floor. During the whole month this exhibition would be on view through a glass door. In February, the earth was to be transported to the Janskerkhof, where it would form a mountain to which chemicals were to be added in order to make it smell like oak leaves. In March, it was to be transported to the front of the main building of the university where it would be spread in the form of a large square planted with artificial flowers, and covered with transparent plastic foil. In April, the earth was to be spread in the form of a country road on which loudspeakers would broadcast the recorded sounds of horses and carriages moving in two directions. In May, the earth was to be thrown in the form of a waterfall from a fifteen meter high building for which an installation was to be designed that would have to react to the sounds produced by a crowd shouting to let the earth come down. The earth would come down in large tubes and be transported back to the top where it would be used for another round. Finally, in June, the earth was to be manured to make it smell like fertile agricultural soil to be exhibited again in and around the Transitorium.

The art project *Agriculture* was to finish with a harvest fair, with various activities in which agricultural machines were to be used and during which both artificial rain was to be produced—by an artificial cloud consisting of balloons—and an artificial sandstorm was to occur. The fair was to close with the manifestation *Tablemusic*, in which musical performances alternated with films of the earlier actions, structured in the form of a dinner. Since it had been the purpose of the composers to confront the commissioners with the absurd aim and impossible consequences of their assignment, it is not surprising that *Agriculture* was never produced. However, all proposals were discussed with a great number of authorities from the University and the city of Utrecht. As expected, they turned them all down, using every bureaucratic argument they could come up with, in order to prevent the project's goal: the stimulation of public creativity by breaking socially established patterns.

Only *Tablemusic* was actually realized. On May 22, 1970, Uhificoco, the Utrechtse High-Fidelity Consumenten Concert (First Utrecht High Fidelity Consumer Concert) was organized by the musicology student Frans de Ruiter. He managed to bring together about five hundred performers, including ensembles and choirs, consisting of university students and students of the Utrecht Conservatory and the specially formed Coleslaw Brigade. The concert, given in the Geertekerk, lasted from four o'clock in the afternoon until midnight. The program consisted of music from Palestrina to Stockhausen and was performed while the different courses of the dinner were served. Over the course of the evening, the sound of the music was progressively distorted to symbolize the process of digestion in the stomach. To inspire the musicians and the cooks a list was made of synesthetic, blasphemous combinations of music and food: "Brahms—Weisswurst mit Bratkartoffeln, Vivaldi soggy cookies, Mozart—gorgonzola, Beethoven—rhubarb stew, Webern—paprika chips, Stravinsky—celery salad, Orff—carrots, Cage—aspirin, Bach—corn-on-the-cob, Boulez— French beans, Schubert—raspberries, and Wagner—cauliflower" (Blok 1972).



Figs. 65-67. Dick Raaijmakers, Sound Walk (1988).



MEDIA-INTEGRATION— COMPOSING MEDIATED ARCHITECTURE AND ENVIRONMENTS

11.3

"If a composer wants to compose space. he has to incorporate space as a 'parameter' in the organization plan of his composition. He has to give all parameters: tone height, duration, intensity sound color and space equal right according to the 'serial method."" (RAIJMAKERS 2000)

LOIE FULLER'S ELECTRIC THEATER PARIS 1900

LOÏE FULLER ENTERED THE WORLD of the arts in the years between the invention of electric light and the beginning of the film age. Fuller was the first artist to work with electricity in developing the art of stage lighting for a completely new form of dance that she invented (Thomas and Perrin 2002).

Born in Fullersburg in 1862, a small town west of Chicago, Fuller trained her natural gifts as a performer by studying a number of musical instruments and taking acting and singing lessons. Her success as a young entertainer nourished her ambition to become a professional artist. In 1886, she was contracted as an actress by Buffalo Bill's *Wild West Show*, where she experienced the pleasures of working and living in a creative community. At the same time she began daydreaming of having her own theater group to tour the world as an art nomad. To achieve this goal, she left the Wild West Show and traveled to London, where she acted in several plays and also co-directed some of them. A few years later, she performed a skirt dance in a theater piece in New York; while experimenting with the movements of her skirt, she became conscious of the esthetic potential of the projection of electric light and color on her dress.

At this point, Fuller began to experiment with theater spotlights, and worked out the choreography for a solo dance based on changes of light and color. She gave some of the spots fixed positions: two from the left and right and two from above. Another spot followed her movements across the stage, while others were positioned, shining upward, under the glass plate on which she danced. Magic lanterns projected abstract and semiabstract forms on her robe consisting of a huge piece of semitransparent silk. By elongating her arms with sticks made of aluminum, Fuller was able to create an enormous stage appearance. Although the patterns she made were mostly abstract, the audience became intrigued and speculated about the themes she supposedly expressed. They projected their own figurative interpretations on the moving patterns in which they recognize a flying bird, a butterfly, an unfolding lily, etc. More than with other forms of dance, guessing the meaning expressed by her choreographies was one of the main attractions of Loïe Fuller's dancing style.

In 1892, her first dance show, *The Serpentine Dance*, premiered at the Casino Theater in New York City. The pieces she created may be considered the first dances defined by their colors. The dances were named after different colors: *Blue*, *Yellow*, *Red*, and so forth. Her choreographies were based not only on the colors themselves, but also on the intensity and direction of the light coming from the different spots. The show was so successful



.... Fig. 68. Loïe Fuller, White Dance (c.1898).



Fig. 69. Loïe Fuller's patent for the aluminum sticks used in the **Serpentine Dance**.

that Fuller travelled to Europe the next year and was contracted by the Folies Bergères in Paris, where she first appeared in 1892 and earned fame as La Loïe, the Fairy of Light. Paris became her hometown, where she met a great number of artists. She even became one of the icons of the esthetic transformation of the art of the fin de siècle, La Belle Epoque, Art Nouveau, and Jugendstil into the art forms of the new century: cinema, Futurism, and abstract art.

In the years between 1892 and 1900 Loïe Fuller's dances were imitated by a huge number of dancers who popularized her Serpentine Dance and other choreographies. Fuller's imitators were seen in the major cities and provincial towns of numerous countries. Fuller lost the court case in which she sued her first imitator, because the judge ruled that a choreography without a narrative did not constitute a "dramatic composition" within the meaning of the copyright act. The aluminum sticks, which were finally awarded a patent, were her only legal success. Despite her legal battles, she had the power to fight back on stage.

She created a number of new inventions, making her the leading star of the Paris World Fair in 1900, which was devoted to the new potential of electricity. The French architect Henri Sauvage designed an Art Nouveau-style pavilion for her, where she not only presented her own newest dances, but also invited a Japanese dance group to add to the spirit of universalism that was so characteristic of the birth of the twentieth century with its renewed interest in folk, exotic, and primitive art.

After her enormous success at the World Fair, Fuller concentrated on developing new light effects for the stage. She befriended Eve Curie, with whom she began research focusing on possible applications of radium in the theater. Besides performing and doing research, she opened her own school for young dancers, and helped launch the career of Isadora Duncan, who later became a great innovator of modern dance.

In addition to her work as a dancer, researcher, and pedagogue, Fuller established friendly relationships with many leading artists of the era, including the writer and publisher Camille Flammarion and the sculptor Auguste Rodin, which led to the foundation of a Rodin museum collection in the US. She inspired hundreds of painters and sculptors who devoted works to her person and appearance, challenged by the very difficult task of representing the movements of her body in the form of static images and sculptures. Due to this exposure, Fuller became the first modern icon of feminism, in addition to her role as the pioneer of the electric and kinetic arts. Her art became the subject of paintings and sculptures, while her "pre-cinematic performance" (Brannigan 2003) became widely distributed through Edison's kinetoscope and early cinema. Her image appears not only in unique art products, but also in the form of mass-produced posters, bronzes, and table-lamps. It is amazing to see how her moving figure was expressed in so many different artistic styles, ranging from the characteristic soft curves of Art Nouveau to the noisy style of the Futurists, as in Gino Severini's paintings of dancers.

Fuller's interest in technology ranged from her curiosity about the possibilities of light projection, to the use of aluminum for her patented garment and wands, to the medium of film. She even produced some experimental films, but only an excerpt of *Le Lys de la Vie* from 1920 has survived. In her day, Loïe Fuller was highly respected for her experi-

ments in dance and kinetic light, for her courage as a woman who liberated herself from any kind of traditional gender expectations, and also for surviving thirty years of art criticism. Despite this huge success, she is presently only remembered by a very small number of dance historians. Nevertheless, we have seen that Fuller's creative synesthesia inspired Hornbostel to come up with his new perceptual paradigm "the unity of the senses" as the result of Fuller's creation of visual music by means of relating colored stage lights to the dancer's body movements (see 1.3.2).

Fuller's influence on avant-garde dance can be traced in an almost direct line, starting with Isadora Duncan, whom Fuller had introduced to French audiences who, together with Ruth St. Denis, influenced Martha Graham, whose pupil Merce Cunningham would fundamentally change the art of dance forever. By combining her natural approach to dance with the use of sophisticated lighting technology, Fuller freed dance from the strict academic conventions dictated by the traditions of classical ballet. She opened a door that would ultimately lead to the development of modern and experimental dance, in which choreographers design movements in relation to unconventional motion schemes and stage effects by using all manner of technique and technology. Her use of technology in connection to dance was the start of a practice that continued in Hans van Manen's use of video in 1979, in the digital sketchbooks created with the help of the computer program Life Forms used by Cunningham since 1989, and in the motion-capture techniques applied since 2001 by William Forsythe in his interactive movement studies.

NEO-PLASTIC MUSIC AND LIGHT PROJECTIONS IN THE PROMENOIR PARIS 1922

THE YEARS FOLLOWING WORLD WAR I were hardly less turbulent than those before the war, when the first revolutionary steps were taken on the road toward the totally new esthetics of abstraction and atonality. The growing intensity of innovative actions was in part due to the exponential growth of the number of cities and countries where the innovation of the arts shaped cultural life. Many artists traveled from one city to another to show their work or to visit artists with similar approaches. In the early years of the century it had mainly been Vienna, Munich, Paris, and Milan where the great changes began, but during the roaring, or as they were called in Germany, golden 20s everything seemed to happen everywhere at the same time.

Artists and their ideas traveled with such high speed that it is sometimes hardly possible to reconstruct the order in which things happened, and in what ways art movements were connected by a common spirit or by competitive attitudes. Many artists belonged to various movements and experimented with different styles, uninterested in the formal categories of the movement they were supposed to belong to. This certainly created a big problem for art theory, but the arts were nevertheless incredibly vibrant in these years, a situation only paralleled in intensity of activity by the 1960s. Within the span of just a few years artists moved from Futurism or Cubism to Dadaism and Surrealism, joined the international movement De Stijl, or started working as "masters" at the Bauhaus. During the first three years of its existence, De Stijl was mainly concerned with the development of a new foundation of the plastic arts: painting, sculpture, and architecture. Figuration, naturalism, and ornamentation were fully rejected in favor of Neo-Plastic principles ruled by the simplicity and purity that primary colors expressed and by the dominant use of horizontal and vertical straight lines and square and oblong forms. Thanks to his literary abilities and his experiences as an experimental poet, and like F.T. Marinetti a few years earlier, Theo van Doesburg challenged artists who sympathized with the newly articulated esthetic ideals to write down their reflections on the new art forms and movements, which he would publish in the new magazine *De Stijl* (The Style).

The first issue of the magazine was published in Delft in October 1917; a year later, in November 1918, *De Stijl*'s first and only collective manifesto appeared. It consisted of nine short program points calling for an approach to art in which the artist's individualism

김준 영구님은



MAANDBLAD VOOR DE MO-DERNE BEELDENDE VAKKEN REDACTIE THEO VAN DOES-BURG MET MEDEWERKING VAN VOORNAME BINNEN-EN BUITENLANDSCHE KUNSTE-NAARS. UITGAVE X. HARMS TIEPEN TE DELFT IN 1917.

Fig. 70. Front cover of De Stijl (1917).





should be fundamentally subjected to a new universal approach to the arts. The *nieuwe beelding*, or Neo-Plasticism, focused on pure pictorial qualities, replacing all naturalistic expression with abstract, man-made visual imagery based on the new plasticity of painting, sculpture, and architecture. Individual arbitrariness was rejected and replaced by a universal approach to connect life, art, and culture. For this reason, the involvement of architecture in Neo-Plastic art was essential since what Mondrian called "the spiritual-physical unity of esthetic pleasure" was joined to the functional use of space.

From its beginning, the orientation of *De Stijl* was explicitly international, placing value on connecting artists from different countries who shared an abstract approach to modern art. The immediate cause of the movement was that, at the time, abstract art was almost completely ignored by Dutch newspapers and art magazines. By starting their own magazine the artists created their own medium of communication and developed their own artistic style of writing about art. The initiative was strongly criticized by the art critics in the Netherlands, although the reaction from other countries was positive.

The Futurist Gino Severini began contributing to the magazine from the second issue onward. He was followed by a great number of authors from a variety of countries, including Raoul Hausmann, El Lissitzky, László Moholy-Nagy, Enrico Prampolini, Georges Antheil, Kurt Schwitters, Hans Arp, Carlo Carrà, and others, who lent the magazine a distinctly international character, strengthened by the use of four different languages: Dutch, French, German, and English. Along with editor Theo van Doesburg, it was Piet Mondrian who, from his hometown of Paris, contributed most substantially to the magazine with a huge number of articles. Other local contributors included the architects Jan Wils, Robert van 't Hoff, and J.J.P. Oud, painter Vilmos Huszár, poet Anthony Kok, and the Belgian sculptor Georges Vantongerloo. Over the course of years, not only was Neo-Plasticism discussed, but also themes and elements of Futurism, Dada, Surrealism, Constructivism, Suprematism, Bauhaus, and many other modern art movements and styles.

From 1921 onward, two art forms that had not been discussed in *De Stijl* before began to attract first Van Doesburg's and then Mondrian's attention. In 1920, Van Doesburg received a letter from Hans Richter and Viking Eggeling in which they invited him to Berlin to see the progress they were making with their experiments in the development of abstract film. They also wanted to introduce him to Walter Gropius, who had founded the Staatliches Bauhaus in Weimar a year earlier. Two months later Van Doesburg met Gropius. From that moment on *De Stijl* became an influential, but also feared, factor in the further development of the Bauhaus, especially since Van Doesburg started to work at the Bauhaus as a guest teacher, trying to change its strictly functional approach into an approach directed toward the development of free forms of art.

In December 1920, Van Doesburg visited Berlin; soon after his return he published the first in a series of articles on the progress of Richter's and Eggeling's abstract film experiments (Van Doesburg 1921). In his article "Abstracte Filmbeelding" (Abstract Film Plasticity) of 1921, Van Doesburg welcomed Richter's and Eggeling's experiments. Despite the fact that these had not yet resulted in an actual film, their hand-painted graphic designs were discussed together with the technical problems associated with the yet to be made film Horizontal-Vertical Orchestra. In a few lines Van Doesburg described the potential of this new medium: This cinematic plasticity not only makes a collaboration of all arts based on a new basso continuo possible, but it can also free the creator of the new images from the old and primitive way of the craft of hand painting with oil paints. As soon as the film technique is ready for dynamo-plasticism, the artists will "write" their compositions, in which the colors or proportions of shapes will be described exactly by numbers, after which their designs will be realized in a mechanical way and by electrical power, resulting in the most perfect expression. (Van Doesburg 1921)

Van Doesburg's prophecy became reality halfway the sixties, when John Witney started utilizing computer technology to make his films. It has become common practice among the present generation of abstract filmmakers, particularly during the last decade, to create their art by writing computer programs to generate precisely calculated dynamics of shapes and colors, much as Van Doesburg predicted in 1921.

In turn, Mondrian began a series of articles with similarly remarkable insight in which he forecast the growing influence that electricity had on art. Mondrian's speculations followed his attendance of Russolo's *intonarumori* concert in Paris in 1921. In his articles "The 'Bruiteurs Futuristes Italiens'" and "The 'New' in Music," he praised and criticized Russolo's efforts to innovate music. He was positive about the expansion of the tone scale to include noise, but he criticized the way this was done. Although the *intonarumori* had the potential to generate machine-like sounds, Russolo used them to create sounds that were naturalistic and representational. They were thus still used as regular musical instruments, according to Mondrian. Russolo employed them in a manner that complemented the conventional tone scale, based on the natural overtone series, rather than offering a completely new esthetic based on the abstract principles of Neo-Plasticism. However, Mondrian welcomed Russolo's attempt and pointed to the very different speeds of the processes of innovation in music as compared to painting.

In his next article, he reflected on what was missing in Russolo's art of noise, concluding that he must develop his own ideas about what real innovation in music might be. Mondrian sketched the foundations of Neo-Plastic music, the synesthetic echo of Neo-Plastic art, in his subsequent articles (Mondrian, 1922a, 1922b). He began with the observation that the flute opposed the lyre (Bacchus-Apollo) already in antiquity, just as in our time the "jazz band" confronts the "concert orchestra." Automatically, from this opposition, Neo-Plastic music will arise. In the next article he outlined Neo-Plastic music in detail:

In the Neo-Plastic music of the future, the [plastic means] should be determined sound, in the duality of tone and non-tone (noise).... The color is determined by: 1. that [the sound] is flat; 2. pure (primary color); 3. sharply delimited without begin "closed."... The new music will first acquire the means of reproducing sound that, as much as possible, will no longer have the round or closed character of form, but on the contrary, will have the character of the straight and open. This will require instruments of new design... The "non-tone" will have to be "sound" but not a "tone." It should be formed from the sound (noise) that not determined by tone, but by timbre and the means of production, and also arrives at the deepest purity. (Mondrian, 1922b) Although it was not yet clear what kind of instruments he meant, in the last part of the same article Mondrian not only foresaw the future of electronic music (which actually began thirty years later!), but also that still another art would be possible in the future:

[A]n art situated between painting and music. Since it is expressed by color and noncolor, it will be painting; but because the colors and non-colors will be shown in time and not in space, it will approach music. Because time and space are only different aspects of the same thing, in the Neo-Plastic conception music is plastic (i.e. expressed in space), and the "plastic" (painting) is possible in time.

According to Mondrian, this art would have to be presented in new places satisfying new requirements, completely differing from the existing concert halls. The ideal program would be an automated sequence of music produced by electronic sound equipment alternating with projections of light and color for which it will would probably be necessary to attain a stage of evolution even beyond that required by Neo-Plastic painting and music: a true unity of the "physical-spiritual." For Mondrian it was essential that the audience could walk around freely in this environment, which in his original text he called a *promenoir*.¹⁵

¹⁵ In 1995, on the occasion of the fiftieth anniversary of Mondrian's death, teachers and students of the Interfaculty interpreted these ideas with state-of-the-art technology in the Schoenberg Auditorium of the Royal Conservatoire, transformed for this purpose into a true promenoir (see III.2.4).

TOUR SPATIODYNAMIQUE CYBERNÉTIQUE ET SONORE SAINT-CLOUD 1955

THE YEAR BEFORE JOHN CAGE visited Pierre Schaeffer in his new *Studio d'Essai* in Paris, Schaeffer completed his first composition, *Etude aux Chemins de Fer* (Study of Railways). It consisted of a montage of sounds recorded at the train depot in Paris and was broadcast by Radio Paris in the fall of 1948, together with the *Etude aux Tourniquets, Etude Noire, Etude Violette, and Etude Pathétique*. These pieces were the first realizations of the dream Schaeffer had had earlier that year to create a *symphonie de bruits* (symphony of noises). The first attempts were disappointing, but lucky discoveries soon came to the rescue.

The interest of his discoveries lie less, in his own opinion, in the use of noises—as opposed to musical sound—than in the possibility of acting on already recorded sound: the setting apart of sound fragments of all origins, thanks to the technique of the closed groove, transformation (fast or slow motion, reverse playing...), arrangement of sequences in the musical play of repetitions and combinations. The word concrète applied to this music does not refer to an esthetic notion. It describes a process that goes from the concrete to the abstract, from materials to composition, as opposed to the traditional process of going from abstract to concrete, from (mental) conception to performance by instruments through the means of a musical score. (Dallet 1996)

Since these pieces were still based on the use of records and the closed-groove technique, the possibilities of sound manipulation were very restricted. This situation that changed in 1951 when Schaeffer began using tape recorders, giving him much more freedom to process and manipulate the recorded sounds.

In the course of 1949, Schaeffer requested funds from RTF to elaborate his work on *musique concrète*, after which he invited the sound engineer Jaques Poullin and the composer Pierre Henry to work with him. Henry had studied piano and percussion with Felix Passerone, composition with Nadia Boulanger, and harmony with Olivier Messiaen at the Paris Conservatoire and had just completed a commission to compose the music for a television documentary *Voir l'invisble* (Seeing the Invisible). Together with Schaeffer, Henry began working on *Symphonie pour un Homme Seul*, composed in ten movements and meant to invoke the sounds of a man walking alone at night. The piece attracted a lot of attention and positive responses and is generally recognized as the first successful piece of *musique concrète*.



For a number of years Schaeffer and Henry continued their collaboration, for example in *Toute la Lyre*, a *musique concrète* opera (1951), the first work realized by the newly founded G.R.M.C., the *Groupe de Recherche de Musique Concrète* (Research Group of Concrete Music). Later that year, the studio was visited by Pierre Boulez, Olivier Messiaen, Karlheinz Stockhausen, and many others who followed a training course or collaborated with Schaeffer and Henry to complete new electro-acoustic pieces. Stockhausen had just visited Karel Goeyvaerts, who worked at the Belgian radio station in Brussels, experimenting with sine wave generators. Goeyvaerts's direction by starting his own experiments based on purely electronic composition at the radio studio in Cologne, which resulted in *Studie I* (1953) and *Studie II* (1954). From this time onward, one may speak of three "schools" in electronic music: the French musique concrète, the American tape music, and the Belgian/ German *elektronische Musik* (electronic music).

In 1953, Schaeffer and Henry drifted apart (Ernst 1972). Henry became the director of the Groupe de Recherche de Musique Concrète (G.R.M.C.) and dealt with the many demands for music and special effects for cinema, theater, and radio, whereas Schaeffer focused on his writing activities, which would ultimately result in his chef d'oeuvre Traité des objets *musicaux* (Treatise on Musical Objects). In 1954, Henry was approached by the former painter Nicolas Schöffer, who had started to work in a spatial, sculptural dimension, to collaborate with him in developing a Tour Spatiodynamique, Cybernétique et Sonore (Spatiodynamic, Cybernetic, and Sonorous Tower). In 1948, Schöffer had begun conceptualizing a new form of sculpture, consisting of open frames intended to make space dynamic by connecting vertical and horizontal metal staffs of various types: iron, steel, messing, aluminum, and copper. By using a minimum amount of material, a maximum spatial effect was created with an airy, transparent, and translucent character; its visual rhythm changed when people passed by or walked around the open structure. These sculptures were originally built on a scale reminiscent of regular sculptures, but after a few years Schöffer began to conceive them on a much larger scale and to relate them to the scale of architecture and urban space. His ideas developed in a complex direction, i.e. to build them as towers with kinetic and sonorous properties, related cybernetically to the physical parameters of the environment. The towers were to function as urban landmarks, and had to change appearance according to the changes in the environmental temperature, humidity, light, sound, and color.

Schöffer met one of the directors of the Philips company, Marcel Jolly, who responded positively to his ideas, understanding the potential of this kind of artistic high-tech production as well as the problems of raising money and finding the right engineers to collaborate with an artist (Schöffer 1973). Jolly solved one problem by convincing the board of the *Exposition Internationale des Travaux Publics* (International Exposition of Public Works) to invest in the idea and to commission Schöffer to design his first cybernetic tower for the exposition that was held in the park of Saint-Cloud in 1955. The second problem was solved when Jolly approached his engineer friend Jacques Bureau and asked him to translate Schöffer's cybernetic ideas into a technical description of a feedback controller, a so-called *homeostat*, that could be understood and realized by Philips's engineers. In a lecture for the Société Francaise d'Esthétique in 1954, Schöffer described his ideas on *Le Spatiodynamisme* (Spatiodynamism) in detail. Shortly after, he designed a fifty-meter-high tower and engaged Pierre Henry to think of potential approaches to sonification. Since the Tour Spatiodynamique, Cybernétique et Sonore of Saint-Cloud was meant to contain moving parts (in contrast to the earlier static spatio-dynamic sculptures), Henry began recording the sounds of strings, manipulating their sounds by speeding up, slowing down, and juxtaposing the different sound layers with tape recorders. Due to a lack of money it was impossible to install the number of electric motors needed to move the colored discs that were envisaged (Sers 1971), and Henry had to start all over again, finding a way of using sounds produced by the tower itself. In the second attempt, he used his own skills as a percussionist, recording the sounds produced when beating on different parts of the tower as if it was a percussion instrument. After processing the sounds, he created twelve tapes played by as many tape players hidden in the base of the tower and controlled by the homeostat, reacting to the intensity of environmental sound, the intensity of the light, and the temperature. One of the original recordings can be found on a record included with Marcel Joray's book on Nicolas Schöffer (1963). From this disc one learns that Henry's composition precedes today's IDM (Intelligent Dance Music) and industrial noise by over thirty years with its metal sounds, its accelerating beats with sharp attacks, and the overall rather high tempo. One wonders how these speedy sounds corresponded to the still, rather static character of the tower and in what way the sound level produced by the tower was matched by the natural environmental sounds of the park. The brochure of the exposition in Saint-Cloud, reproduced in Joray's book, states that the *homeostat* was able to keep this balance and that it was even able to switch off unpleasant sounds, yet how this was done remains unclear.

Despite the widely differing artistic frames of reference of Henry and Schöffer—Henry's world of composed *musique concrète* and Schöffer's world of modern, abstract art—they shared an interest in using technology and in relating their art to other art forms, especially to the art of the human body and dance. They both collaborated with Maurice Béjart and his dancers. In 1955 Henry reworked *Symphonie pour un Homme Seul* for Béjart's choreography, which was the beginning of a long collaboration in which Henry toured the world with Béjart's group, working as their sound engineer.

In the same period, Béjart and his dancers collaborated with Schöffer by developing choreographies in response to Schöffer's spatiodynamic works. These experiments were part of Schöffer's inspiration for *CYSP 1*. This moving interactive sculpture, the first in history and also created with the help of Philips, reacted to the light color and sound level of the environment. It reacted with fast movements to blue light and silence and by slowing down its movements when it sensed red light or intense environmental sound. After a soloperformance by *CYSP 1* in the *Nuit de la Poésie* at the Théatre Sarah Bernhardt in Paris, *CYSP 1* was featured in a dance piece presented at the *Festival d'Art d'Avant Garde* in Marseille on the roof of Le Corbusier's *Cité Radieuse* in 1956.

Both Henry and Schöffer have left their marks on their respective disciplines—music and art—as well as on the relationships between the arts through their open and highly experimental attitude toward involving new technologies in the innovation process in order to arrive at a synesthetic perceptual effect. After many years of separation, in which both artists went their own way, they collaborated again in *KYLDEX 1*, an experimental cybernetic spectacle that was staged in Hamburg in 1973. In this piece, Schöffer's kinetic light art was presented with Henry's music in a choreography of Alwin Nicolais danced by Caroline

Fig. 73. CYSP I and dancers from Les Ballets de Béjart (Cité Radieuse, Marseille, 1956).

Fig. 74. Nicolas Schöffer, KYLDEX I (1973).





Carlson and Emery Hermans, and directed by Rolf Lieberman. Audience interaction was realized by giving the spectators the opportunity to vote on which scenes they wanted to be repeated, prolonged, or cut out, by raising colored cardboards indicating their choice. Along with this early realization of interactive art, Henry is admired today, remarkably, by the techno-scene for his groundbreaking work in electronic music. Despite Henry's resentment toward today's inarticulated computer sound processing and his insistence on combining new digital technology with old analogue techniques for the best possible sound quality, he still reveals his young heart by contributing to the music of today's young generation. In 1998 he remixed his *Dixième symphonie de Beethoven* for the Montreux Jazz Festival. In 2000 he presented *Le Tam-tam du Merveilleux*, a completely new techno dance piece, to 6,000 people at the Place Beaubourg in front of the Centre Pompidou.

VORTEX CONCERTS SAN FRANCISCO 1957

JORDAN BELSON, who started out as a painter, focused on developing his own kind of non-objective cinema after visiting the Art in Cinema festival in San Francisco in 1946 where he learned about the approaches of Norman McLaren and especially Oskar Fischinger to abstract film. Soon after, Belson produced his own first animation, *Transmutation*, which was screened in the second Art in Cinema festival in 1947. This film impressed Fischinger so much that he recommended Belson for a Guggenheim Fellowship.

After this first work, Belson developed new ideas and techniques for the blending and flowing of colors, replacing his earlier focus on geometrical shapes. However, upon further experimentation with animation techniques, Belson saw how difficult it was to achieve the kind of film experience he wanted and he returned to painting and drawing for another four years before he started working on film again. In 1952 and 1953, he produced *Mambo*, *Caravan*, *Bop-Scotch*, and *Mandala*, a film in which pointillistically painted vibrating discs seem to resonate to the colored attacks of the instruments of a Balinese Gamelan orchestra.

New approaches to the combination of visual imagery and music were launched by two collaborations: Belson and the composer Henry Jacobs on the one hand and experimental filmmakers John and James Whitney on the other. The Whitneys called their work "audiovisual research." The Whitney brothers made their first abstract films during WWII. John had visited Paris in 1939 when he dropped out of Pomona College, the same school Cage had left a few years earlier for a similar reason: to visit Europe. Like Cage, John Whitney had strong doubts about what discipline he wanted to devote himself to, feeling inclined toward composing music, but pulled toward technology and building new machines as well. In Paris, he met René Leibowitz, a former student of Schoenberg and the conductor of the French National Symphony Orchestra. Whitney studied dodecaphony and the serial method of composition with Leibowitz. He learned about mirroring and reversing musical patterns and began to apply these principles to visual experiments with an 8-mm film camera. However, Whitney was unaware of the earlier efforts of abstract filmmakers to create a *musique visuelle* when he applied compositional techniques to moving visual images.

He returned to California in 1940 and began experimenting with audiovisual music together with his brother James, a painter who would later continue to make abstract films in a highly personal style. John was soon drafted into the army and spent a few years at the Lockheed Aircraft Factory. What he learned there about analogue computers gave him ideas regarding the potential of computerized motion control. However, it took him at least 142

II SYNESTHETICS IN ART



Fig. 75. Henry Jacobs and Jordan Belson at Morrison Planetarium in San Francisco, preparing the Vortex Concerts (c. 1957).

another decade before he was able to get hold of this type of equipment; in the meantime he used 8-mm film and, together with James, designed a system that would allow them to animate both visual motion as well as musical motion. With this equipment, they were able to create a direct audiovisual connection between image and sound. The resulting work was *Five Abstract Film Exercises* which was shown at the *Art in Cinema* festival in 1946 in San Francisco and in 1949 at the *First International Experimental Film Competition* in Knokke-Le Zoute where it won the first prize in the sound category.

Some years later, John Whitney gained access to computer technology that finally allowed him to compose the audiovisual music he had dreamed of, based on the complementary notions of harmony in music and moving images. Beginning in 1966, he was supported by IBM for some time and achieved further success and independence with his Motion Graphics Inc. business, allowing him to continue his research and work on the theoretical foundation of what he called Digital Harmony (Whitney 1980). He described this work, the ways in which music and visual art complement each other, and the three basic audiovisual notions of differentiality, resonance, and harmony, as follows:

First, motion becomes pattern if objects move differentially. Second, a resolution to order in patterns of motion occurs at points of resonance. And third, this resolution at resonant events, especially at the whole number ratios, characterizes the differential resonant phenomena of visual harmony. (Whitney 1980)

Whitney brought together music and visual art in a composed manner based on computer programming, whereas Jacobs and Belson were connecting electronic music to light and film projections in a huge spatial environment, the San Francisco Morrison Planetarium. In 1957, Jacobs convinced the Morrison Planetarium to grant him use of their speaker system to perform concerts. Belson joined him to create visual effects to be projected onto the dome of the planetarium; this collaboration became known as the *Vortex Concerts*. The concert series was launched with the cooperation of radio station KPFA and the California Academy of Sciences. The program notes stated: "Vortex is a new form of theater based on the combination of electronics, optics and architecture. Its purpose is to reach an audience as a pure theater appealing directly to the senses." (Hollings 2002)

Since some of the music of the first 1957 concert series has been rereleased on CD in 2002, it is possible to get some sense of its sound, as music critic Hollings describes it in The Wire:

Gordon Longfellow's 350-2 is a veiled homage to the ampex 350 tape recorder, while Jacob's own Logos started out as an accompaniment to a short animated abstract film. David L. Talcott's Trilogy feeds a lone signal through a feedback tape loop producing extremely long decays, and William Loughborough's For the Big Horn was intended for projection through a loudspeaker of his own devising with a 12 foot diameter. The spirit of this whole endeavor is summed up magnificently in Longfellow's exposition on his Notes on the History of a World, Part 3 for electronically altered piano: In this work, he writes, I have endeavored to create musically the cycle of cosmic beginning and ending.

Being a bit more specific, the program notes of *Vortex 5*, which was presented in 1959, a year after the presentation at the Brussels World Fair, describes the event's intention as follows:



Fig. 76. Still from Jordan Belson's **Allures** (1961). The image shows a result of the interference pattern projectors which were used at the Vortex Concerts.

Fig. 77. Program cover from Vortex III (1958).



Technically, Vortex utilizes all known systems of projection, along with one of the most highly developed sound playback systems extant. Yet it is a live creation of sound and image, being performed for a specific audience. Vortex is based on a mutual complement of aural and visual elements, in which they reveal unspoken meanings about one another which exist in neither alone.

The Vortex Concerts attracted some 10,000 people in the three years of its existence. Five different programs were presented in that time, with repeated performances. The programs of Vortex 4 (1958) and Vortex 5 (1959) demonstrate the range of electronic music originating in Europe and the US that was heard along with ethnic music and jazz: Stockhausen's Gesang der Jünglinge (Song of the Youths), Toru Takemitsu's Static Relief and Untitled, Vladimir Ussachevsky's A Piece for Tape Recorder, Luciano Berio's Ommagio a Joyce, Dick Raaijmakers's Song of the Second Moon, György Ligeti's Artikulation, Bruno Maderna's Continuo, Luc Ferrari's Etude aux Sons Tendus, and Henk Badings's Dialogue for Man and Machine.

The planetarium must have made an overwhelming impression on the audience in a way Scriabin would have appreciated. A completely new kind of music was presented in an ambient sound environment consisting of thirty-six surround loudspeakers, three large bass speakers (one of which was mounted at the zenith), and a group of speakers placed in the center of the dome, making it impossible to locate the physical source of the music. The title *Vortex* came from one of the effects in which the sounds were spun around the room with unprecedented speed. Dozens of light projection devices and a few special interference-pattern projectors were added for Belson's light show, for which he also used fragments of his own film work (some of which were later incorporated into his film *Allures*), from Hy Hirsh's oscilloscope films, and from *Yantra*, the film James Whitney was working on at the time. As Belson described some of his experiences:

One of my greatest pleasures was working with the star machine at a point when the entire dome was bathed in a kind of deep red. As the color began to fade away, there was a point when it overlapped with this beautiful starry sky; it was a breathtaking and dramatic moment. We could tint the space any color we wanted to. Just being able to control the darkness was very important. We could get it down to jet black, and then take it down another twenty-five degrees lower than that, so you really got that sinking-in feeling. Also we experimented with projecting images that had no motion picture frame lines; we masked and filtered the light, and used images that didn't touch the frame lines. It had an uncanny effect: not only was the image free of the frame, but free of space, somehow. It just hung there three-dimensionally because there was no frame of reference (Youngblood 1970).

In 1958, at the first postwar World's Fair, Expo 58, in Brussels, a large European audience was confronted for the first time with the new electronic music presented in relation to light, color, film, sculpture, and architectural space. Jacobs and Belson were invited to the fair to give performances of their successful *Vortex Concerts*. This not only offered them an opportunity to introduce their sound and light experiments to Europe, but also enabled them to access the newest European electronic music and incorporate it into their fourth and fifth concert programs back in San Francisco.

LE POEME ELECTRONIQUE BRUSSELS 1958

11.3.5

ANOTHER, even more spectacular, manifestation of creative synesthesia presented at the Brussels World's Fair was the Philips pavilion, *Poème électronique*, in which the blessings of electronic technology were honored. L.C. Kalff, the general art director of Philips, had commissioned the project. He had invited the architect Le Corbusier to translate his concept into an artistic form since he wanted to abandon the usual approach of industrial companies to present their newest products in the form of a glossy exhibition of the products themselves. He wanted Le Corbusier to create an audiovisual environment that confronted the audience with the futuristic potential of Philips, the multinational company producing electric lighting systems and consumer electronic commodities, and its progress and technological innovation. Kalff already had a clearly defined view of what he wanted to achieve at the start of the project:

In the interior of the pavilion we want to present a synthesis of light and sound in a completely new and modern form. We are thinking of a huge dome, whose walls will continuously change in light and color, according to the rhythm of modern stereo music, in which after 6 minutes a more or less abstract monument will become visible in the middle or at the back of the dome that will symbolically show the pedigree of Philips and its products.

Originally, Kalff wanted to invite Le Corbusier together with composer Benjamin Britten and sculptor Zadkine, but Le Corbusier refused the other two artists; he proposed the French-American composer Edgar Varèse for the music and said that he would take care of the monument himself, since the creation of plastic forms was his profession. The design of the pavilion itself he left to the composer Iannis Xenakis who had started a few years ago at his office as an engineering assistant while following composition lessons from Olivier Messiaen.

Le Corbusier was especially attracted to the project because it gave him an opportunity to work with the ideas of Victor Basch. Basch had collaborated with Le Corbusier and the French painter Amédée Ozenfant on the magazine *L'Esprit Nouveau* in 1920, and had worked in the field of experimental esthetics. In Basch's theory the appreciation of a piece of art is based on three factors: direct factors, formal factors, and associative factors. According to Basch the traditional esthetics had overestimated the role of symbolism and association, at the cost of failing to recognize the importance of the direct effects of the perceptual elements: color, form, rhythm, sound, and so forth. Le Corbusier was not very interested in the architectural outer form of the building since his primary aim was to apply the "direct" esthetics of sensory stimulation, that is, playing with the senses of the audience. Consequently, he conceptualized two types of ambiences (environments), one of which was based on associative icons, e.g. a "sky" with clouds, the sun, sunset, night, stars, and dawn, which was to be contrasted to another type of ambiance consisting of what he called psychophysical sensations, based on the direct esthetic effect of pure color and light. In addition to these ambiences, a film was to be produced, consisting of stills alternating with moving images, both with highly symbolic values. The film illustrated the evolution of mankind in a collage of archaic icons and was projected simultaneously on several surfaces. The sequences of the ambiances as well as those of the film were organized in a scenario consisting of a total of 480 seconds divided into seven parts: four lasting sixty seconds each and three parts, the third, fourth and seventh, consisting of 84, 36, and 120 seconds, respectively. One also wonders whether Le Corbusier was aware of the consequence of using highly symbolic imagery in the film along with abstract colored light. The first strongly appeals to a mode of perception in which recognition and a rational interpretation of the images, whereas the second often induces a much more psychedelic effect.

The film consisted of seven sequences: 1. *Genèse* (Genesis): monkeys, bull fight, a woman awakes; 2. *D'argile et d'esprit* (Matter and Spirit): skulls, skeletons of dinosaurs, monkeys, and men, idols and masks from different cultures; 3. *Des profondeurs à l'aube* (From Darkness to Dawn): eyes of animals and men, faces of negroes, crickets, the hand of a skeleton of the Cro Magnon man, a war deity, concentration camps, war toys, biblical images; 4. *Des Dieux faits d'hommes* (Manmade Gods): images of different cultures, Easter Island, Buddha; 5. *Ainsi forgent les ans* (How Time Molds Civilization): high-tech images, an engineer, a surgeon, an astronomer, miners, a buffalo, a working horse, the comedians Charlie Chaplin, Laurel and Hardy, bombers, radar, anxious children, the mushroom cloud of an atomic bomb; 6. *Harmonie* (Harmony): images of the Eiffel Tower, machine parts, the surface of the sun, Laurel and Hardy, a loving couple on a couch, and babies; 7. *Et pour donner à tous* (To All Mankind): many buildings designed by Le Corbusier, a picture on an open hand, ending with people living in primitive circumstances, and above all, many more babies.

As if Kalff's basic concept for *Poème électronique* and Le Corbusier's scenario were not complex enough, the whole project became even more complicated because Le Corbusier, Varèse, and Xenakis were working in different places, unable to discuss the progress of the different elements on a regular basis. Le Corbusier was in India working on Chandigarh, the new capital of Punjab, whereas Varèse was in Eindhoven working at the Philips laboratory, and Xenakis worked on the design of the pavilion in Le Corbusier's office in Paris. Le Corbusier gave Varèse complete freedom for his composition from the beginning, except that the total duration was set to eight minutes and a few seconds of silence were needed halfway through the piece; Xenakis was trusted to simply do his job at the office. Despite his artistic grandeur, Le Corbusier completely underestimated the complexity of the project both from a compositional and a technical point of view. Synchronizing all the scenarios for the light and color projection, the film, and the soundtrack was highly complex and beyond Le Corbusier's capacities.









Figs. 79-82. Sketch and models for the Philips Pavilion

Lootsma (1984) has made a detailed analysis of all the failures of the project, interpreting *Poème électronique* alternately as an impossible Platonic dream, a bachelor's machine, and even as an alchemical exercise, in which the synthesis aimed for would have resulted in the audience functioning at a higher psychophysical level. Yet, one has to admit the project has a special merit compared to, for instance, Scriabin's similar aim. Despite all the conceptual, technical, and personal problems the project generated, it actually materialized, even in such a way that a large audience appreciated it for its newness and as an extraordinary perceptual experience. Moreover, it is an excellent example of a naïve approach to multimedia composition, charming for its overdose of digestible information. Each audience member filtered *Poème électronique* differently, and reports of what was seen and heard—including images and sounds not present at all but constructed subjectively in peoples' minds—often conflicted. This resulted in vital discussions and debates after the actual experience and rather interesting press reviews.

It is not exactly clear why Le Corbusier was so fond of Varèse and insisted on having him as the composer for Poème électronique. Varèse, who had emigrated to New York in 1915, had made his name as composer of new music, using unusual orchestration often consisting of percussion and wind instruments to create music in an anti-symphonic style. He was adverse to the classical mixture of instrumental timbres, which formed the basis of regular symphonic music, as he wanted to isolate the different sound colors as much as possible similarly to the direct sensation of abstract, moving, colored light. Although he was strongly influenced by the Futurists' art of noises and was also searching for a liberation of sound, he departed from the Futurist approach. He sought a further articulation of the musical use of timbre by composing new sound colors, a process he preferred to call the organization of sound. Since he also refused to organize his composed sounds according to Schoenbergian serial principles, Varèse developed his own style of oppositional poetics, based on a counterpoint of timbre, which constituted the foundation of his compositions. Although he structured his pieces according to numerical proportions like the golden ratio, he never started from exact schemes, but arranged the proportions of the oppositions intuitively, in an almost improvisational manner, only slowly deciding what phrase was to follow an earlier one.

Maybe it was due to the unusual combination of rational principles in combination with a more direct sensory esthetics that Le Corbusier, who also was attracted by supposedly universal principles underlying physical and psychological reality, chose Varèse to participate in the project. Another possibility may be that he was simply impressed and attracted by Varèse's independent character. Le Corbusier had first met Varèse in New York in 1935, and in 1954, long after this meeting, he asked Varèse to write the music for the opening of the chapel in Ronchamp, but Varèse refused. Whatever inspired Le Corbusier's persistence, Varèse accepted the 1958 commission, but not before insisting clearly on "an absolute dissociation of image and sound." The power of Varèse's music was always based on in contrast, and he wanted to expand the opposition of dynamics and tension to include the contrast between visible and audible rhythms. Although he read a first draft of Le Corbusier's scenario, he insisted on composing separately from the sequences of it and on exclusively following his own poetics of opposition, a condition that Le Corbusier accepted.

For Varèse the commission was interesting since it challenged him in a completely new way. All of his life (like Le Corbusier, he was 70 at the time) he had dreamed of working with electronic instruments that would free him from the determined timbres of existing acoustic instruments, but he had never had the opportunity to work with electronic equipment. Now that he was given the opportunity to work in a studio with the assistance of Philips's engineers and scientists, the collaboration unfortunately turned out to be a disastrous experience, personally as well as artistically. *Poème électronique* is generally considered one of his weakest compositions, which is especially regrettable since it is his last completed work. However, it remains a fact that his approach to this commission expressed his deep understanding of the verticality of harmony and the simultaneous working of audiovisual counterpoint.

It took Varèse seven months to complete the piece, not only because of his typically slow method of working, but also due to the extra handicap of his unfamiliarity with the electronic gear he had at his disposal. He had only had some experience with tape-recorders, which he had used in his composition *Déserts*. The engineers who were supposed to assist him held his working method in such low esteem that they could not withhold expressing their opinions, which caused Varèse to exclaim "we thought we were getting rid of primadonnas in music but now we have prima-donna engineers!"

Despite these frustrations, Varèse was able to finish the piece in due time and according to his own standards. His composition consisted of two opposing, alternating sonorous types. In Part I, complex spectral noise bands, percussion, and machine-like sounds prevailed. Even the bell and siren sounds shared the dense, complex spectra of the percussion and noises. Part II, on the other hand, was dominated by simpler harmonic (or quasiharmonic) spectra, generated equally by electronic oscillators and by the vowels of human languages and voices (Cogan 1987). Unfortunately, an important opportunity was lost when the Philips engineering staff completely neglected Varèse's fascination with the potential of the spatial representation of sound and the interaction, collision, and integration of sounds coming from different locations and directions. The pavilion building itself had embraced this idea by incorporating three routes du son (sound routes), constructed by mounting about 350 loudspeakers to distribute the sound of Varèse's separate sound channels into the walls for the system to realize moving sound. However, as the precise synchronization of the ambiences and the film failed because the technical necessity of an effective control board had been underestimated, the sound distribution through space could also not be achieved to the fullest.

The many failures and missed opportunities notwithstanding, *Poème électronique* will survive as a unique monument of total art and multimedia experimentation, initiated and sponsored by industry, that was special because of its quite unorthodox architecture. With Le Corbusier concentrating on the interior event, it fell to Xenakis to design a building based on the form of the stomach, as Le Corbusier had pointed out, to hit the audience in the belly where the digestion of all the impressions would take place. Along with this symbolic reason, there was a practical purpose for this shape: the audience had to enter the pavilion on one side and leave on the other, so that people waiting in line could enter while others exited. The place would have to be big enough to host five hundred people. Since Le Corbusier's only concern was with the interior, he thought that the easiest way to create

the building was to use permanent scaffolds, functioning as the supporting construction, so that the walls and ceilings could be made of rather light material simply attached to the scaffolding. Although Xenakis was not in a position to reject Le Corbusier's directions, he did not favor the idea of permanent scaffolds and sought a way to integrate the construction with the covering materials.

Bound to work from Le Corbusier's rounded floor plan, Xenakis had to work with curves, and he slowly arrived at a tent-like shape designed on a purely mathematical basis, using curved planes supported by rotating straight lines, known in mathematics as *hypars*, or hyperbolic paraboloids. Xenakis had studied these mathematical structures for some years and had also used them as the basis for the musical composition *Metastaseis* (1954), his first orchestral work. Trying to capture the natural phenomena of motion in mathematic formulae, to transform them into musical structure and architectural form, was a deep fascination of Xenakis. With Le Corbusier he shared an interest in the relationship of light to architecture and the way ever-changing sunlight influences the experience of space.

This common interest first found expression in their design for the convent of La Tourette, in which the side chapel was a dark space with small "light cannons," through which the daylight could enter, literally shaping the space. The church itself was also dark, except for an opening in the ceiling through which sunlight could enter as in a *camera obscura*, projecting the movement of the sun as a wandering spot on the floor. The exterior walls of the monastery's ground floor consisted of strips of concrete alternating with strips of glass of different widths that functioned as musical glass walls, or *pans de verre ondulatoires*, creating a constantly changing rhythm of projected sunlight on the floor (Ostwalt 1991).

However, in the Philips pavilion sunlight had to be excluded because otherwise the electric light changes and film projections would not work. For this reason Xenakis made an even more direct connection to the idea of moving space, designing concave and convex planes that express the idea of motion itself. To achieve this he used the same principle of gradually changing lines forming curved planes that he used to create the structure of *Metastaseis*. Le Corbusier approved the model and gave Xenakis permission to work it out with the help of the staff of Philips and of several construction offices.

Although the structural connection between music and architecture has long stayed in the background of discussions on *Le Poème électronique*, the quintessence of this rather hidden connection has been analyzed in detail by Dick Raaijmakers in his essay *Cahier M* (2000). According to Raaijmakers the shape of Xenakis's design is an early example of modern computer-generated "liquid architecture" based on a spatial application of a basic law of musical dynamics. Xenakis's "morphed planes" can be regarded as a spatial transformation of the harp-like arpeggio in music, not only metaphorically, but even quite literally if one looks at Xenakis's design of the primary plane on which the curved walls are based.



Fig. 83. Edgard Varèse, page from the score for Poème électronique

EXPOSITION OF MUSIC— ELECTRONIC TELEVISION WUPPERTAL 1963

11.3.6

IN HIS DRIVE TO ADD a new approach to the arts, Nam June Paik transformed himself from a traditional composer of music to a visual artist. He first drew attention by working with sounds produced by objects themselves (from the destruction of pianos to the sounds of *objets trouvés*) and later by applying techniques from the realm of electronic music to that of electronic visual art. To understand Paik's transformation from a composer of music to his present, widely recognized status as the founding father and prominent creator of video art, a transformation that took place in the period 1960-63, we have to follow his development through its main stages and the different places where he lived and worked.

Nam June Paik was born in 1932 in Seoul, Korea, where he took private piano lessons and studied composition. His family left Korea in 1949 because of the Korean War, moved to Hong Kong, and a year later to Japan, where Paik studied music, art history, and esthetics at the University of Tokyo. In 1956 he wrote a thesis on Arnold Schoenberg and graduated with a degree in esthetics. He left Japan to continue his studies in twentieth-century music, first at the University of Munich and later at the Conservatory of Music in Freiburg. Before Paik met Cage at the *International Summer Course* in 1957, he had already finished two compositions, his strictly serial solo violin variations and the non-serial composition *String Quartet* (1955-57), after which he started experimenting with tape recorders. With the anti-music piece *Hommage à John Cage*, a second phase in Paik's career began, comprising a dozen multimedia performances, ranging from *Etude für Piano* (1960) in which he cut off Cage's tie, to his participation in Stockhausen's music theater piece *Originale* (1961), in which he presented variations of his own pieces *Simple*, *Zen for Head* and *Etude Platonique nr. 3* (Stockhausen 1975).

In these years, Paik asked himself many essential and existential questions about the nature of music and the modern practice of serial and electronic music. In his studies of the history and theory of German musical esthetics he had "not found an answer to the fundamental question 'what is music?' except that music is, at its widest definition, merely a sequence of events in time" (Paik, cited in Hanhardt 1982). A letter to Cage in 1959 clearly expressed his interest in making music visual through the use of televisions as objects (Hanhardt 1982). Paik had come to this idea by reading some speculative texts of the German painter Karl Otto Götz, who had been serving in a radar station during World War II and had concluded

Fig. 84. Charlotte Moorman playing a cello held between the teeth of Nam June Paik, while sitting on the back of an unidentified man (New York, January 18, 1966).





Fig. 85. Nam June Paik and Karl Otto Götz at **Exposition of Music—Electronic Televison** (Wuppertal, 1963).





Fig. 86. Nam June Paik, John Cage, and David Tudor (1960).

Fig. 87. Robot-K-456 (1965).

from experiments with the equipment that in the future it would probably be possible to develop *elektronenmalerei* (electronic painting). Götz, however, had never carried out this idea himself since he had no idea how to control the radar's electronic movement and how to print the resulting patterns as stills (Götz 1959, 1960, 1961). Still, under his supervision, hand-painted pixel paintings were produced by groups of children who created a protoelectronic version of the digital pixel images that are now known by everybody. For Paik, it was the moving, unstable aspect of electronic imagery that attracted him because of its "suitability to complement the time flow of electronic music," as explained in his flyer for the first presentation of this idea in his *Exposition of Music—Electronic Televison* at Gallery Parnass in Wuppertal in March 1963 (Herzogenrath 1977).

The first manifestation of visual electronic art, Paik's *Exposition of Music—Electronic Television* featured thirteen prepared televisions, each showing images based on distortions of broadcast TV signals created by specific manipulations of the electronic circuits of regular black and white TV sets. During the previous two years Paik had studied electronic technology and experimented with manipulating the regular circuits in such a way that half of the televisions showed different, though constant, distortions of the signal, while the other half could be influenced by the audience by touching foot switches, knobs, or microphones. Despite the historical momentousness of the event and the enthusiastic responses of the audience, hardly anyone noticed either the TV sets, which had been spread out in all sorts of unlikely positions on the floor of one of the rooms amongst other objects, or the revolutionary novelty of using television technology to create controlled electronic imagery.

Paik already resented the fact that, during his *Etude für Piano* his actions had received much more attention than his 15" tape piece *Simple*, even though he spent eighty percent of his time on the tape. In the case of *Exposition of Music—Electronic Television*, the audience's attention was focused on the other attributes Paik had in the rooms of the gallery:

a cow's head, a large balloon, four prepared pianos, a staircase with all kinds of materials on it that produced sounds when walked on, a Zen-box in the bathroom to look at oneself naked, gramophone and tape recorder installations, heating devices, and sounding objects everywhere, including the garden, all often ingeniously interconnected to produce various sounds when touched by the audience in different ways. (Schmit 1977)

In his essay "Overkill as Ideology", David Ross interprets Paik's desire to overawe his audience as stemming from his uncertainty as an expatriate, never knowing the language of the country where he lived and never knowing whether his intentions were adequately understood (Ross 1977). To overcome this communication problem, Paik used so many signs, signals, and gestures that he blurred the core statement he wanted to make. Although this may be true, it is also evident that Paik himself consciously sought an effect he called "intensity by variability," a quality he missed in what he felt were often rather boring electronic music concerts and the performances of his fellow Fluxus artists.

In spite of the lack of any rewarding response to his electronic imagery, he was convinced of the potential of electronics to create a visually attractive environment for electronic music, and he decided to visit Japan to learn more about the newly invented color TV technology. Together with the electronic engineer Shuya Abe, Paik worked for a year on the Paik/Abe Video Synthesizer, which was used many times in the multi-monitor project Participation TV (1963-71). In addition, they created Robot K-456, a twenty-channel radio-controlled robot. After the year in Japan, Paik visited New York, where he met Charlotte Moorman, a cellist and the organizer of the Festival of New Music. Moorman had earlier invited Stockhausen to present his work Gruppen (Groups) and an action piece at the festival. Stockhausen reacted by proposing to perform Originale, but told Moorman it would be difficult to organize the cast since it consisted of poets, painters, an actress, and a model. An anecdote recounts that, as Moorman read the list of performers she asked Stockhausen "What is a Paik?" and Stockhausen informed her of the phenomenon Nam June Paik. Moorman realized she had already read about Paik in the Fluxus publication An Anthology and that Earle Brown had told her about Paik's Korean sacred terror contribution to the German art scene. Moorman decided to write Paik to invite him over, but when she arrived home that night the phone rang: "Hallo? Charlotte Moorman? Here is Paik. Where? In New York,"

Moorman and Paik met later that night, and from then on they worked closely together for a number of years in a unique form of co-composition and co-performance. Together, they initiated a wonderful series of performances in which Moorman's cello playing and Paik's experiments with live TVs, mounted on Moorman's body, were combined into action performances designed and developed by both of them. Their creative collaboration began with the performance *Variations on a Theme by Saint-Saëns* (1964) and was soon followed by *Cello Sonata No. 1 in C-Major for Adults Only* (1965), a piece reflecting Paik's criticism on the lack of sex in music as compared to the role of eroticism in all other art forms: dance, theater, sculpture, and painting.

In 1967, this fascination was explicitly expressed for the first time in the *Opéra Sextronique*, when Moorman was arrested for undressing on stage. The scandal it aroused and the court defense caused a political debate resulting in a liberal redefinition of the New York State law on public obscenity. The theme was later further developed in *TV Bra for Living Sculpture* (1969), *Chroma Key Bra* (1970), *Concerto for TV-Cello and Videotapes* (1971), and *TV-Bed* (1972). Besides his collaboration with Moorman, Paik continued his work with Abe on their video synthesizer and began working with filmmaker Jud Yalkut on single-channel videotapes. He also continued his work on video installations and video sculptures, a series that culminated in the famous TV-Buddha, consisting of a Buddha sculpture "watching" a TV-monitor that simultaneously displayed its own image while being recorded by a video camera.

SYNESTHETICS IN ART EDUCATION

THE INTERFACULTY: A CASE STUDY

THE THIRD SYNESTHETIC WAVE IN MODERN ART

THE INTERFACULTY – A NEW CURRICULUM FOR ART, SCIENCE AND TECHNOLOGY

THE ROYAL ACADEMY OF ART 1682

THE ROYAL CONSERVATOIRE 1826

111.1.3

DICK RAAIJMAKERS, NATLAB, 1956-59; STUDIO VOOR ELEKTRONISCHE MUZIEK RIJKSUNIVERSITEIT UTRECHT 1960 ELEKTRONISCHE STUDIO ROYAL CONSERVATOIRE 1966 INSTITUTE OF SONOLOGY UTRECHT-THE HAGUE 1966-86

111.1.4

CAM CENTRUM VOOR AUDIOVISUELE MEDIA 1987-89 ROBOTIC SCULPTURES 1988 SONOROUS ORIGINS: THE FLYING RHOMB 1988

111.1.5

BOOK III – THE NEW MEDIA, A HOMAGE TO JOHN CAGE 1988

III.I.6

THE INTERFACULTY IMAGE AND SOUND 1989

111.1.7

THE INTERFACULTY ARTSCIENCE 2004

111.2

111.2.2

111.2.3 FORT KLANK 1993 11.2.4

111.2.5

111.2.6

111.2.7

SCHEUER IM HAAG 1995

AND IMAGES 1994-2003

THE INNOVATION PROJECT: MEDIA ARTS AND

MUSIC THEATER - COMPOSED MUSICAL SPACE. LIGHT AND COLOR, HUMAN INTERFACES, LANGUAGE

111.2.1

THE ACADEMY OF LIGHT 1993

MONDRIAN'S PROMENOIR 1994

SCHOOL FOR SOUNDMEN 1994

SONIC ACTS – FESTIVAL OF SOUNDS

DIE GLÜCKLICHE HAND – GEÖFFNET 1993

162

INTRODUCTION: THE THIRD SYNESTHETIC WAVE IN MODERN ART

111.0

DESPITE THE INVOLVEMENT OF MANY of the great masters of twentieth century art in experimenting with multimedia art forms, for quite a long time policy makers in art education have been reluctant, not to say unwilling, to incorporate the study of these artistic experiments into the art curriculum. Institutional art education has not been able or willing to answer the challenge of founding an art curriculum on inter- or meta-disciplinary esthetic principles. Usually, multimedia technologies are only part of visual arts programs, in which hardly any attention, if at all, is given to sound and language.

Faculty structure and art history classes in the different types of art schools are organized on a disciplinary basis. In part, this may be due to the specialized knowledge and strictly disciplinary interest of art historians and art theorists who, for a long time, considered all inter-, trans-, and meta-disciplinary experiments to be fringe phenomena that didn't essentially contribute to the development of the discipline of their specialization.

Although excellent studies have been made of total art (Henri 1970), performance art (Goldberg 1990), and the "art and technology" and "environmental art" movements (Bijvoet 1997), these studies have hardly influenced the art curriculum until now. However, to solely blame art historians and art theorists for the current lack of meta-disciplinary knowledge in art education would be unjust. As a matter of fact, only a few artists themselves have cared about the innovation of art education from a meta-disciplinary point of view. Those who did were not quite successful in realizing long-term institutional innovations, like their companions who fundamentally tried to innovate the arts curriculum at the Bauhaus and Black Mountain College.

Never and nowhere a beginning has been made to implement Schoenberg's ideas to found a School for Soundmen where music, sound, recording, radio, film, and television technology could be studied in relation to each other (Schoenberg 1941-43). Similarly, Moholy-Nagy's dream to found an Institute of Light, where electric light could be studied from a metadisciplinary point of view, was never realized (Moholy-Nagy, 1943).

I proposed the thesis that the new audio art movement was an example of the third phase of modern art. This is not to say that the innovation of the arts and the integrative tendencies caused by the emerging new technologies have had no influence whatsoever on the art curriculum. However, when we look at the present organization of art education, it is still hard to find any example of a curriculum that gives art students a focused insight into the complex synesthetics of the new multimedia art forms: a curriculum based on the mixing and mingling of perceptual dimensions that were formerly the exclusive domain of the visual arts, music, architecture, theater, and dance.

Fortunately, nowadays it is possible to find some departments in art schools or art colleges where multidisciplinary courses can be followed. Often, these courses are initiated by individual artists with a special attraction to digital technology because of their intuitive recognition of its powerful multimedia potential. In most cases, however, these courses fail to bring together the basic knowledge and physical space for multimedia experimentation that is needed to create new forms of synesthetic art in which sound, image, and movement are composed based on an esthetically balanced concept. That it has been possible to develop a new interdisciplinary arts curriculum in The Hague has been a direct consequence of the restructuring of higher education in the Netherlands and especially of the transfer of the Institute of Sonology from Utrecht University to the Royal Conservatoire in 1986. A short history of these institutes will occupy us in the coming section, but first I will introduce my own role in the establishment of synesthetic art education in The Hague.

During the Music Psychology class that I taught at the Institute of Sonology, I was confronted for the first time with students' questions about the artistic possibilities of creating synesthetic effects by relating their electronic music to visual media like film, video, or performance. In my class, I had talked about the psycho-physical experiments that suggested the existence of cross-modal, synesthetic dimensions relating to the different sense modalities. To introduce the students to the artistic applications of synesthetic principles, I let them read the chapter "The Synchronization of the Senses" from Sergei Eisenstein's book *The Film Sense* from 1943, in which he introduced the concept of "vertical montage," and the second part of Gene Youngblood's book *Expanded Cinema* (1970), "Synesthetic Cinema: The End of Drama." I borrowed the film package on *Der Absolute Film* (see ILL4) from the Goethe Institute in Amsterdam and rented the film *Ballet Mécanique* to give the students some sensory impressions of the principles described by Eisenstein and Youngblood. From there on, we discussed the individual questions of the students concerning the ways they wanted to apply these ideas in their own projects.

At that time, their interest was further aroused by some of the composers and performers who showed their experimental audiovisual instruments, installations, and live electronic performances during the International Computer Music Conference that was hosted by the Royal Conservatoire in the fall of 1986. I will describe in detail below how, from that time on, new practice-based and theoretical courses for students wanting to create interdisciplinary art forms were started. As an institutional context for this new activity the Center for Audiovisual Media, CAM, was founded (see III.14).

It had already become evident that digital technology would have an enormous influence on the future of society. Computers—the ZX Spectrum, Apple, Commodore 64, Atari had arrived not only on the desks of scientists, businessmen, designers, and artists, but they had also fallen into the hands of a new generation of children who turned away from the TV to play with computer games and who learned by creating their own worlds of moving image and sound. In 1982, three years after it had been founded, Ars Electronica in Linz, Austria—still the leading festival for electronic arts today— devoted itself for the first time to the culture of the information society:

As industrial society has revolved around the machine, the age of the microprocessor—the third industrial revolution—will be determined by information and communication. Information society, with the development of broadband cable systems, home electronics, and direct radio satellites, will produce new modes of cultural behavior and—due to the change of technologies and media—also new forms and content of artistic creativity.

A few years later in 1986, the festival published *Ten Indications of an Emerging Computer Culture*. Half of these indications were directly relevant to the future of art and the artist: "Computer culture permits a new type of artists; Computer culture permits a new world of images and sounds; Computer culture permits new networks; Computer culture permits new media; and, computer culture allows new experiences in art and culture."

In 1988, I was invited to present my thoughts about synesthetic art and art education at the audio art symposium, Audio Art: Kunstformen der Entgrenzung (Audio Art: Art Forms of De-Bordering), which was incorporated into the program of Ars Electronica. In my lecture, entitled The Third Synesthetic Wave in Modern Art, I proposed that the new audio art movement was an example of the third phase of modern art, which would eventually become characterized by a further dissolving of the borders of the traditional art forms, much more strongly than before. In the first phase of modern art (1892-1933), electric light and film had challenged musicians and painters to create new synesthetic relations in the form of multidisciplinary stage performances, cinematographic forms of visual music, and forms of light art that related to musical motion in an abstract way. In the second phase (1948-1970), a new synesthetic impulse was given by the introduction of electronic sound, the sophistication of light and projection technology, and a revival of the ideal of the Gesamtkunstwerk in the form of total events and environments. The beginning of the third synesthetic wave in modern art was marked by the introduction of digital multimedia technology in the early 1980s and by the needs of a new breed of artists who wanted to apply this technology to transform unusual spaces into immersive techno-spaces by means of amplified and projected sound, light, color, and video.

Moholy-Nagy's "art of relationships" has therefore not only become characteristic of the innovation of the visual arts, but has actually become a dominant mark of the innovation of all old and new art forms—dance, music, poetry, theater, film, and the media arts—during the twentieth century. This innovation was not restricted to the creation of relations between mono-modal elements and dimensions within each of the artistic disciplines, such as the relations between color and shape, pitch and duration, etc., but it also became manifest at the level of the creation of relations between the artistic disciplines themselves, such as in music theater, visual music, video art, performance art, and the media arts. Similarly, I have shown that the desire to create new relationships between the arts was not something exclusively new to the twentieth century.

As early as 1725 and 1848, new artistic concepts had been proposed to integrate the esthetics of different artistic domains. Interestingly, both Castel's and Wagner's proposals were based not on intrinsic esthetic values but on philosophical or political considerations. Castel proposed to found a new painter's school based on musical principles, in order to be able to paint sounds and all sorts of music by means of color and moving visual patterns. This came from his desire to create a philosophical argument against the dominant rational empiricism of his time, which left no space for analogical reasoning and the validity of understanding meaning by creating artistic cross-overs, especially between music and painting. In Wagner's future vision, the different arts-in his opinion all being at the apex of their development-left them no other direction than to join their powers in the Gesamtkunstwerk, the total work of art, that had to immerse the audience in the powerful mythological roots of Nordic culture to convince the people of its future victory in the European battle for political power. Together, these two concepts constitute a double helix that has spiraled its way into contemporary art. Both of these cross-disciplinary considerations and experiments resulted in new forms of music theater, light art, visual music, kinetic art, events, actions, happenings, environments, installations, and multimedia art that were all characterized by a dissolving of former disciplinary boundaries. Often, (non-Western) philosophical considerations or (socially inspired) political aims played a role in the artists' motives to break away from disciplinary conventions, although in many cases these motives were equally nourished by the curiosity to explore new technologies for their synesthetic possibilities.

How did art education respond to this tendency to unite the arts through creative synesthetic means? In what ways did the concepts of the *clavecin oculaire* and the *Gesamtkunstwerk* find their way into art education? In what ways were combinations of media organized and composed? What materials and technologies were used? How did art educators and art students absorb the experimentation with new materials, new media, and new concepts? Two art institutions, the German Bauhaus and the American Black Mountain College provide us with the first indications of answers to these questions.

The periods from 1919-1933 (Bauhaus) and from 1933-1957 (Black Mountain College) were the two most innovative phases of modern art education in Europe and the US. From 1923-1928, the Bauhaus pedagogy was dominated by the Vorkurs (preliminary course) taught by László Moholy-Nagy and Josef Albers. This Vorkurs was extended to the learning environments of Moholy-Nagy's and Albers's metal and glass workshops. After Moholy-Nagy's departure from the Bauhaus in 1928, Albers headed the Vorkurs until the Bauhaus closed in 1933. Later that year, after emigrating to the US, Albers became a member of the core faculty of the recently founded Black Mountain College. His influence on the development of the college lasted until 1948, the year he organized the summer school. In her book The Arts at Black Mountain College (2002), Mary Emma Harris describes how Albers's 1948 summer school transformed the college, which until then used to be dominated by German esthetics, into a truly American place. According to Harris, "[t]he summer of 1948... was a magical one. It marked the end of the dominance of the European artists at the college and the emergence of the young Americans, who were to be creative leaders in the arts in the United States for the next twenty-five years." Among the new teachers were M.C. Richards (literature), Charles Olson (fine arts), John Cage (music), Merce Cunningham (dance), Willem de Kooning (painting), and Buckminster Fuller (architecture).

The environments of the Bauhaus, Black Mountain College, their respective artistic-pedagogical aims, and their respective faculty's mentalities and atmospheres are inspiring examples of the philosophy and practice of the teaching and learning climate that was later created by the Interfaculty. The philosophies of both the Bauhaus and Black Mountain College were based on the principles of the "new pedagogy." Bauhaus founder Gropius was influenced by the European reform pedagogues Montessori, Pestalozzi, Fröbel, and Steiner, whereas the founders of Black Mountain College, John Rice and Theodore Dreier, were driven by John Dewey's democratic reform pedagogy (Dewey 1916, 1934). The following sections tell the story of the emergence of the need to develop interdisciplinary art education and how, as a result of a revival of this need an educational experiment started in 1989 that aimed to create another innovative approach to art education, this time within the framework of the oldest conservatoire of music and dance and the oldest art academy of the Netherlands. The spark lighting this fire was John Cage's visit to the Royal Conservatoire in 1988 (see III.15).

THE INTERFACULTY - A NEW CURRICULUM FOR ART, SCIENCE AND TECHNOLOGY

AFTER A PRAGMATIC BEGINNING at the Insitute of Sonology, consisting of classes in which analogue and digital synthesis and the processing of image and sound could be studied and practiced, a new four-year curriculum was developed. It was offered for the first time in 1989 at the newly founded Interfaculty Image & Sound, a few months before the merger of the Royal Conservatoire with the Royal Academy of Art into the University of the Arts. The aim of the Interfaculty was to offer art education for students wanting to develop themselves as interdisciplinary artists and to equip them with the skills to develop new concepts for multimedia applications in the arts.

In 1993, the Interfaculty Image and Sound presented its ambitions full-scale for the first time. In that year the Interfaculty's plan to create new educational formats for developing a curriculum for media arts and music theater was accepted by the innovation fund of the Council for Higher Vocational Education (HBO-Raad). In the same year, the Royal Conservatoire was being restructured so as to house 1500 m2 of new studios for the Sonology Department, the Electronic Composition Studio, the Music Registration Department, and the Interfaculty Image & Sound.

Together with Dick Raaijmakers and Hans Locher, I proposed a plan to create a big manifestation to celebrate the material impulse to innovate art education by preparing it for the digital phase of modern art. The manifestation was presented as the International Schoenberg-Kandinsky Symposium and was organized in the auditorium of the Gemeentemuseum in The Hague. Part of the symposium was a public meeting of pioneer artists in the fields of electric sound, light, and projection, entitled *The Academy of Light*.

In the museum's Kandinsky hall, Schoenberg's *Pierrot Lunaire* was performed, and in the Schoenberg hall of the Royal Conservatoire a performance was organized of the production *Die Glückliche Hand – Geöffnet* (The Lucky Hand—Opened), which was based on Schoenberg's "music with drama" *Die Glückliche Hand. Die Glückliche Hand – Geöffnet* was the Interfaculty's first large scale collective production by the faculty and students, based on Raaijmakers's open form approach of "opening" the score through a remediation of the different parts with modern means and by recomposing the whole.

Die Glückliche Hand-Geöffnet was the Interfaculty's first large scale collective production. This first Interfaculty project, like all the other ones described in this chapter, was characterized by synesthetic concepts regarding parallels between music and painting, theater and light (Kandinsky, Schoenberg), sound, color, and light technology (Lev Termen, Bulat Galeyev, Gustav Metzger, Elfriede Fischinger, and William Moritz), electronic music, light projection, and environmental space (Mondrian), and the "invention" of an instrument to create color-music compositions based on Castel's color scale (Scheuer).

As of 1994, the Interfaculty produced Sonic Acts, a "festival of sounds and images," in collaboration with club Paradiso in Amsterdam. The idea was born after an article had been published about the new interfaces created by the students of Sonology and Image & Sound and the new interfaces used by young artists working as DJs and VJs in the dance culture. At Paradiso, students were confronted on multiple levels with the reality of a production house with an intense form of operation. Working days started at 6:00 in the morning and lasted till 4:00 at night. The students were working in cable teams, building sets, lighting, sound engineering, designing PR materials, acting as runners in the production team, or cleaners in the catering. Over the years, Sonic Acts has added a new approach to the already quite rich festival culture of the Netherlands in the field of the electronic arts by focusing on the zone connecting composed electronic music and live electronic music with digital visuals and physical performances.

During its fifteen years of existence, the Image and Sound curriculum existed as a learning environment for stimulating the development of students' artistic expression through their use of new technologies combining visual and auditory elements. Often this resulted in works that took the form of experimental film, video art, music theater, spatial installation, or performance art. In order to encourage an experimental attitude among the students, many collective Interfaculty projects were organized in which research themes, such as composed musical space, light and color, human interfaces, and language, were studied to add to the knowledge of the language of image and sound. The results of these research projects were presented in the form of productions, such as music theatrical pieces, architectural environments, sonic acts, and in various other forms during projects on location for public audiences.

THE ROYAL ACADEMY OF ART 1682

THE HISTORY OF INSTITUTIONALIZED art education in the Netherlands goes back to 1682 when some members of the St. Lucas Painters' Guild decided that the rules of the medieval guild structure were outdated. Willem Doudijns, Theodorus van der Schuur, Daniël Mijtens, Robert Duval, and Augustinus Terwesten decided to leave the St. Lucas Guild, which had its home base in De Waag in Amsterdam, and to found the confrèrie Pictura, for which they found a new home on the first floor of the De Leidse Poort, also in Amsterdam. Shortly thereafter, they left Amsterdam to found a new academy in The Hague, the Haagsche Teeken-Academie (The Hague Drawing Academy), where they taught model drawing during the evenings and on Saturdays discussed art in a club environment. After a few years, Terwesten became court painter in Brandenburg, Germany and founded the Academy of Art in Berlin.

During the eighteenth century, the academy in The Hague flourished, owing to well-established relations with the aristocracy, but the situation drastically changed due to the general financial malaise following the Dutch "Golden Century." In 1800, the number of students had fallen below ten, a state of affairs that continued during the next two decades of the Napoleonic occupation of the Netherlands. Only after King William I was installed did things change. William I, who had an eye and an ear for the importance of culture and art, took a number of measures to raise the national level of artistic consciousness. Within a few years, he had not only substantially raised financial support for the Academy in The Hague, but he had also founded four music conservatories—in The Hague, Amsterdam, Brussels, and Liège—and had ordered Jean Emile Humbert to buy as many antique sculptures in Italy as he could find. These were shipped to Leiden where they eventually would form the basis of the collection of the Dutch National Museum of Antiquities.

In 1821, the drawing school was integrated into the newly founded School for Civic Engineering. A new building was designed by Zeger Reyers to be built at the Prinsessegracht. There, dozens of students followed classes in drawing, painting, or architectural design. During the nineteenth century, the Academy attracted many talented artists, like Johannes Bosboom, Isaac Israëls, Willem Maris, Jacob Maris, J. H. Weissenbruch, G.H. Breitner, K.P.C. de Bazel, and Thorn Prikker. The first decades of the twentieth century were marked by a growing interest in the applied arts and design. Inspired by the new views developed at the Bauhaus, the director, J.H. Plantenga, initiated the course Advertisement Drawing and Furniture Design. By attracting highly qualified teachers such as Gerrit Kiljan, Paul Citroen, Paul Schuitema, and Cor Alons, the course developed into the departments of graphic and typographic design and interior design. All of this resulted in a marked growth of the number of students and the need for a larger building. The new structure was designed by a team consisting of J.B. Lürsen, architect J.W.E. Buijs, and J.H. Plantenga. Zeger Reyers's neo-classical building, resembling a Greek temple, was replaced by an industrial building constructed with modern materials, like concrete and steel, while the huge glass windows created an open and light atmosphere.

In 1957, the Academy and the school for civic engineering were separated, and the Academy received the prefix "Royal," owing to its 275th anniversary. The new director, the sculptor J.J. Beljon, consolidated the department structure and added a new department for textile and fashion design. Beljon left the academy in 1985 and was replaced by the art historian Chris Rehorst, who faced the difficult tasks of integrating the independent School voor Fotografie en Fotonica (School for Photography and Photonics) into the Academy and preparing the Royal Academy of Art for the merger with the Royal Conservatoire. Since 2000, the Academy has been directed by Jack Verduyn Lunel, a former politician and director of the Nederlandse Federatie van Kunstenaarsvereningen (Dutch Federation of Artist Societies).

THE ROYAL CONSERVATOIRE 1826

THE ROYAL CONSERVATOIRE WAS FOUNDED by King William I in 1826 in the same period that he rescued the Art Academy by giving it a substantial financial injection. In contrast to European art academies with their much older histories, the first European music conservatory had opened in Paris in only 1792, shortly before the French Revolution. Since William I did not want his initiative to be associated with the period of the French occupation, the institute was called Koninklijke Muzijk- en Zangschool (Royal Music and Singing School). However, in 1900, when all negative associations with the word "conservatoire" had finally faded away, the name was changed into Koninklijk Conservatorium (Royal Conservatory). In 2004, the name was changed to the Royal Conservatoire, reflecting its French origin.

The Conservatoire's first director was the German violinist J.H. Lübeck, who wrote the first curriculum for singing, theory, and thirteen instruments (piano, violin, viola, violoncello, flute, clarinet, oboe, bassoon, trumpet, horn, trombone, bass, and timpani). Within two years, over a hundred students were enrolled, and in 1840 the school found suitable accommodation in the building of the Art Academy and the engineering school, which was renamed the Palais des Arts on that occasion.

In 1882, after the number of students had grown to over three hundred, the music school found its own building at Korte Beestenmarkt, where it stayed till 1979 when the new building at Juliana van Stolberglaan was opened. During the first decades of its existence, the school educated some rather successful individuals, such as the composer Johannes Verhulst and the singer Sophie van Hove, both of whom earned fame throughout Europe. In 1865, Lübeck died and was replaced by the piano and organ player W.F.G. Nicolaï, who had already taught organ and orchestra classes for a decade and who added classes in composition, chamber music, and pedagogy to the institute's offerings.

During the first two decades of the twentieth century, the Conservatoire was run by Henri A. Viotta, a musician who had become so impressed by Wagner's theoretical writings that, after finishing his music studies (piano, cello, and composition), he studied law and wrote a dissertation on musical authorship. During his directorate he founded the Residentie Orkest in The Hague and attracted many instrumentalists for the orchestra, who also became teachers at the Conservatoire; in this manner he established a firm relation between music education and professional musical practice.



Fig. 88. The first studio for electronic music at the Royal Conservatoire (1966-1967).

After Viotta, Johan Wagenaar ran the Conservatoire for almost twenty years. His primary interest was to raise the quality of the curriculum further by introducing special examination classes, while stimulating theoretical knowledge by introducing major programs in the fields of music theory, composition, choir direction, and musicology.

In 1937, Sam Dresden became the new director. In his inaugural speech, he noted that Dutch music education was not successful enough in preparing students for achievements in international competitions in comparison with other countries. He also observed a lack of orientation toward the new media of those days, like radio, gramophone, film, and mechanical music in general. Dresden, however, never had the opportunity to realize his ambitions; a few years after his inauguration the Germans occupied the Netherlands and Dresden, a Jew, was ousted from his job.

On the occasion of the 150th anniversary of the Royal Conservatoire in 1976, John Kasander wrote a concise history of the Conservatoire in which he gave an extensive report on the way it was directed during World War II and on the accents placed during the first decades after the war by the composers Hendrik Andriessen, Kees van Baaren, and Jan van Vlijmen (Kasander 1976). During the German occupation, new initiatives were taken to incorporate a dance school and to start new courses for educating music teachers for elementary schools and high schools. According to Kasander, and to many others, it was Kees van Baaren who, after Lübeck and Wagenaar, created the third milestone in the development of the Royal Conservatoire during his directorship (1958-1970).

Van Baaren's influence was not based on his organizational qualities, but on his magical personality and his weekly open class for composition students and instrumentalists in which their proposals for change were discussed. He drew attention to the recently rediscovered piano pieces of Liszt and the new compositional approaches of Charles Ives, Karlheinz Stockhausen, and Henri Pousseur.

Within a few years, Van Baaren had attracted many talented Dutch composers to this class: Otto Ketting, Dick Borstlap, Joop Stokkermans, Ton Hartsuiker, Louis Andriessen, Misha Mengelberg, Peter Schat, and Reinbert de Leeuw, who, without exception, would soon take a leading role in the Dutch and international music world. In 1966, Van Baaren invited Dick Raaijmakers to open an electronic studio in the Conservatoire, where all interested students would have an opportunity to learn the basics of electronic and electroacoustic music by manipulating tape-recorders, generators, and filters. This equipment was brought together in a simple but highly effective studio, generating immediate and lasting interest. Raaijmakers was later involved in the process of innovation during the 1980s when, in a few years time, new courses were developed in the fields of Music Registration, Sonology, and Image and Sound.



Fig. 89. Raaijmakers in the early studio for electronic music (Rijksuniversiteit Utrecht, 1957-1958).

DICK RAAIJMAKERS NATLAB 1956-59 STUDIO VOOR ELEKTRONISCHE MUZIEK RIJKSUNIVERSITEIT UTRECHT 1960 ELEKTRONISCHE STUDIO ROYAL CONSERVATOIRE 1966 INSTITUTE OF SONOLOGY UTRECHT-THE HAGUE 1966-86

111.1.3

DICK RAAIJMAKERS HAD studied piano before he turned to his favorite subject: radio technology. After finishing his studies in Tilburg and The Hague, he moved to Eindhoven to work in the Philips radio factory where the physicist Hendrik Casimir, the director of Philips's Natuurkundig Laboratorium, (Physics Laboratory) commonly known as the Nat-Lab, recognized his special talent. In 1956, Casimir invited Raaijmakers to become an assistant in the acoustical department where he could work in close collaboration with Henk Badings, Ton de Leeuw, and Rudolf Escher. He was commissioned to create three works of popular electronic music, *Song of the Second Moon, Night Train Blues*, and *Colonel Bogey*, under the pseudonym Kid Baltan.

Philips had the hope that the electronic music produced could be marketed on a large scale. Unlike today, there was not yet a general audience for electronic music; other than the success of using electronic music for outer space sound effects in science fiction movies and the creation of the specific sound of early rock 'n roll bands, which, at that time, was an all-American affair, it seemed quite difficult to exploit electronic music in the popular genre of easy listening. As an art piece, however, the Song of the Second Moon was quite successful. It was presented at Vortex 5 together with pieces by Luciano Berio, Vladimir Ussachevsky, Toru Takemitsu, György Ligeti, and special visual effects by Hy Hirsh and James Whitney, under the visual supervision of Jordan Belson and with Henry Jacobs coordinating the audio (see II.34). Despite this international recognition of the artistic quality involved, Philips stopped its research and development activities in this direction in 1959.

At that point, Raaijmakers resigned from his job and started to search for an environment where a new electronic studio for composers, including his own practice as a composer of concert and film music, could be located. Negotiations began first with the Technological University in Delft, where composer Jan Boerman worked in a small studio, and later with the universities in Amsterdam and Utrecht. Finally, one of the curators of Utrecht University, J.H. des Tombe, succeeded in interesting the university board in starting a Studio for Electronic Music, where the equipment of the Philips studio would be housed and where a small scientific staff supported by some technicians, who would get an assignment as regular university personnel, would be installed. Although the composer's facility itself was saved, Raaijmakers did not agree with the condition that research results would have to be published on a regular basis to give the studio a rationalization for its existence in a scientific context. Raaijmakers left Utrecht and started a private studio with Jan Boerman in The Hague. Van Baaren's offer to Raaijmakers to join the Conservatoire arrived just before the Studio for Electronic Music in Utrecht changed its name to the Institute of Sonology.

Despite the high and rather strict academic standards of both the Institute of Sonology in Utrecht and the Electronic Studio in The Hague, these institutions were able to create independent artistic atmospheres characterized by an experimental and open attitude, an international orientation, and an all-day and night working schedule. However, there were also some marked differences in their esthetic, technical, and educational orientations. Whereas Utrecht was high-tech oriented and leaning toward the serial approach to composition introduced there by Gottfried Michael Koenig, in The Hague Raaijmakers preferred to work with so-called proto-electronic equipment and simple electric circuits, which he often developed himself in collaboration with some of the students.

Another difference was that in The Hague the Electronic Studio was integrated into the regular curriculum of the vocational training of composition students, whereas the Institute of Sonology offered a one-year post-doctoral course for composers and researchers. The Institute of Sonology was not equipped to present concerts for large audiences, whereas the Royal Conservatoire's concert hall was used as an open laboratory space where all the equipment from the Electronic Studio was placed on tables and on the stage floor, to experiment with electronic circuits, in which tape music was mixed with live music played by regular instrumentalists.

These "instant concerts" or "rehearings" often took the shape of multimedia events, in which classical films and recordings made by the avant-garde of the 1920s (*Entr'acte, Sonate in Urlauten*) were presented together with modern classical works (such as Cage's *William's Mix for magnetic tape and slides*, Stockhausen's *Hymnen*, and Kagel's *Match*). Sometimes some of the artists working at the Free Academy, including light artist Livinus van der Bundt, experimental filmmaker Frans Zwartjes, and performance artists Moniek Toebosch and Michel Waisvisz, were invited to contribute to these rehearings. Occasionally, the stage was made available for experimental groups like The New Electric Chamber Music Ensemble.

In 1968 and 1969, these concerts were prepared by the so-called practice class, formed by Raaijmakers and students, among others Gilius van Bergeijk and Victor Wentink, studying and discussing the early works of Futurists, Constructivists, and Dadaists. The presentations had a historic and artistic dimension, usually resulting in an atmosphere of total, Fluxus-like art. Basic to the approach was the collective atmosphere of the open form, although the evenings, which often lasted for four or five hours, were always programmed in a way that resulted in a classical climax. This highly creative episode resulted in the new ensemble *Het Leven* (Life), which toured the Netherlands during the early seventies, creating controversy and turmoil everywhere.

As a result of the democratization movement, in 1970 the self-installed *algemene vergadering* (general assembly) of the Conservatoire decided that the regular classes should be complemented by projects in which all students of the conservatoire or specially formed groups of students would work collectively on a particular theme.

Two years later, Jan van Vlijmen, who had become the director after Van Baaren's death, organized the first large project focusing on Claudio Monteverdi's operatic masterpieces. For this project, he attracted some of the masters of the early music movement—Nicolaus Harnoncourt, Alice Harnoncourt, Alfred Deller, Eugen Dombois, and Gustav Leonhardt, among others. Their contribution to the project resulted in a lasting effect on the international fame of the Early Music Department, which already counted among its faculty a number of the world's leading musicians in this field—Marius van Altena, Frans Brüggen,

Anner Bijlsma, Jeanette van Wingerden, Kees Otten, and Sigiswald Kuyken. It was the first of the series of composer's projects; after Monteverdi (1970) and Bach (1975) all projects focused on living, contemporary composers, such as Karlheinz Stockhausen (in 1984), followed by composer's projects organized by Van Vlijmen's successor, Frans de Ruiter, who invited Olivier Messiaen in 1986, John Cage in 1988, Mauricio Kagel in 1991, György Ligeti in 1996, György Kurtág in 1997-98, Steve Reich in 2003 and Heiner Goebbels in 2008.

The practice class, in which the teachers of the Composition Department and instrumentalists had been working creatively together for a number of years, ended in 1973 when Van Vlijmen declared that "the time of experimentation is over." Although Het Leven stopped performing in the same year, the formation of new ensembles continued during the 1970s. In 1972 De Volharding was founded after the successful premiere of Louis Andriessen's piece of the same name, followed in 1974 by the founding of the Schoenberg Ensemble by Reinbert de Leeuw and in 1976 by Hoketus, which was founded by Andriessen for a younger generation of pop music-oriented instrumentalists.

During Van Vlijmen's management the Conservatoire's departments were restructured, now comprising a Classical Department, a Vocal Department, a Jazz Department, an Early Music Department, a Pedagogy Department, a Composition Department, a Ballet Department, and even a High School, where young dancers could follow a combined curriculum consisting of regular school classes and classical ballet training. This structure of strict departmentalization is a result of Van Vlijmen's policy to attract internationally renowned specialists in the different fields as well as of the practical and functional need for a clear structure to arrive at a workable program of requirements before moving to a new building. Relocation was absolutely necessary since the Conservatoire had been growing so fast that the historical location in the center of The Hague had become far too small and unsafe to house over 600 students and 150 teachers. The new building opened in 1980, a huge block next to the main entrance highway to the city, which included an immense concert hall, a fully equipped theater for opera and ballet and dozens of teaching rooms and study rooms for practicing, at the time unique for the Netherlands. In 1980, shortly before the opening of the new building, however, it turned out that the program of requirements had not foreseen a space to house the Electronic Studio. This led to some quick, improvised changes, resulting in giving up the bicycle parking in the basement and transforming the space into some studios and teaching rooms for the Electronic Studio.

At this time, the late 1970s and early 80s, a regime of financial cuts began to affect all forms of education in the Netherlands, a process that has continued ever since. One of the first victims of this operation was the Institute of Sonology. Since it was not part of the regular faculty structure of Utrecht University, there was hardly any support within the university to prevent it from closing. To survive, the Institute had to look for a new institutional context that was not only interested in its activities but that could also give it the needed financial support to keep it going. The University of Amsterdam was approached, but since this university faced the same problems as Utrecht University, another potential hosting institute was approached, the Sweelinck Conservatory in Amsterdam, where composer Ton de Leeuw had recently opened a new electronic studio for composition students. But it was Van Vlijmen's opinion that the Royal Conservatoire was the ideal place to house

the Institute of Sonology because of the internationally recognized position of its Composition Department (which included Louis Andriessen, Jan Boerman, Dick Raaijmakers, Gilius van Bergeijk, and Diderik Wagenaar) and because of the historical roots of the Electronic Studio, which are actually the same as those of the Institute of Sonology.

As the Royal Conservatoire was still owned by the government at that time, the Ministry of Education, Culture, and Sciences used its power to influence the final decision by creating a sound financial compensation to accomplish this move in 1986. As a result of this transfer the Royal Conservatoire housed the largest center for electronic music and became the first HBO (higher vocational education) institute with a scientific research program in the field of sonology. This guaranteed the continuation of the activities of researchers Gottfried Michael Koenig, Werner Kaegi, and Jaap Vink, but also resulted in two new research posts for guest researchers. Michel Waisvisz was appointed to study live electronic music practice and the development of new musical interfaces, and I was invited to elaborate my research on the subjects of experimental synesthesia and the de-bordering of the arts and the integration of the electronic arts.
CAM CENTRUM VOOR AUDIOVISUELE MEDIA 1987-89 ROBOTIC SCULPTURES 1988 SONOROUS ORIGINS: THE FLYING RHOMB 1988

111.1.4





IN SEPTEMBER 1986, I received a part-time research assignment for three years and, after discussing my intentions with Raaijmakers, I felt encouraged to make my ideas and research activities visible in the form of educational activities. We discussed the need for new courses in which the relation of image and sound would be studied both from a theoretical point of view as well as being a form of compositional or performative activity. At that time I met Louis Spoelstra, who had been asked by the School of Photography and Photonics to start a video course, and I asked him to join the initiative to found the Center for Audiovisual Media (CAM), which was launched in April 1987. Five courses were to be offered as of September of that year: *Audio and Video Design I* and *II*, taught by former music registration student Raymond Raphaël and Louis Spoelstra, *Computer Graphics and Sound I* and *II*, taught by sound engineer Jan Panis and artist Chee Kong Mok, and *Phenomenology and Psychology of Image and Sound*, which I taught with Dick Raaijmakers.

In 1988, new courses were added and three projects were carried out in the second year: the exposition *Robotic Sculptures*, the educational film *Sonorous Origins: The Flying Rhomb*, and the multimedia event *Book III – The New Media*.

During these two seasons, 166 students followed one or more of the CAM courses, about half of them being regular students of the Conservatoire or the Art Academy and half of them new subscribers, often young composers or artists who had not had the opportunity to concentrate on audiovisual or digital media during their studies. Due to this overwhelming interest, a new four-year course plan was announced. The CAM courses were the first steps on the road to the founding of the Interfaculty Image and Sound in 1989.

After the introductory CAM course *Computer Graphics and Sound*, a follow-up course was offered that was completely oriented toward production. To reflect this aim the name of the computer course was changed. *Computer graphics* was found to be too limited since it mainly attracted students interested in existing software rather than students who wanted to learn the basics of the digital medium by learning to program it. For this reason the teachers Chee Kong Mok and Jan Panis proposed to rename the follow-up computer course *Electronic Imagery, Computer Aided Sound in the Media Arts*.

This turned out to be a successful move since it attracted students with more experimental attitudes. They were asked to make a simple kinetic sculpture, the movement of which was to be controlled by using the simplest function of the computer: switching an electric circuit on and off as a response to signals from sensors or other interfaces or controllers. On March 4, 1988 the resulting works were shown in the exhibition *Robotic Sculptures* during the Conservatoire's open house. The works were placed around a huge sand painting of the CAM logo on the floor of the foyer, consisting of an enlarged representation of one of the images produced by Chladni (see fig92) in the nineteenth century. Chladni had found that, when sand was randomly distributed on a copper plate and when this was stroked with a violin bow, the vibration patterns in the plate became visible as the sand distributed itself into patterns according to the vibration nodes, often resulting in beautiful symmetrical images.

The *pièce de résistance* of the exhibition was the *Electronic Ant*, an interactive work by Daan Dijkmeijer, consisting of an ant built from a acrylic glass body with six legs made of copper wire. The ant's sense organ consisted of a small loudspeaker mounted on its head, transformed into a microphone. Upon registering a clapping or whistling noise, the ant's legs would make wild movements. Another work, *LED's Dance*, consisted of a piece of software, written by Ruben Harry, which translated simple sound patterns into graphic onscreen patterns. Joost van Balkom's *Radio Installation* was inspired by John Cage's *Imaginary Landscape No. 1*. A new element was that the radios were switched on and off via the use of a random computer program written by Van Balkom during the course.

Another simple and powerful application of the digital on/off principle was designed by Huib Swets in his installation *Hairdryers*. Two hairdryers were mounted on long copper pipes placed in opposition to each other. Between them, a movable pipe was mounted from above to a flat copper plate. The hairdryers blew the air alternately from the left or the right side, producing a standing wave inside the middle pipe. The fifth installation, *TV Chair*, was an interactive piece made by course instructor Chee Kong Mok. It consisted of a TV connected to a video player and a computer. The audience was asked to sit on a chair and to hold a gun. As soon as the TV screen showed a gun pointed toward the screen, one was supposed to shoot at it. When the gunpoint was hit, it disappeared from the screen, but when one missed, the gun fired back and one was shot from the chair by a loud sound.

The exhibition attracted much attention, as did the new brochure, which contained the course program for the following year. For the *Audio and Video* course, two new teachers were contracted to teach video art, the artist Rudy Luyters, who taught at the Royal Academy of Art, and Bill Spinhoven, a programmer at the video art gallery Montevideo in Amsterdam. This resulted in a shift of the course's content in the direction of video art, audio art, and electronic art. A new teacher was hired for the computer course as well, since Mok was to leave for a research job at MIT in Boston. He was replaced by Trevor Batten, a computer artist who had previously taught media arts at the Akademie voor Kunst en Industrie (Academy for Art and Industry) in Enschede. Completely new were the courses *Experimental Film and Origins of Sound* by filmmaker Babeth van Loo and anthropologist Fred Gales and *Composition and the Contemplative Tradition* by filmmaker Mark Hammond. During the course *Phenomenology and Psychology of Image and Sound*, Frits Weiland guest lectured on his approach to the subject of music and film.

The students who subscribed to the follow-up *Audio and Video* course held a common interest in creating a video documentary. They were therefore introduced to the work of Walter Maioli, then researching in the archives of the Jaap Kunst Centrum, the Tropenmuseum, the Institute of Social History in Amsterdam, and the National Museum of Ethnology in Leiden, which turned out to be his main source of information because of its huge collection of bullroarers of the Papua people of West-Irian. For his project *Sonorous Origins* Maioli was collecting information regarding prehistoric and early musical instruments. Maioli was invited to give a lecture and demonstration of his collection of instruments and to discuss the possibility of making a video documentary on some aspects of his work. It was decided to focus on a particularly interesting instrument found to be part of all early cultures, the bullroarer or flying rhomb. The flying rhomb consists of a piece of wood, stone, or bone that is connected to a rope. The rope is swung, setting the rhomb in a

III SYNESTHETICS IN ART EDUCATION

rotating motion and creating a buzzing sound, the pitch of which changes according to the speed at which the rope is spun. Archeological research has shown that the flying rhomb was used by early humankind all over the globe, since artifacts of them have been found on all continents, the oldest dated as early as 40,000 years ago.

The video gave a voice to anthropologists who have posited that the bullroarer not only had the function of keeping wild animals at a distance, scaring them with its intense sound, but that it was also used in initiation rites in which young men were told by the elderly that the instrument was the tongue of their ancestors through which their voices could be heard in order to learn the powers needed in life. Some of the specialists Maioli met during his research visits to the different institutes were involved in the documentary. Maioli introduced the anthropologist Fred Gales, a specialist in visual anthropology. Gales was able to uncover some anthropological films containing shots of the flying rhomb used in its original environment for use in the documentary. Maioli also contacted some of his Papuan and Indian friends from Surinam, whom he got to know in the Netherlands and whom he had been helping to reconstruct their musical pasts.

As New Guinea (presently called Papua) and Surinam had been former Dutch colonies, a number of their original inhabitants, Papuans and Indians from the rain forests, had found refuge in the Netherlands for political reasons after New Guinea became a part of Indonesia in the 1960s and Surinam gained independence in the early 1980s. To stay true to their original culture the Papuans had started a music group, Yamore, to keep alive what they knew about their original, ritual music and dance forms, whereas the Surinamese Indians had formed the group Sampari with a similar aim. For some time Maioli had worked with them to help them reconstruct the original forms as accurately as possible. For the video, Maioli invited Papuan musician Julian Nunaki and the Indian musician Steve Van De Bosch to play the flying rhomb.

The result was a concert of flying rhombs in the Schoenberg Concert Hall of the Royal Conservatoire, in which Nunaki and Van De Bosch, dressed in their ritual outfits, played bullroarers. During the concert some rhombs, painted with fluorescent paint, were filmed in stroboscope light to show the nature of the double rotating motion of the flying rhomb. The next day, the National Museum of Ethnology was visited to film the museum curator's explanation of some of the beautifully decorated bullroarers in the exhibition hall. That afternoon, recordings were made in the dunes near Wassenaar, where Maioli played the flying rhomb. Unexpectedly, here the other function of the bullroarer was shown: as soon as a sound was produced, hundreds of birds flew up from the high grass where they had effectively been hiding. The filming was concluded at Maioli's home in Amsterdam, where he presented his own collection of flying rhombs and demonstrated the variation of sounds produced by different materials and sizes. During the next few weeks the students, coached by Louis Spoelstra and Raymond Raphaël, edited the video and audio recordings.

The resulting video documentary was screened at the opening party of the second year of the CAM courses, in September 1988 in the foyer of the Royal Conservatoire. A few years later, in 1993, *The Flying Rhomb* was part of the film program at the Wunderkammer, curated by Maioli during the manifestation Fort >< Klank, an exhibition of primitive sound principles he created with Dick Raaijmakers and Horst Rickels in Fort Asperen (see III.2.3).



Fig. 93. Daan Dijkmeijer, The Electronic Ant (1988).



Fig. 94. Chladni pattern, Robotic Sculptures exhibition, Royal Conservatoire (March 4, 1988).

Fig. 95. John Cage at the performance of Book III (1988).

BOOK III – THE NEW MEDIA A HOMAGE TO JOHN CAGE 1988

JOHN CAGE VISITED THE ROYAL CONSERVATOIRE in November 1988 as the central figure of the fifth Composer Project, in which a dense program of lectures, films, work-shops, rehearsals, and concerts focusing on the work of one composer replaces the regular curriculum of all students. Beginning in 1982 with Stockhausen's visit, living composers have spent two or more weeks at the Conservatoire, commenting on their work, attending rehearsals, giving playing instructions, answering questions, and working with composition students.

The project Book III – The New Media was created as an additional contribution to the project John Cage in The Hague. Book III was proposed in order to stress some aspects of Cage's work that were fundamental to his approach to composition and art in general but that had not been included in the original program. During the preparation director Frans de Ruiter had discussed the program with Cage, and they had agreed that the program would consist of two "books." Book I consisted of performances of dozens of works by professional musicians and dancers, as well as by students of the Conservatoire's symphony orchestra, dance students, and ad-hoc ensembles formed by composition students and school musicians. Book II was a program of workshops given by Cage himself and specialists like Joan LaBarbara, Reinbert de Leeuw, Geoffrey Madge, Vera Beths, and the Arditti Quartet, with lectures by Frans van Rossum, Leigh Landy, Willem Marie Speelman, and others about different aspects of Cage's work.

When Frans de Ruiter announced the program during a meeting of the Composition Department, Gilius van Bergeijk responded with enthusiasm because it offered an opportunity to realize some of Cage's early works using the still-functioning historical equipment of the Electronic Studio. Raaijmakers, however, criticized the program. In his opinion, the use of computers and new media received little attention in the program, though Cage was one of the first composers to work with all manner of new electric and electronic equipment. Cage's significance to other art forms and their incorporation into his work were also neglected, and thus his role as a meta-composer was not being given the attention Raaijmakers thought it deserved. For these reasons Raaijmakers proposed adding these elements to the program in the form of a series of activities described as *Book III – The New Media*.



Fig. 96. John Cage at work with students: Ronald Philippi, Calliope Tsoupaki, Micha Hamel, Marion de Laat.

Fig. 97. John Cage at the closing exhibition of **Book III**.





In a letter to the students of the Composition, Music Registration, Sonology, and CAM departments, Raaijmakers explained his aims as follows:

The project's intention is to create a confrontation between the users of the typical new media equipment and John Cage who has worked with these media all of his life. In relation to John Cage, the concept of new media has to be interpreted quite widely, since it relates to areas as: choreography, art, literature, typography, radio (radiophony, lectures, radio plays), film, television, video, electronic music, tape-music, computer music, theater, performance, happening, installation, and natural sounds, silence, shells and "fresh air."

The students were invited to come up with ideas for projects in which these media are used; these would be offered to Cage, asking him to make a meta-composition in which all the different components would find a place, as Cage had done at Black Mountain College in 1952. Although Raaijmakers wanted to "create a confrontation," Book III was not meant as a provocation; it was a sincere invitation to Cage to relate himself not only to the composition students, the performing musicians and the dance students but to all the different types of students at the Royal Conservatoire, including the creative artists in the CAM and Sonology courses. To stress this intention and in addition to the call for proposals for new media projects and the invitation to Cage to relate himself to these projects, it was decided to make a welcoming gesture by transforming the foyer of the Conservatoire into a macrobiotic restaurant which was to serve meals twice a day for Cage and teachers and students who wanted to share this meal. This gesture was made because at the end of the 1960s Cage had turned to macrobiotic food after Yoko Ono had suggested this diet might be helpful to fight the arthritis he suffered from for many years. Cage travelled around the world with his own kitchen equipment, cooking his own meals ever since. Two weeks before his arrival his kitchen set arrived at the Conservatoire and, knowing this, we decided to surprise him by serving what we called Good Food, installing a macrobiotic kitchen in the foyer.

Cage was clearly less amused by the discussion of the *Book III – The New Media* project during the first workshop *Composition/New Media*. Raaijmakers explained the concept of *Book III* and the plans of the sixty students and artists who had sent in proposals. There was a group wanting to "make music using records, turntables, and 'scratch- and cue techniques'," there were sculptors who wanted to "confirm the character of a space by placing an installation that would amplify the reflected sounds of that space." One composer wanted to "transform the whole building into a musical instrument by using computers and synthesizers." Another wanted to "do a voice improvisation with amplified and distorted violin sounds." Another one proposed to "transform the movements of the tree in the court-yard into sound." And somebody said, "I want to make a video on the essence of man as he is imprisoned by his ties to nature and his longing for the super-natural (has already been worked out rather concretely)." Cage took all of this quite seriously and answered the many questions characteristically, by raising counter-questions. However, he did not respond at all to the question of whether he wanted to compose the final result of Book III, teaching us that no answer is an answer too.

During the following days a severe tension built up; on several occasions Cage showed his uncompromising nature and peculiar attitude toward music. At the moment he entered the concert hall to give his first public master class with Reinbert de Leeuw, who had been studying the work *Quartets* (1976) for 93 instruments with the symphony orchestra students, Cage immediately addressed the violin players, saying: "No vibrato." The students were shocked since the only way they knew how to play their instrument was with vibrato. Never before had they been confronted with a composer who gave preference to the particular moment when a note is played over its tone.

For Cage, this was simply a matter of counting and listening with utmost concentration to the other instruments, but most students did not accept this esthetic and walked out of the class. The performance of Quartets for 93 instruments was replaced in the program by the version for 24 instruments. Shortly after this, Cage was asked why his rejection of jazz was so absolute that there was no opportunity for students and teachers of the Jazz Department to participate. Again, Cage responded in his characteristic way: "Music as discourse (jazz) doesn't work. If you're going to have a discussion, have it and use words. (Dialogue is another matter)." Within a few days the majority of the Conservatoire students ignored the Cage project completely, resuming their regular lessons with their teachers or withdrawing between the safe walls of their private study rooms. Tension was felt everywhere in the building. Most people stayed away from the foyer and the restaurant, which was the central place to be for those whose interest in Cage's controversial ideas grew the more they learned about them. But even the peaceful meals led to a confrontation, this time with the Conservatoire's hospitality manager, who began to complain about the smells of the tea, the miso soup, the brown rice, and the vegetables, which penetrated all the rooms of the building via the air condition system.

At this point, some participants in *Book III* reacted creatively to the situation. One of the participating groups, the *NN-Collective*, elected to use the energy of the non-participants in a positive way, placing sensors at the entrance door and connecting the signal to an installation in the foyer consisting of a huge tube and a monitor on which a computer generated abstract images. Whenever a person entered the building the tube reacted with a soft gong-like sound and a visual element was added to the pattern on a monitor each time. When more people entered the building, the amount of audiovisual information increased. Within a very short time the foyer was buzzing with life during the whole day, from early morning till late at night. In one corner, the organizers of Book III placed an information desk, from which all activities relating to the project were discussed and coordinated. In another corner, a video-player, which had been used to show a one-hour film program once a day, played recordings of TV announcements, interviews, and comments broadcast by the networks throughout the day.

Rumors about the tensions Cage instigated attracted much press, and many TV, radio, and newspaper reporters began to visit the Conservatoire. From then on, every hour of the day people worked in the foyer, giving explanations to the press, discussing the permanent changes in the program, and organizing new, improvised events to replace canceled works.

One of the plans had been to visit the province of Friesland for a walk in the Waddenzee, a part of the North Sea that transforms two times per day into dry land. The place is known for the huge colonies of seals and birds living there, but at the time the biotope was threatened because of the plans of some oil companies to exploit the oil found below the sea. The Waddenzee is not only known as a unique resort for animals but it is also visited by many people who enjoy walking there when the sea has withdrawn. It offers a unique sensation for a number of reasons, one of which is the special sucking sound produced by every footstep in the wet clay. The idea was to ask Cage to take a walk and to record the sounds he produced this way. However, Cage did not want to travel that far, and the preparations were canceled. Raaijmakers insisted on executing the idea anyway, although in a different way. He himself took a walk in Meyendel, a dune landscape near The Hague. For one hour Raaijmakers walked with microphones connected to his feet and to a stereo recorder in the partly frozen landscape recording the crispy sounds of his footsteps, while Kasper van der Horst made a video recording of his walk.

Chance and unpredictability are not only characteristic of Cage's works, but evidently became his second nature over the years. Though rejecting the idea to connect to the sound of nature in Friesland, he reacted positively and with interest to the news that Walter Maioli would arrive unexpectedly from Italy to give a lecture and demonstration of his collection of prehistoric and natural musical instruments. Maybe it reminded him of the days when he was too poor to pay percussionists to perform his Quartet for percussion and had taken Fischinger's advice to collect various sounding objects. There may have been another reason or perhaps even no reason at all. Cage simply favored this unforeseen event. He greatly appreciated the lecture and the demonstration of the flying rhomb and the other instruments, expressing gratitude to Maioli afterward and asking him many specific questions about the different instruments discussed and shown.

Another unexpected event was the reception that the American Embassy offered to Cage to celebrate his visit to The Hague. The cultural attaché asked the organizers of *Book III* to develop an idea to make the reception a special event, but there was little time to plan. After a short brainstorming session it was decided that mushrooms would be the central theme of the reception. This related to Cage's renowned qualities as a mycologist. From an early age onward, Cage had been a mushroom hunter and had studied their variety and characteristics in depth. In the early 1950s, he had even won a substantial amount of money in a mushroom quiz organized and broadcast by the Italian network RAI, which allowed him to buy a Volkswagen van, in which he traveled the US for many years with Merce Cunningham's dance group. On the morning of the reception, Dick Raaijmakers, together with his friend Franco Ferro, an Italian restaurant owner and mycologist, went mushroom-hunting, returning by the end of the afternoon to the Conservatoire with a dozen filled boxes. Within a minute of their arrival Cage smelled the fresh mushrooms and immediately began to select the best ones, asking Ferro to bring a special oil to prepare them for the reception.

At the same time, the stage of the theater hall was transformed into a reception room, with a long buffet table on which the inedible mushrooms were placed as a decorative center piece surrounded by bowls and plates of sushi and other Japanese snacks. In one corner an American flag was raised, in another a waiter was positioned with drinks and glasses, while the theater technicians mounted lights projecting stars all around. Just before the guests arrived, Cage returned from the kitchen with a bowl of fried mushrooms, placing it in the middle of the centerpiece. In his speech the US ambassador thanked the Royal Conservatoire for organizing a project on a scale that would never have been possible in







Figs. 99-102. Mushroom reception



the United States, to which Cage replied "Why don't you give up the concept of the United States?" Guests formed a line to shake hands with Cage, who took up the mushroom bowl and a pair of chopsticks to place some mushrooms on everybody's tongue. The tense atmosphere, which had been characteristic of the whole week, finally disappeared and for a couple of hours everybody was cheering, joking, and laughing.

The second week started without this relaxed atmosphere. Cage was even more alert than during the first week, completely ignoring parts of the program he did not like and giving full attention to activities that appealed to him. When Raaijmakers pressed Cage for a response to his invitation to make a meta-composition of the components of *Book III* that were planned to be presented by the end of the week, Cage neither ignored the question nor did he come up with a counter-question; he simply answered "No." It became clear that Cage had made up his mind about the *Workshop Composition/New Media* since he met often with the composition students and even disappeared with them for four days in the theater to work with them on a meta-composition that rather matched the group work Raaijmakers had in mind for *Book III*. Thus, two separate groups prepared final presentations for the Saturday night, one group working closely with Cage on a presentation form similar to his Europera series, and the other group led by Raaijmakers, who decided to work out a scheme for the meta-composition of *Book III* himself.

By that time, the sixty original participants of *Book III* had organized themselves into 17 groups. There was a dance group that hung frames with plastic covers on which they painted while dancing. The sculptors made a video of the Conservatoire building as viewed from the highest point of the roof. A group of actors prepared some scenes consisting of fragments of Slauerhoff's poetry. Three DJs had prepared their "scratch and cue" act. Fragments of a film on food art by Daniel Spoerri were to be shown as well as fragments from the *Sound Walk* film. One composer was chosen to perform a composed "smell piece." The gong-tube was to be activated by replacing the sensors from the entrance door to the door of theater hall, etc.

As the composition group worked in the theater hall, the *Book III* presentation, entitled *Music for the Five Senses*, began after the composer's concert, and was held in the foyer and in the concert hall, from which the chairs had been removed. The ground plan of both spaces was virtually divided into 64 units, representing the fields of a chessboard. Each group was assigned to a field by following a random procedure. The order of the composition was determined by the movement of a horse according to the rules of chess, in which the horse lands on each field only once. When a field was landed upon where a performance was taking place its sound was amplified by Raaijmakers, who controlled the overall sound at a mixing console. When there was no action in a field, there was only background sound consisting of a mix of all the sounds produced by all performances. The audience was free to move around and approach the places of action or to stay away from them. Book III was an experiment with a clear intention but without a pre-established goal. The intention was to approach John Cage's visit to The Hague with a Cagean attitude to realize "an experiment the relevance of which was not determined by its success or failure, but by the realization of an action without knowing its results beforehand" (Cage 1961).



Fig. 103. Students on stage in Die Glückliche Hand - Geöffnet (1993).

THE INTERFACULTY IMAGE AND SOUND 1989

111.1.6

LUYTERS HAD STOPPED TEACHING at the Academy in September 1989, preventing the commencement of the curriculum on an interdisciplinary basis. Instead, a quick solution was arrived at to start the new course anyway; after the first entrance examinations four out of twenty candidates were selected for the new four-year program. The solution was to offer these students a multidisciplinary media arts degree by combining two years of the music registration curriculum, two years of the video design curriculum, and specialized CAM courses. After just one year it turned out that the multidisciplinary approach would not work; the music registration staff and teachers and those of the video design course were reluctant to contribute to the combined studies of media arts. This approach was therefore scrapped, and from then on all efforts were focused on developing completely new classes and projects based on a purely interdisciplinary approach.

The concept of the new curriculum of the Interfaculty Image & Sound was described in the constitutional document "Toward an Interfaculty Image & Sound," which stated that "the program will be based on artistic as well as technological and scientific aspects of working with the new media. Scientific research to improve the knowledge of this field is part of the objectives of the Interfaculty Image & Sound." The artistic aspect of the educational content would refer to "the relations between art, music and sound in the *Gesamtkunstwerk* (music and theater), the New Theater (music, image, and movement), film (image, sound, music, and text) and multimedia (installations, sound sculptures, and interactive media)." Technologically speaking, "the concept of 'new media' is interpreted in an extended way, relating not only to digital technology but also referring to the preceding analogue media: light, film, radio, electronic music, television, video, and audio art." And, scientifically speaking, "the program will refer to phenomenology, information science, semiotics, psychophysics, and cognitive science."

New teachers were attracted, such as video artist Kasper van der Horst, painter Robin Deirkauf, sound artist Horst Rickels, and linguist Doro Franck. To arrive at a minimal *critical mass* of students it was decided that some parts of the program, i.e. the former CAM courses, would also be available as optional courses for interested students from the other departments of the Conservatoire and the Academy. In all cases, the artists teaching in the Interfaculty had been contracted because of their particular interest in the experimental character of the Image and Sound curriculum and their willingness to contribute to its growth. Some offered to teach, while others were invited to the program, and in a few cases teachers were recommended by colleagues at the Interfaculty. All senior teachers

had been educated in one of the traditional disciplines: painting, percussion, music theory, theater science, art history, or psychology, whereas the junior teachers had studied photography, sonology, or image and sound. Over the years, performance workshops were given by a number of international and Dutch guest teachers: Walter Maioli, Angelika Oei, Adil Hussein, Hideki Hayashi, Judit Keri, and Elsemieke Scholte. Later, introductory classes have been given by recent graduates.

Contemporary art education is determined by two extremely opposing philosophies. On the one hand we find the strict conventions and *absolute norms* of classical music, dance, and theater training, which are determined largely by completely fixed levels of technical difficulty of the repertoire. On the other hand we find an attitude that is characterized by an extreme form of *individual freedom*, often combined with an anti-intellectualist and *laissez-faire* attitude, which has been the dominant fashion in many art academies during the past decades and which fits the twentieth-century paradigm of autonomous art. My experience has been that the interdisciplinary Image and Sound curriculum has been strongly criticized by educators representing one of these extreme positions, though rarely in an open and straightforward way. Because critics of the first category work from a strictly disciplinary basis, it is comprehensible that their rejection of an interdisciplinary approach to art education is based on their fear of anarchy and lack of discipline. It is more difficult to come to grips with the criticisms of colleagues who refused to understand that for years many outstanding artists have been working in areas co-defined by influences from other art forms, technologies, and new media. Such critics reject the notion that a new approach in education is called for, in which the acquisition of basic knowledge of various disciplines, investigation, and research are a valid component of creative training.

In the last few years such criticism has fortunately been replaced by an attitude of curiosity and interest since for most of our colleagues it has become evident that electronic technology is reshaping society at large, including the cultural world and the expressive possibilities of the arts. During the past fifteen years in the classes and the projects of the Interfaculty Image and Sound a new lexicon has been developed to communicate and understand this new "language of image and sound." To give a detailed impression of this lexicon and the basic idiom and grammar of this language in which artistic and technological concepts fuse, its development is described in the form of reports of the manifestations, events, exhibitions, and festivals that have been organized by the Interfaculty.

Looking back at how the Image and Sound curriculum has developed over the past fifteen years, I have to stress that, especially during the first five years, the development of the program was highly intuitive. The CAM courses were immediate responses to the observed needs of a new type of student that refused to choose a classical disciplinary form of higher education. Often, the students who subscribed to the new courses expressed an interest in a wide array of subjects. They usually expressed their needs by stating they were looking for a broad form of education, while refusing, or being unable, to articulate in what direction they wanted to go. Surely, they wanted to learn to create works of arts by using new technologies, but they had no idea in what way they would achieve this. In some way this was also true for the initiators of the courses. The only thing we knew then was that the digital revolution would create new possibilities for the media arts, video, audio, and installation art by making new connections or by investigating the potential of the new media themselves to arrive at completely new forms. The only thing we could do was to offer courses about the history of experimental film and electronic music, by introducing video and audio technology, and by organizing the courses in such a way that the students always learned to work with moving image and sound in relation to each other.

Despite the government's policy to stimulate the use of computers in higher education in the early 1990s, the funding did not allow making any investments in large computer systems that were needed to keep up with new developments in visualization technologies as they were already then being used at American and Japanese universities. In those places, artists had started to collaborate with scientists, which enabled them to work with advanced equipment. This makes one wonder if this situation might have been the reason that Dutch media art, which had an international reputation in the 1970s and early 1980s, gained by Nan Hoover, Michel Cardena, Raoul Marroquin, Elsa Stansfield and Madelon Hooykaas, Lydia Schouten, Servaas, and many others, lost its top position after the introduction of digital visual technology. It might be too easy an explanation, but it remains a fact that the Dutch art community in those years had no relations with the Dutch universities, a situation which has been changing recently, albeit slowly.

Still, the teachers and students of the Interfaculty Image and Sound were quite proud to have personal relations with some of the pioneers of electronic music at the Royal Conservatoire and to be able to follow optional courses offered by the Institute of Sonology. Students who wanted to learn more about digital technology could follow programming lessons with sonologist Paul Berg, to do basic experiments on the Atari computers, or to create colored graphics by using the first Amiga computer. Filmmaker [and current head of the ArtScience Interfaculty, ed.] Joost Rekveld made his first digital animations on an Atari, but he decided to concentrate on celluloid for making his abstract films before he returned to the computer years later. Marcel Kaars managed to create moving colored graphics on the Amiga, which he presented at the first Sonic Acts festival in 1994.

Although we might regret that we had not been able to work with advanced systems, at that time we did not experience this as a negative factor. On the contrary, because of Raaijmakers's presence and his knowledge of and experience with the basics of analogue sound synthesis, a philosophy was developed that favored what Raaijmakers called, a "protoelectronic" approach to the creation of art. In those days, it was not uncommon to talk about "wooden computers" when explaining to the students that some of their ideas could be better realized by building a mechanical device than to wait for new digital hardware or software. According to this approach it was much more important to study the plastic aspects of the electronic media and to relate these to the three-dimensional characteristics of the spatial environment. It is this philosophy that became characteristic for the approach of the Interfaculty Image and Sound. We stimulated students to think about the fact that the electronic media were based on one-dimensional point-technology, despite the appearance of the images on two-dimensional screens or the display of sounds by stereophonic or quadrophonic loudspeaker systems. Since the presentation of these one-dimensional electronic sounds and images always takes place in an environment that is physically defined by three spatial dimensions, the students were permanently challenged to think of, what we termed the "2.5D reality" of the media arts, and to think about the question of how to relate the characteristics of the equipment with those of the spatial environment.

In 1993, the director of the Royal Academy, Chris Rehorst, proposed expanding the Interfaculty with three of his teachers, the art historian Michael van Hoogenhuyze, the fine artist Klaus Baumgärtner, and the architect Eric Vreedenburgh. Film teacher Babeth van Loo was later replaced by Joost Rekveld, who was one of the first students to graduate from the Interfaculty in 1994. The teacher of sound, Raymond Raphaël, was replaced by the first Sonology student who had graduated from the Royal Conservatoire in 1992, Edwin van der Heide. In 1998, Taco Stolk, a former student of the Interfaculty, replaced Doro Franck and a year later the dramaturgist Paul Slangen replaced Jan Zoet, who had become director of the Rotterdamse Schouwburg. In 2001, the improv musician and sonologist Joel Ryan was invited to join the faculty. In 2002, former Image & Sound student Robert Pravda was asked to continue his activities as the initiator of the workshop electro-instrumental music as a regular teacher, and in 2004 the former student Jan Peter van der Wenden was asked to become coordinator after earning his Master's degree in the field of Media Technology. In the same year, the former student Sanne van Rijn was invited as a regular guest teacher to develop the Alter Ego research group with Taco Stolk. After his retirement as core faculty member in 1995, Dick Raaijmakers continued to give several master classes, ending with his course "The Morphology of Electric Sound" in the spring semester of 2005.

In the period 1993-2006, the number of students following the Image & Sound course had grown steadily from 15 to 65, including about 15 students who followed the Master's program, which has been offered since 2001. In the course of these years the facilities have also grown substantially. In 1992-93, the first new studios in the Conservatoire were realized. One of these studios was originally used for three channel video editing (presently all editing is digitalized), another for digital imaging, and the third one, which is also used as a teaching room, was used for digital sound processing. Soon after the opening of the new studios in the Conservatoire in 1993 there was again a lack of space. Because the Royal Academy of Art was one of the founders of the Interfaculty, it seemed reasonable that the academy would help to find new space. However, the academy itself was facing huge housing problems as its activities were dispersed across four locations. In 1996, plans were made to concentrate all activities in the main building by acquiring an adjacent building. This meant that, for a number of years, some extra space was found in one of the annexes of the academy before the problem was finally solved in 1999 with the realization of some permanent classrooms and studios in the main building. These consisted of a king-sized classroom where, between classes, students could work on their installations, try out their performances, and prepare presentations of their work; there was also a smaller classroom and a number of studios for film shooting, film editing, digital processing of image and sound, and a small laboratory for the research and development of new interfaces, LabLand.

After some years of pragmatic experimentation, a stable curriculum structure was realized in 1993. We organized classes in modules, lasting for a number of weeks. Since 1993 until 2004, when the curriculum was evaluated and rewritten fundamentally, only practical changes were made in the schedule to accommodate the art practices of the teachers. Moreover, we established transparent examination procedures and clear judging criteria, although adjustments and refinements are still made every year since education always needs to adapt to new situations and insights. Sometimes, this is necessary because every new generation of young people shows new interests and needs, and sometimes teachers want to teach in another way than what they are used to, based on their developing insights into the educational process or simply as a result of the natural law of permanent change. However, despite this basic necessary flexibility, we have also found that the more security given in education, the more adventurous are the roads to be taken. This security is guaranteed best when students get the feeling that they can always communicate with their teachers and that their questions will always be answered, although not always immediately. Most students like to be stimulated to cross the borders of their self-conceived capacities. Discovering more colors in their creative spectrum also widens their perception and understanding of the world.

However, learning to become a creative artist also always implies moments of stagnation, dead ends, or simply not knowing how to proceed. Often, students are enormously relieved when, upon returning to school after having withdrawn from school activities for a while, they are greeted by teachers approach saying: "welcome to the club." A short time-out or an advice to move in unforeseen directions is often enough to get the students back on their feet in a short time. For anyone, it can be difficult to face a blockade, a period when good intentions and rational control over the creative process turn out to be insufficient to keep the creative flow going. This is probably the most important experience that has been shared over the years by the Interfaculty's teachers. To have the guts to tell students to give up, to abandon their plans, and to allow them to reestablish contact with their subconscious pool of energies, desires, and directions by giving them the freedom to temporarily turn their attention to matters other than their relation to the curriculum.

The Interfaculty Image & Sound attracts students with a wide variety of interests and backgrounds. Often they are attracted to the curriculum because it offers them the freedom to choose or invent their own medium of expression. Most of them are not attracted to one of the traditional disciplines as they are presently offered by universities, art academies, or music schools. After many years of musical training they only know for sure that they do not want to become a performing musician for the rest of their lives. Or they dislike the extreme individualism, characteristic of most art academies. Although sometimes they are interested in the depth of the classical academic disciplines, they still prefer to develop a broad and generalist view rather than the regular forms of specialization.

Because the Interfaculty offers quite a broad spectrum of approaches to the arts, ranging from music, sound, and performance to a range of plastic art forms, including film and digital imagery, the motivation expressed by candidates asking for an interview is usually the remark that "the course just offers to me what I am looking for," which they often specify by saying that they are looking for "a broad orientation." From the point of view of the teachers, however, it is even more important to find out if the candidate's interest profile matches with the thematic profile offered by the Image & Sound curriculum. Often candidates do not want to choose a regular curriculum since they have a fundamental problem with making choices in general. Usually, these are not the candidates who pass the entrance examination. The wide range of themes and subjects is offered to help the students to make choices that fit their particular gifts, which are often quite complex and mostly unknown to the students themselves when they apply.

For many years now, the head or the study coordinator of the Interfaculty interviews about eighty potential candidates annually. In about half of the cases the candidate is advised to look for another form of education since his or her chances of passing the entrance examination are estimated to be too low. Of the other half, usually about twenty-five candidates actually register for the entrance examination. The requirements for the examination are 1) to send a letter of motivation, including a resume; 2) to send a portfolio consisting of earlier work; and 3) to produce a special assignment for the examination, consisting of a scale model of a multimedia artwork in which special attention is given to the relation between image and sound. This assignment has been added to the examination requirements to get an idea of the candidate's fantasy and his or her esthetic and technical capacities. Over the years, this element has shown its value, not in the least because of the positive effect this has on the candidate's motivation. Without exception, they enjoy making such a scale model, whereas for the examination committee it is entertaining as well because it is often a reliable indicator of the candidate's ability to show the curves or angles of the flow and rhythm of the movements of his or her head, heart, and hands.

Each candidate is personally interviewed by the examination committee, usually consisting of five teachers. The committee selects a maximum of 17 of the best students. We have found that this is the maximum number of students for the classes, which usually last for a full day each and in which theory and hands-on activities are combined.

Each year we are surprised by how much the classes differ from the previous one. Probably, this is because the Image & Sound curriculum attracts people with quite heterogeneous qualities; this in itself is not a big surprise, but the fact that heterogeneity seems to be endless is. During the first years, we had classes with students who found jobs in the world of radio and television and in the information and communication industry. However, over the years most students have begun to prepare themselves for the life of an independent artist, which often means that, for many years, they will have a mixed professional practice that combines jobs such as a theater engineer, a club programmer, a multimedia developer, or an art teacher with their own practice as a creative artist or a cultural entrepreneur. It is remarkable that over the years the number of female students has been growing slowly but steadily. The freshman year of 2003 was the first to be composed half of males and half of females. Also, the number of students from foreign countries has been growing steadily, reaching 50% in 2003 as well.

Over the years the Interfaculty has attracted students from the UK, Iceland, Norway, Sweden, Finland, Estonia, Latvia, Germany, Denmark, Belgium, France, Switzerland, Austria, Serbia, Croatia, Rumania, Spain, Greece, Italy, Turkey, Iran, India, China, Korea, Japan, Australia, Rwanda, Ghana, Venezuela, Bolivia, Mexico, and the US. One of the constants over the years has been the age range of the bachelor students, which varies from 19-26. Another constant has been the usually quite problematic personal backgrounds of the majority of the students. Over the years we have learned the principle of "person over art." Often the students used the first two years of the study to free themselves from the pains of their personal traumas. This became visible in the changes to their haircut, the way they dressed, and the way they communicated with their teachers and peers. Once this process had been completed, they opened themselves to experimentation with concepts, materials, and media they had never touched before. But if this did not happen, their personal problems prevented the growth of their artistic freedom. Happily this did not occur very often, but, whenever it did, these students needed extra care till the end of their studies.

To immediately experience the contemporary standards of the professional practice, firstyear students visited a location outside of the school during their first week, where they either worked on a project that was to be presented publicly or attended an international art event. For a number of years, the Sonic Acts festival (see III.2.7) took place in the last week of August, which necessitated a period of two weeks during which all students prepared, rehearsed, and completed their performances, acts and films, while the first-year students learned to assist them technically, creatively, or otherwise. In the last few years, however, the festival has occurred in December or February.

Since then, special introductory programs have been developed for the first-year students. Several times the introduction week consisted of an excursion to the international festival Ars Electronica in Linz, where students were confronted with the state-of-the-art of the electronic arts by visiting exhibitions, concerts, lectures, and the usual parties organized by local artists and art students. The Dokumenta in Kassel was also visited once. And three times, in Wirdum, Asten, and Slenaken, we organized location-based projects in special places in the countryside, where we asked new students to make a work of art relating to the *genius loci*. In those cases, guest teachers were invited to inform the students about the location's specific qualities and to discuss their plans to create works that were directly related to the place. The shared experience of traveling, sleeping, eating, and working together for one or two weeks was an excellent start of the year. Students got to know each other and some of their teachers in a very short time. In situations like these, heterogeneity could be transformed into homogeneity rather quickly.

Classes began immediately after the introduction week. They were organized in modules, generally consisting of six full days spread over three weeks. Only the first class—Robin Deirkauf's *Sense Interference*—lasted for a full five-day week. This course consisted of a number of exercises in which sensory information was translated into an expressive form belonging to another sense modality. For instance, students were asked to draw a sound or a smell, using colored crayons, or they had to make a physical gesture according to the feeling of the colored glasses they were wearing. They had to guess what image another student painted on their back or they had to describe an object that they could only feel, but could not see. When they could not find the right word, they had to invent one. Often this resulted in the creation of a code language that was used by the students for the rest of the year, resulting in a lot of fun between them and surprised reactions from others who had no idea what they were talking about.

After this week the module schedule began, with one class on Mondays and Tuesdays and another on Thursdays and Fridays for three weeks. (Wednesdays are free as the majority of the students must earn money during the week to survive.) The modules consisted of the following courses: Sketching Methods, New Basics, Masters of the 20th Century, Sound and Space, Theatrical Exercises, Sound Direction, Experimental Film, Media Arts, Digital Imagery, Meta Media, Electronic Improvisation, and Web Design. Sometimes the modules were given in the form of team teaching to acquaint the teachers with each other's vocabularies and approaches. From its beginnings team teaching has played an important role in structuring the lessons of the Image and Sound curriculum and in creating a teaching culture that has become a special characteristic of the Interfaculty. Team teaching has greatly contributed to the mutual understanding between the teachers, although in the last few years most have preferred to teach alone. Yet, when teachers or students want to focus on a particular subject—semiotics, for instance—a team of teachers is formed from whom the students learn as much as the co-teachers themselves do.

The second year consisted of a continuation of this intensive module approach. However, after the first two years only a few classes were given since by that time students had grown accustomed to individual coaching with two teachers of their choice. This personal form of communication outside of the classes began at the start of the second year and continued until the end of their studies. Students often changed drastically after the first two years. By that time, many of them had found a particular and individual form of expression. These forms could broadly be described as an attraction to installation art, performance, film, or digital art, but we also saw the creation of hybrid forms that were hard to fit into one of these categories.

During their third year many students found their way outside the borders of the school. Some of them visited another art school in Europe for a semester, whereas others took optional classes at Leiden University or in the sonology or composition departments. Others dared to present their work within the framework of small collectives of artists that were often formed by students of different art schools. By the time of their final examination at the end of the fourth year, many students were already standing with one leg in the professional world.

Two times a year, in January and June, students presented their work in an exam scenario. During the examination their work was judged on the basis of the following criteria: 1) the work had to be based on a concept created by the student and had to reflect positive, qualitative development; 2) the work had to appeal to two sense modalities, usually vision and hearing; 3) the work had to form a whole, consisting of elements that are all equally detailed; 4) the work had to demonstrate that the student had learned from the lessons; and 5) the materials and technical means had to be proportional to the relevance of the concept. We have used these criteria over the years since they were considered to be fundamental constituents of the quality of any multi- or interdisciplinary work. This implied that, from the beginning we challenged students to follow their own particular paths expressed by the chosen medium and the personal and authentic way it is given form. Only once in their studies, during the first semester of the first year, were the students confronted with an assignment, that, similar to the assignment for the entrance exam, was the same for everyone: they were asked to make a mobile, consisting of visible and audible parts. This was a general assignment in order to help the students make a start since we had experienced that the younger students in particular often had difficulty beginning a work based on their own concept. The assignment was introduced in a number of lessons in which Calder's mobiles were discussed, and we invited the students to present and discuss their plans with some of the teachers before they began the production process.

THE INTERFACULTY ARTSCIENCE 2004

ON JANUARY 8 AND 9, 2004 a conference was organized to discuss the future of the Interfaculty Image & Sound. Topics included the relation of art education with the real world of the art practice, the wish to develop a new course program based on compact introductory courses and intensive research projects, the wish to re-establish the method of team-teaching based on new combinations of teachers, and the wish to organize the program in such a way that students would be free to determine the order of activities they wanted to take part in. On the second day of the conference, these wishes were presented in the form of a proposal to the director of the Royal Conservatoire, Frans de Ruiter, and the director of the Academy of Art, Jack Verduyn Lunel.

The conclusions of the discussion among the teachers may be summarized as follows. September 2004 was going to be the fifteenth anniversary of the Interfaculty Image and Sound, a fact worthy of celebrating. However, at the same time, it should be remembered that, after fifteen years, Image and Sound still did not exist; the Interfaculty had no formal status within the Academy, and the Image and Sound curriculum was not recognized as a form of interdisciplinary art education in the Dutch educational system.

Formally, during its first six years Image and Sound had been a specialization within the regular music curriculum, whereas for its last nine years Image and Sound had been a specialization within the regular visual arts curriculum. This meant that the basic principle of interdisciplinarity had had no institutional consequences whatsoever despite its rather big influence on the general climate of the music and art education offered in The Hague. Although this was not something to complain about loudly - the Image and Sound curriculum was developed rather freely as it had never been subject to legal opposition - in recent years the government had installed "visitation committees" to control the quality of the ways in which (art) education was organized, a task that has now been taken over by a new accreditation organization. This change made it impossible to continue in this "hidden" way. Therefore, an important question was how to meet the official requirements while keeping alive the subversive qualities that had been developed during the past fifteen years and that had resulted in many successful manifestations in as many unexpected directions including the quite special atmosphere and preferences of Image and Sound.

During the conference the wish was expressed to educate artists in such a way that, in addition to learning to create a work of art, they would also have language skills and documentation skills, would be able to read the quality of their own and others' works, and would be able to defend and criticize it in public. Certainly, this ambition contrasted highly with the then-present situation in art education, in which language skills had no high priority in the educational process. It became clear that an agenda had to be developed aiming at changing this situation by introducing the concepts of research, documentation, publishing, and discussion into the new curriculum.

One of the most alarmingly poignant points of the teachers' evaluation was the observation that there was still too big a contrast between art education and the art practice. When teachers entered the school they felt that they were leaving their role as artists behind them and that they had to transform themselves into officials who had to face all kinds of school behavior, ranging from having to deal with problems related to adolescence to all kinds of bureaucratic requirements. Within the school they found it nearly impossible to be an artist. For this reason, most of the projects organized outside of the walls of the school were experienced as being much more realistic and artistically challenging than teaching classes or judging students' works during examinations. Ideally, education should be a beehive where everybody flies out to find honey and brings it back to add another honeycomb to its structure. In order to incorporate this kind of dynamics into education, more courses and projects should be made "portable," taking place outside the school. This might also be an effective response to the students' needs to learn more about their future field of work: the art world and the social context in which it operates. Also, there was a general feeling that the name "Image and Sound" was not the best name for the way in which the teachers wanted to develop their educational aims in the coming years. In the future, it would be a challenge to cope with a new and strong direction in the recent developments of contemporary arts as described by Stephen Wilson in his book Information Arts (2001).

Wilson pointed out that the traditional categorization of the arts becomes obsolete the moment that artworks incorporate chemistry, genetics, architecture, characteristics of geographical sites, etc. Artists are increasingly investigating new contexts, whether these are located within the scientific laboratory or in the urban or natural environment. All this means that Moholy-Nagy's "art of relationships" is no longer restricted to the relationships between the arts, which had been the subject of the Interfaculty Image and Sound, but that the relationships extend to areas and enterprises outside of the traditional fields and domains, including the worlds of science, technology, and the social matrix in the widest sense of the word. Given these developments it was a challenge to adjust the curriculum of the Image and Sound program to the new situation and to start exploring the new domain.

During the months after the conference, the Image and Sound teachers were invited to redefine their courses and to come up with proposals for research projects in which they would collaborate with the students on subjects that were closely related to the present fascinations of their own arts practice. Soon after the conference a new name, "art science," was found for the new program. The term art science, written as ArtScience, had been coined to indicate a new domain that had recently been detected by a small but steadily growing number of artists, scientists, and educators. Although their agendas were not identical, they shared a common interest to re-connect the worlds of art and science.

Thus, a response was finally given to C.P. Snow's observation that, despite the intrinsic connections between what Snow called the two cultures of art and science, artists and

scientists have become members of non-communicating, antithetical endeavors (Snow 1993). In the years after Snow published his "two cultures theory," many people interpreted this as a confirmation that the worlds of art and science had nothing in common, but they neglected Snow's criticism of this situation and his call for a re-integration, something that can be learned from this recent comment:

[T]he fact that Snow felt that this situation was both intolerable and inexcusable seems to have had less impact than his point that there were two distinct cultures. People raised to believe this thesis may fail to perceive connections that do exist. (Root-Bernstein 2004)

Interestingly, Snow's call is presently being answered by a fast-growing number of people who want to contribute to the interaction of art and science as expressed, for instance, by the new notion of Artscience (Edwards 2008). For example, in Kenneth Clark's view the sciences and the arts are so similar that both draw from the same pool of talented individuals. However, as funding and jobs for scientists have grown and funding and jobs for artists have shrunk correspondingly, an imbalance has developed:

Art and science are not... two contrary activities, but in fact draw on many of the same capabilities of the human mind... The development of science... has touched that part of the human spirit from which art springs, and has drained away a great deal of what once contributed to art... We must... wait patiently for our faculties to be reunited. (Clark quoted in Root-Bernstein 2004)

Waiting patiently for this to happen is, of course, not the best strategy to bring art and science any closer. If one really believes that both of these cultures may profit from a rapprochement, the only way to find out is to take action and to start transdisciplinary projects in which artists and scientists work together to produce new knowledge about the process of artistic creation and to create new artistic products that incorporates this knowledge.

One of the consequences of this will be that new research methods and new forms of publication will have to be developed. For many of the projects described in chapter II of this part, research has been done in the form of fundamental research (historical documentation, including field research), practice-based research (the investigation and application of new technologies), and experimentation (the re-composition of historical concepts using new technologies). The results of this research have been used to shape the form of the stage presentations, but the ways in which this was done were only minimally documented. Usually, immediately after these presentations another new project was prepared, and there was hardly ever any time to present the research and the creative results of the projects in the form of documents or publications. As a consequence, the research results were not communicated to artists in other countries, who might have been interested to learn about this Dutch approach to the education of art and technology.

The ambition to connect the creative process to scientific research had major consequences for the character of the curriculum. Teachers and students had to be involved in initiating creative processes in the form of experiments that could simultaneously be considered scientific exploration and artistic research. One of the consequences of this was a fusion of the art studio and the scientific laboratory. All participants, teachers and students, were expected to dig into the deepest corners of their imagination to use this faculty as a creative and intuitive source of knowledge and as a source of ideas to realize unusual works of art. Together, the teachers and students investigated which creative methods might take the form of research in the scientific sense of the word. This could result in works of art, in a presentation of the results of the research, or, preferably, in a combination of both.

The domain of ArtScience, as it is described here, one in which education, research, and production are focused on bringing together art and science, had not been properly mapped before. The student was not only acquiring knowledge and skills, but he or she was also challenged to contribute to this program, which could be considered as an artwork itself, and to the exploration of the new discipline. This required a special motivation, an eager research attitude, and a dedicated input on the part of both teachers and students. The motivation had to be directed to developing the ability to learn by translating opinions into questions and to produce new knowledge and skills as a result of the research. This also implied that students were not only capable of receiving criticism in the form of feedback, but that they would be able to formulate criticism in a similar way.

The new curriculum offered many opportunities for multi-talented students wanting to develop their creative and explorative talents because it was designed as a field in which the different courses and research groups were organized not only in the familiar successive order of the traditional curriculum, but also simultaneously. The curriculum itself was designed as an open system, which enabled students at any time during their studies to choose a particular course or research project fitting their own needs at that particular moment. As a consequence, the students could determine their own personal trajectory through the curriculum, limited only by the minimum number of courses and projects required to earn a degree. Gradually students learned to define their personal field of fascination and their own particular way of doing the necessary research. In addition to the courses and research projects, from the second year on students were supported by two personal coaches who helped them to define their own approach to the creating art and acquiring knowledge, to assist them in making choices about navigating through the curriculum and to help them find their way in the art world outside of the school.

The new curriculum was based on compact basic courses in the areas of Fundamentals of Art, Fundamentals of Science, Fundamentals of ICT, Fundamentals of the Moving Image, Fundamentals of Sound, and Fundamentals of Web Publishing. Besides these basic courses, introductory courses were offered covering a variety of different skills and theoretical subjects: *Sketching Methods, Sense Interference, Ear Cleaning, Sound/Color/Form, Image and Sound, Electric Music Theater, Free Style Video, Human Interfaces, Interaction Models, Pattern and Visualization, Making Art of Databases, and Thought Processes in Art. Moreover, the research groups were formed around central themes related to the art practice and the personal research of the artists involved in the ArtScience program. In the research groups new steps were taken to deepen and extend this research, for instance by focusing on the special requirements of a new context for which an artwork was developed. Students worked on defined aspects of the research group. Research groups were organized around the themes: <i>The Language of Image and Sound, Interactive Sonic Spaces*,

The Relation between Art, Place and Spatial Environment, Mental versus Virtual Space: an Actualization of Camillo's "Theater of Memory," Between Context and Structure: Moving Cooking, and Bio-Arts and Information Sciences.

In addition to these courses and research projects, which may be considered as the main constituents of the ArtScience program, students were stimulated to follow optional courses or minor programs at Leiden University, to do internships at institutions outside the school, or to follow a part of their studies abroad at another art school or university. However, they could also spend a substantial amount of time within the walls of the Academy and the Conservatoire studying a variety of subjects and contexts for a longer period of concentration. The interfacing laboratory LabLand allowed for experiments with unusual configurations of analogue and digital equipment (sound, video, computer, etc.), moist media (plants), and scientific instruments (including microscopes, oscilloscopes, etc.). Students wanting to build their own musical instruments and to play live electronics could audition for the RecPlay improvisation ensemble. Or, if they wanted to follow an optional course in the conservatoire, they could choose to follow a theoretical and general music course or an instrumental or vocal course in the Practicum Musicae. Moreover, students who wanted to develop their writing skills could ask for personal coaching.

All this resulted in the transformation of the Image and Sound curriculum into the newly formulated ArtScience program, which was published on the internet on March 30, 2003. Three months later eighteen candidates were selected for the BFA and six for the Master's program, starting their studies in September 2004.

One has to be in the right place on the right time. during the whole working process.

THE INNOVATION PROJECT: MEDIA ARTS AND MUSIC THEATER— COMPOSED MUSICAL SPACE LIGHT AND COLOR HUMAN INTERFACES LANGUAGE

111.2





Figs. 104-105. Laboratory of Plastic Sound (1985).

THE PLAN FOR THE INNOVATION PROJECT evolved from the desire to develop team teaching and project-based education and to give these a structural place in the Image and Sound curriculum. The first collective projects, *Sonorous Origins, The Flying Rhomb* and *Book III – The New Media* (see IIL14-5), had shown that a project in which students were given the opportunity to collaborate with each other and with their teachers intensified and sped up the learning process to a great extent. To create a product with a group appealed to students and trained their ability to collaborate, an absolute necessity in working with new media technologies; although most people learn some aspects very well, accomplishing true results is often beyond the capacity of a single individual. Moreover, realizing such projects requires additional funds, intense hours of teaching over a period of several weeks or months, as well as production materials and a small production staff for organizational efficiency and financial control. Art education rarely has the resources for such an approach, but thanks to the special fund for the innovation of vocational education, a substantial sum was attracted that allowed the realization of some large-scale collective productions and many smaller ones over the course of four years.

The plan was written following discussions with Dick Raaijmakers, theater-maker Paul Koek, dramaturge and producer Jan Zoet, and the director of the Royal Conservatoire, Frans de Ruiter, and articulated the need to study new ways of revitalizing the state of frozen energies characteristic of the art world of the early 1990s. We thought that this revitalization might be achieved by applying the method of the "open form" and by focusing this approach on a playful yet serious inquiry into the creative possibilities of the new forms of electronic technology and the new forms of collaboration it called for. We thought that the Interfaculty Image and Sound, with its completely new staff of teachers and open-minded students, was the ideal place to start a new phase of experimentation from which both the media arts and music theater might profit. But instead of seeking maximum freedom for experimentation, we believed that optimal results would be achieved when projects were based on well-described concepts and contents. To guarantee this, we decided that the projects would concentrate on the study of early, utopian concepts of some of the masters of the twentieth century in which new forms of technology had played an important role. Rather than simply trying to execute these ideas, the concepts were first to be analyzed by studying their component parts and attempting to translate these into contemporary forms by using state-of-the-art technologies, finally re-composing the concepts according to the contemporary esthetics of the collective of artists participating in the creative process.

With these considerations in mind, a list of possible projects was drafted consisting of some 130 interesting concepts. From this, a reduced list of about twenty projects fitting into one of the following themes was made: composed musical space, light and color, human interfaces, and language. These themes became the subject of three different educational forms: courses, studio work, and stage presentations. Some of the projects were realized in direct connection to the courses, like *The School for Soundmen* (after an idea of Schoenberg), *The Academy of Light* (after an idea of Moholy-Nagy), *Film and Music:*

Optophonics (relating to Moholy-Nagy's and Fischinger's experiments), and *Human Interfaces*. Live performances, film viewings, and artists' presentations—such as the *Laboratory* of *Plastic Sound*—were added to the courses as illustrations of the lectures. Other projects were to be realized in the new studios, for example a re-composition of Beckett's television piece *Quad* and *Primitive Sound*, based on Walter Maioli's collection of prehistoric and early musical instruments. The third category consisted of collective projects resulting in stage presentations: *Die Glückliche Hand* – *Geöffnet* (based on Schoenberg's music-theater piece *Die Glückliche Hand*, see III.22), Mondrian's *Promenoir* (based on a concept described by Mondrian, see III.24) and *Scheuer im Haag* (based on an eighteenth-century manuscript by Anton Scheuer and field research on his life in Germany, see III.26).

In his classical work *Opera Aperta* (The Open Work, 1962), Umberto Eco has described the rise of the concept of "the open work" in the arts. According to Eco, the intention of the open work was to generate a much more active attitude in the listeners, viewers, and readers, who were confronted with much more information than in the traditional forms of art. For Eco, Joyce's *Finnegans Wake* is the exemplary literary open work, since "[t]he text presents the reader with a 'field' of possibilities and leaves it in large part to him or her to decide what approach to take" (Robey 1989). Similar intentions can be found in Stéphane Mallarmé's *Livre*, Symbolist poetry, Bertold Brecht's plays, Franz Kafka's novels, Calder's mobiles, and in the music of Stockhausen, Berio, and Pousseur. Eco's notions of "the open work" and "the field" resonate the meta-theoretical concepts of the *General Systems Theory*, which had been formulated by Bertalanffy in 1937 in order to bridge the gap between the different sciences studying living organisms. According to Bertalanffy, organisms are not organized in closed, but rather in open systems that are not defined by fixed relations between the elements, but by "sets of elements standing in interaction" (Bertalanffy 1937).

Without wanting to suggest that when the Interfaculty Image & Sound was founded we were explicitly thinking of applying the General Systems Theory to art education, it remains a fact that the didactical forms that were developed all reflected the basic notions of this way of thinking. Team-teaching may be considered as confronting the students with sets of interacting elements. The traditional one-way message of the lecture and the classical two-way form of the dialogue are replaced by conversations and discussions in which a multitude of viewpoints may stretch personal opinions into collectively shared or opposing multidimensional views. Similar effects were reached by introducing the system of personal coaches. The students' possibility to choose a set of two individual coaches prevented students from becoming too influenced by one particular teacher since they are always also interacting with another coach and, consequently, with different opinions and suggestions. Additionally, the Interfaculty has developed the educational method of the collective project, which cannot be described in terms of isolated didactically organized units such as a series of lessons or regular private talks with coaches because these projects may take place during a certain period of time, ranging from one or two weeks to a complete semester. During these periods the regular curriculum was abandoned, and all the teachers and students worked together by focusing on one theme, resulting in a public presentation. Undoubtedly, these projects come closest to the notion of General Systems Theory, because working together with dozens of people during a long period of time requires a form of organization that recalls Bertalanffy's organismic ideas, especially since the concept of the "open from," as Raaijmakers preferred to call the open work, was explicitly introduced by him as the ideal working method for these leerstukken ("pedagogical pieces"), as he called them.

Usually, those projects started by introducing and discussing them for a few weeks so that everybody was equally informed. This was often the most difficult part because it usually took some time to interest the students in the theme, resulting in rather long theoretical meetings. However, after the preparations had been finished, the actual building started, causing an enormous transformation of the character of the working process. The most fantastic ideas were launched, often leading to quite outrageous and most entertaining discussions. The last week was generally characterized by an extremely tense atmosphere, partly caused by the many hours of physical work and partly by the permanent adaptations made in the dramaturgy. Especially during the last days before the premiere, many ideas, which had first been welcomed, were then considered unsuitable. The consequence of this was that people who had been working for weeks or months on the execution of their ideas were suddenly told to stop their preparations and help other people whose ideas had survived the discussions and decisions.

Of course, the big question is: Who was taking these decisions? Were they taken in a democratic way, as suggested by the concept of the open form and the collective meeting with which the process started? The answer to this question is: No! Were they finally taken by one director? Again, the answer is: No! In addition to the disappointments experienced by people whose ideas were rejected, another big frustration was that, in the last stage of the process nobody seemed to know who was taking these final decisions. With the exception, of course, of the people who actually took them. These were always the people who had invested the most energy in the process, who had always been present at meetings (usually, the collective meetings were visited by 50% of the students), resulting in a process of natural selection. One of the students, who later became a teacher at the Interfaculty, realized only years later that those who made the decisions were simply the people who stayed until the end of the discussions late at night. As the meetings usually extended to the early morning, it was always a rather small group of teachers and a few students who had the interest and energy to stay until the end.

The open form started with a stage of suggested democracy, when everybody was asked to come up with ideas that were discussed in open meetings. This suggestion of freedom was reinforced by the following meetings, where a *laissez-faire* attitude was expressed to stimulate everybody to let-them-make-what-they-want. However, contrary to these rather free-flowing stages, the preparation stage and the final stage of the process were characterized by the combination of a long working experience, an acquired authority, and the personal quality of concentration and endurance during the whole process. This means that the open form is based on a multiplex form of leadership strategies. It is not based on democratic principles, but on sets of interacting elements. How these sets of people create their form is determined by the quality and the frequency of the interaction between them. Therefore, in order to become part of the set of decision-makers one has to be at the right place at the right time, during the whole working process.

The following sections offer a description of the collective projects from the years 1993-2003. The desire to carry out these projects resulted from the Interfaculty's philosophy

that, ideally, art education should be organized as much as possible as a unity of education, research, and production. Although all art education is production-oriented (and this is especially true of interdisciplinary art education, which cannot lean on canonized quality norms), it is important to teach students that inquiry, investigation, and research are absolutely integral to successful, non-trivial works. Though one may think that it would be a natural inclination of artists to develop an investigative attitude, in reality this is rarely the case, and many art educators simply do not know how to motivate their students to spend their energy discovering why they want to be artists, what they want to learn to become professionals, and in what way their intentions are related to the historical and contemporary art practice.

THE ACADEMY OF LIGHT 1993

IN 1993, NEW STUDIOS, workshops, teaching rooms, and offices for electronic music, sonology, music registration, and multimedia had opened. A network was set up to connect all the equipment within these new workspaces and to the theater and concert hall. A celebration was organized in collaboration with the Gemeentemuseum of The Hague, which co-produced the *International Schoenberg-Kandinsky Symposium* with the Royal Conservatoire and the Interfaculty Image and Sound. In addition to lectures by internationally known scholars, the symposium presented two special performances, Schoenberg's *Pierrot Lunaire*—performed in the museum hall and dedicated to the paintings of Kandinsky, and a re-composition of the theater piece *Die Glückliche Hand* in the Schoenberg Hall in the Royal Conservatoire. The evening program opened with a manifestation, *The Academy of Light*, in which a number of pioneers in the fields of light art, visual music and electronic music-light instruments were honored with the Academy of Light Award.

The Academy of Light emerged as a result of the special attention that had been given by Schoenberg and Kandinsky to the creative possibilities of electric light in their respective theater works *Die Glückliche Hand* and *Der Gelbe Klang* (see 11.2.3-4). The teaching staff and students of the Interfaculty spent several months on the re-composition of *Die Glückliche Hand*, giving particular attention to the *Light and Storm Crescendo* and the various ways Schoenberg wanted colored lights to play a dominant role in the different scenes. It was therefore considered appropriate to organize a manifestation presenting different pioneering artists who had worked with light as an artistic medium. In a symbolic way *The Academy of Light* can be considered a tribute to László Moholy-Nagy, who had proposed the founding of such an institute shortly before he died.

The possibilities of expression are dependent for their realization upon a high standard of light and electricity. It is therefore imperative that there be an institute of light and color or institute of electronics—and not in a technological sense alone but in integration with the arts. The objective is to educate the student by way of systematic elementary training in a syllabus of the new values of light and color, including experimentation with the function and property range of television, which also has to be explored in its possibilities without imitation of theater, motion picture or radio. The foundation of such a light workshop which leads to advanced experimentation—on the basis of an artistic and economically productive consciousness—is a vital task that awaits accomplishment. (Moholy-Nagy 1947)



Fig. 106. Lev Termen playing the **theremin** (Gemeentemuseum, The Hague, 1993).

Fig. 107. Lev Termen and Onno Mensink (Gemeentemuseum, The Hague, 1993).



III SYNESTHETICS IN ART EDUCATION

The manifestation was prepared with the help of the Dutch light artist Christa van Santen, who had been introduced to the work of Moholy-Nagy when she had studied under Walter Gropius and Joseph Albers in the US during the 1960s. Back in the Netherlands Van Santen established a Light Lab for architects and urban planners at the Delft University of Technology. After the publication of a number of books on the subject, she opened a private consultancy firm for light in public spaces. For the manifestation *The Academy of Light*, Van Santen offered to create a number of colored objects made of acrylic glass pieces that could absorb and reflect light and color. The manifestation took place in the museum's auditorium, where the evening opened with a videotape by Christian Sidenius, owner of a small theater in Connecticut, where he plays Lumia pieces in the style and tradition of Thomas Wilfred. Following this introduction, the Academy of Light Awards were handed out to the pioneers in attendance to give demonstrations of their work: Lev Termen, Bulat Galeyev, Gustav Metzger, Elfriede Fischinger, and William Moritz.

The first award was given to Lev Termen, then 96, a Russian pioneer in the field of electric technology and the inventor of the *theremin* in 1922. The *theremin* was one of the first purely electronic musical instruments, played by moving one's hands at some distance to two antenna sensors and thereby modulating pitch and loudness. Termen's contribution to light art was the fact that parameters of sound simultaneously controlled the color and intensity of the visual aspect of the instrument. The *theremin* was often used during avant-garde concerts in the pre-Stalin days, when artistic innovation was still considered a positive contribution to the revolution. Termen's presence at the Gemeentemuseum was also significant because the music department of the museum had just purchased a 1930s US-made theremin in New York. Although Termen had brought his daughter Natasha to demonstrate the instrument, after receiving the Academy of Light Award he himself climbed on stage to perform (Gunsky 2000). Konrad Boehmer, of the Institute of Sonology, recognized the music as the song of the Komsomol, the union of the Soviet youth. This was to be Termen's last public performance; he died in the fall of 1993.

The next individual to receive an award was another Russian, Bulat Galevev, the founder and head of the artist's collective SBK Prometei in Kazan, the capital of Tatarstan. The group was founded in the 1960s to elaborate Scriabin's ideas on light-music. The collective is a joint venture between Kazan's conservatory of music and the local airplane factory. It is typical of the inhabitants of Tatarstan to combine subjects that for outsiders seem unrelated, for example their mix of the Islamic faith and orthodox Christianity. This attitude is also exemplified by Galeyev's fascination as a psychologist with synesthetic perception and his work in light-music. Because of the even stranger relation between the conservatory and the airplane factory, Galeyev had been able to work on public colored lighting systems and disco light systems in an era when such technological frivolities were not readily available in the Soviet Union. SBK Prometei has not only profited from the availability of technologies in the airplane factory, but also from Galeyev's vast collection of manuscripts and books relating to synesthesia, color music, and light. This collection, the largest in the world, is the result of Galeyev's position on the editorial board of Leonardo, MIT's magazine on the electronic arts. During his presentation at The Academy of Light, Galeyev showed a video on SBK Prometei and some of the works produced there (Galeyev, 2003).

III SYNESTHETICS IN ART EDUCATION

Gustav Metzger was the third award recipient. He was recognized for his pioneering experiments in the fields of auto-destructive art and auto-creative art, which formed the basis of his work with liquid light projections used during the pop concerts of The Who, The Move, and Cream in the 1960s. Although Metzger has been acknowledged as an artist who pointed out the important issue of the ecological aspects of art, his ideas were seen as forms of conceptual art instead of concrete proposals intended to be created and placed in public space. During the early 1970s, Metzger observed that art had become highly commercialized. Pop Art was increasingly used as a cheap form of decoration, commercially exploited as an entertainment commodity, though the movement had started as a sign of alarm against the mass icons of industrial production that had replaced the depths of original artistic icons. Metzger was unable to change this. Instead, he directed his attention toward Germany.

He had personally suffered a great deal as a result of World War II, in which he lost his whole family, surviving along with other Jewish children sent to the UK. In the early 1970s, nobody but a small group of young radicals seemed to care anymore about Germany's past attempts to eradicate modern art. The modern methods of commercial icon-building reminded Metzger of Hitler's war against modern art and his admiration for cliché images of strong men, vulnerable women, and the beauty of horses. Metzger found the parallels that he noticed between these forms of manipulation alarming. To demonstrate the correspondence between slick, contemporary advertising and the sentimental images promoted by the Nazis (as a response to what they called *entartete Kunst*), Metzger envisioned an exhibition of the art ideals of the Nazis. But he received little support for his ideas and he disappeared for many years from the art scene (Metzger 1996).

Metzger resurfaced a year before *The Academy of Light*, making his comeback during an event organized by V2_, the institute for unstable media based in Rotterdam. For *The Academy of Light*, Metzger prepared a demonstration of his liquid light projections. After receiving the award Metzger covered his face with a safety helmet to prevent injury from the acids he used. He switched on the slide projector and put a piece of nylon in the place of the slide, which was observable as a huge grid on the projection screen. To this he applied a droplet of acid, creating a hole that grew in all directions. When another droplet was added the nylon began to dissolve at an accelerated pace, finally vanishing completely, producing a sudden, intense flash of light from the unfiltered projection lamp.

After a short break the last two awards were handed out to Elfriede Fischinger, the widow of Oskar Fischinger, and to William Moritz, his biographer. Oskar Fischinger was one of the most successful pioneers in the field of abstract animation and he experimented in the field of optophonics, making wave patterns on film that were translated into sound by the photoelectric cell in projectors (see ILL3). Before Fischinger married Elfriede, she was one of his assistants in his studio, where she hand-painted thousands of frames. After Fischinger's death, Elfriede started a collaboration with William Moritz, a theorist and abstract filmmaker teaching at CalArts, the Los Angeles-based California Institute of the Arts. Thanks to their collaboration, Fischinger's works were meticulously ordered and catalogued, a job that had been severely hindered by the fragmented nature of the collection caused by the pressure of the Nazis and Fischinger's sudden flight from Germany in 1936. In 1992, I had visited Fischinger's widow Elfriede in the house in Hollywood where Fischinger had lived





Figs. 108-109. Gustav Metzger (Gemeentemuseum, The Hague, 1993).



Fig. 111. Christa van Santen and Elfriede Fischinger.



Fig. 110. Bulat Galeyev, William Moritz.



Fig. 112. Konrad Boehmer, Michael van Hoogenhuyze.



Fig. 113. Frans Evers and Christa van Santen.

during the last years of his life. There, Elfriede had demonstrated Fischinger's *lumigraph* from 1950. The instrument consisted of an elastic screen lit by a number of lamps mounted on the four sides of the frame (of about 1.60 x 2.40 m) that shone through constantly changing color filters. Upon pressing one's fingers into the screen a surface texture was created that was lit by the nearest lamp. By moving one's hands over the screen the movements produced lines and tracks in a variety of colors. In a dark enough environment it appeared as if the patterns created were floating freely in air. The last part of the program of the manifestation The Academy of Light consisted of a demonstration of this instrument. Elfriede Fischinger and William Moritz improvised a *quatre mains* light play, reacting to the music of Paul Hindemith, one of Oskar Fischinger's favorite composers.

Fig. 114. Edwin van der Heide during a rehearsal of Die Glückliche Hand - Geöffnet (1993).

DIE GLÜCKLICHE HAND — GEÖFFNET 1993

111.2.2

THE SECOND EVENING of the *International Schoenberg-Kandinsky Symposium* took place in the Royal Conservatoire, where the official opening of the new studios was celebrated with the premiere of *Die Glückliche Hand – Geöffnet* (The Lucky Hand – Opened). This was the first large collective project of the Interfaculty Image and Sound and was based on Schoenberg's music theater piece *Die Glückliche Hand* (1910-13). This piece, his second music theater piece, was chosen because of the way it treated the relationship between color and music.

After finishing the piece in 1913, Schoenberg considered producing his "drama with music" as a film in which the colors would be hand painted on celluloid and the music would be performed on an *Aeolian Organ* (one of the first electric player pianos). Production of both a film and a theater version was prevented by the outbreak of World War I. Only much later, in Vienna in 1924 and in Breslau in 1928, theater performances of *Die Glückliche Hand* were realized; neither of them to Schoenberg's satisfaction. The theatrical version of the piece has only been performed a few times, for instance in 1991 in the Netherlands by director Pierre Audi. In this interpretation the use of light and color, and especially the essential *Light and Storm Crescendo*, were hardly given proper attention, despite Schoenberg's remark that

In Die Glückliche Hand *the main thing is: ...The colored light play. Very intense light sources are needed and* good colors. *The set must be painted in such a way that it takes on the colors!* (Stein 1958)

In a 1913 letter to his publisher Emil Hertzka, director of Universal Edition in Vienna, Schoenberg wrote about his vision for the film:

My foremost wish is therefore for something the opposite of what the cinema generally aspires to. I want: The utmost unreality! The whole thing should have the effect (not of a dream) but of chords. Of music. It must never suggest symbols, or meaning, or thoughts, but simply the play of colors and forms. Just as music never drags a meaning around with it, at least not in the form in which it manifests itself, even though meaning is inherent in its nature, so too this should simply be like sounds for the eye, and so far as I am concerned everyone is free to think or feel something similar to what he thinks or feels while hearing music. (Hahl-Koch 1984) The drama of *Die Glückliche Hand* is played by three characters, the man, the woman, and her lover, with a choir singing comments on the development of the storyline, and focuses on the conflict between the artist's inner need to create works of art and his longing for the love of a woman who is betraying him. The conflict is symbolized by the hand, which at once creates art and continues to feel the hand of the woman though she has already left him. In an attempt to win back her love he creates a jewel for her, but becomes aware of the impurity of this act that has nothing to do with making art. The hand that can create things having far-reaching effects is the same hand that tries to keep things that cannot be kept. This pain is expressed by the Light and Storm Crescendo, representing his jealous and apprehensive feelings. Despite its optimistic title the story does not end happily. The man is left alone as the choir sings: "Why do you want to hold something which can only escape you...?"

The preparations for the "re-composition" of *Die Glückliche Hand* began in the summer of 1992, when Dick Raaijmakers wrote the first concept. He then analyzed the work, deconstructing its various layers. Raaijmakers wanted to open the piece, by separating its elements: music, song, light, color, movement, gesture, image, drama, mime, set design, and props. Each component could therefore be individually studied, revealing how it might be (re-)created with modern technological means—Schoenberg himself had wanted to employ the latest film and sound technology. These would become the compositional elements of the re-composition of the piece, resulting in the contemporary version *Die Glückliche Hand* – *Geöffnet*.

Following Schoenberg's point of departure was fundamental to this approach, treating all theatrical means as music, "making music with the means of the stage." Schoenberg wanted all the materials to be treated with the same theatrical value, similarly to how he had started to give equal rights to all tones within the musical scale. In order to achieve this in Raaijmakers's version, the action was decelerated, accelerated, stopped, reversed, magnified, doubled, and repeated. For Raaijmakers, the Light and Storm Crescendo was an ultimate example of this principle of the transformation of music and color, based not just on one dimension—the growth of intensity proportional to the loudness of sound, resulting in a climax—but as a much more complex form of "sound-color crescendo" (or "sound-culture crescendo," as Raaijmakers called it). To be able to connect the various musical and non-musical elements, he expanded the musical concept of the crescendo to a more general meaning, comparable to morphing in computer terminology, in which one image is transformed into another by way of a great number of small steps of transition.

Strictly speaking, Raaijmakers's interpretation is not identical to Schoenberg's, though it does have similarities to his comments on the 1928 performance of *Die Glückliche Hand* in Breslau. At that time Schoenberg stated that the expression of the man's growing pain by the linear increase of the sound of the wind machine and the dynamics of his gestures are only the outer coating of a much more complex inner development:

This can be discerned most clearly in the fact that the light as well as the colors, and particularly the music, follow paths that by no means lead so directly upward as those of the wind-machine or other dynamic elements. These last are less suited to more complicated developments and therefore remain limited to a straight line, to a direct



BAR	FARBE	COLOR
123	Dunkel	dark
125	schwach, rötlichem Licht	pale, reddish light
126	rötlich	reddish
130	Braun	brown
135	schmutzig Grün	dirty green
137	Blaugrau	blue-grey
139	Violett	violet
142	Dunkelrot	dark red
144	Blutrot	bloody red
146	Orange	orange
147	Hellgelb	bright yellow
148	gelbe schreiendes Licht	yelling yellow light
151	blauliches Licht	bluish light

Table 5. THE COLORS OF THE LIGHT AND STORM CRESCENDO (SCHOENBERG 1952).



Fig.116. Stage and model of the stage of Die Glückliche Hand - Geöffnet (1993)

ascent. On the one hand they form the backbone of the development and on the other hand they serve to let the higher type of elements stand out better. The play of light and colors, however, is not based only on intensities, but on values that can only be compared with pitches. Tones, also, can only be easily combined with each other when they have a basic relationship to each other. In just the same way, basic shades of color can only be combined by means of their basic relationship to each other. (Hahl-Koch 1984)

What is this basic relationship? Although Schoenberg himself does not articulate its nature, it is easy to infer from the words he uses to describe the colors of the crescendo (Schoenberg 1952).

From this list (see table 5) one can easily conclude that, parallel to the change from dark to light, the hues are related according to their spectral order. The color circle is traversed one and a half times, first making a full circle in the dark region (bars 125-139), and then, from bars 144-148, traveling another half cycle of bright colors. Indeed, this movement cannot be described in terms of a straight line since it is much closer to an irregularly formed spiral. Saturation, expressed by the complexity of some of the color descriptions (pale reddish light, blue-grey, bloody red, and yelling light), is the third color dimension that causes the irregularity. Thus, next to the lightness of the colors, which are related almost directly to the growing loudness of the wind machine, the hues, or color tones, are ordered according to the principle of the color scale observable in rainbows and the spectral order made visible by a prism, which had been recognized by Newton (see [1.0.]). Schoenberg directly associated this scale of hues with the scale of pitches, but the relationships between colors and musical sounds were much more complex. As Truman (1983) has shown, it is more helpful to describe the development of the sound aspect of the crescendo by the multidimensional term "musical texture." He describes bars 125-136 as being "texturally diffuse," developing into a "clear texture of both motifs and accompaniment" (bars 137-143), and from bar 144 into "an integrated texture of powerful linear drive and thickening ostinatos."

Raaijmakers introduced the term sound-color crescendo as a new compositional means for manipulating this timbral quality. His terminology relates directly to Schoenberg's description of sound color in Theory of Harmony (1911), and his Klangfarbenmelodien concept, in which "sound color melodies" based on the movement of instrumental timbre could be added to the usual compositional parameters of melody, harmony, rhythm, and dynamics. Though in 1911 it was difficult to imagine what Schoenberg envisioned, the introduction of electrical means to record music and electronic sound synthesis allowed composers to employ color as a basic compositional parameter. Raaijmakers's recomposition of Die Glückliche Hand further incorporated the different timbres of historical recordings, including the interpretations of the Columbia Symphony Orchestra directed by Robert Craft, the Residentie Orkest version from 1991, and specially recorded new interpretations. The new interpretations-and thus new timbres-included player piano versions based on the piano extracts made by Eduard Steuermann, Aeolian Organ simulations on contemporary synthesizers, and imitations of Leopold Stokowski's approach to orchestral color as heard in Disney's film Fantasia. This all served to incorporate the characteristic sound and feeling of late 1930s film music.

At the beginning of the 1992-1993 course year, a production team was formed. Students and teachers dedicated the first semester to the re-composition of *Die Glückliche Hand*.

A number of groups were formed to study the different layers of *Die Glückliche Hand*: a light group, a video and digital animation group, a stage design group, a costume group, a props group, a music group, a drama group, and a recording group. Jan Zoet ran the production team, organizing weekly meetings for the groups to report on the progress of their research. The major difference between this project and *Book III – The New Media* was that all individuals worked on the different elements of a common work instead of preparing independent pieces in relative isolation that were only connected later by a meta-composition scheme. With *Die Glückliche Hand – Geöffnet*, the structure of the meta-composition developed as an open form on a week-to-week basis, adjusting itself to the progress made by the teachers and students. For everybody involved, this approach resulted in a completely new creative and social experience over the four months of continuous involvement. The meetings, usually with all forty teachers and students present, constantly produced modifications of the various sketches and forms of each of the components of the work.

A typical weekly meeting began with discussions of the scale model of the Schoenberg Hall, in which Robin Deirkauf placed elements of the stage set, the props, the lighting, and the projection positions. Raaijmakers would present his updated papers, instigating discussions on production issues and new proposals. Paul Koek reported on his work with actors and with the three mime students employing the expressionist gestural idiom Meyerhold developed at the beginning of the twentieth century. Kees Tazelaar, from the Institute of Sonology, would give an account of his experiments in the analogue sound studio. Light designer Kees van der Lagemaat discussed his plan for the light crescendo using early twentieth-century techniques such as electroluminescence as well as modern, computercontrolled neon tubes. Kasper van der Horst related the progress made on the computer morphing of Schoenberg's paintings and the experiments with 3D slide and video projections. Finally, the text group would present its findings on its analysis of the meaning and symbolism in the libretto. This working method soon resulted in a total diffusion of individual authorship. Ideas would often change so many times that after a while it became impossible to know whose comments were responsible for the final shape of the piece. Beyond the feeling of true collaboration, a feeling emerged that, from some point, the piece seemingly grew by itself. It was as if, once an element of the whole became visible or audible, that element itself proposed further changes, adaptations, reductions, new details, or connections. Although this process is known to artists when they work individually, it was striking that a moment arrived in a large group collaboration when the work in progress took the lead itself, as if it was becoming an animal that expressed its needs by making all kinds of unexpected movements.

Thus, the form of *Die Glückliche Hand – Geöffnet* grew steadily, taking a shape that nobody could have foreseen. In the end, the different scenes were performed throughout the Schoenberg Hall, on the stage, on the floor (with the chairs removed as in *Book III—The New Media*), and overhead. Loudspeakers and light spots were placed around the hall on the first balcony. The stage was divided into three parts. On the left there was an area marked by four white screens forming an open cube. In the middle there was a hole in the stage, created by lowering the piano elevator. On the right side of the stage was a huge cage in the form of an upright hexagon built by wired planes. The ground floor was also divided into three sections. On the left there were two large projection screens that could



Fig. 117. Dick Raaijmakers in conversation with students during rehearsals (1993).





Fig. 118. Paul Koek working with mime students.

Fig. 119. Making a Tesla.

be lit from the right side, where a number of laboratory tables with various lighting equipment were placed. Between the screens were two piano-shaped piles of charcoal in which neon tubes were pricked in a random fashion. All along the line from left to right, where the stage rose from the ground floor, twelve TV monitors were placed, masked by black, painted covers with round openings to view the screens. At the back of the hall two huge balloons, used as 3D projection screens, hung from the ceiling. Changes were made right up to the last evening before the premiere on January 9, 1993 as rehearsals demonstrated that some effects simply would not work and that some of the actions took too much time. Even with last-minute cuts, as a result of Raaijmakers's re-composition principles *Die Glückliche Hand* – *Geöffnet* lasted nearly an hour and a half, four times the length of 22 minutes of Schoenberg's original work.

The piece opened with actress Frieda Pittoors, who played both the woman and the role of a commentator. As an introduction she recited a part of Schoenberg's comments on one of the early interpretations of the piece. After this introduction the recording of Robert Craft's version of *Die Glückliche Hand* was played, while the three mime players, placed in the open cube, gave expression to the emotions of the man, the woman, and the gentleman in the expressionist theatrical fashion of the early twentieth century. During their play slides of Schoenberg's own paintings were projected on the two screens standing behind them.

Then the piece began again with *sound color crescendos* realized with the help of modern technology. The man, played by Edwin van der Heide, used electronic gloves (designed by himself) to set into motion the player piano version, the recording of the Steuermann piano version, and the neon tubes in the coal pianos on the floor, which lit up rhythmically according to the dynamic pattern of the music. Toward the end, the music was cross-faded with the first appearance of the choir. The lament of the choir was recorded in the studio, using the voices of Manon Heijnen and Romain Bischoff, and was played simultaneously with the projection of a number of fading anatomical pictures of eyeballs on the spherical projection screens. Because of a faint movement of the air, the eyes seemed to come alive; it was as if two giant's eyes were staring into the hall. The eyes were an expression of Schoenberg's wish to accentuate the eyes of the choir, which he called the "choir of eyes."

During the third scene the man and the woman began to communicate. The man attempted to impress the woman by showing her his hands while lighting his fingertips with blue light. After he had convinced her to touch his hand, he became overconfident and started making a diadem with the equipment on the laboratory tables, accompanied by the hammering sounds of blacksmiths in a forge. "This is the way to make a jewel," he shouted and all of a sudden the colored lights of the diadem were projected through a huge prism and onto the screen. When the woman turned her back to him, the man walked desperately to the cage, thinking of an even greater action to impress her. The cage contained a fivemeter-high Tesla coil that was specially made for the occasion by winding three kilometers of copper wire and another three kilometers of isolation wire around the coil. During his approach to the cage the man held a long stick with a copper hand mounted on it. At the moment the hand came near the condenser connected to the coil, a 300,000-volt spark was created, spreading intense blue lightning and making the crisp sounds of electric sparks. At this point the Light and Storm Crescendo began. From the hole in the middle of the stage, colored smoke was blown into the air while the sound of wind accelerated and transformed into the sound of a storm. Then Jan Boerman's electronic re-composition of the light crescendo was played. It was connected to a computer-controlled RGB neon light box made by Kees van der Lagemaat, displaying changing colors and light intensities directly connected to the music, in the order Schoenberg had composed them. Digital control allowed the command not only of the bright shades of color, but also the dark and dirty colors of the beginning of the crescendo, using very short pulses of light that perceptually blended with the dark intermissions. After this, everything became dark and silent. The closing scene consisted of a block of stone falling while a hyena, representing the man's dual nature, moved across the stage. The twelve monitors were switched on to display a soft tone color crescendo, the choir singing its closing lament: "Didn't you listen to yourself...? Why did you have to experience again what you have gone through so many times before...? Why do you want to hold on to something which only can escape you...?" During the lament the monitors lost their images one by one, as if their signals were lost. From the dark, two loudspeakers were visibly aglow, on fire, and as the flames grew, the sounds of the lament were burnt.



Fig. 120. Fort >< Klank, the waterfall

FORT >< KLANK 1993

111.2.3

FOR A NUMBER OF YEARS, Fort Asperen has been the yearly center of art manifestations organized during the summer. Every year, an artist is invited to develop a concept for a manifestation that usually takes the form of an exhibition. Within the Dutch art world the manifestations are well respected because of the high quality of the exhibited art and the spectacular location. Fort Asperen is a military fortification built in 1850 as a part of the so-called Hollandse Water Linie (Dutch Water Front). The fortification system was built for protection against a military attack as a belated defensive response to the invasion by Napoleon's troops in the early nineteenth century. The fortifications had been built as part of an inundation system designed to stop incoming armies by letting water flow into the polders. This typically Dutch invention had already been used successfully in the sixteenth century to stop the Spanish army when it attempted to occupy the Netherlands. However, due to the development of new, more precise ballistic systems in the nineteenth century and later to the arrival of the aircraft, the system has never been in operation during wartime. The fort has a unique, rounded form that is perceived as a natural hill from a distance because it is almost completely overgrown by foliage. Situated at the border of a quietly meandering river, the Linge, it forms a romantic oasis in the landscape, which further consists of the usual flat and open Dutch polder environment.

During the summer of 1993 the project Fort >< Klank (Fortification >< Sound) was produced by Dick Raaijmakers, Horst Rickels, and Walter Maioli in cooperation with the Interfaculty as the first sound project in a series of fine arts manifestations organized by the Fort Asperen Foundation (Maioli et al. 1994). The organizers wanted to break their tradition of inviting leading artists working in one of the fine arts disciplines and thought of using the fort for a presentation in which sound would be the central theme. After consulting Frans de Ruiter, Dick Raaijkmakers was invited to make a proposal. He came up with the idea of transforming the entire building into a sound producing musical instrument. Preliminary conversations between Raaijmakers and the Fort Asperen Foundation began in September 1992, with the production of the Fort >< Klank project beginning in April 1993 after most of the grant applications had been awarded. Within a few weeks, basic conceptual and practical ideas had been worked out along with a number of concrete proposals and construction plans for sound installations. Taking into account the archaic nature of the fortification, the decision was taken to use primitive materials and mechanical principles to create musical instruments and evoke sounds. Elementary and mechanical "scrape," "scratch," "stomp," and "fall" constructions were preferred to hi-tech designs. The movements of these constructions were transferred directly to the walls and the floors of the fort, with the audience confronted not only with the usual, acoustic manner of sound transmission via the air and the ear, but also via sound vibrations directly felt by the body of the observer. Thus, visitors were participants, fully absorbed by the vibrating fort in such a way that one got the impression of being united with it.

The installations were designed according to primitive principles used since prehistory. Walter Maioli was asked to join the creative team to guide this approach. During the talks with Maioli a number of ideas were discussed, beginning with comparisons of the fortification to the cave-dwellings of early humans, where their sounds were mixed with the natural sounds and the acoustic reverberations of the caves. Among the natural sounds in caves that early humans would have heard was the constant and regular dripping of water, sometimes quietly but in other cases with overwhelming noise, for example when a waterfall was part of a cave's structure. Additionally, they might have heard the scratching sounds of bears sharpening their claws on the cave walls. This left visual patterns that have been compared to *psychograms*, a kind of doodle graphics created by early humans. Even then there were also the sounds of early musical instruments like scrapers and lithophones (a kind of xylophone consisting of stones), combined with rhythmic foot stamping, with echoes creating an immersive effect on the participants. Thinking along these lines, the fortification could be viewed as a station between the caves with their archaic sounds and the present surround-sound systems that try to imitate the enclosed intimacy of the caves within the restricted space of the individual home.

The installations were grouped in circles around the central light shaft connecting the two floors and the basement to make the most of the rounded form of Fort Asperen. This center functioned as the spot in a pond where a stone might land, from which waves reverberate outward in wider and wider circles, similar to the way sound travels through air. Thirty-one installations, consisting of nine different types, were designed and placed around the central light shaft, in which the centerpiece, a waterfall, was built. The installations were connected to a so-called "processing logic control" computer that controlled the total time cycle, twenty-five minutes, and the duration of the activity of each installation. The cycle began with a waterfall falling down the light shaft. In thirty seconds 20,000 liters of water flowed from a container placed on the roof. The effect of the waterfall was acoustically immense; it is quite unusual to hear the sound of a waterfall at arm's length within the closed walls of a building. Next to an important tactile dimension due to the spray of water moving in all directions, there was the significant visual effect of the strange motion patterns observable in the six-meter-wide column of silvery water falling down.

After the violent sound of the waterfall, the fort became silent. Once the public had had time to adapt, they began to distinguish little characteristic sounds. Every so often a high, short, sharp sound could be heard, emerging from one of the twelve bat-simulators hidden in the corners of the many rooms of the fort. They represented the colony of bats normally inhabiting the fort. During the summer the bats lived outside, but during the fall, winter, and spring thousands of them made their home in the fort. (The fort is an ecologically protected environment; the entrance to it is closed when the bats return, therefore the manifestations could only be held during the summer.) Listening to the sounds produced by the bat simulators, all of a sudden one could hear rhythmic, shrieking sounds created by the scraping movements of the *bear claw installation* on the wall of the basement, which, like the bat simulators, was activated by a pneumatic control system connected to the central computer.

The relative quietness was then forcefully disturbed by one of the main installations on the first floor. Three *stamping installations* began their "witches' dance," in which the robustness of the floors was put to the test. Each stamper was built as a bundle of wooden beams held together by iron bands. The beams were connected to a chain and a circling motor arm that first lifted the beams and then let them fall on the floor. The composition of these stamping sounds consisted of a range of separate falls at irregular time intervals, contrasted with moments when all three beams fell together in a wild dance of banging sounds. They were made of six-meter-long iron tubes with a diameter of 40 centimeters, weighing 450 kilos each. They lay horizontally on two vertically placed "combs" and were connected to a chain that pulled them over the combs. Their movements were ordered in three time intervals, each lasting either half a second, one second or three seconds, resulting in isolated subsonic vibrations, synchronized trumpet-like sounds, or sharply timed screams and squeals.

Two installations were placed on the ground floor. The first was a lithophone made by the Italian artist Amalia del Ponte. It consisted of a square piece of Cararra marble and functioned as a gong to announce each new cycle, starting with the waterfall. The other installation was a "circle of soldiers," an enlargement of a children's toy consisting of four chickens on a round wooden plate and connected by ropes to a marble hanging underneath. The marble, when set in motion, caused the chickens to peck rhythmically on the plate. The installation magnified this toy to life-size, using soldiers dressed in mid-nineteenth century uniforms. They held rifles that hit the platform, in response to the motion of a huge stone hung in the basement whose rotating movement was controlled by an x-y pulley system. The purpose of this installation was to introduce a colorful Fremdkörper as a contrast to the overwhelmingly colorless atmosphere of the fortification and the other installations, an allusion to the historical situation when soldiers were "called to the colors" and had to live in Fort Asperen for some time.

The basement of the fortification could be reached by walking a long semi-circular corridor with ten glass windows, so-called lamp niches or lamp alcoves, from which it was possible to view the ammunition magazines without creating the dangerous situation of bringing light into the magazines themselves. To symbolize this potential danger, electromagnetic ticking installations were connected to all windows, which created fast-sounding patterns coming toward the visitors every six seconds. At the end of the corridor visitors could hear and see the bear claw at work, leaving its scratches at regular intervals on the wall. Every week the robot was moved, creating a series of twelve pieces of "graffiti," which transformed the corridor into an art gallery. At the end of the corridor the visitor could enter the basement room, where a *drip installation* had been placed. This installation was created to reflect the architecture of the building, designed in such a way that at different places in the fort water could be collected by an ingenious system of built-in, controlled leakage. The installation consisted of several glass-made reservoirs from which water dripped onto the wet floor. The installation was lit in such a way that the ripples in the water on the floor were reflected on the walls and roof of the room, highlighting the central concept of Fort Asperen as a sound producing musical instrument: the circular nature of the movement of sound waves.







*Fig.***121-123.** Fort >< Klank: top left, scraper installation; top right, bear claw; bottom, soldiers' circle.

Since the opening of *Fort* >< *Klank* took place during the June examination period, it was impossible to involve students in the preparation and construction of the project. The project thus differed completely from *Book III – The New Media* and *Die Glückliche Hand – Geöffnet*. However, an important educational aspect of *Fort* >< *Klank* was realized in the form of the *Wunderkammer*, in which Walter Maioli's collection of primitive and archaic musical instruments was exhibited. In a wooden building next to the fortification, a small museum was created in which hundreds of seeds, shells, horns, animal parts (e.g. rattlesnake bones), whistles, flutes, scrapers, sticks, xylophones, feathers, bullroarers, and so forth were displayed along with anthropological films in which the use of the instruments in various non-Western cultures was demonstrated. Maioli explained the archaic functions and demonstrated the sounds of the instruments in twenty workshops for different age groups, from elementary school children and students at music schools, to college and university students.

In 1993, the start of the new course year coincided with the last week of *Fort* >< *Klank*. For three days teachers and students resided in one of the annexes of the fort in the village of Acquoy, to be informed about the concept behind the project. After an introductory lecture on the concept by Dick Raaijmakers, Horst Rickels, and Walter Maioli, the constructor of the installations, Paul Beuk, explained the technical aspects, including the mechanical principles of the different installations and the working of the computer that was running them. During the next few days sound and video recordings of the installations were made, using special light effects and lots of colored smoke. The use of stroboscopes created a very special view of how the water in the waterfall behaved. When the strobe lights were switched on, it was as if the falling drops of water were frozen for short intervals and that, amazingly, at some moments it seemed as if the drops first moved upward before finally being taken downward by the main stream. For the film, the Papua Julian Nunaki came over to play a scene in which he approached the fort from the outside by a dance and drumming act, resulting in finding the entrance to the fort, after which an audiovisual tour around the sound producing installations was made.



Fig. 124. Jan Zoet in the Promenoir (1994)

MONDRIAN'S PROMENOIR 1994 III.2.4

IN 1994. EXHIBITIONS were organized nationwide to commemorate the fiftieth anniversary of Piet Mondrian's death. As usual in the case of Mondrian's work, attention focused exclusively on his paintings and drawings, though he himself regarded his theoretical writings on Neo-Plasticism in De Stijl and other publications as at least equally important. In approximately fifty essays Mondrian developed his thoughts on the role of "new plasticity" in contemporary life, ranging from ideas on painting, sculpture, architecture, music, theater, literature, and photography to his comments on modern city life in general and "the culture of equivalent relationships" in particular. To do full justice to Mondrian's work, it is important to recognize him as one of the first conceptual artists; he stressed the idea that artists should work according to a system in order to balance the natural dominance of physical forces by a spiritual component. Such a system should result in a "physical-spiritual mutation," as opposed to the approach characteristic for the traditional arts. These used to be dominated by natural, physical forces, which consequently could only result in "physical modifications," the aim of arts based on modifications of natural objects and natural sounds. According to Mondrian an artist "must create solely from the urge to create in a sphere that is not concrete for us-that of thought" (James 1987).

Although it is well known that Mondrian enjoyed attending jazz concerts shortly after World War I when it was introduced to Europe by black American soldiers who refused to return to the US, he had previously become interested in applying his ideas on Neo-Plasticism to new forms of music made on electrical musical instruments. Mondrian's interest in new music dates from 1915-16 when, unable to return to Paris due to World War I, he lived with composer Jacob van Domselaer in the Netherlands. At that time Mondrian was preparing his first essay, "The New Plastic in Painting," which was to be printed in 1917 in De Stijl. Inspired by discussions with Mondrian regarding his conception of "horizontalvertical duality," Van Domselaer attempted to compose an ideal music based on "balanced proportions," introducing the notion of "static sound": "The inert element (harmony) must take center-stage, while the 'movement' (melody), despite the dominance of the inert element, must be free to move, and quiet" (Van Domselaer 1916). Back in Paris, Mondrian attended the Futurist concert of 1921 at which Marinetti gave a lecture on Bruitism and Russolo demonstrated twenty-three of his intonarumori. A month later, Mondrian published his first article on music: "The Manifestation of Neo-Plasticism in Music and the Italian Futurist's Bruiteurs," followed a year later by "Neo-Plasticism: Its Realization in Music and in Future Theater," in which he speculated on the future of electrical music that would have to be combined with light projections in a new type of concert hall, a promenoir.

The Interfaculty Image and Sound wanted to produce a project based on Mondrian's utopian thoughts concerning the art of the future, and especially on his speculations about a new "art situated between painting and music." Preparations for the project took place in three stages. The first stage, lasting from July 1993 through June 1994, began with a detailed study of Mondrian's ideas on Neo-Plastic music and architecture (Mondrian 1921a-b. 1922a-b, 1987; Blotkamp 1987; Raaijmakers 1988). In September 1993, Mondrian's essays on new music, new architecture, and modern urban life as the home of "the new" were collected and read. An early concept of the project was *En zo is de Jazz thans in de bar; Mondrian en de muziek – een multi-mediale Promenoir* ("And thus jazz is presently in the bar; Mondrian and music – a multi-media *Promenoir*"), in which four optional locations where the *promenoir* might be realized were described (Evers and Raaijmakers 1994a, b, c). During the same period, Raaijmakers wrote a series of papers in which he compared Mondrian's musical concepts with similar ideas later developed by George Antheil, Karel Goeyvaerts, Pierre Boulez, and himself (Raaijmakers 2000).

During the second stage of the project, from June to October 1994, a contemporary utopian version of the Promenoir concept was developed, which was finally reduced to a realistic concept in the third stage of the project, the actual building of the *promenoir*. Because of financial limitations, the Promenoir was constructed in the Schoenberg Hall of the Royal Conservatoire, where the final result was presented on December 6, 7, and 8, 1994 during the first days of the Mondrian exhibition in the Municipal Museum of The Hague. The working process was more or less similar to that of *Die Glückliche Hand – Geöffnet*. The first semester of the course-year 1994-1995 was devoted to the project, that was being organized by a small production staff and characterized by the "open form" approach. All the working groups (music, sound, light, projection, stage design, food, and bar) made reports about their investigations and working progress during collective meetings revolving around a scale model of the Schoenberg Hall while discussing the conceptual developments and their practical consequences.

Mondrian's ideas on the ways in which new music might be produced in the future involved two basic aspects of musical creation. First, there was the need to create new varieties of musical instruments based on electric, magnetic, and mechanical technology, thereby excluding the subjectivity of a performer. These instruments, or sound machines, had to be able to create completely new types of sounds consisting of "sound coups." The other aspect focused on the need to create a fundamentally different way of composing musical harmony based on horizontal and vertical movement. For this reason Mondrian rejected Russolo's *intonarumori* since most of them were still based on imitations of natural sounds as indicated by their names: screechers, growlers, cracklers, graters, howlers, buzzers, cluckers, poppers, hissers, croakers, and rustlers. Mondrian sought a music based on what he called "determined sounds" (what composers of electronic music would later call "composed sounds"). Mondrian prophesied that in the future people would "prefer sounds and noises produced by inanimate non-animal materials. [They] will find the noise of a machine more sympathetic (in its 'timbre') than the songs of birds or men." What Mondrian especially liked about machines was their ability to create speed.

Some ten years ago Marinetti proclaimed the necessity of speed. Since the idea of speed is expressed plastically "in the straight" it is surprising that the Italian Futurists have not rigorously applied this truth either to painting or to music. Absolute speed expresses in time what "straightness" establishes in space. Speed destroys the oppression of time and space and thus the domination of the individual; hence its importance for the pure plastic expression of the universal. That is why the power of speed can transform music's expression to greater inwardness, not only through measure and tempo but also through composition and the plastic means.

Mondrian proposed that the plastic means of Neo-Plastic music should be "determined sound" and "the duality of sound and non-sound (noise)." (He similarly considered the plastic means of Neo-Plastic painting "determined color" and "the duality of color and non-color"). The two groups each consisted of three sounds, a red sound, a yellow sound, and a blue sound, to be contrasted with three un-pitched noises: black, grey, and white. Connecting these sounds and non-sounds with curved lines, or separating them with silence, was off limits: they were to rapidly follow each other as percussive coups. In a composition the sounds were not to have the same intensity or be similar in character.

A very loud sound can be opposed by a relatively slight but altogether different noise. In this way it is impossible to produce vagueness or monotony... In Neo-Plastic art, rhythm is the external element of composition, just as color and sound are the external elements of the plastic means.

For this new music a new type of concert hall was necessary that would completely differ from traditional concert halls, theaters, or churches. The space would be readily accessible and it would be possible to come and go anytime without disturbing others, with electrical sound equipment invisible and conveniently placed, and a fully automated buffet. In the original version of his essay published in *De Stijl*, Mondrian clarified his spatial concept with the word *promenoir* referring to the area around the bar to the rear of some theaters and music halls, where people who did not want to take a seat stood in the hope of finding someone to talk to. The program in the *promenoir* was to be repeated and to be fully automated just as in cinemas where the same film is shown several times per day.

At the end of his essay Mondrian foresaw another artistic mutation that went beyond the principles of Neo-Plasticism. He envisioned projections in which space and time, painting and music, would merge into one and the same thing. This new art, situated between painting and music, consisted of rectangular planes of color and non-color that would be projected separately or in succession. These planes and their compositions could not be taken directly from Neo-Plastic painting because their expression in time (as in music) had different requirements. Therefore, Mondrian wrote that "it will probably be necessary to attain a stage of abstract evolution even beyond that now required by Neo-Plastic painting and music: the true unity of the 'physical-spiritual'."

Time will tell whether this vision will ever be realized. Lighting systems have already developed from projection—film, slide, and video—to LED light screens. It is not difficult to imagine the further development of screens into computer controllable foils of all kinds of formats, in which shades of light and color as well as shapes can be programmed at will. The major problem, however, which is not so easily solvable, is how to project sounds in the form of a straight line or a flat plane. Today, loudspeaker technology is not very differ-





Fig. 125. Laser projections in the Promenoir.

Fig. 126. Stage decor "FLower bulbs and tulips" in the Promenoir.

ent from the very first electric loudspeakers; moving cones are still used today as a source of vibration. Although there have been recent technological developements to produce sound in a very specific and limited area, this system is still far from approximating Mondrian's vision of vibrating lines and planes. Despite Mondrian's keen grasp of the futuristic possibilities of abstract light projection, his ideas about sound production and projection seem naïve since they are not only difficult to realize technically, but especially since conceptually they depart too far from natural acoustic laws to be treated in the simple and strict principle of "horizontal-vertical duality."

Nevertheless, in his detailed studies of the subject, Raaijmakers has been able to show that in many ways Mondrian's thoughts on music explored a completely new way of musical thinking. The fact that this music was to be produced by purely electric means-thirty vears before this became practically possible—shows his keen intuition. Concepts such as "dead tones" by Karel Goeyvaerts, Eimert's "pure sine tones," and Stockhausen's distinction between "sounds" and "noise-sounds" remind one immediately of Mondrian's vocabulary. Stockhausen's description of alternations "at high speeds in horizontal and vertical directions" is even identical to the way in which Mondrian expressed his utopian musical movements. In the early 1950s, Karel Goevvaerts contributed to the verticalist notion of sound plasticism with his concept of "dead tones," comparable to Mondrian's "sound coups." These sound objects consisted of layers of sine waves, forming static sounds in a quiet aural space, as if they are waiting to be approached by the listener. Approaching them, the listener will notice that the sound object is in fact not static, as it seemed to be, but rather descending. This tendency of falling harmonics was exploited by Pierre Boulez in his work *Répons*, in which he created what he called "horizontal arpeggios," computer generated harmonic responses to notes produced by acoustic musical instruments. This is the effect of "composed reverberation": the composed, artificial acoustics described in the chapter on *The School for Soundmen* (see III.2.5).

Still, in *Cabier M*, as well as in his lectures during the Promenoir project, Raaijmakers convincingly explained that it is impossible to realize straight lines and flat planes in the world of sound and music. Sounds always move in all directions within three-dimensional space. Even the idealized space of a *promenoir*, consisting architecturally of flat planes, is three-dimensional, and thus it is not only impossible to create a straight musical line or a flat plane of sound, but also the visual perception of flat planes according to the laws of spatial perspective will always be of a mixed nature in which diagonals will be seen.

The rejection of the diagonal line by Mondrian resulted in a definitive separation between Mondrian and his close friend Theo van Doesburg who accepted the diagonal line as a necessary addition to the horizontal-vertical duality, whereas Mondrian wanted to adhere to the principles of his own system of Neo-Plasticism. Raaijmakers considered horizontal and vertical lines in music impossible because musical movement is characterized by always being in transition between horizontal and vertical harmony. For this reason he introduced the concept of "diagonal sound," enabling him to come up with compositional proposals for *Mondrian's Promenoir*. These ideas were elaborated in collaboration with Horst Rickels and Kees Tazelaar, using the chords of Van Domselaer's fifth piano piece. The concept of diagonal sound was first used by George Antheil as a provocation against the seriousness of his contemporaries in a publication in *De Stijl* in 1924 in which he confronted

the "verticalists" (composers constructing complex harmonies) and the "horizontalists" (composers focusing on melodic development) with the diagonal direction as a new musical dimension. Antheil imagined urban soundscapes with huge orchestral machines that launched "sound-rockets," consisting of thousands of sounds to be fired at regular intervals, as an alternative to the traditional sounds that dominate public space (such as church bells). This provocative idea was however never realized.

In the years 1963-67, Raaijmakers studied the problem of horizontal and vertical concepts in music from a theoretical and compositional point of view. In Raaijmakers's view it was only possible to create horizontal and vertical movements of sound when the reality of diagonal movement was accepted in the same way that the diagonal lines that constitute visual perspective in the perception of space had to be accepted. In this respect, aural perception is not very different from visual perception in which the extremes of vision en face and vision *en profil* are only idealized perceptual positions on a continuum that is almost exclusively formed of perceiving reality from an oblique point of view. It is exactly this angle that gives an arpeggio the character of a musical gesture. Without the small time differences between the constituent notes, an arpeggio would sound as one complex, static sound. But even in this complex sound one can hear the partials that seem to move diagonally, interpreted not in a static but a spatial way, as if they have different volumes. The only way to approximate horizontal and vertical movement in music would be to compose the rotation of sounds with spatial aggregates, consisting of layers of frontal and supporting sounds that change their relative position according to their travel in time and space. Their position could be composed in the usual temporal way (as Raaijmakers did in his composition *Ouartet* in 1967), as well as in a spatial manner employing a multi-track loudspeaker system, in which the relative position of the frontal and supporting sounds could be distributed over the different loudspeakers in a given space. When the listener would be allowed to move freely in an acoustically controlled space, it would thus become possible to get an impression of horizontal and vertical sound.

The original concept of the Promenoir project contained a "style crescendo" between electronic music and jazz similar to the connecting crescendos in *Die Glückliche Hand – Geöffnet* (see III.2.2). But because creating the electronic music itself was such a complex task, it was deemed necessary to concentrate on it to the exclusion of jazz. Additionally, there was the major work of both transforming the Schoenberg Hall from a standard concert hall to a *promenoir* and designing and building the light projections.

After Robin Deirkauf had produced many sketches and a scale model of the hall, the decision was made to remove all chairs from the floor and to hide the rising rows of chairs behind a huge projection screen $(30 \times 15 \text{ m})$ covering the whole rear of the Schoenberg Hall. The floor was covered with a white ballet floor, the stage with a black ballet floor, and these were connected with a stairway of four steps to encourage the audience to move around freely between the floor and the stage. Two aluminum pylons ($6 \times 6 \times 1.5 \text{ m}$) were built on the floor; Raaijmakers had used a model of these for his lectures to explain his principle of rotating sounds in the form of "spatial aggregates." They were connected to a hanging system so that they could be moved up and down. The stage was used for the automated buffet, built on the piano elevator, so that it could descend to the basement to be filled with (neutrally colored) snacks and rise automatically at a fixed point during the program. At



Fig. 127. Frans Evers in the Schoenberg Hall



Fig. 128. Robin Deirkauf, Jan Zoet and Dick Raaijmakers around a model of the stage.



Fig. 129. Horst Rickels, two students, and Robin Deirkauf discussing light effects.

	FORM	COLOR	SOUND	MOVEMENT	EFFECT
I.	wann	laser-light Grafov	noise Tazelaar	stochastic	smoke
2.	line	brightness steps Aristotle	click-trains Raaijmakers	arpeggios	acoustic lines
3.	spiral	color circles Newton / Boerman Castel / Scheuer Goethe / Scriabin Deirkauf / Van de Lagemaat	sound colors	crescendo	fans
4.	point	non-color vs. color Deirkauf	C < C-E-A Domselaer	rest	freeze
5.	plane	Red-Yellow-Blue Zoet	chords Rickels	surround	space
6.	syncope	syncope flashes Raaijmakers dark Van de Lagemaat	Flux	silence	buffet rises
7.	diagonal	non-color	chords Rickels	granular	buffet goes down
8.	cross	laser-light Grafov	click-trains Raaijmakers	arpeggios	smoke

Table 6. **RELATIONS BETWEEN FORM, COLOR, SOUND, MOVEMENT, EFFECT FOR MONDRIAN'S PROMENOIR** (RAAIJMAKERS). the rear of the stage there was a bar was on which a row of fifty identical glasses (containing water, vodka and white wine in random order) was placed, lit by a series of neon tubes shining through a slit from below. Two projectors were placed on the small balcony behind the stage, one of them a huge laser projector bought from a former USSR army dump by Vladimir Grafov and the other an extravagant slide projector that projected a long film consisting of color filters glued to each other. Both projections were cast on the screen at the back of the hall, thereby transforming the back into the front of the hall. Light designer Kees van der Lagemaat used over seventy RGB spots to light the pylons, the pillars, the buffet, and the bar, and twelve cyclo spots were used as a special moving light effect. Sound producer Piet Nieuwint installed twenty-eight loudspeakers and a multitrack mixing table to distribute the sounds over the space according to Raaijmakers's layout.

The idea for the structure in which the music and light program was to be presented did not emerge until the final weeks of preparation. An abstract temporal-spatial structure based on simple geometric forms—point, line, plane, diagonal, cross, and spiral, to which were added two visual motion patterns *wann* (old English for "dancing light reflections") and syncope (contrasting color and non-color)—was devised. The scheme below reveals how (colored) lights, sounds, musical movements, and effects were related to forms (see Table 6).

The program was presented in three forty-minute cycles for three nights. The spectators were free to enter or leave the *promenoir* at any time. At the beginning of a cycle agitating, stochastically ordered noise patterns were heard, while fast-moving laser light was projected onto a silver blob that reflected it to all the corners of the smoke-filled *promenoir*, creating chaotically moving lines in the space. The smoke was then blown away by a "choir of fans" that was amplified and mixed with the recorded clicking sounds of the moving mirrors in the laser projector. These sounds were arranged in the form of sharp arpeggios, resulting in acoustic lines traveling through the space. Then, from the ceiling, colored lights focused on the black-and-white division line of the floor, using Aristotle's ordering of hues according to their brightness value: *albus* (white), *flavus* (yellow), *aureus* (orange), *rubeus* (red), *viridis* (green), *caeruleus* (blue), *purpurus* (purple), and *niger* (black).

With the sounds of the fans again in the foreground, the film of color filters was pulled horizontally through the slide projector, resulting in a slow parade of monumental color fields moving from right to left on the immense projection screen. The hues and order of the colors were taken from the Newtonian color circle (orange, yellow, green, blue, indigo, violet) followed by Castel's color scale (*bleu, violant, agathe, violet, cramoisi, rouge, orangé, fauve, jaune, olive, verd, celadon*). After this the colors of Scheuer's Harmonie der zwölf Sonnenfarben (see III.2.6) were projected (*Blau, Zelidon, Grün, Olive, Gelb, Aurore, Orange, Roth, Carmosin, Violet, Agat, Violant*), followed by Goethe's color-order (*Gelb, Gelbrot, Purpur (Rot), Blaurot, Blau, Grün*), and the parade of color circles concluded with Scriabin's color spiral (*Blau-grell, Blau-weisslich, Mond-Blau, Grün, Gelb, Orangerosa, Rot, Dunkelrot, Stahlartig, mit Metallglanz, Pupurviolet, Violett*). Subsequently, Jan Boerman's re-composition of Schoenberg's *Light and Storm Crescendo* (1993) was heard, with colored lights, produced by Van der Lagemaat's cyclo spots, creating a spiraling motion, a movement taken over by spiraling noise sounds mixed together with the closing sounds of the light crescendo. From these noise sounds, the note C emerged on a trombone, the slide projector transforming the projection screen into a matrix consisting of numerous light points that slowly moved over the screen. When the C transformed into a triad of three "primary" tones, the non-colored light spots disappeared and primary colors were projected on the pillars onto the second floor, which, like the chords distributed over the surround loudspeaker system, accentuated the width and height of the *promenoir*. Then, all of a sudden, these quiet sounds were transformed into the dynamic, agitated and loud motions of Raaijmakers's electro-acoustic work *Flux* (1967), which consisted of distorted trombone sounds mixed with oscillating machine sounds, while white and colored lights flashed in irregular order. During the last moments of Flux the *promenoir* became dark and finally fell silent, and the sparsely lit buffet rose slowly from the floor of the stage, accompanied by the slow, penetrating pulse of an alarm signal.

When the audience, scattered about the space, noticed the smell of the buffet, they went to it and remained there until all the food was eaten and the buffet descended once again. The rotating chords from Van Domselaer's piano piece were then played by trumpet, trombone, and tuba. These tones were stable "coups," arranged in diagonal arpeggios. Slowly, the extreme upper and very low regions of the sounds were amplified, whereas the middle region disappeared. Thus only some granular fragments of the tones were left, which were played for some time, until they were replaced by a new cycle of the choir of fans and click arpeggios, the laser projecting a cross on the screen. A new cycle began with the moving laser light as the Promenoir filled with smoke.

SCHOOL FOR SOUNDMEN 1994

THE INTENTIONS OF THE PROJECT School for Soundmen, presented on January 5-7, 1994, were similar to those of *The Academy of Light* project. In both cases early concepts from the innovation of art education were used to introduce subjects of study that were not part of the regular curriculum. Whereas *The Academy of Light* drew inspiration from Moholy-Nagy's idea for an "institute of light," the point of departure for the *School for Soundmen* was a concept written by Schoenberg in the early 1940s in which he proposed to the board of the Academy of Motion Pictures, Arts and Sciences in Los Angeles the foundation of a school for soundmen. As a consequence of his observation that the film, radio, and recording industry lacked specialized soundmen who trained in technology as well as music, he said he would initiate such training:

I would be ready to found a "School for Soundmen" (movie and radio technique) purporting to give its students a scientific and practical training in all fields pertaining to musical and technical necessities of motion pictures, radio and phonograph. (Schoenberg 1941-1944)

According to Schoenberg, American films excelled in nearly all of their aspects: action, dramatization, scenery, and photography, but this level of perfection was not found in the way music was used. He criticized the way scenes in which actors spoke were "underscored" by simply lowering the volume of the music to the lowest pianissimo, destroying any possibility of more subtle contributions from the music. Additionally, Schoenberg criticized the radio and recording industries, complaining that new music was rarely recorded or broadcast and that

the problems of recording music whose duration exceeds 9 minutes must be solved. Those interruptions destroy the continuity in a severe manner. And often, when the ending of one record and the beginning of the next are overlapping, broadcasters usually play a number of measures twice. (ibid.)

The intention of the *School for Soundmen* project was certainly not to follow Schoenberg's suggestions literally; part of the problems he described had already been solved, while others, like the composition and production of film music, are still so problematic and unrecognized that structural solutions as he had suggested are implausible. The important thing, however, is that Schoenberg, like Moholy-Nagy, was truly concerned with education and the lack of attention art curricula gave to the integration of new media technology.

Only in the last decade can one notice that a growing number of institutions have implemented new courses in this direction. Interestingly, a *School of Sound* was founded in the UK in 1998 as a biannual, international symposium on "the art of sound with the moving image."

A theme was chosen for *School of Soundmen* that was of interest to many of the students and teachers of the Composition, Sonology, Music Registration, and Image and Sound departments; namely, *New Spatiality: Music—Technology—Place*. The study project focused on three sub-themes: composed musical space, reproduced space, and the genius loci. Three readers were produced to introduce the themes, with historical and recent texts on the different subjects (Evers and Raaijmakers 1994a, b, c). Over a three-day period each of the themes received a full day of introduction by a member of the faculty and was discussed by the eighty participants.

On the first day the subject of composed musical space was discussed following an introduction by Dick Raaijmakers. In his talk he stated that sound and image are expanding in a similar way: sonically from mono, stereo, quadraphonic, and ambient to surround sound and holophony; visually from black and white to color photography, film and TV, stereoscopy, flat screen, and high definition to 3D space simulation and holography. Whereas the arts withdraw from 3D illusions, preferring a non-illusionary, conceptual world of images and sounds for example in the work of Malevitch, Mondrian, Duchamp, Stockhausen, and Cage, modern technology attempts to produce 3D illusions based on one-dimensional, electronic point technology. In the past composers often adjusted their music to the acoustics of architectural space, but nowadays composers do not want to use space in its passive capacity of adding reverberations to the sound because they want to mobilize space as a source of sound. Raaijmakers described three options for realizing this. The first option was to mark a space by using loudspeakers to form "traces," "routes," and "planes" to form imaginary movements of sound, resulting in forms of antiphony and sound polyphony, as evident in the music of Stockhausen, Varèse, Nono, and Boerman. The sounding space was autonomous and disconnected from the topographical space in which the sounds were (re-)produced. Another option was to treat space as a serial parameter subjected to compositional structure, as in works by Goeyvaerts and Stockhausen. The third option consisted of developing a "composed acoustics" according to the principle of "autosummation." This method is based on creating "sound-after-the-sound" using real-time computer technology, overruling architectural acoustics. It was this principle, employed by Pierre Boulez in his piece Répons, that was criticized by Raaijmakers in his music theater pieces Dépons/Der Fall and Der Fall/Dépons.

The next day the discussion theme was technology as reproduced space, introduced by a personal statement by Stan Tempelaars, who commented on the popularity of contemporary surround sound technology. According to Tempelaars,

monophonic sound reproduction, despite some improvement of the sound quality, has always had the disadvantage of creating identical signals, resulting in the well-known key-hole effect, whereas our ears are usually confronted with signals which are only partially correlated. The blessing of stereophonic reproduction has been that this artificial effect has disappeared. The problem with the present surround systems, however, is that they continuously appeal to the ear's alerting system, for instance by hearing a helicopter coming from the left backside whereas the image shows one coming from the right front side. There is a continuous discrepancy between the suggested space and the real space. The only exceptions to be found are the atmospheric sounds which don't pretend to give information about the direction the sound is coming from, such as the machine sounds of a submarine or the cracking sounds in a wood. But, when these technologies are trying to suggest another reality, the only way to achieve this is by developing virtual reality systems. This can be interesting, since the major problem of the present technology of music reproduction is that music is reduced to an acoustic signal, which seriously hurts the communication process. (Tempelaars 1994)

The last day of the study project was dedicated to the theme of place: the genius loci. Michael van Hoogenhuvze introduced the subject by reflecting on the historical process of disconnecting the design qualities of buildings and cities from the material resources and other characteristics of the surrounding natural landscape. Van Hoogenhuyze claimed that from the moment when artists were no longer bound to a particular place and materials could be transported over long distances, it became difficult to identify a place by its historical and geographic characteristics. In our urban environment an open space, if it is to be found at all, is often little more than an incident without any relationship to the original landscape or the history of the place. This being the case, designers have the responsibility to be extra careful in considering the shape of their designs. Since urban environments are nowadays knots in transportation networks and spatial constellations to serve a population's functional needs, little attention is given to the esthetic qualities of non-functional places. The same can be said about music. In the past composers knew precisely in what place and in what space their music would sound. Nowadays, this is usually not the case. Without being atavistic or nostalgic, it could be a challenge for composers and sound designers to compose and design sounds and music for a specific place. They might therefore hope to attract new attention to the special qualities of particular places and develop a new awareness of the relationship between a specific place and musical sound, a relationship that seems to have become superfluous in our age of electronic sound registration and reproduction.

During the evenings of the *School for Soundmen*, Raaijmakers and Paul Koek presented a number of results of their collaboration in the area of what they called "electric music theater" together with works of Cornelis de Bondt and Mauricio Kagel. During the first evening de Bondt's music theater piece *Beethoven is Doof* was performed by De Bondt and actor Hans Dagelet, followed by Kagel's *Atem für ein Blaser* performed by Michael Barker with video by Hans Roozendaal. The last performance consisted of a number of scenes from Raaijmaker's electric music theater piece *Der Fall/Dépons*, directed by Paul Koek and played by Dennis Rudge, Henriëtte Koch, Daniel Graber, and Martin Burr. The program for the second evening consisted of two re-compositions. The first was a re-composition of the sounds of *Fort* >< *Klank* (see III.23), using a ten meter tower of loudspeakers to reproduce the sound of the waterfall. The second re-composition consisted of a number of scenes from *Die Glückliche Hand* – *Geöffnet* (see III.22). During the last evening Raaijmakers presented his work Intona, in which he investigates the autonomous sound qualities of microphones by subjecting them to grinding, sawing, crushing, cooking, burning, and other such actions.


SCHEUER IM HAAG 1995

111.2.6

1995 WAS ONE OF THE MOST PRODUCTIVE years in the career of Dick Raaijmakers, with four premieres of new electric music theater pieces: *Der Stein, Mussolini's Fall, Hermans Hand*, and *Scheuer im Haag. Der Stein* is a suitcase opera based on a peculiar manuscript written by an unknown eighteenth-century German musician, Anton Scheuer. It was presented in February at the Rumori Concert in Frascati, Amsterdam and at the Royal Conservatoire during the May Festival. *Mussolini's Fall* was a huge theater piece commissioned and presented in June by the Holland Festival. Both were directed by Paul Koek and produced by the Hollandia theater company. In the fall, Raaijmakers was the central composer of the Festival in de Branding, based in The Hague, in which a variety of works were presented. In *Hermans Hand* a number of students of the Interfaculty Image and Sound played roles as extras on stage.

Der Stein could be considered as a study for the larger work *Scheuer im Haag*, in which all students and teachers of the Interfaculty participated along with a number of students of the Composition, Sonology, Percussion, Opera and Ballet Departments of the Royal Conservatoire. *Scheuer im Haag*, a co-production of the Festival in de Branding, the Interfaculty Image and Sound, and Hollandia was presented in the Kees van Baaren Theater Hall of the Royal Conservatoire on October 27 and 28, 1995. Just like *Die Glückliche Hand – Geöffnet* and *Mondrian's Promenoir, Scheuer im Haag* was a collective work realized using an open form approach. This time the subject to be "opened" was not a score or conceptual system, but the manuscript written by Anton Scheuer describing a "composing machine" that employed a parallel ordering of musical tones and colors according to their spectral order.

In 1974, the manuscript was described and offered for sale in the catalogue of Frits Knuf's antiquarian bookshop in Amsterdam. Raaijmakers had bought the manuscript and toyed with some ideas for many years without any results until 1994, when it became the basic material for *Der Stein*. He then shared it with the students and teachers of the Interfaculty to study it and to use it as the basis of a large-scale collective work.

Work on *Scheuer im Haag* occurred in three stages. First, a study of Scheuer's manuscript, in the period August 1994—February 1995, that led to *Der Stein*. Subsequently, a small team of Interfaculty teachers and students traveled to Germany to do three days of field research at locations and libraries in the area where the manuscript had been written. Many documents were uncovered, revealing a wealth of relevant facts about Scheuer and the context in which the manuscript had been produced. Finally, there was the actual open

form preparation and production of Scheuer im Haag in September-October 1995.

The study of the manuscript began with a transcription of the complete German text by Raaijmakers and a translation into Dutch by dramaturge Paul Slangen. The manuscript consisted of eighteen handwritten pages bound in a hard, orange cover. On the inside of each cover a color-circle and a circular staff with a musical scale were painted. The circles were mounted with discs fixed to the covers with ivory knobs in such a way that they could be rotated. The discs were divided into twelve segments. On some of them Ut, Re Mi, Fa, Sol, La, Si was written and connected to two series of numbers that refer to specific chords. The full title of the manuscript is *Die Harmonies der zwoelf Sonnen Farben mit den zwoelf Musicthoenen – ein Physisches Originalexperiment in 72 hervorstechende Accorden – Nebst einem Klagelied des Verfassers, und einem Deutshen fürs Clavir* (The Harmony of the twelve Colors of the Sun with the twelve Musical Tones – a Fundamental Physical Experiment in 72 outstanding Chords – Containing a Lamentation by the Author and a Deutshen for Keyboard).

The introduction was written in the form of a plea to her Royal Highness, the Princess of Orange-Nassau, and signed "Anton Scheuer in Haag, 1789." Scheuer implored the princess to reinstate him as the director of music in the health resort Bad Ems and to employ him as a teacher at the Gymnasium in Hadamar. He explained that he had lost a former teaching job because of problems with the church and his recent job as the director of music because of problems with the state. He explained that, after attempting to prevent an illegal alteration of the border between Trier and Nassau, he had been arrested and sent to jail in Koblenz, in Trier. The stone marking the border had been moved by superintendent Comrad Cavarelle from Trier in order to get hold of one of the mineral water springs in Niederselters, a small town near the river Ems, which formed the border between Trier and Nassau. Cavarelle had been working as a commission agent for the springs belonging to the court in Trier. Scheuer observed his illegal act and informed the court in Dillenburg (Nassau), but the message first fell into the hands of Trier, leading to Scheuer's arrest by Trier officials and a trial in which he was sentenced to jail for three months by the court in Koblenz. After he had been set free, he immediately took up his activities as a secret agent, at which time he was arrested again and sentenced to jail for another six months. During his stay in jail Scheuer read about how mathematician Asclepi in Rome and Castel in Paris had compared optics with music.

In his wisdom the Creator had hidden twelve colors in the sun and the rainbows in such a way that the one trusts the other, the one blends with the other, and loses itself in that (...) With a prism one can see the twelve colors that make the eye happy, as the musical tones do that to the ear (...) The harmonic circles clarify this parallel: Blau (C), Zeladon (Cis), Grün (D), Olive (Dis), Gelb (E), Aurore (F), Orange (Fis), Roth (G), Cramoisin (Gis), Violet (A), Agat (B) and Violant (H) (...) As long as the twelve colors and tones are not ruled by a King and dwell through each other in the wild, our eye and ear don't find rest or satisfaction. Everything moves around without direction, as a ship which has lost its mast and helm.

In Der Stein, Raaijmakers presented Scheuer as a psychiatric patient living in a mental asylum in Haag, a small town near Munich. In the manuscript Scheuer described himself as a "patient" living in "Haag." At that time the field research had not vet revealed that "Haag" actually referred to Den Haag (The Hague) in the Netherlands, where the Princess of Orange-Nassau then lived, and not to one of the thirty towns in Germany also called Haag. The field research further revealed that, following his jail sentences, Scheuer had lived a stable family life and taught French and Latin at the Gymnasium of Hadamar. He achieved this despite enduring and neurotic complaints documented in his many letters requesting more money or more wood in the winter. With this all vet to be discovered, Raaijmakers based Der Stein on the confused communication between two main characters, the mentally ill Scheuer and the director of the asylum, himself suffering from severe mental disturbances. During his conversations with Scheuer the director often confuses their situation with the relation between Anselm Ritter von Feuerbach and Kasper Hauser and between Walter Morgenthaler and the schizophrenic painter Adolf Wölfli; both patients had ideas comparable to Scheuer's about the relationship between sound and color. This exaggerated interpretation of Scheuer's state of mind developed into a fantastic and crazy dramaturgy, making for a funny and impressive piece, especially thanks to the intense acting of Bert Luppes and Benjamin Verdonck and the unconventional and uncompromising direction by Paul Koek.

The research trip to Germany was undertaken because of the general lack of knowledge about Anton Scheuer. Konrad Boehmer, head of the Institute of Sonology, had prepared the field research by finding archives with historical data and court reports related to Scheuer and writing letters announcing our visit. In early April, Boehmer, three students, and I traveled to Koblenz, where we immediately spotted a tower, the Heribert-Turm, once part of the old fortress Ehrenbreitstein, that looked similar to the sketch of the tower in Scheuer's manuscript. Since the fortification had been demolished in the nineteenth century, it was difficult to discover whether this tower had ever been used as a prison, but the similarity of its appearance to the drawing was so striking that we took it as a promising sign for the success of the trip.

The second day was spent driving around to the different places in Scheuer's story. First we visited Dillenburg, seat of the court of Orange-Nassau. There, we left a request in the town hall for the archivist to look for documents relating to the story and we visited Orange Tower, which houses a museum dedicated to the history of the Orange-Nassau family. We discovered that the princess to whom Scheuer had addressed his story and plea was Princess Wilhelmina van Orange-Nassau, wife of Prince William V of Orange, and that she lived in The Hague at the time Scheuer sent her his manuscript. From Dillenburg we traveled to Hadamar, the site of the Gymnasium where Scheuer had worked as a teacher, and then to Niederselters and Oberselters, two small villages connected by a bridge over the Ems River. This was the spot where the marble border marker had been placed with the emblem of Trier to prevent the house of Orange-Nassau from getting hold of the spring in Niederselters.

To use of our time efficiently, we decided to split into two groups on the following day. Boehmer and I visited the Hessisches Hauptstaatsarchiv/Nassauische Landesbibliothek in Wiesbaden, and the students went again to Oberselters and Niederselters. The library of Wiesbaden had prepared for our visit, with dozens of portfolios filled with documents from the period 1788-90 already pulled from the shelves. After one and a half hours we found the first document confirming Scheuer's existence: a collection of papers concerning the Gymnasium in Hadamar, in which Scheuer is listed as one of the teachers of Latin and French in that period. Later, we found more documents, including the letters in which Scheuer complained about his low salary or in which he asked for more wood. Returning proudly to the hotel to inform the students about our findings, the students laughed because their visit to Selters had turned out to be even more successful than ours. They told us about their talk with a certain Ms. Geisler there, who informed them about the local historian, Eugen Caspary, who had studied Scheuer's life and his activities as a double-spy for Nassau and Trier in detail. Although Caspary could not be reached personally, Ms. Geisler found a copy of the lecture he had given on the subject in 1990 for the local union of historians, which clarified a lot about the intriguing story, including the involvement of Prince William V of Orange and Princess Wilhelmina of Orange-Nassau.

On the last day of the field research Boehmer and I visited the Laudeshauptarchiv Koblenz, where we found documents pertaining to Scheuer's imprisonment. We learned that Scheuer had indeed been jailed twice. The first time, he spent three months in prison before being released because of his deeply expressed loyalty toward Trier. Immediately after his liberation he started to spy again for Nassau, after which he was sentenced to jail for six months. In the afternoon we caught up with the students, who had traveled to Bad Ems, a former health resort once visited by the royalty and aristocracy from as far as England, Sweden, Russia, and Italy. This was the place where Scheuer had been the director of music before he began his spying activities. It is quite probable that, in the very luxurious environment of the casino, he had become attracted to big money and double-talk. Since our field research had already been so unexpectedly successful in such a short time, we were hardly surprised to find out that Bad Ems was the location of the German governmental espionage school. At the time of our visit it was just closing down, following the reunification of Germany and the move of the national government to Berlin.

Back in The Hague, all documents were carefully read, including those mailed later by the archivists. From the hundreds of handwritten pages a detailed reconstruction was made of Scheuer's life, of his actions as a double agent and of the political climate at the time, which had been characterized by an incredible animosity and jealousy between the states of Trier and Nassau. Since 1771, the mineral water source in Niederselters had been exploited successfully by Orange-Nassau. In 1785, a new outlet of the spring was detected in Oberselters, and the court of Nassau hoped to expand its income by exploiting this second source too. This sharpened the already existing conflict with Trier since the new source was in Amt Camberg, which was jointly ruled by Nassau and Trier. Legal decisions could only be made when representatives of both rulers agreed. Trier had already disputed Nassau's exploitation of the first spring in Niederselters. From the moment the new spring in Oberselters was found, both parties tried to prevent its exploitation by the other with all kinds of illegal actions. Some citizens conspiring with Trier began to exploit the source illegally, upon which Nassau hid the source of the spring with stones and grass (Eisenbach 1991).

In 1788 Trier fought back, devising a secret plan to replace a border marker such that both springs would fall into its hands. Anticipating this act, Nassau hired Scheuer to collect information about the plans Trier was preparing. Scheuer was quite willing to do so, having lost his job as a private teacher following a conflict with a Catholic priest. Scheuer must have been quite sensitive to this new patronage since, at that time, the Church still reigned in Trier, and Nassau was ruled by royal aristocracy without ties to Rome. This is the historical context of Scheuer's adventures as a spy, his imprisonment, the composition of the manuscript, and his return to teaching. Interestingly, Scheuer's story covers only a short period in the conflict about the springs, which culminated in 1794 when hundreds of armed men gathered at the "golden ground." Though bloodshed was avoided, tension lasted for a decade marked by dozens of incidents. After the spring had been repeatedly covered and uncovered many times, the conflict finally faded in 1811, when it was decisively filled with sand and stones. Sixty years later, when Prussia annexed Nassau, the spring in Oberselters saw new life with the founding of the commercial company the Mineral Spring of Nassau-Selters.

During September and October 1995 the piece *Scheuer im Haag* was prepared by a huge collective of seventy teachers and students of the Interfaculty Image and Sound and some of the other departments of the Royal Conservatoire. A rehearsal space was found in the former public library of The Hague. During these weeks a scenario was developed, consisting of nine scenes situated in the main locations of Scheuer's story: the health resort in Bad Ems, where Scheuer had been the music director, the party hall in Selters where Scheuer had learned of the conspiracy to replace the stone marking the border, the bridge where the stone had been placed, the carriage in which Scheuer had been transported to jail after his arrest, the dungeon in the tower where he had worked on his manuscript and his colormusic experiments, the palace in The Hague where his plea to the Princess of Orange had been received and, finally, the school in Hadamar where he had taught Latin and French.

Two weeks before its premiere the whole piece was rehearsed using makeshift props found in the library. Despite its rough state the rehearsal inspired everyone involved, and energy permeated the atmosphere for the remainder of the project. Increasingly extreme proposals were made during the discussion sessions, and for the first time students from other departments of the Conservatoire prepared contributions. Paul Koek invited composer Yannis Kyriakides to form a group of Bohemian musicians, Luuk Nagtenaal was engaged to form a group of percussion students to play some pieces on wood (representing Scheuer's permanent need for more wood), and Hannah Samson was asked to coordinate a group of ballet children to perform as Scheuer's school class.

As usual, Raaijmakers came up with the most extravagant idea. Since the order of the scenes followed the traditional theatrical unity of time, space, and action, he was afraid that the piece would be no more than a regular burlesque theater piece. He began considering the creation of a "satellite module" to penetrate all scenes and disturb the oiled machine of the storyline. He introduced this need at one of the group meetings, to which a student responded with a proposal to utilize the thousands of metal bookcases and shelves still in the library that were waiting to be thrown away. This inspired everyone present to imagine ways these could be used as building materials for the stage sets; they were connected by screws, making it possible to use them as construction modules. A group of students working with the architect and guest teacher Eric Vreedenburgh made designs to represent the moving roof, the bridge, the fortification, and other monumental forms.



Fig. 131. Bert Luppes and the group of young ballet students. *Fig.* 132. A huge piano keyboard played with a giant hammer.



Raaijmakers, viewing the piles of cases and shelves, suddenly envisioned them all on stage as a hindrance to the actors' movements. A plan was made to start the piece with an overture consisting of hundreds of bookshelves falling from the top of the theater onto the stage, and then removing and replacing them throughout the piece. All the materials were moved to the Royal Conservatoire a week before the premiere to begin experimenting with the falling shelves. The floor of the stage was covered with wood and mounted with contact microphones to amplify and filter the sounds of shelves and bookcases landing on it. Tests to determine what would sound best revealed that, simply because of their weight, it was impossible to drop more than a few shelves at a time. Furthermore, the effect was far from spectacular, and the sounds were weak. A Swiss student, Daniel Graber, recalled that a mountain had once collapsed in Switzerland due to its own massive weight. He posited that a slide, being an artificial mountain side, might produce the desired effect, and indeed it was possible to prepare large and heavy piles of shelving that fell down because of their own weight when pushed to the edge of the slide. In this way it was even possible to compose the rhythm of the resulting sounds.

The piece was performed as a tryout on October 27. The premiere took place the following day as an overture to the celebration of Raaijmakers's sixty-fifth birthday. Once the audience was seated, the fire screen was pulled up, and simultaneously the first pile of shelves clattered down, followed for ten minutes by a rain of three thousand shelves and racks, bouncing up and moving all around until they found their place on stage. After this, fifteen students, dressed in eighteenth-century lackey costumes that producer Jan Zoet had borrowed from the Brussels opera house, entered the stage and began removing the shelves, making room for the actors. A group of twelve-year-old ballet students took their seats at small tables and were welcomed by their teacher Anton Scheuer, played by Bert Luppes. They sang a German children's song that was found during the research trip. After this, the children did a dance set to a simple choreography. While the children were dancing, smells were brought into the theater hall by two "odor lackeys" placing heated bowls filled which fragrant oils in front of two fans that blew the smell in the direction of the audience. Deirkauf had made a composition of smells for each scene, a series starting with the smell of camphor followed by the fragrance of Anaïs Anaïs. After this dance, the children left the stage and the first scene started, situated in the casino of the health resort Bad Ems.

A small orchestra, situated at the left side of the theater in front of the stage, started playing a medley of Bohemian songs, and a huge chandelier was unpacked from a wooden case hung over the stage. Then a number of well-dressed ladies appeared on little carts that were moved by the lackeys, who had stopped replacing the shelves; meanwhile the smells of eucalyptus and mint were spreading through the hall. The ladies started playing cards and throwing balls on roulette tables, while recorded casino sounds were played to create an overall agitated atmosphere. Slowly, this scene morphed into the next scene, which depicted the party hall in Selters where Comrad Cavarelle from Trier had arranged a feast for the citizens of Niederselters to distract their attention from his plans to move the border stone by getting them drunk and sleepy. But the conspiracy was observed by Scheuer, which was expressed in the scene by large listening horns hanging from the ceiling of the party hall, while the citizens were drinking beer from glasses lit from the inside. The ceiling was made of an arrangement of bookcases so connected that, when pulled up, the ceiling could make moving waves representing the distorted perception of the beer-drinkers. The



Figs. 133-134. *Top:* Diana Tyourkedjieva, Gabrielle Moulhen, Anna McMichael. *Bottom:* Image & Sound students Peter Bindels, Saša Milanovic, Remco de Jong, Alex Schaub, Martin Putto, Stephane Brys, Boris Debackere



sound consisted of some fragments from Mozart's opera *Don Giovanni* mixed with the sound of Morse code and mumbling voices, the smells of sausages and beer were produced, and video recordings of kaleidoscopic images were projected in the background.

Then an aria was sung live by Hans Vandenburg, former lead singer of the pop group Gruppo Sportivo. The aria was based on a text found in Eisenbach's article describing the start of the conflict and accompanied by recorded music played by Edwin van der Heide with his electronic hands. Van der Heide was situated near the sound engineers in the middle of the hall. As soon as he stood up and started playing, he was lit by a spot, which resulted in a duet connecting the singer on stage with the audience area where Van der Heide was playing. After this aria, the party hall was cleared and a group of lackeys started to dismantle the ceiling, transforming it into another shape that would be the central place of action in the next scene. While they were doing their job, the semi-transparent front screen came down, making the stage invisible, as the smells of cedar and pine began filling the theater hall. One could hear the sounds of water and cutting stone, and the silhouette of a huge bridge, made from the shelves, appeared on the screen. The whole scene was played in the form of a shadow projection, showing the silhouette of Comrad Cavarelle and his companions, who dragged a black border marker with the emblem of Trier to the bridge where they cut out a hole in which they placed the stone. They were observed from a distance by Anton Scheuer, easily recognizable by his silhouette and his characteristic movements. At that point the concrete sounds disappeared, while re-compositions of Beethoven's Fidelio by composer Kees Tazelaar were played.

After the screen had been pulled up and the bridge taken down, a video was played at the back of the stage, representing the carriage in which Scheuer was seated after he had been arrested by the officials from Trier for his act of espionage and his attempt to deliver his report to the court in Nassau. In the video only the contours of the cage and its windows could be seen with the contour of the figure of Scheuer seated behind one of the windows against a background of moving trees and accompanied by the smells of grass and lavender. Our research had shown that, after his arrest, Scheuer had tried to convince his guards in the carriage to travel immediately to The Hague, where the Princess of Orange-Nassau would reward them with an enormous sum of money. But his guards had turned down his offer, after which Scheuer had started to free himself from his handcuffs. To represent this, an escapologist was hired to do a Houdini act on stage by freeing himself from his chains while being humiliated by the same soprano singer who later would play the role of the Princess of Orange-Nassau, in the palace scene. After this scene, the fortification was built by connecting a number of bookshelves into long strips hung vertically next to each other, thus creating a huge, irregularly formed, unstable projection screen on which slides were projected with overviews of Ehrenbreitstein fortress together with fragments of the film made by filmmaker Frank Scheffer of Stockhausen's Helicopter String Quartet. This was mixed with the sound of one of the Wölfli songs, as it had been played in Der Stein.

The next scene consisted of the dungeon where Scheuer was imprisoned. While the smell of gunpowder filled the hall, Scheuer could be seen conducting his color experiments in a laboratory, where he worked with colored glass bowls in which he mixed the colors, lit fireworks, and read books, while a text by composer Peter Schat was lip-synced by one of the lackeys. The text glorified universal truth, as expressed by the major musical triad, which was demonstrated on a huge piano keyboard played with a giant hammer while a color circle was projected on a monitor. Then the stage was emptied again to be changed into the palace of the Princess of Orange-Nassau, which was indicated by the smells of oranges and mandarins. On the floor, a huge wheel was covered with color filters in the way that Scheuer had drawn the color circles in his manuscript. The wheel was suspended horizontally over the stage, pulled up, and lit in such a way that the color circle was projected on the stage floor. Twelve lackeys walked onto the stage and took their positions on one of the colored segments of the circle. They all had organ pipes mounted on their backs and connected to tubes that they could blow into to create the sound of the chords that had been composed by Horst Rickels. The wheel was turned by long ribbons, which swirled around while the lackeys walked in a circle, playing their chords.

When the sounds of the organ pipes had been replaced by music played by the Bohemian orchestra, the Princess of Orange-Nassau came forward from the back of the stage. She opened her dress, from which two children appeared who called the other children from backstage to take their places at the school tables. Then Scheuer appeared again in his role as a teacher and addressed the children by singing a song on the future of technology, using phrases written by F.T. Marinetti and accompanied by the sound of a New Age synthesizer song. While he sang about a future in which it would be possible to replace parts of the human body by new technological means, the orchestra pit rose to the stage level, revealing a monumental banquet with big pumpkins and pretzels and hundreds of plates with all kinds of German food. The audience was then invited to join the banquet to celebrate the fifty-sixth birthday of Dick Raaijmakers.

SONIC ACTS FESTIVAL OF SOUNDS AND IMAGES 1994-2003

111.2.7

SINCE THE MONEY submitted by the innovation fund covered the costs of the projects in the period 1991-1993, new means had to be found to allow for the continuation the collective projects. In 1994, an opportunity to realize this was offered by club Paradiso in Amsterdam, which was looking for new ways to innovate its programming. This resulted in the co-founding of a new festival, Sonic Acts, in which new forms of electronic music are presented in a multimedia program, consisting of live electronic music, theatrical acts, DJ and VJ sets, films, video, and composed light. From 1994 till 2003 participation in the Sonic Acts festival was part of the core curriculum of the Image & Sound course. Every year teachers and students worked for a long period on the preparation and realization of the festival, in which students were confronted with the regular demands of the professional environment.

In 1994, the Amsterdam-based club Paradiso showed interest in producing a "festival of sounds and images" in collaboration with the creative departments of the Royal Conservatoire. The idea to produce an event like this was triggered after free-lance reporter Minou Op den Velde had written an article in the CJP youth magazine about the new musical interfaces and installation pieces built by the students of the Sonology and Image and Sound departments that resulted in live electronic music and new media art forms. Since Op den Velde had previously worked for the VPRO television programs *Onrust* and *TV-Nomaden*, in which she had reported on producers of house music and on sonologists working at the Conservatoire, she thought of a way to bring these groups together. At that time, Paradiso's new director, Pierre Ballings, was searching for new impulses to innovate Paradiso's programming and he agreed to develop a new program in which the experimental composers and sound artists would be confronted with the producers of new forms of popular electronic music.

Since its inception, Sonic Acts had been organized yearly on an experimental basis and every year a new editorial formula had been developed by a continually changing team of editors working on the basis of what Ballings called "a working society." In some significant ways this ideal resembled the method of the open form used by the Interfaculty Image and Sound in its collective projects by working as much as possible in a horizontal structure based on bottom-up concept development and top-down support in the form of financial and organizational backing, all of this balanced by an editorial filtering of proposals that were judged on their realistic possibilities. Certainly, this approach implied that risks were sometimes taken concerning the quality of the pieces and productions to be presented, but this prevented the festival from relying on a smooth and slick way of programming based on an easy and predictable success formula. One of the consequences of this approach was that much work had to be done to refresh the formula each year, to find new editors who could handle this challenge, and to explain these yearly changes to the supporting funds. This last task in particular had become a project in itself since our actions would eventually significantly contribute to a new initiative taken by all main art funds to realize a new procedure and to find extra financial means for interdisciplinary productions in the field of art and new media.

The first Sonic Acts festival was produced and edited by Pierre Ballings, Minou Op den Velde, Ikaros van Duppen, Paul Berg, and myself, and it was presented on August 18 and 19, 1994. The program focused on the live presentation of electronic music created by new musical interfaces, controllers, and sensors that connect computer stored data with human movements and gestures, thereby enabling performers to play live electronic music on stage. During Sonic Acts 1994, these new interfaces were demonstrated and discussed in the afternoon session and played in live performances on stage during the evening programs. The development of new musical interfaces was highly stimulated by Michael Waisvisz and his collaborators at STEIM, the Amsterdam-based studio for electro-instrumental music where Waisvisz had developed The Hands, a new type of high-tech gloves that allowed a performer to use each of his fingers to trigger sound-samples stored in a computer, and to re-work them live on stage. Waisvisz developed The Hands as a criticism to the static character of the concerts of electronic music produced during the 1960s and 1970s when taped music was played without any visual or physical musical component. Based on his wish to restore this, Waisvisz had started to investigate the possibilities of digital and MIDI-technology to create new musical interfaces that would be able to create physical action. His work as a researcher at the Sonology department had resulted in the development of new musical instruments by a substantial number of students, often supported by the researchers and technicians of STEIM.

The following interview was conducted by Alessandro Romanini, curator of the section "Sculpting Time" at the XII Biennale di Scultura, Carrara, 2008, and originally appeared in the journal HiArt I: Innovazione tecnologica e nuovi linguaggi (2008).

ALESSANDRO ROMANINI AND FRANS EVERS

Art and Technology. a Multi-Century Dialogue

A.R.: Since when is it possible, going back in time, to start talking about the relationship between art and technology?

F.E.: Although for most people today the concepts of "art" and "technology" represent completely different domains of human endeavor, in earlier times this difference was not evident at all. For the old Greeks music could be studied from a number of different but related points of view: **theoria**, **epistēmē**, **technē**, and **mathēma**, concepts which were more or less equivalent with the later to be used Latin terms: **speculatio**, **scientia**, **ars**, and **disciplina**. From this we may conclude that already early in history the meaning of concepts such as **art**, **science**, and **technology** were not so strictly separated as they are today. Interestingly, music and art were considered to reflect an amalgamate of philosophical speculation, science, technology, mathematics and disciplinary know-how. However, even without pointing to these early theoretical considerations, we know that already in prehistoric times the invention of new technologies always resulted in new forms of artistic expression, whether in the form of ornamentation found on functional objects, as a purely autonomous quality of beauty in the form of jewelry, or as objects which may have been used for ritual aims or to express social status.

A.R.: Starting with the magic lantern, passing through the shadow plays, kaleidoscopes to panorama and diorama, artists and experimenters have felt the need of involving time and movement in the representation of reality. What have been the dynamics and principles of technical involvement by the artists from the Renaissance to the beginning of the 20th century?

F.E.: When, around 550 BC, Pythagoras was observing some blacksmiths at work in the forge, he noticed that their big and heavy hammers produced lower sounds than the smaller hammers which produced higher pitched sounds. This observation formed the basis of the experiments by the Pythagoreans with the monochord, resulting in exact knowledge concerning the numerical proportions of the lengths of the string expressing the harmonic relationships of the tones within the octave. For many centuries this knowledge was used to develop the precise tuning of string instruments, flutes, and bells. Another major step in the development of musical instruments was the invention of the hydraulis, the water-powered organ, by Ktesibios of Alexandria around 250 BC. The organ became quite popular in the Roman Empire, where emperor Nero was one of its dedicated players. During the decline and fall of the Western part of the empire around 475 AD the instrument survived in Byzantium from where, at the beginning of the Renaissance, it was exported back to Italy, where it started its second life. This time the organ was further improved by transforming it into

The concept of the unity of the senses has been a favorite subject of the arts since times immemorial. a completely automated organ by the invention of the **cylindrus phonotacticus**, the player mechanism of the organ. These automated organs where described in detail in Athanasius Kircher's famous compendium on music, **Musurgia Universalis**, which was written in Rome and printed in Amsterdam in 1650. Specially interesting is the picture of an organ on which a **kinetic sculpture** is mounted, consisting of four blacksmiths with their hammers. While the organ plays the programmed melody **Musica Pythagorica** the blacksmiths move their hammers up and down, referring to Pythagoras's **synesthetic observation** concerning the significant relations between visual and aural perception and the physical dimensions of **size**, **weight**, and **pitch**.

This multimedia organ may be seen as a tribute to the age old knowledge of the Pythagoreans but also as a foreshadow of the future technological and social-economical processes of **mechanization** (resulting in the industrial revolution since the late eighteenth century) and **automation** (resulting in the information revolution since the late Twentieth century). Whereas at the same time the idea to construct such an automated audiovisual instrument may simply be enjoyed as an early prototype of a contemporary **art installation** consisting of a musical piece and a kinetic sculpture expressing an informative story.

A.R.: First photography, then cinema, have drawn the starting point of a direct relationship between artistic representation and technological medium, changing deeply the concept of representing reality. From your point of view, in which way painting and the other visual arts have reacted to that? Which formal and technical solution have they chosen?

F.E.: Evidently, photography and cinema have had an enormous influence on painting and the visual arts. The reproductive powers of these technologies forced the fine arts to look for other pictorial aims than to represent reality. In the course of a few decades visual reality was deconstructed in its constituting elements: **color, lightness, point, line,** and **plane**. By the early Twentieth century abstract imagery started to replace naturalistic figuration. Wassily Kandinsky looked for a new autonomous basis for painting by holding the non-referential nature of music as an example for painting which should become to be based on compositions of **colors, lines, geometrical shapes,** etc... Or, as Picabia formulated it: "an attempt to express the purest part of the abstract reality of form and color in itself." For other painters, such as Piet Mondrian, the traditional interest in natural forms of the landscape became replaced by an interest in the geometrical and constructive forms of the cityscape.

But there were also painters who were more radical and completely rejected the medium of painting by using the electric media to develop completely new forms of light art (i.e. Thomas Wilfred, Nicolas Schöffer) and **abstract cinema** based on the **animation technique** (Walther Ruttmann, Viking Eggeling, Oskar Fischinger). Interestingly, all of these former painters not only shared an interest in what was called at that time the **fourth dimension** (space/time), but also in the original ideas of Louis Bertrand Castel who from I725 had been promoting the idea of **the art of painting sounds** and the **ocular harpsichord**—an instrument which in the XIX century, when many of them were actually built, became commonly called a **color organ**. Castel's idea of a **musique visuelle** (visual music) has been re-invented by almost every new generation of artists wanting to explore the growing potential of the electric, electronic and digital media to further develop an autonomous language of moving image and sound. A.R.: From a theoretical point of view, Wagner's Gesamtkunstwerk in the mid XIX century—and the later theory of time perception by Henri Bergson affected the theoretical, perceptual, and artistic parameters of modern art and the way of feeling and perceiving reality. By the very end of the XIX century multiple and radical transformations of the perceptual and esthetic parameters and principles took place, due to big amount of technical innovations and new scientific discoveries such as the popularization of train transportation and telegraph, electric light, cinematography, Freud's interpretation of dreams, Max Planck's theory, Röntgen's detection of X-rays, etc. Can you describe your interpretation about how this affected artistic expression and human perception?

F.E.: The scientific and technological progress which culminated at the end of the XIX century in many new inventions not only had an enormous influence on society at large but also left its marks on the art of the Twentieth century. During the first two decades everywhere in Europe artists founded new arts movements to formulate artistic answers to the challenges of these new developments. In Vienna the Wiener Werkstätte (founded by the architect Joseph Hoffmann and the painter Kolo Moser in 1903) and the Second Viennese School (founded by Arnold Schoenberg, Anton Webern, and Alban Berg in 1904). In Italy the Futurists (founded by Fillipo Tomasso Marinetti in 1909) in Munich Der Blaue Reiter (founded by Wassily Kandinsky and Franz Marc in 1912), in the Netherlands The Stijl (founded by the painter Theo van Doesburg in 1917), in Weimar Bauhaus (founded by architect Walter Gropius in 1919) responded to the broad call for and need for a new esthetics by creating new art and publishing their ideas in magazines and manifestos. Despite many differences between these groups in intention, taste, and style, almost all of these artists shared the common conviction that their proposed artistic innovations should reflect and stimulate the social changes taking place in society at that time. In the fields of the fine arts abstract and constructivist imagery started to compete successfully with representational figuration and symbolist imagery, and in music a-tonal and formal approaches to composition opened new musical and sonic perspectives. These revolutions, and their parallels in the fields of dance, theater and literature have been described by art historians, musicologists, dance, theater, and literature-scholars in detail.

But, despite the depth reached in understanding the innovations which took place within the domains of each separate discipline, hardly any attention has been given to two, at least equally important, artistic revolutions which re-shaped the arts in the twentieth century: I) the de-bordering of the artistic disciplines; and 2) the role technology and new media played in this process. One of the most peculiar characteristics of modern art has been the recurring efforts made by avant-garde artists to dissolve the boundaries between the artistic disciplines. When reviewing the development of the arts during the twentieth century it can be observed that many artists proposed new concepts for art works in which elements formerly belonging to separate artistic domains were brought together to interact in multi-, inter-, and meta-disciplinary works of art. Challenged by new technologies new esthetic concepts were proposed to unite the arts by creating new **transformations** and **configurations**.

Music and painting came together in the **phantasmagoric** and **psychedelic** images of the **new media**, in **light art** and **experimental film** which found their way to a small but dedicated audience in art houses and underground venues. And all art forms together were suggested to collaborate in new total theater concepts since Wagner had proclaimed the **Gesamtkunstwerk** which was supposed to become the art of the future intended to **immerse** and **overawe** mass audiences with the director's conceptions of a new world culture based on the proud history of Northern Europe. Interestingly, it wasn't the opera or the total theater, but the newly invented cinematography that was to become the most suitable medium realizing this aim **in extremis** by the spectacular feature films produced by the commercial studios in Hollywood and Bollywood.

A.R.: Around the 1920s a big amount of artistic experimentation driven by the synesthetic concept (meaning the attempt to create a relation between painting and music, cinematic experimentation on the rhythm, the relation between image and sound etc.) was tying art and technology. In which way you think they affected the artistic evolution and how can we detect in today's art and perception the result of this experimentation?

F.E.: Although the word synesthésie first appeared in France around 1860, the concept of the unity of the senses has been a favorite subject of the arts since times immemorial. Already thousands of years ago the sounds of music were described in terms of color. But we also know that the interest in synesthetic phenomena (colored hearing, synesthetic metaphor, creative synesthesia) is not a cultural constant. Periodically artists seem to lose and regain the interest to express the unity of the senses and the unity of the arts in poems, paintings, music, and theater pieces or, nowadays, in all kinds of digital multimedia, intermedia and metamedia art. Around 1850 the composer Wagner and the poet Charles Baudelaire expressed this synesthetic ideal in respectively the concept of the Gesamtkunstwerk, and the poem "Les Correspondances." Despite their rather different specific motivations, between 1910-13 synesthesia as an artistic means was used by the composer Arnold Schoenberg (to express his protagonist's Freudian crisis resulting from the conflict between love and creation by the abstract play of colors and forms as being like **sounds for the eye**), the painter Wassily Kandinsky (to express a theater of the future by synthesizing music, color, and movement by juxtaposing the arts in their external movements based on their **inner necessity**) and the Futurist painters Bruno Corra and Arnaldo Ginna (who wanted to create a stupefying intensity of projected colored light to convince the masses). Schoenberg wanted to realize his drama with music, The Lucky Hand, as a machine consisting of a film in which the colors should be hand-painted on the celluloid to arrive at the "exact opposite of what cinema normally hopes to achieve. I demand the greatest unreality! The general effect doesn't have to be a dream, but something similar to music, to harmony," while the music should be played by an Aeolian Organ, one of the first automated player pianos. For Kandinsky his monumental theater piece The Yellow Sound had to demonstrate his criticism of the Wagnerian method of increasing the dramatic effect by the purely additive means of synchronizing the movements of the music and the gestures of the singers with the movements of the props and visuals of the stage design. And Corra and Ginna who didn't refer to Castel's art of painting sounds but to the 19th century physicist Tyndall's work on making sounds visible, first built a color piano to transfer the tempered scale of music into the field of color before they started to use the film medium, experiments which are all described is their manifest Abstract Cinema - Chromatic Music (1912). Unfortunately the film version of The Lucky Hand was never realized, whereas, according to Schoenberg, the few theater versions produced during his life were not satisfying at all. But, The Yellow Sound was even never produced at all during Kandinsky's life and only two time after his death. And all Corra and Ginna's film experiments are lost.

But, fortunately, in 1916 the theater critic Bernhard Diebold wrote a series of articles in the Neue Zürcher Zeitung on Expressionism and Cinema, in which he called for "a new blending of the fine arts, music, dance and cinema by artists who would have to use the best techniques and accumulated wisdom of painting, sculpture, dance and music to create fine and perfect art works (preferably abstract in nature) in controlled time and space." The painters Viking Eggeling and Hans Richter, who at that time lived in Zurich to participate in the Dada activities, upon reading the article in

the newspaper, immediately left for Berlin were they started to work on their films **Symphonie Diagonale**, respectively **Film ist Rhythmus**. Independent from them, Walther Ruttmann had started to work on his first abstract animation fim, **Lichtspiel Opus I**, which premiered in 1921. A few years later, in 1925 in Berling the first synesthetic films were presented during the group manifestation **Der Absolute Film**, in which also the semi abstract film experiments by Fernand Léger, **Images Mobiles**, and René Clair's and Francis Picabia's **Entr'acte** took place. Interestingly, also Ludwig Hirschfeld-Mack's **Farbenlichtspiele** were presented, experimental plays consisting of music and light projections which he had developed in the Bauhaus in Weimar a few years earlier.

1925 may not only be considered a the year when synesthetic art in the form of **abstract film** and light art came of age, but it may also be considered the birth year of the first scientific theory of perception based on the notion of **the unity of the senses**, a theory which was published by the ethnomusicologist Erich von Hornbostel. Although Hornbostel's theory stimulated the study of natural and artificial forms of synesthetic perception in the psychology laboratories in Germany and the US, his theory did not attract a wider circle of scientists prior to 1978, when the psychophysicist Lawrence E. Marks published his book The Unity of The Senses - Interrelations among the Modalities. An important reason for the almost complete disappearance in the interest in perceptual synesthetic phenomena after 1933 was the outbreak of WWII and the forced emigration of scientists and artist from Germany to the US. And another, not less important cause has been the removal of the keyword synesthesia from the Psychological Abstract by the American Psychological Association, shortly after World War II, for reasons which have not yet been elucidated. One of the main side-effects of this intellectual suppression has been that synesthetic art in the US and elsewhere went underground, a situation which was first given attention by Gene Youngblood, who, in his book Expanded Cinema (1970), described the impact of synesthetic cinema in the context and perspective of the emerging electronic culture, the videosphere and the global intermedia network, a situation which until today has hardly received any serious consideration by art critics and cultural theorists. Despite the growing interest in recent years in several countries where synesthesia associations are founded in which scientists and synesthetes discuss a wide range of spontaneous synesthetic phenomena, it has to be concluded that the mental condition of creative synesthesia is still hardly known and understood. Artistic synesthesia is still a matter of the happy few artists who have marked the world of art-rock during the 1970s and '80s in New York City, as this was recently shown in Tony Oursler's Synesthesia Project (2004). Oursler interviewed "twelve legendary figures in the downtown music, performance and art scenes: John Cale, Thurston Moore, Dan Graham, Genesis P-Orridge, Kim Gordon, Glenn Branca, Laurie Anderson, Tony Conrad, David Byrne, Lydia Lunch, Alan Vega, and Arto Lindsay. These works were originally included as one element of Oursler and Mike Kelley's multimedia installation The Poetics Project. These conversations reveal fascinating insights and anecdotes from some of the most influential figures in the experimental rock and art underground of the 1970s and 80s, from pre-punk innovators to post-punk icons, from industrial and avant-garde music to noise bands and No Wave."

A.R.: What role played the birth and the development of the urban agglomeration and metropolis at the start of the Twentieth century, with its exponential growth of sound and visual input and stimulation of human perception, in creating new ways of perception and the contemporary artistic solutions?

F.E.: Instead of answering this question in a general way, I suggest to take Mondrian as an exemplary artist who started his career as a naturalist landscape painter but who became increasingly fascinated by the phenomena of the modern city during the course of his life. Although many people know his compositions, consisting of lines and planes in primary colors and non-colors, not many people know that Mondrian's first works in this style resulted from looking through his house's window to the facades of the buildings at the opposite side of the street. In his paintings this fascination for the city's structures finally resulted in his last painting, Broadway Boogie Woogie, which may be interpreted as a bird's eye view of the street grid of Manhattan. However, his fascination for the urban phenomena was not restricted to the metropolitan images, but extended to the phenomena of movement, speed and sound. In a number of his writings from the years 1919-1922: Natural Reality and Abstract Reality: A Trialogue (While Strolling from the Country to the City); Two Paris Sketches: Les Grands Boulevards and Little Restaurant-Palm Sunday; The Manifestation of Neo-Plasticism in Music and the Italian Bruiteurs; and Neo-Plasticism: Its Realization in Music and Future Theater, in which Mondrian described the new ways of perception generated by the urban environment and the ways in which these perceptions challenge the artist to come up with ever newer sounds and visions. After visiting a concert in Paris by Luigi Russolo with his **intonarumori**, he not only criticizes these Futurist's sounds for still being too natural, but he also asks himself how really abstract, Neo-Plastic music would sound. "In the Neo-Plastic Music of the Future, the direct plastic means should be determined sound, the duality of sound and nonsound (noise). 'Sound' is here used to signify in the auditory what is expressed by color in Neo-Plastic painting - more or less in the sense of 'tone' in music. And the word 'nonsound' is chosen what in Neo-Plastic painting is expressed as noncolor, that is, white, black, and gray. Thus 'noise' denotes percussive sound (coup) rather than an assemblage of diverse sounds incapable of forming a harmony in the old sense." In his 1922 essay Mondrian predicts the invention of **electronic music** which will actually come of age almost 30 years later! But this is not all. At the end of his essay he states that this new music requires a new type of hall, a promenoir where people can walk around while listening to the automated music program which has to be alternated with long intermissions consisting of projected images. "Neo-Plasting painting and Neo-Plastic music will thus have the same plastic expression. In the future, yet another art is possible: an art situated between painting and music. Since it is expressed by color and noncolor, it will be painting; but because the colors and noncolors will be shown in time and not in space, it will approach music... to assimilate such an esthetic image by abstraction, it will probably be necessary to attain a stage of abstract evolution even beyond that now required by Neo-Plastic painting and music: true unity of the "physical-spiritual."

A.R.: Linguistic irradiation caused by a deep and diffuse involvement of technology seems to have disempowered the traditional borders between the different artistic disciplines. Does it still make sense for critics and theorists to talk about artistic categories such as painting, sculpting, photo, video...? Or will a sort of expressive media flux become dominant? Which kind of parameters you think would be productive to introduce in order to understand the future scenarios?

F.E.: In my view the Twentieth century has shown a fundamental shift from monosensory esthetics to multisensory synesthetics determined by synesthetic concepts such as **color organs**, **chromatic music**, **visual music**, **color music**, **Neo-Plastic music**, **audiovisual music**, **liquid light**, **synesthetic cinema** etc. to describe the new art forms. Next to this, the meaning of terms with an originally monosensory character expanded to other fields: musical concepts like **harmony**, **counterpoint**, **rhythm**, **dynamics**, and **composition** became used to express architectural and cinematographic qualities as well. And terms with a symbolic or referential meaning were replaced by physical terminology: **sound**, **noise**, **volume**, **duration**, **beat**, **pulse**, **light**, **color**, **projection**, **motion**, **speed**, **space**, **dimension**, **texture**, and **pattern**, as well as terms derived from information science such as: data, sample, sequence, processing, etc. In my thesis, **The Language of Image & Sound**,¹⁶ I state that the new art lexicon is based on two basic approaches to multimedia composition. The first one is based on **transformative operations**: the transfiguration of music into moving patterns of **light**, **color**, and **visual shapes** (Castel: **the art of painting sound**) resulting in forms of **light art**, **film animation**, and **electronic imagery**, whereas the second one is based on **configurational operations of summation**, **subtraction** and **juxtaposition** in order to arrive at forms of **total theater** and **total art** (Wagner: **Gesamtkunstwerk**) based on the integration of elements of a variety of different art forms.

The Language of Image & Sound offers an exemplary strategy for art educators wanting to incorporate new forms of art, such as multimedia, net art, generative art, interactive art, etc. into the arts curriculum by introducing and discussing the historical and contemporary arts practices of light art, experimental film, total theater, and total art. Today, new concepts and new esthetic insights are needed to cope with the artistic challenges of present multimedia technology and the need to develop total concepts consisting of image, sound, music, and text. As yet it is hard to foresee how these new concepts will look like, how they will sound, how they feel and what taste they will have. But, it is not risky to predict that most of the new multimedia concepts will, basically, be variations of either a transformational compositional operation as it is historically expressed by the concept underlying most forms of light art and experimental film and today in the emerging forms of generative art, or of configurational compositional operations as they are historically expressed by the concepts of the Gesamtkunstwerk, total theater, and total art, and today in the emerging forms of interactive art.

A.R.: From the 60s of the Twentieth century, the relation between art and technology has seen an exponential development. Electronic and digital evolution gave birth to complete new forms of expression. Photography, video, multisensorial installations, and multimedia seem to have substituted the old media. Can we speak about the death of painting and cinema? Can you frame this kind of situation and the possible further evolution?

F.E.: One of the most interesting aspects of culture is that almost every generation of people is confronted with the appearance of new artifacts at some point in their live. In earlier times traveling merchants imported and exported locally produced goods from one place to the other. Nowadays most cultures are confronted at the same time with new products and technologies. A remarkable characteristic of culture is that, although its capability to absorb new artifacts and media seems to be unlimited, at the same time culture seems totally incapable of **cleaning up the house**. Culture grows in layers: for historians and archeologists it is not so difficult to point at, or dig up remnants of the past which in one way or the other are still part of the present. This isn't only true for objects, but it's also true for media—however dominant new media may become, the old ones will never totally disappear. Certainly, one may say that -to some extent- substitution might take place, but it is more appropriate to draw attention to the important phenomena of **remediation** and **media-integration**.

The phenomenon of **remediation** may be observed every time a new medium is introduced. This law—**the content of any** (new) **medium is always another** (preceding) **medium**—was already described by Marshall McLuhan in 1964: "The content of writing is speech, just as the written word is the content of print." In a similar way the content of photography is painting, the content of film: theater, and the content of interactive multimedia: the **Gesamtkunstwerk**. The second phenomenon, which I call **media-integration**, is a related consequence of the fact that new media do not

¹⁶ The Language of Image and Sound was the preliminary title of Evers's dissertation. [Ed.]

substitute old ones but rather have the tendency to accumulate and interact. Usually it takes a few decades before technologies integrate in such ways that new forms of perception result from this integration. Historically, the most famous example has been the **audiovisual** union of sight and sound through the sonification of motion pictures. Already in 1895 William Dickson (the real inventor of the motion pictures at Edison's lab) had been experimenting with synchronizing film with a soundtrack recorded on a wax cylinder. But not earlier than 1927 the **talkies** would start to become common practice, giving a boost to the sense of presence the film medium was able to generate. The enormous impact of this audiovisual integration on the development of the film art has been described by Sergei Eisenstein in his book **The Film Sense** (1943). In this book Eisenstein introduced and discussed the new concept of **vertical montage** – the ways to associate (or better: re-associate or recompose) the cinematographic relationships between image and sound. Another example will soon become noticeable by the spectacular emergence of new forms of **sensory integration** which will result from the coming integration of computer technology with television and telephony, a process which will further expand people's **sense of (tele-)presence**.

To be aware of both phenomena, remediation and media-integration, is important for art educators offering courses or curricula in one of the branches of the media arts, and art students wanting to work in these directions. Virtual reality is not a separate reality but simply another information layer in an environment which forever will be determined by the characteristics of three dimensional physical space as mankind has known it from the beginning. This implies that two dimensional projections, however sophisticated these in themselves may be, will always relate to the spatial characteristics of objects and spaces where the projection takes place. Architects and sculptors are the specialists of 3D space and plastic objects. Therefore it is important that the study of new media takes place in learning environments where this kind of knowledge, and that of painters, photographers, filmmakers, and musicians is still present and alive.

A.R.: What kind of didactic and pedagogic parameters should be given to the art students in order to give them effective means to develop their own expressive vision and professional skills in the complex context we have discussed so far?

F.E.: Despite the involvement of many of the great masters of the Twentieth century art in experimenting with multidisciplinary and intermedia art forms, for quite a long time art education has been reluctant, not to say unwilling, to incorporate in the curriculum the study of these experiments, the role of creative synesthesia and the aim to develop a new esthetics: synesthetics. Faculty structure and art history classes in the different types of art schools are still exclusively organized on a strictly disciplinary basis. That this structure still exists is mainly due to the overspecialized art historians and art theorists who, for a long time, have been considering all inter-, trans-, and metadisciplinary experiments as fringe phenomena which didn't essentially contribute to the development of the discipline of their specialization. Although excellent studies have been made of total art (Henri 1970), performance art (Goldberg 1990) and the art and technology and environmental art movements (Bijvoet 1997), these studies have hardly influenced the art curriculum. However, to solely blame the historians and theorists for the ruling lack of metadisciplinary knowledge in art education, would be unfair. As a matter of fact, only very few artists have cared for the innovation of art education from an expanded metadisciplinary point of view. Unfortunately, never and nowhere a beginning was made to implement Schoenberg's ideas to found a School for Soundmen where music, sound, recording, radio, film, and television technology could be studied in relation to each other. And similarly, Moholy-Nagy's dream to found an Institute of Light, where electric light could be studied from a metadisciplinary point of view, was never realized. Therefore it is important to look what we can learn from the only two attempts to innovate the art curriculum in fundamental ways. The **Bauhaus** and **Black Mountain College** have been the two most extreme innovative examples of modern art education in Europe and the United States which both existed only for a limited peridod of time: fourteen years (1919-1933), twenty-four years (1933-1957) respectively.

The Bauhaus was founded by the architect Walter Gropius and financially supported by the city of Weimar (and after 1924 by the city of Dessau) to educate designers for the clear purpose of integrating the design and construction of the inside and outside of modern architecture, by studying the characteristics of new materials like concrete, steel and glass and by applying strictly formal design principles. Or, in Gropius's own words: "to create a new guild of craftsmen, without the class distinctions which raise an arrogant barrier between craftsman and artist." Gropius was influenced by the European reform pedagogues Montessori, Pestalozzi, Fröbel, and Steiner and their student oriented practical pedagogy. Teachers included Johannes Itten, László Moholy-Nagy, Josef Albers, Wassily Kandinsky, Paul Klee, and Oskar Schlemmer, whereas the curatorium of the Circle of Bauhaus Friends consisted of Josef Hoffmann, H.P. Berlage, Arnold Schoenberg, Oskar Kokoschka, Marc Chagall, and Albert Einstein. The work at school reflected the typical city life education with meetings concentrated in well-planned courses and classes, laboratory work, and incidental stage performances and parties with bizarre dress-codes and dance music produced by the students' own jazz band. From 1923-1928 the Bauhaus pedagogy was dominated by the Vorkurs (preliminary course) teached by Moholy-Nagy and Josef Albers. This Vorkurs was extended in the learning environments of Moholy-Nagy and Albers's metal and glass workshops. After Moholy-Nagy's departure from the Bauhaus in 1928, Albers headed the Vorkurs till the Bauhaus closed in 1933 as a result of the pressure by national-socialist politicians. Later that year, after emigrating to the US, Albers became member of the core faculty of Black Mountain College.

Black Mountain College had been founded shortly before by John Andrew Rice, a professor of classics, and his colleagues Theodore Dreier together with other faculty who had been fired or resigned from Rollins College the previous spring because their sympathy for John Dewey's reform pedagogy was deemed too strong. Mary Emma Harris, who mapped Black Mountain's history in detail, described the college's aim as to educate the whole student - head, heart and hand - through studies, the experience of living in a small community and manual work. Although the founders—in a truly experimental spirit—did not wish to bind the college to a rigidly codified educational doctrine, they did have strong feelings and ideas about education. The college was to be owned and operated by the faculty. A Board of Fellows made up of faculty and one student formed the central governing body. An Advisory Board [consisting of a.o. John Dewey, Max Lerner, Walter Gropius, Carl Jung, Franz Kline, and Albert Einstein, F.E.] lent counsel to the community but had no legal authority. Decisions were based on consensus rather than a vote. Academic bookkeeping - grades and quality points as a measure of an education - was abolished (though grades were recorded for transfer purposes). Graduation was based on achievement of a project in the student's area of specialization along with examinations - both written and oral - by the faculty and an outside examiner. Students, faculty and families ate in a common dining hall. Although there were cooks and other service personnel for those tasks requiring continuous attention, most of the general maintenance of the campus was performed by students and faculty. The arts were central to the educational experience rather than on the periphery.

Albers's influence on the development of the college lasted until 1948, the year he organized his last summer school. This summer marked the end of the dominance of the European tradition at the college and the emergence of the young Americans, who were to be the creative leaders in the arts in the United States for the next twenty-five years. Among the new teachers were John Cage (music), Merce Cunningham (dance), Willem de Kooning (painting), M.C. Richards (literature), Charles Olson (fine arts), and Buckminster Fuller (architecture).

Forty years later, in 1988, John Cage was invited to visit The Hague to be the composer-in-residence of the composer project series, a tradition the Royal Conservatoire had started in the early 70s when the teachers and students had voted in a democratic meeting to organize a yearly central educational project for the whole student community. When Cage was invited, he was asked to work with the performing musicians to study a number of his works for public presentations, and with composition students to introduce his approach to musical composition. When Cage's visit had been announced during a meeting of the composition department, composer Dick Raaijmakers criticized the program by remarking that Cage's experimental attitude regarding the use of all kinds of unconventional media for his compositions had been completely left out of the program. He proposed to organize, next to the performance and composition program, which respectively had been called Book I and Book II, another part of the program, Book III, in which attention was asked for Cage's creative involvement with the new media. In a letter to the students of the Composition, Music Registration, and Sonology Departments and the students and teachers of the Center for Audiovisual Media, which I had founded with Raaijmakers two years earlier to introduce film, video and computer animation courses in the music curriculum, the aim of the project Book III - The New Media was explained as follows:

The project's intention is to create a confrontation between the users of the typical new media equipment and John Cage who has worked with these media all of his life. In relation to John Cage, the concept of new media has to be interpreted quite widely, since it relates to areas as: choreography, art, literature, typography, radio (radiophony, lectures, radio plays), film, television, video, electronic music, tape-music, computer music, theater, performance, happening, installation, and natural sounds, silence, shells, and "fresh air."

The students were invited to come up with ideas for projects in which these media were used, which would be offered to Cage asking him to make a meta-composition in which all the different components would find a place, in a similar way as he had done in the piece **Untitled Event** at Black Mountain College in 1952. **Book III** became a legendary educational project, inspired by an artist who himself had dropped out from college because he hated schools. Paradoxically, as a professional artist Cage became famous for his unconventional teaching in classes outside and inside academia. During the two weeks that Cage visited The Hague only about one hundred students and teachers related to him personally, while 500 of them completely neglected his presence. However, everybody who actually related to him and took his approach to art seriously by asking him questions during the rehearsals and workshops, or during the lunches and dinners in the macrobiotic restaurant we had installed for him in the Conservatoire's foyer, was deeply affected and inspired.

Two years after Cage's visit, in 1990, the **Interfaculty Image & Sound** was founded at the occasion of the merger of the Royal Conservatoire and the Royal Academy of Art with the intention to develop an interdisciplinary art curriculum in order to do justice to the changed landscape of the arts under the influence of the new technologies and the collaborative explorative culture resulting from it.

During the last seventeen years a project-based, open curriculum has been developed, organized in the form of **collective projects** (to stimulate the ability to participate and collaborate), **introduc**tory courses (to compensate for educational starting deficiencies), research groups (to develop a new interdisciplinary language), and individual coaching (to care for each student's optimal individual development). Group projects focus on creating large scale performances and presentations at prestigious as well as at underground venues and at national and international festivals such as Sonic Acts (Amsterdam), Todays Art (The Hague), Audio Art Symposium (Krakow), Transmediale (Berlin), etc. During the seventeen years of its existence the curriculum offered by the Interfaculty has been adjusted almost yearly due to artistic and educational considerations as well as practical conditions. A thorough evaluation of the program four years ago resulted in the conclusion that the teacher's wanted a closer relation between their educational activities and their arts practices. This resulted in redesigning the introductory courses and in defining research groups based on the teacher's personal arts practices. Since then the curriculum is offered under the name ArtScience. Present subjects studied in the introductory courses are: Image & Sound, Sense Interference, Creative Synesthesia, Ear Cleaning, Mind Mapping, Diagonal Montage, Metamedia, Thought Processes in Art, Free Style Video, and—in collaboration with Leiden University's Master of MediaTechnology program — Introduction to Programming, Science Practice, Web Technology, Human Computer Interfaces, Multimedia Systems, Technology and Philosophy, and Language and Text. The themes of the research groups are: Virtual Communities, Autonomous Robots, Generative Art, Interactive Sonic Spaces, Genius Loci and Contextual Art: Alter Ego.¹⁷ The faculty consists of seventeen teachers. Sixty students follow the BFA program, and fifteen the MMus program.

One of the biggest challenges and tasks of future art education is to answer the question of how to relate the art curriculum to a new metadisciplinary esthetics. The expansion of kinetics to the field of the fine arts and the digital integration of musical, visual, textual, and numerical concepts and data asks for a new curriculum for artists who refuse to limit themselves to the study of one artistic discipline. What practical and theoretical framework should an arts study have to offer to a new generation of artists who imagine a new language of image and sound? It is my belief that such a new study should on the one hand be based on an open curriculum in which the student determines the road to be taken, whereas on the other hand it should have strong ties to art schools and conservatories that have their roots in the traditional, classical values of their respective fields. My argument for this is that, despite the substantial differences between the new digital technology and the historical mechanical technology, it would be a mistake to think that the new synesthetics can be developed without any knowledge of traditional esthetics. Ideally, the new curriculum should have access to the treasuries of the different artistic disciplines and be related to the best institutes of higher education. It is my experience that it is possible to create a learning environment where both experimental courses as well as traditional ones contribute to the curriculum. It has been shown that such a mixed curriculum is highly attractive to students who are looking for an art education that is not defined by borders and limits, but that is actively stimulating the search for new spaces, fields and domains resulting from new interactions between art, science, and technology.

February 8, 2007

¹⁷ This list of courses is different from the list that Evers presents in III.I.7 [Ed.]

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Α

Abe, Shuya 158 Albers, Josef 65, 168, 221, 281, 282 Alberti, Leone Battista 44 Alons, Cor 173 Van Altena, Marius 181 Anderson, Laurie 277 Andriessen, Hendrik 177 Andriessen, Louis 177, 182, 183 Anschütz, Georg 20, 69 Antheil, George 64, 76, 77, 132, 244, 247, 248 Apollinaire, Guillaume 60, 107 Argelander, Annelies 20 Aristotle 44, 46, 251 Arnheim, Rudolf xxvi Arp, Hans/Jean 103, 104, 132 Asclepi, Giuseppe 258 Ascott, Roy xvii, xx, 83 Audi. Pierre 227 Austbø, Håkon 94 В Van Baaren, Kees 177, 180, 181 Bach. J.S. 82, 85, 123, 182 Badings, Henk 145, 180 Van Balkom, Joost 187 Balla, Giacomo 60, 64 Ball, Hugo xxxi, 103, 104 Ballings, Pierre 267, 268, 300 Barker, Michael 255 Baron-Cohen, Simon 6 Basch, Victor 147 Batten, Trevor 187 Baudelaire, Charles xxviii, xxx, 12, 25, 276 Baumgärtner, Klaus 202 De Bazel, K.P.C. 173 Beckett, Samuel 216 Beethoven, Ludwig van 123, 140, 255, 265 Béjart, Maurice 138 Beljon, J.J. 174 Belson, Jordan 58, 82, 141, 143, 145, 180 Berg, Alban 98, 102, 268, 275 Van Bergeijk, Gilius 181, 183, 191 Berg, Paul 201 Bergson, Henri 275 Berio, Luciano 145, 180, 216 Berlage, H.P. 281 Berman, Greta 6 Bertalanffy, Ludwig von 216 Beths, Vera 191 Bijlsma, Anner 182

Bijvoet, Marga 122, 165, 280 Bird, Bonny 110 Bishop, Bainbridge 56 Bischoff, Romain 234 Blanc-Gatti, Charles 2, 3 Blavatsky, Helena 93, 96

Bleuler, Eugen 12, 23 Blok, Cor 122 Boccioni, Umberto 60 Boehmer, Konrad 83, 221, 259, 260.285 Boerman, Jan 180, 183, 235, 251, 254 De Bondt, Cornelis 255 Borstlap, Dick 177 Bosboom, Johannes 173 Boulanger, Nadia 135 Boulez, Pierre 102, 119, 123, 137, 244, 247, 254 Bowie, David 85 Boyle, Marc 85 Ter Braak, Menno 71 Bragdon, Claude 70 Brahms, Johannes 123 Branca, Glenn 277 Brecht, George 115, 117, 118, 119, 120, 216 Breitner, G.H. 173 Breton, André 107, III Brewster, David 55, 56 Britten, Benjamin 147 Brüggen, Frans 181 Buhlig, Richard 110 Buijs, J.W.E. 174 Van der Bundt, Livinus 181 Burr, Martin 255 Bütting, Max xxxi, 73 Byrne, David 277 С Cage, John vii, xix, xx, xxvi, xxvii, 64, 81, 82, 109, 110, 111, 112, 114, 115, 117, 118, 119, 120, 123, 135, 141, 155, 168, 169, 181, 182, 187, 191, 193, 194, 195, 197, 254, 282 Calder, Alexander xvii, II4, 206, 216 Cale, John 277 Calkins, Mary W. 12, 13 Cardano, Gerolamo 44 Cardena, Michel 201 Cardew, Cornelius 85 Carlson, Caroline 140 Carrà, Carlo 132 Casimir, Hendrik 180 Caspary, Eugen 260 Castel, Louis-Bertrand vii, xiii, xxviii, xxx, xxxi, 39, 41, 42, 46, 47, 50, 51, 52, 53, 54, 56, 58, 63, 69, 70, 71, 93, 114, 168, 172, 251, 258, 274, 276, 279 Cavarelle, Comrad 258, 263, 265 Chagall, Marc 281

Chaplin, Charlie 148 Chopin, Frédéric 60 Citroen, Paul. 173 Clair, René 74, 76, 107, 277 Clark, Kenneth 209 Clavière, J. 31 Cocteau, Jean III Conrad, Tony 277 Coomaraswamy, Ananda III Corra, Bruno xxx, 56, 60, 63, 71, 74, 276

Craft, Robert 23I, 234 Cunningham, Merce 110, 111, 112, 115, 119, 129, 169, 195, 282 Curie, Eve 128 Cytowic, Richard 1, 8, 30, 31 Czerny, Carl 119

D

Dagelet, Hans 255 Dann, Kevin II Day, Sean A. 3, 5 Deirkauf, Robin xvii, xx, 199, 205, 232, 248, 263 Deller, Alfred 181 Descartes, René 44, 46 Descazeaux, M. 52 Des Tombe, J.H. 180 Dewey, John 169, 281 Dickson, William 280 Diderot, Denis 50, 53 Diebold, Bernhard xxxi, 71, 73, 79, 107, 276 Dijkmeijer, Daan 187 Van Doesburg, Theo 60, 103, 104. 131, 132, 133, 247, 275 Dombois, Eugen 181 Van Domselaer, Jacob 243, 247, 252 Dorris, David 120 Doudijns, Willem 173 Dreier, Theodore 169, 281 Dresden, Sam 177 Duchamp, Marcel xx, 60, 76, 107, III. II2. 254 Duffy, Patricia 6 Duncan, Isadora 128, 129 Duval. Robert 173

Е

Eckerson, A.B. 20 Eco, Umberto 216 Eggeling, Viking xvii, xx, 39, 56, 73, 74, 79, 107, 132, 274, 276 Eimert, Herbert 247 Einstein, Albert 281 Eisenstein, Sergei xiii, 20, 48, 166, 280 Eno, Brian 85 Ephraim, Jan 103 Ernst, Max 103, 107, 137 Escher, Rudolf 180 Fechner, Gustav 8, 13 Feininger, Lyonel 65, 103 Ferrari, Luc 145 Ferro, Franco 195 Ferry, Brian 85 Fischinger, Oskar xxviii, 20, 39, 56, 71, 73, 79, 81, 82, 110, 111, 141, 172, 195, 216, 221, 222, 225 274 290 Flammarion, Camille 128 Forsythe, William 129 Franck, Doro xix, xx, 199, 202 Franssen, Maarten 53, 54 Freud, Sigmund 275 Friedlander, Paul 58 Frijda, Nico xviii Fröbel, Friedrich 169, 281 Fuller, Buckminster 169 Fuller, Loïe xviii, xxx, 14, 126, 128, 129, 282

G

Gage, John 44 Gales, Fred 186, 187, 188 Galeyev, Bulat 172, 221 Galton, Francis 8, 13 Gaspar, Bela 81 Gautier, Théophile 12, 25 Ginna, Arnaldo xxx, 56, 60, 63, 71, 74.276 Goebbels, Heiner 182 Goethe, Wolfgang 96, 251 Goeyvaerts, Karel 137, 244, 247, 254 Goldberg, Roselee 90 Gordon, Kim 277 Götz, Karl Otto 155, 157 Gowing, Lawrence 83 Graber, Daniel 255, 263 Graham, Martha 110, 112, 129, 277 Grafov, Vladimir 250, 251 Greenberg, Clement xxvi Gropius, Walter 65, 67, 69, 132, 169, 221, 275, 281 Grosschenbacher, Peter 6 Guyot, Guillaume-Germain 54

н

Hallock-Greenewalt, Mary 56, 70, 74 Hamilton, Richard 83 Hammond, Laurens 109 Hammond, Mark 186, 187 Hansen, Al 118 Harnoncourt, Alice 181 Harris, Mary Emma 168 Harris, Moses 44, 115, 281 Harrison, George 85, 287

Harrisson, John 6 Harry, Ruben 187 Hartmann, Thomas de 98 Hartsuiker, Ton 177 Hauser, Kasper 259 Hausmann, Raoul 132 Hawking, Stephen 10 Havashi, Hideki 200 Van der Heide, Edwin xx, 58, 202, 234, 265 Heijnen, Manon 234 Helms, Hans 119 Hendrix, Jimi 85 Hennings, Emmy 103, 107 Henri, Adrian 90. 115 Henry, Pierre 110, 135, 137, 138, 140, 141, 180 Hermans, Emery 140 Hertzka, Emil 227 Heyrman, Hugo 6 Higgins, Dick 115, 118 Hills, Joan 85 Hindemith, Paul 225 Hirschfeld-Mack, Ludwig xxxi, 20, 39, 56, 67, 69, 74, 277 Hirsh, Hy 145, 180 Hitler, Adolf 67, 222 Van 't Hoff. Robert 132 Hoffman, Hans 117 Hoffmann, E.T.A. xxx, I2, 23, 275, 281 Hollings, Ken 143 Homer 9 Van Hoogenhuyze, Michael xx, 202, 255, 300 Hoover, Nan 201 Hooykaas, Madelon 201 Horace 44 Hornbostel, Erich M. von vii, I, 14, 16, 19, 20, 21, 31, 129, 277 Van der Horst, Kasper xx, 195, 199, 232 Van Hove, Sophie 175 Humbert, Jean Emile 173 Hussein, Adil 200 Huszár, Vilmos 132 Huygens, Christiaan 42

Ichiyana, Toshi II8 Israëls, Isaac 173 Itten, Johannes 65, 83, 281 Ives, Charles 177

1

Jacobs, Henry 141, 143, 145, 180 Jameson, D.D. 56 Jennerjahn, Betty 115 Johns, Jasper 118 Jolly, Marcel 137 Joyce, James 145, 216 Jung, Carl 281 K

Kaars, Marcel 201 Kagel, Mauricio 181, 182, 255 Kalff, L.C. 147, 148 Kandinsky, Wassily vii, xx, xxvi, xxviii, xxx, 65, 67, 69, 81, 96, 97, 98, 102, 103, 114, 172, 219, 274, 275, 276, 281 Kaprow, Allan xx, 115, 117, 118, 119. Karwoski, T.F. 20, 21 Kashevaroff, Xenia 112 Kelley, Mike 277 Keri, Judit 200 Ketting, Otto 177 Kiljan, Gerrit 173 Kircher, Athanasius xxx, 39, 41, 42, 44, 46, 47, 274 Klee, Paul 65, 67, 83, 97, 103, 281 Klein, Adrian xxxi, 71, 74 Kline, Franz 281 Koch, Henriëtte 255 Koek, Paul. xx. 215, 232, 255, 257. 259, 261 Koenig, Gottfried Michael 181, 183 Köhler, Wolfgang 30 Kok, Anthony 132 Kokoschka, Öskar 103, 281 De Kooning, Willem 169, 282 Krafft, Georg Wolfgang 53, 54 Kreisler, Johannes 12 Krüger, Johann 54 Ktesibios of Alexandria 273 Kubin, Alfred 97 Kurtàg, György 182 Kuyken, Sigiswald 182 Kyriakides, Yannis 261

L

Laban, Rudolf von 103 LaBarbara, Joan 191 Van der Lagemaat, Kees 232, 235, 251 Landy, Leigh 191 Lang, Fritz 81 Làszló, Alexander 79 Laurel, Stan and Oliver Hardy 148 Le Corbusier 65, 138, 147, 148, 150, 151, 152 De Leeuw, Reinbert 177, 182, 191, 194 De Leeuw, Ton 180

De Leeuw, Ton 180 Léger, Fernand 74, 76, 277 Lehmann, Karl 12, 23 Leibowitz, René 141 Lemierre, Antoine-Marin 54 Lennon, John 85

Leonhardt, Gustav 181 Lessing, Gotthold xxiv, xxvi Lichtenstein, Roy 118 Lieberman, Rolf 140 Ligeti, György 145, 180, 182 Lindsay, Arto 277 Lippard, Lucy 122 Lissitzky, El 104, 132 Liszt, Franz 177 Locher, Hans xix, 85, 171 Locke, John 1, 9, 10, 11, 14 Van Loo, Babeth xx, 186, 187, 202 Lübeck, J.H. 175, 177 Lunch, Lydia 277 Luppes, Bert 259, 263 Lürsen, J.B. 174 Luyters, Rudy 187, 199 м Macke, August 96, 97 216, 237, 238, 241

MacLow, Jackson 118 Maderna, Bruno 145 Madge, Geoffrey 191 Maillebois, Comte de 53 Majoli, Walter 187, 188, 195, 200. Mallarmé, Stéphane 60, 216 Van Manen, Hans 129 Marc. Franz 97, 275 Maré, Rolf de 76 Marinetti, F.T. xx, xxx, 59, 60, 64, 103. 104. 111. 131. 243. 244. 266, 275 Maris, Jacob 173 Maris, Willem 173 Marks, Lawrence E. vii, xiv, xix, 4, 6, 8, 21, 23, 25, 27, 29, 30, 31 277 Marroquin, Raoul 201 Martenot, Maurice 109 Martino, Gail 4, 6 Matter, Herbert 112, 148 Maxfield, Richard 118 McLaren, Norman 141 McLuhan, Marshall 279 Meister Eckhart 115 Mendelssohn, Felix 60 Mengelberg, Misha 122, 177 Merleau-Ponty, Maurice 20 Messiaen, Olivier 3, 102, 135, 137, 147, 182 Metzger, Gustav xx, 83, 85, 172, 221, 222 Meyers, Charles 94 Mijtens, Daniël 173 Modigliani, Amedeo 103

Meyers, Charles 94 Mijtens, Daniël 173 Modigliani, Amedeo 103 Van Moerkerken, Emiel xviii Moholy-Nagy, Làszló xx, xxiii, 20, 56, 65, 67, 69, 104, 111, 132, 165, 167, 168, 208, 215, 216, 219, 221, 253, 280, 281

Mok, Chee Kong 186, 187 Mondrian, Piet vii, xx, xxviii, xxxi, 40, 63, 110, 111, 117, 132, 133, 134, 172, 216, 243, 244, 245 247 254 257 274 277, 278 Montesquieu 50, 51, 52 Montessori, Maria 169, 281 Monteverdi, Claudio 181, 182 Moore, Thurston 277 Moorman, Charlotte 158 Morgenthaler, Walter 259 Moritz, William xxxi, 71, 76, 172. 221, 222, 225 Moser Alexander 56, 93 Moser, Kolo 275 Mozart, Wolfgang Amadeus 60, 123, 265 Müller, Johannes II, I2 Munsell, Albert H. 46 Münter, Gabrielle 97 Murphy, Dudley 76, 107 Mussolini. Benito 64 Mussorgsky, Modest 67 N

Nagtenaal, Luuk 261 Nero 273 Newton, Isaac xxx, 10, 39, 41, 42, 44, 45, 46, 47, 52, 60, 231, 251 Nicolaï, W.F.G. 175 Van Noorden, Leon xviii Nunaki, Julian 188, 241

0

Odbert, H.S. 20 Odgaard, Eric 6 Oei, Angelika 200 Olson, Charles II5, I68, 282 Ono, Yoko 85, 193 Op den Velde, Minou 267, 268 Orff, Carl 123 Osgood, Charles E. 20, 21 Van Ostaijen, Paul 60 Oswald, William 46 Otten, Kees I82 Oud, J.J.P. I32 Oursler, Tony 277 Ozenfant, Amédée 147

Paik, Nam June 117, 119, 155, 157, 158 Palestrina, Giovanni Pierluigi da 123 Panis, Jan 186 Pasmore, Victor 83 Passerone, Felix 135 Pestalozzi, Johann Heinrich 169, 281

Picabia, Francis 74, 76, 103, 107, 274, 277 Piekur, Sarah 6 Pittoors, Frieda 234 Planck, Max 275 Plantenga, J.H. 173, 174 Poe, Edgar Allen 12 Van de Poel, Rob 94 Pollock, Jackson 117 Ponte, Amalia del 239 P-Orridge, Genesis 277 Poullin, Jacques 135 Pound, Ezra 76 Pousseur, Henri 177, 216 Prampolini, Enrico 103, 132 Pravda, Robert 202 Prikker, Thorn 173 Pythagoras xxx, 39, 41, 47, 120, 273, 274 R Raaijmakers, Dick vii, xiv, xvii, xix, xx, 102, 121, 122, 145, 152, 171, 177, 180, 181, 183, 186, 188, 191, 193, 195, 197, 201, 202, 215, 216, 228, 231, 232, 233, 234, 237, 241, 244, 247, 248, 251, 252, 254, 255, 257, 258, 259, 261, 263, 266, 282 Ramachandran, Vilayanur 6 Raphaël, Raymond 186, 188, 202 Rauschenberg, Robert xx, xxvi, 114, 115, 118, 119, 120 Ray, Man 76, 107 Van Rees, Otto 103 Rehorst, Chris 174, 202 Reich, Steve 182 Rekveld, Joost xx, 201, 202, 300 Reyers, Zeger 173, 174 Rice, John 169, 281 Richards, Mary Caroline 115, 168, 282 Richter, Hans xx, 73, 74, 79, 103, 107, 112, 132, 276 Rickels, Horst xx, 188, 199, 237. 241, 247, 266 Riggs, L.A. 20 Rimbaud, Arthur 12 Rimington, Alexander Wallace 56, 70, 94 Rimsky-Korsakov, Nicolai 94 Ritter von Feuerbach, Anselm 259 Rochas, Albert de 13, 31 Rockwell, John 99 Rodin, Auguste 128

Rodin, Auguste 128 Röntgen, Wilhelm 275 Rood, Ogden 46 Roozendaal, Hans 255 Ross. David 157

Van Rossum, Frans 191 Rousseau, Jean-Jacques 50, 53 Rudge, Dennis 255 De Ruiter, Frans xiii, 123, 182, 191, 207.215.237.300 Runge, Philipp Otto 46 Russolo, Luigi 63, 64, 104, 133, 243, 244, 278 Ruttmann, Walther xxxi, 39, 56, 73, 74, 79, 107, 274, 277 Ryan, Joel 202 S Curt Sachs, 14 Sachs, Georg xviii, II Sagiv, Noam 6 Samaras, Lucas II8 Samson, Hannah 261 Samuel, Claude 3 Van Santen, Christa 221 Sarabai, Gita III Satie, Eric 76 Saunderson, Nicholas 10 Savérien, Alexandre 54 Schaap, Theo xviii Schaeffer, Pierre 60, 64, 114, 135, 137 Schapiro, Meyer II7 Scha, Remko xiii Schat. Peter 177. 265 Scheffer, Frank 265 Scheuer, Anton 56, 172, 216, 251. 257, 258, 259, 260, 261, 263, 265, 266 Scheyer, Galka II0 Schlemmer, Oskar 67, 281 Schneider, Marius 19 Schoenberg, Arnold xx, xxviii, xxxi, 12, 97, 98, 100, 101, 102, 103, 110, 141, 155, 165, 171, 172, 182, 215, 216, 219, 227, 228, 231, 232, 234, 235. 248, 251, 253, 275, 276, 280, 281 Schöffer, Nicolas xvii, 58, 137, 138, 274 Scholte, Elsemieke 200 Schouten, Lydia 201 Schubert, Franz 123 Schuitema, Paul 173 Schüller, Günther 98 Schwerdtfeger, Kurt 56, 67, 69 Schwitters, Kurt 107, 132 Scriabin, Alexander xxviii, xxx, I6, 56, 63, 70, 93, 94, 96, 97, 145, 150, 221, 251 Segal, George 118 Servaas 201 Severini, Gino 60, 128, 132 Shelley, Mary 12 Shultz, Carrie 6 Sidenius, Christian 221

Simonides 44 Slangen, Paul 202, 258 Smith, Harry 58, 82 Snow, C.P. 208, 209 Solovvov Vladimir 93 Speelman, Willem Marie 191 Spielberg, Steven 58 Spinhoven, Bill 187 Spoelstra, Louis 186, 188 Spoerri, Daniel 197 Stalin, J.V. 64, 221 Stansfield, Elsa 201 St. Denis, Ruth 129 Steen, Carol 6 Steiner, Rudolf 96, 169, 281 Stockhausen, Karlheinz 119, 123, 137, 145, 155, 158, 177, 181, 182, 191, 216, 247, 254, 265 Stokkermans, Joop 177 Stokowski, Leopold 82, 231 Stolk, Taco xx, 202 Stravinsky, Igor 64, 77, 123 Suci, George J. 20 Suzuki, D.T. III Swets, Huib 187

5, **T**

Takemitsu, Toru 145, 180 Tannenbaum, Percy H. 20 Tazelaar, Kees 232, 247, 265 Telemann, Georg Philipp 52 Tempelaars, Stan xviii, 254 Termen, Lev 172, 221 Terwesten, Augustinus 173 Tinguely, Jean xvii Toebosch, Moniek 181 Townshend, Pete 83 Trautwein, Friedrich 109 Truman, Philip 231 Tudor, David 112, 115 Tzara, Tristan 104, 107

U

Ussachevsky, Vladimir 145, 180 Utrecht, Luuk xviii

V

Van De Bosch, Steve 188 Vandenburg, Hans 265 Van der Schuur, Theodorus 173 Vantongerloo, Georges 132 Varèse, Edgar 64, 81, 82, 147, 148, 150, 151, 254, 286 Vega, Alan 277 Verdonck, Benjamin 259 Verduyn Lunel, Jack 174, 207 Verhulst, Johannes 175 Vinci, Leonardo da 44 Vink, Jaap 183 Viotta, Henri A. 175, 177 Vitruvius 44 Vivaldi, Antonio 123 Van Vlijmen, Jan 177, 182 Voltaire xxxi, 50, 51, 53, 103 Vreedenburgh, Eric 202, 261

W

Wagenaar, Diderik 183 Wagenaar, Johan 177 Wagner, Richard vii, xiii, xxviii, xxx, 12, 39, 88, 89, 90, 91 93. 97. 98. 100. 114. 123. 168. 175, 275, 276, 279 Waisvisz, Michel 181, 183, 268 Watts, Robert 118 Weber, Carl Maria von 25 Webern, Anton 98, 102, 123, 275 Weiland, Frits xviii, 187 Weiss, Adolf 69, 110 Weissenbruch, J.H. 173 Wellek, Albert 42, 53, 54 Van der Wenden, Jan Peter 202 Wentink, Victor 181 Werner, Heinz 20, 183 Whitney, James 82, 141, 145, 180 Whitney, John 58, 82, 133, 141, 143 Wilde, Oscar 12 Wilfred, Thomas xx, xxviii, xxxi, 39, 56, 70, 74, 81, 221, 274 Wilhelmina, Princess of Orange-Nassau 259, 260, 261, 265, 266 William I, King of Orange-Nassau 173, 175 William V, Prince of Orange 259, 260 Willmann, R.R. 30 Wills, Sheri 6 Wils, Jan 132 Van Wingerden, Jeanette 182 Van Winkel, Camiel 122 Wölfli, Adolf 259, 265 Wundt, Wilhelm 8, 12, 13

Х

Xenakis, lannis 147, 148, 151, 152

Y

Yavlensky, Alexei 97 Youngblood, Gene vii, xxxi, 7l, 166, 277 Young, La Monte 118, 120

Ζ

Zadkine, Ossip 147 Zietz, Karl xviii, 29 Zoet, Jan xx, 202, 215, 232, 263 Zwartjes, Frans 181

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