THE STRANGE DANCE:
9 EVENINGS: THEATRE & ENGINEERING AS CREATIVE COLLABORATION

by

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ABSTRACT

This dissertation examines the historical case study of *9 Evenings: Theatre & Engineering*, a 1966 series of technology-based performances created collaboratively by avant-garde artists and Bell Labs engineers in New York City. The *9 Evenings* project, part of the 1960s Art & Technology movement, was a well-documented attempt to bridge C.P. Snow's iconic "Two Cultures" of science and art. It inspired the formation of an international networked organization of artists collaborating with engineers called Experiments in Art and Technology (E.A.T.). Both the *9 Evenings* artists and engineers were influenced by Cybernetics and other new ideas emerging from 20th century science, and they saw the value of experimenting with new communications technologies as part of their respective collaborative practices. I argue that the *9 Evenings* project helped pioneer creative collaboration as a key aspect of today's digital culture that to date has not been sufficiently examined. I also argue that technology had, and increasingly has significant roles to play in the creative collaboration process, including as translator, or "boundary object" in an emerging "collaboration aesthetic" that foregrounds dialogic processes and new knowledge rather than creating art objects. There is a review of a large body of historical and contemporary literature about mid-twentieth century art that includes original documents written by the *9 Evenings* artists and engineers. There is an examination of recent writings about creative collaboration by business experts, social scientists, and arts scholars. Through case study methodology and research design, the artists' and engineers' first-hand accounts are applied to a matrix of successful creative collaboration elements and to technology's identified roles in collaboration. I conclude that as creative collaboration, the *9 Evenings* project was both revolutionary and transformational. It was revolutionary for its intentional focus on dialogic processes utilizing technology as both tools and boundary objects to generate new knowledge, and it was transformational emotionally, intellectually and professionally for many, if not all of the artists and engineers.

Keywords: Art-and-Technology Histories; Creative Collaboration; Cybernetics; Boundary Object; Collaboration Aesthetic; Experiments-in-Art-and-Technology

DEDICATION

I dedicate this to my husband Marty,

my dear Mother, and

the late Bertram Oppenheimer: the other Dr. Oppenheimer.

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CHAPTER 1: INTRODUCTION

"We had become interested in the process we were involved in, which was the meeting, marrying, and mating of artists and scientists that was a kind of coupling, some form of, hopefully, a synergistic new wrinkle in artistic thought and scientific thought. That they would repel each other, and attract each other in some strange dance, and we would get out of that the flowering, the explosion, the evolution of something for the future." (Steve Paxton, "Open Score - 9 Evenings" film by E.A.T., 1966/1997)

As we enter the second decade of the 21st century, we find ourselves surrounded by screens and immersed in an always-connected digital world filled with smaller, ever-more-accessible media technologies. In the last hundred years, we've experienced the quick adoption and rapid growth of photography, film, telephony, radio, television and computers that are now electronically networked communication systems. These complex technologies, originally developed by engineers and scientists, now have become creative tools used by artists throughout the 20th century to produce the photographs, films, TV and radio shows, music, and other media-based electronic arts we all know and love. A new "digital culture," defined by media studies scholars such as Charlie Gere (2002), is the result of art and science becoming increasingly interconnected through creative collaborations using new technologies.

In the Cold War era of the 1950s and '60s, science and art were thought to be quite different domains. Science, signified in history books and media by the atom bomb and the Space Race, was feared yet valorized for its technological achievements. Art, on the other hand, was the domain mostly of the elite, cloistered in museums, opera houses, and privately-owned galleries catering to rich collectors. Artists were pictured as strange,

creative people; they were poor dreamers who often worked alone in draughty studios, disconnected from the "real world" making paintings or poems that were impractical and incomprehensible. Conversely, scientists were inventors and pioneers, wrestling with important, relevant, and real world problems like curing cancer or inventing new life- and labor-saving technologies.

Science and Art, represented largely through their stereotyped images of artists and scientists, were described in the late 1950s by British scholar C. P. Snow in his famous essay as inhabiting "Two Cultures" (Snow 1965). Snow described the "Two Cultures" of science and arts/humanities as separate and unable to communicate with each other. More recently, art and science historians Carolyn Jones and Peter Galison (1998) stated that both domains historically have been defined by the characteristics of their opposite, with art being subjective and interior and science being objective and exterior. This dichotomy, while still persistent, can be traced back centuries, but that is beyond the scope of this dissertation.

In this dissertation, I propose that a historical case study, *9 Evenings: Theater and Engineering*, models a creative collaboration practice using new technologies that begins to bridge this dichotomy. I believe it was the intentional creative collaborations between these post-World War II avant-garde artists and experimental engineers, using new technologies as art making tools, that helped shaped today's digital culture. This event has not been sufficiently examined through the lens of creative collaboration, a phenomenon that is pervasive in our 21st century digital culture. I also believe that the technologies had, and still have, a significant role to play in collaboration as translators or "boundary objects" (Star and Griesemer 1989) in an emerging "collaboration aesthetic"

(Kester 2000). The purpose of my research is to connect the historical *9 Evenings* collaborative practices to more recent research about creative collaboration and contemporary digital culture in order to better understand the significance of intentionally practicing and designing for creative collaboration using media technologies now and in the future.

9 Evenings as Case Study of Creative Collaboration

9 Evenings: Theater and Engineering was a series of multimedia public performances created in 1966 by a collection of Cold War U.S. avant-garde artists and experimental communications engineers from Bell Telephone Laboratories, an acknowledged epicenter of telecommunications research. It is a unique and important historical case study because of its intentional large-scale, well publicized, and well-documented attempt to bridge the "Two Cultures" of Art and Science through their creative collaboration project. The vision behind this initiative was to intentionally collaborate and learn about each other's world to create art, using new technologies of the day. The outcome was revolutionary and transformative for the participants.

Origins & Description

In 1960, when Bell Labs engineer Billy Klüver helped his friend, artist Jean Tinguely, build a self-destructing machine called *Homage to New York* in the garden of the Museum of Modern Art, painter Robert Rauschenberg met and asked Klüver to help create an interactive artwork. This began a life-long friendship and instigated a then-revolutionary concept of an artist and engineer collaborating to make art using new communications and other experimental technologies.

Subsequently Klüver and Rauschenberg worked together, along with a few of Klüver's Bell Labs colleagues, on several interactive sound sculptures. During this time, Klüver was introduced to the multi-talented array of avant-garde artists associated with Rauschenberg (Klüver 1966). Their on-going creative collaborations became the genesis, in 1966, for a more ambitious series of large technology-based performances they called *9 Evenings: Theater and Engineering*. These performances brought together the two cultures of New York City's avant-garde artists and the experimental engineers at Bell Labs. The 9 artists recruited for this project by Rauschenberg and Klüver were from their mutual circle of friends: sound artist/musician John Cage and his pianist/composer David Tudor, Swedish artist Öyvind Fahlström, visual/theater artist Robert Whitman, and dancers Deborah and Alex Hay, Yvonne Rainer, Lucinda Child, and Steve Paxton from the loose performance collective known as the Judson Dance Theater.

The 10 artists and 30+ engineers came from collaborative subcultures with similar values and practices that included open, egalitarian approaches to experimentation; discipline boundary-crossing; respect for technology as a tool; and a project-based approach to creative research and production influenced by cybernetics theory. Each was eager to learn from the other, aware at the outset that they were living in two different worlds and unable to easily speak the other's specialized language.

In January 1966, all participants met for the first time at Rauschenberg's studio where they discussed collaborating to create a series of public technology-based performances that were presented in New York City as the *9 Evenings: Theater and Engineering*. This project was unique because of its double "rockstar" status, with internationally-known avant-garde artists including Rauschenberg and John Cage and

their colleagues paired up with a diverse team of recognized engineers led by Klüver at Bell Telephone Labs. The artists had worked together for many years while most of the engineers had barely met the artists or seen their work.

9 Evenings was a series of 10 performances, each created by one artist and a lead engineer who in turn collaborated with other engineers as needed (Appendix A). The event was presented over a period of 9 evenings, with 2 performances occurring each evening. It took place inside a cavernous armory, attracted over 10,000 people, and was extremely well-documented: a filmmaker was hired to shoot every performance, hundreds of photos were taken by multiple photographers and participants (including the press), and first-hand accounts were written by several of the artists and engineers.

The *9 Evenings* event was the culmination of an intentional experiment in creative collaboration. Although judged a failure for the most part by journalists and art critics at that time, it is now seen as a watershed event that modelled the process of bringing engineering and art together by using technology. Avant-garde artists from an insular urban village in New York City consciously reached beyond their world to communicate and create something bigger than themselves. Engineers working in the New Jersey suburbs in a rarefied Cold War technology research laboratory spent their nights and weekends trying to adapt new technologies to do things like turn off lights in an auditorium every time a tennis ball was hit by a racket.

Out of that initial, unique one-to-one partnership of an avant-garde artist and an electrical engineer emerged a model for creative collaboration that was then tested and iterated during the *9 Evenings*. More than most other genre-busting art events happening during that era, *9 Evenings* caught the collective imaginations of the larger international

scientific and art worlds. Despite being called a "failure" by the New York City press, *9 Evenings* led directly to the formation of Experiments in Art and Technology (E.A.T), an international networking organization with local chapters that continued for decades to promote and support a model of creative collaboration now widely practiced.

According to dance historian Sally Banes (1993), the early post-war period was an expansive time of the new American avant-garde. The *9 Evenings* project was a coming together of a complicated social network of friendships and professional relationships that had developed in New York City since the 1950s. In turn, those artists were a subset of a larger eclectic community of avant-garde musicians, dancers, painters, performers, sculptors, filmmakers, and poets who lived in Greenwich Village who already had developed a strong work ethic of democratic collaboration and collective artmaking. Artists such as Andy Warhol, John Cage, Merce Cunningham, and Allan Kaprow were creating and defining the major art movements of the day, including Pop Art, Conceptual Art, Happenings, Performance Art, Underground Films, New Music, Fluxus, and Postmodern Dance. They also instigated a revolutionary breaking down of boundaries between arts disciplines that uniquely characterized the period in which painters were making dances, dancers were using artists as performers, and new forms of image and sound recording technologies such as film and audiotape (and later video and computers) were becoming more accessible and incorporated into artmaking processes.

These were artists who discovered the essence of a collaborative process was a cooperative venture based on shared power and authority. Their core beliefs, rooted in democratic equality and freedom, focused on power that comes from expertise and ability rather than role or title. They were artists who were open to experimentation and new

ideas, and who routinely came together to share and create something bigger and more interesting than they could do alone. The new technologies of the day – television, audiotape, film – were introduced as artmaking tools, and the artists wanted more access to them. They also understood the big, new ideas about media technologies espoused by Marshall McLuhan that described how media shape consciousness and shrink the world to a global village. So, when Billy Klüver came into their midst, with his interest in bringing artists and engineers together to create new, more humane uses for technologies, everyone was more than ready (Oppenheimer 2005).

Subsequent to *9 Evenings* and because of their successful artist-engineer collaborations, some of the *9 Evenings* participants formed E.A.T., an international matchmaking and networking organization to serve more artists' visions. E.A.T. took on large projects such as designing a pavilion at Osaka's Expo '70, organizing art and technology museum exhibitions, and actively promoting and replicating the successful collaboration model of *9 Evenings*.

Just before Klüver's death in 2004, the large E.A.T. archives that previously had been stored in his basement were moved to the Getty Research Center in Los Angeles. The films and other technology-based artifacts were placed in the Langlois Foundation in Montreal. These newly-accessible archives made it possible for scholars to examine the collaborations in greater detail for the first time in 40 years.

20th Century Creative Collaborations in the Arts and Sciences

Because of its ephemeral nature, creative collaboration as a phenomenon is a mysterious, complex process that is hard to document and define. Business consultant Robert Hargrove defines collaboration as "an act of shared creation and/or shared

discovery: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event" (Hargrove 1997, 4).

Historical first-hand accounts and documentations of well-known collaborators such as Marie and Pierre Curie are rare and often written by others. Collaborations among artists or scientists are mostly expressed after the fact through their resulting creative end products – paintings or operas, technologies or discoveries of DNA, for example. But the actual day-to-day interchanges, underlying values, and actual communications-based practices have not been well-documented, most likely because the collaborators are too busy doing the work and there is no one else around to step outside the process, ask questions, and record things as they happen.

As a field of study, creative collaboration is relatively new, with many of the significant writings about the phenomenon itself dating back less than thirty years. During World War II, the word "collaborator" had a negative connotation of working in sympathy with the various Axis governments. Only more recently has the word become associated with positive creative processes connected mostly to technological innovation.

While the concept of creative collaboration is *not* new in 20th century art, its use has mostly been confined within the art world, with only artists of similar or different genres and art forms working together, like Pablo Picasso and Georges Braque. The performing and cinematic arts always have practiced collaboration between artists and art forms: the collective nature of their final work includes multiple genres of acting, staging, directing, writing, composing and performing music, dancing, etc. The revolutionary

concept after WWII was the development of creative collaboration between artists and scientists of all types – inventors, engineers – as well as the use of communications technologies as significant objects or tools in the collaborative process.

According to performance art historian RoseLee Goldberg (1988), historically almost all the avant-garde art movements of the early 20th century originated in collaborative communities of interdisciplinary artists and art forms. Art historian Barbara Rose traced these histories when she wrote about E.A.T. in *Pavilion* (1972), definitively linking them to the *9 Evenings* project and noting their influence on the artists, especially Rauschenberg and Cage.

The sciences also have a 20th century history of "avant-garde" or experimental collaboration. According to communications historian Fred Turner (2006), it was the period around World War II that initiated interdisciplinary collaborations between natural and social scientists. He has recently traced these lesser-known histories of scientific collaboration, describing how, faced with the urgency of saving the Free World, scientists and academics had come together before and during the war to develop technologies ranging from radar to the atomic bomb.

The development of those wartime technologies included a new worldview based on mathematician Norbert Wiener's concept of cybernetics and grounded in a theory of connected communication systems of people, technology, and information. Thanks in part to Wiener's popular book *The Human Use of Human Beings* (1950), cybernetics theory was widely adopted mid-century by engineers and others in the social and applied sciences as a way of seeing the world as networks of information that circulate between human and machine systems. Cybernetics, which influenced the development of the

computer, also played a pivotal role in the *9 Evenings*. Both the artists and engineers embraced its concepts as part of their respective collaborative practices (Turner, 2006).

Hargrove (1997), John-Steiner (2000), and other collaboration researchers were among the first to study creative collaboration as a phenomenon, turning to the creative fields of art and science for their case studies of 20th century teams such as the Curies (radium), J. Robert Oppenheimer (atom bomb), and Picasso and Braque (Cubism). What is surprising now is that these researchers did not consider the historical mid-century collaborations between artists and engineers, especially given one of their key findings points to the importance of "complementarity," defined as the need for distinctive, diverse points of view, which was a prominent aspect of artist/engineer collaborations (John-Steiner 2000).

None of the researchers identified or examined the more recent histories of artists who, working with engineers and inventors, made art by experimenting with the "new" communications tools developed before and during the Cold War era. This art movement, often referred to as "Art & Technology," is significant for its links to creative collaboration. Also known by names such as Intermedia (Higgins 1966), Kinetic Art (Burnham 1968), the Theatre of Mixed Means (Kostelanetz 1968), and Expanded Cinema (Youngblood 1970), the movement included new, often technology-based multimedia forms such as robotic sculptures, Light Shows, Happenings, and Performance Art. Artists were breaking down the barriers between art forms such as painting and dance, foregrounding the art making process over the traditional end product, and were redefining their relationship to the audience and everyday life.

Throughout the 20th century artists were influenced by new ideas emerging from the sciences around physics (relativity of time and space), technology, media communications, and cybernetic man-machine systems and were eager to experiment with and incorporate the new communications technologies as part of their collaborative art making practices. Engineers, especially at Bell Labs, were eager to work with artists to explore new uses for the technologies they were inventing (Oppenheimer 2005).

The *9 Evenings* project was not the first or only example from the Art & Technology movement where artists and engineers collaborated using communications technologies. Art historian Frank Popper (1993) identifies other, earlier artists, mostly avant-garde musicians working with engineers, including French composer Edmond Couchot, who worked with IBM and Texas Instruments engineers in 1964 to create interactive "musical mobiles." In his research into the San Francisco Tape Music Center, David Bernstein (2008) describes inventor/engineer Don Buchla working with sound artists and musicians such as Morton Subotnik and Terry Riley in the early 1960s to invent a sound synthesizer. According to sound arts historian Douglas Kahn (1999), Bell Labs engineer Max Mathews invited sound artist James Tenney to be an artist-in-residence at Bell Labs in the early 1960s. However, those collaborations were not as well documented as *9 Evenings*, nor were they as ambitious in size and scale, and they didn't capture the attention of print and media journalists in the arts and sciences that ultimately helped spread the idea of technology-based creative collaboration internationally.

Significance of *9 Evenings* as Creative Collaboration

My dissertation research revolves around two major questions that emerged from the *9 Evenings* collaborations:

1. How did the artists and engineers actually collaborate and communicate their ideas and practices to each other?

2. What role(s) did technology play in those collaborations?

I also ask these questions:

- How did the historically separate worlds of art and science, with their distinct cultures and epistemologies, begin to converge as artists gained access to communications technologies to make art?

- How is it that in today's digital culture, it is somewhat commonplace for artists and non-artists, including scientists and engineers, to collaborate using new technologies?

- What can we learn from early collaborations between artists and scientists to design and empower more successful creative collaborations using technology?

In my dissertation, I am using the dual lenses of recent creative collaboration research and digital culture histories because I believe that the *9 Evenings'* collaborations uncover key aspects of successful collaborative practices using technologies that are a recurring, yet hidden phenomenon not yet fully explored in either creative collaboration research or digital culture studies. My findings indicate that creative collaboration has historical precedents in both early 20th century avant-garde art movements and in WWII interdisciplinary scientific research around communications technologies. Those technologies play a significant role in the collaborations as translators or "boundary objects" enabling the artists and engineers to communicate and translate ideas across different subcultures.

There is an emerging "collaborative aesthetic" found in electronic-based artmaking practices focused on complex dialogic processes that are transformative, creating new ideas, not necessarily new art objects. This concept was articulated by Grant Kester in 2000 and has yet to be fully defined or explored in the art world.

I propose that the importance of the *9 Evenings* as creative collaborations is based on the following four claims, which will be supported in this dissertation:

1. The artists and engineers, who came from two different worlds of the arts and applied sciences, intentionally chose to collaborate in order to learn new ways of thinking and working as both artists and engineers and to gain access to new technologies;

2. The participants shared collaborative values and an understanding of cybernetics as a worldview that were just emerging in the more traditional worlds of the arts and sciences at the time;

3. The event spawned the formation of Experiments in Art and Technology (E.A.T.), an organization that continued the same *9 Evenings* model of collaborations between artists and scientist/engineers using new technologies into the present day; and,

4. Despite its initial lack of critical success in the New York press, the event continues to represent an early model for a new "collaborative aesthetic" that is now part of interdisciplinary, technology-based creative practices known as digital culture.

Research Parameters

My research subject is a forty-year-old historical event created by a network of people who now mostly can't be interviewed. No personal interviews were conducted with the artists or engineers because most of them are either not alive, in good health or easily accessible. I recognize that memories of an event 40 years past are not the most reliable sources of information for a historian. Recognizing this, I have done an exhaustive job of locating and studying most of the important documents, records, and artifacts of this event using these as my data. I have accessed first-hand written or recorded accounts found in published and unpublished essays and books from the time period; contemporary, more interpretive writings about the *9 Evenings* and that time period; and historical photos, video and audio documents now accessible through the Getty Research Institute, Langlois Foundation website, and digital documentaries of some of the performances now available from Artpix.

I travelled several times to the Getty Research Institute in Los Angeles, home of the E.A.T. archives and the main source of original photos, audiotapes, and writings by *9 Evenings* artists and engineers. Those archives also contain a 1975 PhD dissertation by Norma Loewen with rare first-hand descriptions of the *9 Evenings* collaborations. They also include excerpts of interviews from some of the artists and engineers produced by Harriett DeLong for a never-published book about E.A.T. that I transcribed from audiotapes. These are the documents that served as raw data for my research.

Dissertation Organization

Chapter 2 of this dissertation is based on a literature review of supporting works. I describe my research methodology of the *9 Evenings* case study in Chapter 3. Chapter 4

contains a synthesis and discussion of my findings; in it I match elements of creative

collaboration and uses of technology I found in my research to direct quotations from

many of the *9 Evenings* artists and engineers. Chapter 5 summarizes my case study

methodology, research findings and conclusions, and points to new questions and future

areas of study related to the histories of E.A.T. and video art and to the uses of new

technologies as part of an emerging creative collaborative aesthetic that is integral to an

ever-expanding global digital culture.

CHAPTER 2: LITERATURE REVIEW

Introduction

In Chapter 1, I introduced my argument that the 1966 *9 Evenings*, as a unique case study of technology-based collaborative artworks created by avant-garde artists and experimental engineers, helped pioneer creative collaboration, which is an expanding aspect of today's digital culture. I believe that the *9 Evenings* artists and engineers, by intentionally bridging the historically separated "Two Cultures" of Art and Science through their collaborations using new technologies, helped develop a successful model for creative collaboration that is now more widely practiced but not yet fully defined and understood.

My research is driven by these two questions: how did the *9 Evenings* artists and engineers communicate and collaborate? And what were the roles of technology in those creative collaborations?

This chapter demonstrates collaboration's growing importance in today's digital culture by analyzing and critiquing selected historical and emerging contemporary literature about artists and engineers collaborating with new technologies in the 20th and current century, and more recent writings about creative collaboration. It emphasizes pertinent shortcomings and strengths, relevant ideas and arguments, and links and gaps between two different domains of knowledge (digital culture and creative collaboration). In this chapter, I identify significant ideas and concepts, such as cybernetics theory, as part of a worldview shared by the artists and engineers. These findings lead to an

emerging definition of a 21st century "collaboration aesthetics," along with a description of the expanding role(s) technologies play as translators or "boundary objects" in today's digital creative collaborations.

The entire body of literature, both scholarly and popular, containing the intertwined histories of 20th century art, science and technology known as digital culture is an open-ended, ongoing area of study, with new research being published almost daily. Digital culture is an expanding intersection of the broader academic fields of humanities, art history, electronic or "new" media, and cultural studies. Alternatively, the literature focusing on creative collaboration research is more recent and not usually referenced by cultural writers or researchers. This body of work emerged mostly out of the social sciences and business world, with few arts-based studies, and it contains new ideas about the origins and nature of creative collaboration as an extension of psychology, human development, and creativity that is directly applicable to my research into *9 Evenings*.

"Art & Technology" and Collaboration

The historical body of literature on the Art & Technology movement is relatively small and hard to find because it mostly is out of print and unavailable electronically. It chronicles artists working on the fringes of a traditional art world that, at the time, predominantly focused on objects such as paintings and sculpture, or on centuries-old performing art forms such as ballet, opera, and theater. It was only in the mid-1960s and beyond, when newer technologies like video and computers became more pervasive as creative tools, that the mainstream art press began to publish writings by and about artists using technology.

The term "Art & Technology" was a catchall phrase used by writers who, starting in the early 1970s, described this time period in books such as *Art and the Future* (Davis 1973), *Science & Technology in the Arts* (Krantz 1974), and *Science and Technology in Art Today* (Benthall 1972). The few books and essays written in the 1960s when *9 Evenings* was produced used other, less specific terms and phrases such as "theatre of mixed-means" (Kostelanetz 1968), "systems esthetics" and "kinetic sculpture" (Burnham 1968), "intermedia" (Higgins 1966), "Happenings" (Kirby 1969), and "expanded cinema" (Youngblood 1970). All were attempts to describe the experimental mixed-media works of avant-garde artists who were redefining art as a creative process that broke through traditional genres; openly acknowledged the audience as part of the process; adopted scientific concepts; and used non-traditional materials like electricity and communications technologies to make art. Some of the major mid-60s events such as *9 Evenings,* organizations like *Experiments in Art and Technology*, and museum exhibitions like *Art and Technology* at the Los Angeles Contemporary Museum of Art in 1968 were the inspiration for later writers to use the phrase Art & Technology.

Art & Technology: Historical

I classify the Art & Technology books published in the 1960s and 1970s as "historical writings" because they followed closely after the *9 Evenings* event and were written by eyewitnesses who had direct access to the *9 Evenings* artists and engineers. These primary writings were attempts to chronicle and explain the explosion of avant-garde American artists, artworks and events of that era. Most of them focused on collaboration (though not in any depth), along with the creative uses of technology and

application of cybernetics theory. In contrast, most contemporary digital media artists and scholars have focused more on the technologies, not collaboration.

The more prominent (and accessible) historical writings about Art & Technology all feature the *9 Evenings* event (Burnham 1968; Kirby 1969; Youngblood 1970; Rose 1972; Davis 1973; Krantz 1974). These texts represent valuable primary- and secondary-source images and accounts of the artists, ideas, practices, and critical reactions to the works. They provide access to some of the artists' and engineers' own words through their detailed first-hand interviews and accounts of the artists' and engineers' creative collaborative practices, as well as other eyewitness accounts by critics or journalists covering the worlds of experimental art and/or engineering. Collectively they indicate that both groups were eager to explore each other's worlds and were influenced, some even transformed, by the creative collaboration process.

Barbara Rose's essay in *Pavilion* (1972), a book about the 1970 Osaka Expo building redesigned by E.A.T., is titled "Art as Experience, Environment, Process." In it, she argues for the importance of the ideal of collaboration as a "social interaction" and she describes key aspects of collaboration, such as lack of a chain of command that presciently predicted similar findings in more recent collaboration research. She wrote "The collaborative process by which the Pavilion was realized was a specifically American experiment in democratic interchange. The process by which it was created, …of people taking responsibility without an authoritarian chain of command, acting within the area of their own competence as the need arose, learning new techniques of communicating with each other and with members of a culture vastly different from their own, may be a model for social interaction. Such an ideal of collaboration and decision

through consensus may indeed be impossible to generalize in terms of a whole society because it demands on the part of any participating individual the ability to think freely as well as comprehensively, to understand an operation of great complexity in which he must play a highly specialized role" (Rose 1972, 102).

Rose's insights into the collaborative process in that era are rare because they reveal a deep understanding as a participant of some of the key elements of the collaborative process. She describes working democratically, without a chain of command, with all participating from their specific expertise and learning how to communicate with members of different cultures. Other writers, such as Davis (1973), also described some of these elements of successful collaborations, but only Rose managed to identify so many.

Most of the key historical writings about Art & Technology also included histories of earlier avant-garde movements such as Dada, Futurism, Constructivism, and Surrealism. All were interested in science and technology, and they rejected art as objects in favor of more performance-based, collaborative works. These earlier histories are an important link to the *9 Evenings* project because they provide a direct lineage to the major revolutionary ideas about science, technology, art, and collaboration that influenced Rauschenberg and Cage's interactive, performance-based approaches to technology as collaborative art making tools.

Rauschenberg and Cage met at the legendary Black Mountain College in the early 1950s, where they were exposed to the ideas of the German-based Bauhaus movement, with its own European avant-garde lineage and "focus on combining all the arts to create a new synthesis of the arts that would embrace and use modern technology" (Rose 1972,

87). As the leading artists in *9 Evenings*, they in turn influenced other artists to embrace these radical ideas about the nature of art and its relationship to technology.

Michael Kirby, a New York City art professor and critic, was one of the earliest Art & Technology writers to acknowledge these avant-garde histories in his work. He wrote two books that described the Happenings phenomena: *Happenings* (1965) and *The Art of Time: Essays on the Avant-Garde* (1969). "Happenings," a term coined by artist Allan Kaprow, were usually non-narrative performances actively involving the audience as participants. As a friend of the *9 Evenings* artists who also participated in the performances, Kirby wrote valuable first-hand accounts of the event. His books are unique for their scholarly approach to Happenings, including one of the first in-depth historical narratives that links Dada, Futurism, Surrealism and the Bauhaus both to technology and to what is now recognized as the first Happening produced collaboratively by Cage, Rauschenberg, Cunningham and others at Black Mountain College in 1952 (Kirby 1969). However, he does not explicitly explore the *9 Evenings* collaborations to any degree, nor does he recognize their importance as collaborations per se, either at the time or as part of their avant-garde heritage.

Douglas Davis also was one of the early Art & Technology writers tracing the origins of these works back to the earlier European 20th century avant-garde collectives. Davis, whose *Art and the Future* (1973) is one of the most-often quoted texts about the Art & Technology movement, was a journalist who became a pioneering media artist in the early 1970s. He interviewed many of the artists and engineers who participated in the *9 Evenings* and provided detailed descriptions of the collaborative processes of the performances and the event as a whole. He emphasized the *9 Evenings* participants'

assertions that they were primarily interested in the collaborative process itself rather than making lasting artworks, and added that this was a dominant attitude (process over product) in much postwar American art. However, his descriptions are just that – descriptions – without any analysis of the elements of the collaborative processes, either as part of past avant-gardes or as part of *9 Evenings*.

These art historians, writing about *9 Evenings* soon after the event, laid groundwork that emphasized the collaborations and linked the project to earlier avant-gardes; however, they did not take the next step to explore the avant-gardes' histories of creative collaboration or the collaborative processes in any depth. Instead, they all focused on the artists' diverse interests in technology and progress, and how these revolutionary ideas were transported to America during the world wars, connecting them directly to the *9 Evenings* artists, especially John Cage.

Within the Art & Technology documents are two containing first-hand accounts of the *9 Evenings* event written by some of the artists and engineers. One is an oft-cited 1967 essay written collaboratively by Klüver and Simone Whitman (then married to Robert Whitman) for *Artforum* magazine. Whitman interviewed the *9 Evenings* artists and engineers, and she quotes them, along with her journal entries, as part of her chronological narrative of the collaborations. The second is an article jointly authored by Robinson and Paxton for Ikon Press entitled "Art and Technology: A Dialogue" that is a transcription of their conversation about the event (see List of References).

Most of the other historical writings about Art & Technology that cited *9 Evenings* can be summarized as descriptions written for the popular art press by participants and other eyewitnesses, or as reviews written shortly after the event, most of

which are critical of the performances or event due to failure of the technology or a lack of interest/understanding of how the performances were collaboratively created. Some of the writings, including those by Billy Klüver (1966), Brian O'Doherty (1967), and Lucy Lippard (1967), have been reproduced in more recent publications about E.A.T. and the *9 Evenings*.

Contemporary Digital Culture

Beginning in the 1980s, an ever-growing body of arts-based literature emerged examining 20th century contemporary art works produced with technology, including the Art & Technology era, to reclaim and critique the artists, art works, and practices bound up in the interwined histories of art, science and technology of that century. With the rapid expansion of artists using new communications and other digital technologies such as Virtual Reality and the Internet, there was, and still is a need to understand, link, and critique the myriad historical antecedents. Many of these writings refer to *9 Evenings* and E.A.T., but mostly at a superficial level. Only recently have these archives been made accessible to scholars. Within the last decade, a new collection of contemporary descriptions and critical analyses of *9 Evenings*, as a subset of digital culture, have begun to be written and published.

Contemporary writings about digital culture can be classified into three categories:

1. Those with a focus on the **performing arts, technology,** and the performance, music, and/or dance artists who were part of *9 Evenings* (Banes 1993; Bernstein 2008; Dunn 1992; Goldberg 1988; Kahn 1999; Sayre 1989);

2. Those with a focus on the **connections between engineering/science and the arts**: time, cybernetics theory, creative collaborative practices, "Two Cultures" dichotomies and metaphors, and technologies invented and used by both artists and engineers (Bivjoet 1990 and 1997; Century 1999; Daniels 2008; Gere 2002 and 2006; Jones and Gallison 1998; Lee 2004; Murray 2003; Packer and Jordan 2001; Turner 2006 and 2008; Wilson 2002);

3. Those with a focus on *9 Evenings,* based on access to Klüver and his archives at the Getty Museum and Langlois Foundation (Bardiotte 2006; Dyson 2006; Lacerte 2008; Morris 2006; Shanken 2008).

Because of their collective interest in key aspects of art/science collaborations in general, and *9 Evenings* specifically, these writings are the first to emphasize the importance of *9 Evenings* as a case study of intentional creative collaboration, which is the contention of this dissertation. They also emphasize and explore the same revolutionary avant-garde ideas and concepts around art, science, and technology that drove the project's vision. However, few of them focus in any depth on successful creative collaborative processes and interactions as distinct phenomena. My research starts at this knowledge gap and connects this insight to newer collaboration research in the social sciences, arts and business world.

Performing Arts and Technology

Music and Technology

The writings about the performing arts and technology emphasize the performative, collaborative, ephemeral, body-centric and process-based aspects of art that were central aspects of all the *9 Evenings* performances. A majority of *9 Evenings* artists

were dancers and musicians (Cage, Lucinda Childs, Deborah and Alex Hays, Steve Paxton, Yvonne Rainer, and David Tudor), with six of them members of the Judson Dance Theater, including Rauschenberg, a painter who participated as a performer. Robert Whitman also considered himself a theater-based artist despite his visual arts training. The practice of collaboration is emphasized in these writings, but none of them acknowledge or connect to the newer creative collaboration research.

Three of the authors focus on music and technology (Dunn, Bernstein, and Kahn), and their works trace the diverse histories of musicians and composers who worked with engineers years before the *9 Evenings* to help invent new uses for communications technologies such as radio, audio recorders and synthesizers. John Cage dominates these (and most other Art & Technology) histories, and he figures prominently in all these writings as a teacher, friend, and source of inspiration to other electronic musicians/composers.

David Dunn's extended essay "A History of Electronic Pioneers" (1992) was written as part of an exhibition catalogue of early electronic video artists' works including Woody and Steina Vasulka and Nam June Paik. He provides an exhaustive chronological overview of the multiple histories of electronic music technologies and aesthetics from the beginning of the 20th century, and proves the dominance of collaboration between artists and engineers through his many examples. He also briefly mentions the major contributions of Bell Telephone Labs engineers and the technologies they invented, along with the artists who worked with them. However, he rarely describes the collaborations in any depth, and offers no analysis of the process.

David Bernstein's more recent history titled *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde* (2008) provides an intimate set of histories about the musicians, engineers, and diverse artists who founded and participated in this vital nexus of the West Coast counterculture and electronic music avant-garde, which included electronic composers Terry Riley, Morton Subotnik, Pauline Oliveros, and Steve Reich. First-hand accounts written by many of the surviving participants describe in some detail how the collaborations happened, often echoing or providing counterpoint to the *9 Evenings* collaborations. As with Dunn, Bernstein doesn't offer any analysis or deeper understanding of the collaborations.

Douglas Kahn's 1999 interview with sound artist James Tenney *does* get at one of the larger aspects of collaboration and communication between the arts and applied sciences: Tenney's unique ability to bridge the languages of art and science. Kahn provides the most detailed, first-hand account of an artist collaborating with Bell Labs engineers found in all the readings. Tenney, who died in 2007, was part of the Greenwich Village avant-garde scene and was one of the first composers to use computer synthesized sound. Kahn is a sound artist and media arts historian who has done extensive research into the history of sound and music in the twentieth century, so his interview with Tenney is well informed and historically well grounded. The early work at Bell Labs in 1961-4 described by Tenney helped elucidate some of the actual differences and similarities of the "Two Cultures" that he embodied. Tenney explored the similarities between musical composition and sound generation by computers with the engineers that possibly sparked their interests in collaborating with the *9 Evenings* artists. However,

Kahn does not attempt to link Tenney's work to the *9 Evenings* project or analyze the collaborations in any depth.

Performance & Technology

RoseLee Goldberg's writings about the history of Performance Art are considered the definitive study of the genre. She was one of the first art historians to focus on this history, beginning with her first book, *Performance Art: From Futurism to the Present* (1988). In it, she presents a detailed study of the historical roots of performance art, starting with the now-familiar early 20th century Futurists, Constructivists, Dadaists, and Surrealists. She notes the absence of this history in the larger history of art, and argues that it is a vital element that should be included because of its multimedia dimension and its connection to larger cultural and political ideas found in contemporary art. She describes the avant-garde New York downtown scene in the 1960s but does not specifically mention *9 Evenings* or E.A.T. Her well-illustrated research, including many rare photos, about the early avant-gardes provides detailed instances of the artists working together collaboratively, but it lacks any first-hand descriptions about *how* the artists worked together from their diverse genres as filmmakers, actors, graphic designers, poets, musicians, and writers. She also de-emphasizes the concepts around machines and technology and instead focuses mostly on the performative aspects.

Henry Sayre's *The Object of Performance: The American Avant-Garde since 1970* (1989) argues for a new kind of avant-garde out of a modernism based in performance that is collaborative and escapes the "cult of individual genius." He analyzes in some depth the collaborations of Rauschenberg, Cage and Cunningham, describing the heart of their collaborative practice as "an aesthetic of heterogeneity - that is, a more or

less freewheeling trust that, in the chance encounter of diverse materials, objects and images arbitrarily brought together in the work of art, certain areas of interest and moments of revelation will reveal themselves" (Sayres 1989, 104). This analysis, alongside Rose's, identifies and anticipates some of the key elements of a successful collaboration, including diversity and heterogeneity.

Sally Banes' two books, *Greenwich Village 1963: Avant-Garde Performances and the Effervescent Body* and *Democracy's Body: Judson Dance Theater, 1962-1964* (both 1993) are a revelation. They are key texts in terms of their deep, complex analysis of the aesthetics and practices of the postwar American avant-garde. Banes, a dance historian, explores the myriad cultural, economic and political roots of the Judson Dance Theater, a diverse artist collective of dancers, painters, composers, and musicians who crossed artistic boundaries and collaborated in the bohemian Greenwich Village of the early 1960s in New York City. She argues that this was the first generation of postmodern artists who shaped the debates, art forms, and institutions that would animate art and culture for the rest of the century.

Banes is persuasive through her complex weavings of urban history, artist biographies, socioeconomic theories, and cultural ideas about the contemporary arts and popular culture of the time period. These weavings provide a unique multi-dimensional portrait of this group of artists who also made up the majority of the *9 Evenings* project. Her theories, about postmodernism and the concept of "collage" being the dominant art form of collaboration, representing "unity in diversity and diversity in unity," and including the central role of the audience/viewer in creating meaning out of its disparate elements, are echoed in other, later writings on arts-based collaboration (Banes 1993).

Banes gets at the complexities of the utopian historical time period of *9 Evenings,*

providing a multi-layered context for reading and interpreting the artists' and engineers'

words about collaboration. This postmodern historiographic approach enables her to look

at earlier avant-gardes and discover comparisons not found in any of the other writings.

For instance, she wrote "Like the Soviet avant-garde of the 1920s, the early Sixties artists

were both interested in and historically capable of truly acknowledging the sophisticated

mass culture they were part of – and the fact that they were part of it. They used

computers and television, collaborated with engineers, and brought mass media

techniques into the art gallery" (Banes 1993, 6).

Her insights into the creative processes and psyches, both individual and

collective, of the *9 Evenings* artists helps to create a complex, historically-grounded

context that weaves together multiple histories of sociology and economics, a bohemian

neighborhood, and avant-garde artists. She anticipated the more recent historiographical

approaches to digital culture described in this document but barely addressed the

technological histories or the inner workings of the collaborative practices.

"Two Cultures" & Connections Between Art and Science

"The amazing thing is that it's possible for artists and scientists to talk together at all. The
first meeting I was scared. Then, the minute it came down to the hardware it was
working. It's like a triangle between the scientists and the artists and the hardware. The
main thing is to establish a working relationship and the hardware is the basis for this."
(Klüver 1967, 1)

Writings about the connections to, and differences between the arts and sciences

are by far the largest category of contemporary writings about new media or digital

culture that emerged out of the Art & Technology era. The "Two Cultures" C.P. Snow

wrote about at the beginning of the 1960s is still a powerful metaphor that haunts the majority of these contemporary writings. In addition, just as Billy Klüver visualized the relationship between the *9 Evenings* artists and engineers and their "hardware" as a triangle, a similar three-sided relationship still dominates as a starting point for approaching the multiple 20th century digital histories from a variety of perspectives represented in the reviewed literature that follows. The works help emphasize the collaborations and the important role of the technologies as a third "partner."

These writings, mostly published since the turn of the 21st century, are emblematic of the most recent culturally-focused research into the two merged worlds of art and science. Most of the writers are part of a small international community of transdisciplinary scholars who know each other, draw on and support each other's writings, and have each staked out their own unique approaches to this ever-expanding subject area.

"Two Cultures" Dichotomy

The first group of writers (Murray 2003; Packer and Jordan 2001; Jones and Galison 1998; and Lee 2004) use the "Two Cultures" as one of their central metaphors. Janet Murray's essay "Inventing the Medium," that introduces Wardrip-Fruin and Montfort's voluminous collection of original historical texts by recognized artists, scientists, and others called *The New Media Reader* (2003) provides an insightful definition of the "Two Cultures" of philosophers/humanists/artists and inventors/scientists. She visualizes them as two strands of DNA, so intertwined as to really be seen as one entity, and poetically traces their dual histories. She helps make

sense of what happened after *9 Evenings*, at the dawn of the computer age, and she emphasizes the role collaboration plays in the process.

Packer and Jordan's *Multimedia: From Wagner to Virtual Reality* (2001) is another collection of original writings by key historical and contemporary artists and engineers/scientists focused on the collaborations between the arts and sciences in the 20th century. Klüver, Wiener, and Cage each have representative essays. The writings in this collection trace the origins of scientific and artistic ideas around communication, collaboration, and the connection of computers and other "new" technologies to creativity. However, Packer and Jordan erroneously claim that "it was not until Bell Labs scientist Billy Klüver placed the potential of advanced engineering into the hands of artists in New York that integrated works of art and technology began to flourish." (Packer 2001, xix) The authors ignore earlier histories of musicians working with electronics engineers, such as electronic composer Morton Subotnik working with Don Buchla at the San Francisco Tape Music Center.

Pamela M. Lee's *Chronophobia: On Time in the Art of the 1960s* (2004) is, in part, a critical look back at the Art & Technology collaborations of the '60s, including *9 Evenings* and E.A.T. Lee, an art history professor, characterizes those collaborations as "the possibility of a happy rapprochement between technology and art. Often enough, these collaborations were characterized as a love of technology by artists reciprocated by a love of art by technologists" (Lee 2004, 12). My research suggests that this is *not* necessarily true of the actual, more complex motives of the *9 Evenings* artists and engineers, reinforcing the need for a more informed interrogation into the collaborations. Lee characterizes the collaborations as an antidote to C.P. Snow's essay on the "Two

Cultures," indicating the persistent power of the art/science dichotomy in contemporary writings.

In *Picturing Science Producing Art* (1998), Caroline Jones and Peter Galison paint a more complex picture of the classic dichotomy. They interpret Snow's essay to mean "the two cultures were not only different, they were unequal: the scientific ethos stood for all that was hopeful, progressive, vigorously heterosexual, and future oriented, while the artistic-literary tradition embodied the profoundly hidebound culture of a decaying elite." They also take a step back, referring to Thomas Kuhn's *Structure of Scientific Revolutions* published in 1962, and argue that the '60s artists and engineers are trying to look past the dichotomy and reveal art and science as two "products of human behavior" that need to be explored for their differences and similarities. This explanation comes closest to characterizing Klüver's and other *9 Evenings* participants' ideas about the true nature of art and science, as well as a key aspect of the *9 Evenings* collaborations (Jones and Gallison 1998, 4).

Connections: Artist + Engineer + Technology = Collaboration

The second group of writings emphasizes the three-sided aspect of art and science that includes technology and encompasses collaborative practices. They directly tackle Klüver's triangle metaphor of artist, scientist and "hardware" (technology) and examine from multiple perspectives the intertwined histories of art, science, applied science/engineering, and technology that, of necessity, must all be addressed simultaneously. In these works, creative collaboration is emphasized and explored in greater depth.

Marga Bijvoet is one of the earliest contemporary art scholars to specifically

research the collaborative aspects of art and technology. She wrote an essay in 1990 titled

"How Intimate can Art and Technology Really be? - A Survey of the Art and Technology

Movement of the Sixties," as part of the anthology *Culture, Technology, and Creativity in*

the Late Twentieth Century edited by Phillip Haywood (1990). Bijvoet explored the new

concepts of collaboration that emerged from the Art & Technology movement, making

the argument that the *9 Evenings* events "not only changed the attitudes of the

participating engineers and scientists towards the arts, but required the artists to develop a

new attitude towards both the work process itself and the final product as 'art object'"

(Bijvoet 1990, 23).

Based on her PhD dissertation, Bijvoet subsequently published *Art as Inquiry:*

Toward New Collaborations Between Art, Science, and Technology in 1997 that further

explored the Art & Technology histories, including *9 Evenings*. She describes the roots of

ideas, concepts, and aesthetics of the Art & Technology movement, including cybernetics

and systems theories that characterize the artworks' "immateriality, temporalness, and

non-object-ness" (Bijvoet 1997, 10). Bijvoet claims that the Art & Technology

movement lasted only four years (1968-72), when new communications technologies

emerged to capture the imagination of artists. She also argues that this movement was

different from other art and technology movements in the 20th century with its intent to

breach boundaries between disciplines within the arts, between arts and sciences, and

between art and life. She describes the artists' and scientists' parallel interests in systems

and cybernetics, with artists adopting terms like "feedback" and "closed-circuit" from

engineers. Bijvoet also claims that the idea of art as information and patterns of

organization coming from cybernetics dominated, but faded in the art world after 1975 (Bijvoet 1997, 4).

Stephen Wilson's *Information Arts: Intersections of Art, Science, and Technology* (2002) is an encyclopaedic tome presenting a comprehensive overview of the myriad ways science and technology intersect with the arts. A professor of conceptual art, Wilson argues that the arts need to be more connected to science and technology in order to be relevant and aware of their profound influence over every aspect of life, and he attempts to bridge that gulf. He provides working definitions of "science," "technology," and "art," and addresses the historical separation of art and science, including Snow's "Two Cultures."

Wilson also explains how the newer domains of Cultural Studies and Cultural Theory "challenge traditional ways of studying culture and question the wisdom of trying to understand the arts, humanities, and sciences in isolation from each other and of segregating 'high' and 'low' culture." He claims that critical theory deconstructs long-standing sacred cows "such as science's privileged claims to truth and objectivity, as well as art's claims to a special elevated sensitivity. Artists and scientists are seen as creatures of culture, and their work is understood within larger psycho-political-economic-cultural frameworks..."(Wilson 2002, 6). His book supports the need for, and wisdom of tearing down the walls between the disciplines of art and science, along with a call for more complex historiography.

In a much shorter 1999 publication, Michael Century, a Canadian media arts scholar, conducted a study for the Rockefeller Foundation on the history of the 20th century "studio-laboratory." His work presents a new framework for viewing the hybrid

art, technology, and science activities of the "studio-laboratory" historically, and identifies different themes based on the dynamics of "transdisciplinary" knowledge production in science and technology. He describes the characteristics of World War II research laboratories: collaborative, multi-site, and emphasizing applied knowledge and social accountability. He also is the first writer to introduce the concepts of technology as "boundary object" and the "art-hacker information culture." He elaborates on art-hacker culture as having two aspects: an "open source" philosophy of development, and heterogeneous collaboration between diverse people (Century 1999, 42).

This document is the earliest digital culture writing found that introduces several new key concepts and ideas central to my research. First, Century introduced the idea of looking at university and corporate research laboratories as sites of creative collaboration between the arts and sciences. He identified a new space that is outside the art world, emerging instead out of World War II science-based, government-funded weapons research, where artists are recognized as equal partners in experimentation and discovery of new technologies. This new site for examining the connected histories helps recontextualize Bell Telephone Laboratories as an experimental creative space, and examine *9 Evenings* as an intertwined relationship with both art and science that is as much about scientific experimentation as about creating art. Century specifically mentions E.A.T. as a historical "studio-laboratory" but not in any detail.

Two linked key ideas that Century introduces emerge again in more recent writings. One is the concept of "art-hacker information culture" he defines as "rejecting any separation of form and content, and viewing communication as active, reflexive responses to problem solving not confined to pre-figured options shaped by an existing

system." The "open source" philosophy of technology development is a second concept described as part of this culture, coming out of early computer hacker practices where "many artisans contribute within an open, standards-defined framework, freely sharing improvements and benefiting jointly from collective rising tide" (Century 1999, 42).

Century's third key concept, the idea of technology as a "boundary object," is a term first introduced in 1989 by sociology historian S. Leigh Star. It describes objects such as cultural artifacts (pottery, jewelry) that support the collaborative process by acting as a translator, "inhabiting several intersecting social worlds" that meet the informational needs of each of them (Star 1989, 509). This is the earliest instance of the use of the term "boundary object" in the context of art and technology histories, and it reappears in more recent writings by Turner (2006) and Daniels and Schmidt (2008).

Charlie Gere, a British media arts historian, wrote two books that also begin to recontextualize *9 Evenings*. In *Digital Culture* (2002) and *Art, Time and Technology* (2006), Gere defines digital culture as "a historically contingent phenomenon" that emerged from capitalism and World War II warfare research. It is driven not only by the development of technology, but also by other sources, including "techno-scientific discourses about information and systems, avant-garde art practice, counter-cultural utopianism, critical theory and philosophy, and even subcultural formations such as Punk. These different elements are as much a product of the paradigm of abstraction, codification, self-regulation, virtualization and programming as the computer" (Gere 2002, 14).

Both Century and Gere start to resuscitate the *9 Evenings* project historically, with its converging worlds of avant-garde artists and World War II-based research, in a way

not described in previous historical accounts. Gere is part of a community of media arts historians who emphasize the 20th century histories of science and technology as equally important root histories intertwined with the art historical early 20th century avant-gardes that collectively define 21st century digital culture. Gere, Bijvoet, along with earlier art historians like Burnham and Davis, also emphasize the role of cybernetics, but the contemporary writers are able to see deeper, more diverse connections to key people like Cage (whose inventor father researched radar); to technology histories that emerge out of science and engineering; and to the countercultural roots of computer hacking and open source. What Gere and others (except for Bijvoet) largely ignore is the importance of creative collaboration as another key aspect of this new digital culture.

Dieter Daniels and Barbara Schmidt edited a book of essays that came out of a seminal 2005 *Refresh! First International Conference on the Histories of Media Art, Science and Technology* at the Banff Centre in Canada. In it, they foreground the key concepts and themes described in Gere's work. *Artists as Inventors, Inventors as Artists* (2008) has as its main themes the concept of technology as a boundary object between the arts and sciences, and the conflicts among ethical, aesthetic and economic values in the systems of art versus technology. They also use Snow's "Two Cultures" as a foil to get at the "broader methodological debate on the interrelationship of culture, science, and technology that has been taking shape since the mid-twentieth century." Daniels and Schmidt traced the roots of media art practices from "origins in electronic music, media-based poetry, expanded cinema, and electronic visual arts [as a] new form of artistic expression beyond the bounds of all established genres, one that does not merely take technology as its subject but rather uses it as a medium, and one that, in a way that is both

experimental as well as exemplary, lets interdisciplinarity and intermediality become a process of self-reflection that can at the same time be a sensory experience"(Daniels and Schmidt 2008, 10).

Three essays in their book directly relate to my dissertation. One, a 1996 interview with Billy Klüver written by Edward Shanken and edited by Schmidt, provides new insights into Klüver's ideas about the worlds of art and science and the *9 Evenings* artists and engineers. This and a second essay, "*9 Evenings* and Experiments in Art and Technology: A Gap to Fill in Art History's Recent Chronicles" by Sylvie Lacerte are new writings that come from recent access to Klüver and the E.A.T. archives. Lacerte was a researcher-in-residence at the Langlois Foundation in 2005 and was one of the first scholars to have direct access to all the films and other documents from *9 Evenings*. This essay is an edited version of her research findings that focuses on all the technologies invented and used in *9 Evenings*. In her literature review, she states that only a few Art & Technology anthologies mention E.A.T., concluding that "not one comprehensive and contextual analysis of this phenomenon has ever been undertaken" (Daniels and Schmidt 2008, 170).

The third essay, Simon Penny's "Bridging Two Cultures: Towards an Interdisciplinary History of the Artist-Inventor and the Machine-Artwork" gets at creative collaboration and its association with artists who, out of necessity, become inventors when the tools they need aren't readily available. He asserts that "beyond the ghetto of visual arts, cultural and technological practice is more often pursued by collaborative groups of practitioners. Most scientific research occurs this way, as does theater, filmmaking, and architecture….It may also be argued that collaboration has been

necessitated by the unwieldy prototypical nature of the technologies cobbled together to achieve goals in the first decades of digital arts production" (Daniels and Schmidt 2008, 145).

While Penny does not delve into a deeper analysis of those collaborations, he makes other points not related to collaboration that directly relate to my research. He asserts that the Art & Technology movement emerged out of a time of both technological and social change, where "its practitioners were informed by the civil rights movement, race politics, nascent feminist and environmental politics, by political activism, and by the culture of experimentation with chemically altered states of consciousness. Another key influence was the culture of second-order cybernetics, itself a radically interdisciplinary culture, in which technical theories of control and communication became generalized to address diverse biological and social as well as technological topics" (Daniels and Schmidt 2008, 156).

Penny reintroduces one more powerful idea that Century also described – the art-hacker culture that values the alternative "ethos of open source" as opposed to the "cult of individuality in the arts and the hierarchical corporate mode." This also describes the ethos of creative collaboration, in which there exists a gift culture of sharing and communal lack of hierarchy that leads to successful collaborations and new inventions specifically found in the history of the media arts but not often recognized overtly as collaborative practices. Penny asserts that "technocultural artifacts developed by this [new media] community consistently precede the cultural and technical imagination of their society, and of academic/industrial research by a decade to a generation" (Daniels and Schmidt 2008, 146).

Communications historian Fred Turner also focuses on the Art & Technology

movement from multiple historical perspectives: '60s counterculture, World War II

research technology development, and the invention of cybernetics theory. In his 2006

book *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network*

and the Rise of Digital Utopianism, Turner reveals how the military-industrial-academic

research world of World War II and the Cold War gave rise to a free-wheeling,

interdisciplinary, collaborative, and highly entrepreneurial style of work that, when

connected to the avant-garde art world of New York City and the counterculture ideals

and values embodied by Stewart Brand, found its way into Silicon Valley and the

contemporary culture of personal computing (Turner 2006).

Turner argues that the engineers and other kinds of scientists coming out of World

War II embraced both computers and Norbert Wiener's new cybernetic rhetoric of

systems and information, and that they imagined institutions as living organisms, social

networks as webs of information, and the gathering and interpretation of information as

keys to understanding not only the technical but also the natural and social worlds. He

describes how cybernetics became a "universal discipline." Because of these changes in

scientific practice, specialists in one discipline began to do things that had previously

been considered the proper domain of specialists in other areas. Turner makes a strong

case for how artists and engineers both embraced the cybernetics view. His research

supports my argument that the *9 Evenings* artists and engineers had similar worldviews,

enabling them to collaborate and embrace a process-based approach to creating the

technologies and the performances (Turner 2006).

Turner's book is remarkable for its foregrounding of collaboration as a creative process emerging from the experimental worlds of both art and engineering. He uncovers the common ground of two very different subcultures: World War II research and '60s countercultural ideals not articulated as clearly elsewhere. He describes their commonalities as a shared celebration of intellectual work, technology, and collaborative work styles that collectively revelled in the economic and technological abundance of post-World War II America. Many of the scholars previously mentioned have addressed some of these aspects, but Turner uncovers the intertwined art/science roots of the Art & Technology era's creative collaboration practices.

Turner subsequently wrote "Romantic Automatism: Art, Technology, and Collaborative Labor in Cold War America" (2008), a long article that goes one step further towards examining creative collaboration and its interconnected roots in both 20th century culture and technology-driven industry. In it, Turner analyzes the role of avant-garde artists in transforming the theories of dehumanizing automation into liberating, collaborative practices that reveal mankind as a creative, collaborative agent within systems of technology and chaos. He links early artistic connections to automation (Surrealists), Jackson Pollack's individualistic, "automatic" painting style, and Rauschenberg and Cage's subsequent reaction to Abstract Expressionism's egotism in their *9 Evenings* performances.

His essay presents a new interpretation of the role of the *9 Evenings* artists as active agents in their collaborations. It explains, in part, why the artists were such a revelation to the engineers. As Turner describes in his introduction: "To date, scholars have in fact analyzed Happenings and the automation debates within two very separate

fields: the history of art and the history of technology, respectively. Yet, in this case, the history of artistic practice and the history of the integration of computing into everyday life need to be seen as entwined. The automation debates and the happening at Black Mountain grew out of a remarkably similar understanding of human subjectivity… In the postwar years, these artists and others around them transformed the erasure of self, so feared by opponents of business automation, into the basis of a new form of artistic agency and a new, collaborative social style specifically opposed to the hierarchies of the automated factory - an agency and a style that I will call 'Romantic automatism'"

Turner argues that the *9 Evenings* artists redefined automation and technology as empowering, and defined collaboration as a new mode of communal, self-less creativity. He writes that "...they offered those [industry] leaders a new ideological framework in which they could imagine themselves as creative agents and their factories not simply as sites of production, but as spaces for bohemian collaboration" (Turner 2008, 6-7).

9 Evenings, E.A.T. Archives and Collaboration

The third category of Art & Technology and collaboration writings are the recent publications by scholars who had direct access to Billy Klüver and his substantial E.A.T. archives. Klüver, who died in 2004, and his widow Julie Martin placed their voluminous archives of E.A.T. in the Getty Research Institute in Los Angeles. Additionally, there are film documentations of all *9 Evenings* performances recorded by Alphons Shilling: still photos, tapes of phone conversations, and other media documents that are housed at the Langlois Foundation in Montreal. These archives were just recently made available to scholars.

"And then it was now: Enduring Rhetorics," one of the recent Langlois website writings by media historian Fran Dyson (2006), attempts to define how *9 Evenings* and subsequent E.A.T. collaborations were a conduit between the complex worlds of art and technology. Like many of the Art & Technology historians before her, Dyson initially draws on the historical dichotomy of art and science, but she quickly moves into the domains of culture and economics, quoting another of Klüver's many art/science metaphors in which he described the artist confronting the "castle of technology" and the act of getting past the gate by fraternizing with the soldiers on the wall – the engineers. She then imagines the resulting collaboration as a "border transaction - engineers get to feel a bit like artists, artists get their hands on technology, one speaks for the other, they become friends, their interests merge and in that merging, the possibility of a non-antagonistic relationship between culture and technology is broached"(Dyson 2006).

Clarisse Bardiot, another Langlois researcher-in-residence, focused on the set of diagrams created by engineer Herb Schneider in the final month of *9 Evenings*. These diagrams enabled the artists to more easily communicate their ideas and technological needs to the engineers. Her online essay also is a chapter in a catalogue for the MIT List Center's *9 Evenings Reconsidered* (2006) travelling exhibition. It, along with an essay by curator Catherine Morris, provides the most detailed accounts found of the actual collaborative practices between many of the artists and engineers. She and Morris interviewed Schneider and obtained his first-hand account of how and why the diagrams for each performance were created.

Creative Collaboration Research

Both the artists and engineers involved in the *9 Evenings* event were clear from the start that they wanted to make the collaborative process their main focus and mode of operation. Many of the writings about the Art & Technology movement described above also identify and focus on the collaborative aspects of the artworks made by artists, including *9 Evenings*.

Missing from all these writings is an expanded definition or description of the creative collaboration process as a distinct practice as well as a set of elements and behaviors that describe conditions needed for a successful collaboration. Also missing are detailed descriptions of how the artists and engineers communicated and worked together as well as the role(s) that technology played in those collaborative processes.

The contemporary arts, the business world, and the social sciences each have a body of literature about creative collaboration. What links all the creative collaboration writings is their overwhelming choice of scientists and/or artists as the creative subjects for their case studies. The business writers and social scientists all selected a wide spectrum of artists and scientist/engineers, with one focusing on jazz musicians and comedians because of their unique collaborative practices around improvisation in real-time performances.

Creative Collaboration in the Arts

In 1984, the Smithsonian's Hirschhorn Museum and Sculpture Garden in Washington D.C. presented an exhibition titled *Artistic Collaboration in the Twentieth Century*. The catalogue for the exhibition featured three essays and contains some of the only writing exploring creative collaboration in the 20th century art world both

historically and as a new theory of what catalogue contributor David Shapiro called "pluralistic aesthetics," that is, collaboration defined by its process, not by the resulting object (McCabe 1984).

Cynthia Jaffee McCabe was the curator of the exhibit. For it, she wrote an essay called "Artistic Collaboration in the Twentieth Century: The Period between Two Wars." It traces the history of collaboration in early avant-garde movements from the Futurists to the Surrealists. In it, she defines artistic collaboration as "When two or more creative artists mutually generate provocative aesthetic ideas…. Painters, sculptors, poets, writers, choreographers, video artists, filmmakers, photographers, and composers can act together in teams to produce startling new works that would be inconceivable individually." She concludes that "Chance and calculation are the two poles of twentieth-century artistic collaboration. From the inception of WWI to the aftermath of WWII…unpremeditated collaborations predominated and, indeed, were intrinsic parts of two of the most important avant-garde movements: Dadaism and Surrealism. Both Dada, a nihilist anti-art response to moral and material chaos, which revered the laws of chance, and Surrealism, an interwar manifestation of universal malaise that exalted the role of the unconscious, had major impact because of their collaborative components" (McCabe 1984, 42).

McCabe limits her definition of collaboration to artists working together, which is typical of most writings about collaboration in the art world. As with many of the other writings mentioned above, she does not go into any detail about those collaborations nor does she examine the elements and processes. She does, however, identify the common thread of collaboration between the early avant-gardes and *9 Evenings*. Her definition

begins to identify a key aspect of collaboration: that new works produced "would be inconceivable individually" (McCabe 1984).

Art historian Robert C. Hobbs also wrote an essay for the catalogue called "Rewriting History: Artistic Collaboration since 1960" that compares the "great person" approach to art history with artists' collaborations in the 20th century. He believes that collaboration brought the artist and audience closer to the true creative process by emphasizing its open, dynamic attributes and connection to people as a dialogue or discourse. However, his belief that artistic collaborations in the 1960s were "largely modelled on corporate types" runs counter to my findings that most of the artist collectives, including *9 Evenings*, actually applied democratic, non-hierarchical practices not always found in corporations (McCabe 1984, 87).

"Art as Collaboration: Toward a Theory of Pluralist Aesthetics 1950-1980," a third catalogue essay written by poet and art historian David Shapiro, took Banes' metaphor of collage as collaboration one step further by linking it to cybernetic systems theory. In it he wrote, "Collaboration may be said to be a mode analogous to collage. The best collaborations of the Dadaists and Surrealists, as well as the members of the so-called New York school of poetry, emphasize the theme of abruptness, of textural changes, and of the sense of rupture and discontinuity…. In systems theory, collaborative cultural modes are those of 'open systems' with feedback mechanisms for correction and anticipation of the future" (McCabe 1984, 45).

Shapiro acknowledges that, by now, the collaborative aspects of avant-garde movements are almost a cliché, but he warns, "I think it is well to recall that the greater myth of the hero sometimes deforms this communal sense, and we begin to have a van

Gogh without Gauguin…" He describes a "theory of collaboration" in a group of American early '60s poets (Koch, Ashbery and others) that "is seen as a utopia of communality, of group dynamics, and of systems." He then looks at the collaborations of Cage, Cunningham, and Rauschenberg as "a supremely generative nexus in our epoch. Cage uses Zen Buddhism to offset his lack of psychoanalysis and is led to the sense of egoless collaboration….Rauschenberg is willing to embrace technology affirmatively and collaborate with engineers in participational schemata. Cage affirms the idea of group systems in his collaborations.... All three of them avoid the individual sensualism of the Expressionists; all three are close to a global bias in their work despite all discontinuity" (McCabe 1984, 50-58).

Shapiro concludes his essay by telling us "Collaboration in our epoch is a polyphony of real, historical, and conditioned voices speaking of their common predicament in subjugating systems" (McCabe 1984, 61). He anticipates Turner's description of "Romantic automatism," in which collaboration supports artists as free agents working within technological systems, and where Rauschenberg, Cage and Cunningham "served as key intermediaries between the technical and artistic worlds, simultaneously embracing and rewriting the new forms of human-machine relations emerging around them" (Turner 2008, 7).

Australian art historian Charles Green wrote *The Third Hand: Collaboration in Art From Conceptualism to Postmodernism* in 2001. He theorizes about artistic collaboration by defining his concept of the "third hand" as a new form of joint authorship that represents a third artist or "hand." He proposes that collaborative practices begun in the 1960s were a defining aspect of art making in the late 20th century.

Since the last half of the last century, he contends that artists have been self-consciously exploring different identities, attempting to dispel the media clichè of the lone artist in a studio, waiting for inspiration with no connection to the past or rest of society. He looks at three types of collaborations: marriage/partnerships (Helen and Newton Harrison and others), couples like Gilbert and George who developed "third" identities, and bureaucratic identities or brands. None of these types of collaborations describe *9 Evenings*, however, and Green doesn't acknowledge collaborations outside the art world, the earlier avant-garde or Art & Technology collectives, or the use of technology as part of the mix.

Art professors Linda Candy and Ernest Edmonds focus on artists collaborating with technologists to create digital artworks in their 2002 book *Explorations in Art and Technology*. They acknowledge the 1960's Art and Technology movement, describing E.A.T. and a 1968 British exhibition "Cybernetic Serendipity." However, they make no attempt to examine earlier projects in light of their current research, other than to acknowledge them as historical antecedents. Their book's structure is somewhat disjointed, including a brief history of their Creativity and Cognition Research Studios along with more detailed descriptions and discussion of their research subjects and methods. Candy and Edmonds examine case studies of seven artist/technologist collaborative projects as they were happening, collecting in the process a variety of data including transcriptions of conversations, written reports, and interviews.

Collaborative Aesthetic

Grant Kester's 2000 essay, "Conversation Pieces: Collaboration and Artistic Identity," was written for an exhibition titled *Unlimited Partnerships: Collaboration in*

Contemporary Art at the CEPA Gallery. He, like Green and others, begins with the "cliché" of the solitary artist genius and posits a "subterranean tradition of dispersed or collective authorship, collaborative interaction and process-based forms of production that periodically emerges into art world consciousness..." including the Surrealists and later artist collectives. He describes a "collaborative aesthetic" where "collaborative artists are as concerned with the experience of collaborative interaction itself, the new insights and new forms of knowledge that are catalyzed through this interaction, as they are with the creation of a physical product. Here the 'work' of art refers as much to a process as it does to an object." As a result, he explains, "the expressive privilege of the artist is, at least partially, displaced in favor of a network of discursive and dialogical relationships among and between the artist and their co-participants. Primary emphasis is placed on the character of this interaction rather than on the physical or formal integrity of a given artifact, or the artist's experience in producing it" (Kester 2000, 5).

Kester also asserts this kind of collective aesthetic is prevalent in digital media production, explaining that "Here the creative process is exploded outwards to accommodate any number of potential levels of collaboration and creative interaction….the physical form of the image is simply one manifestation of a larger process, and it is this larger process that constitutes the 'work' of art. The creation of the image serves as the occasion for a series of social interactions among collaborators that can operate on a number of different levels: aesthetic and compositional questions, political strategy, and so on. In this sense the resulting image might be said to function as the token or 'evidence' of dialogical exchange" (Kester 2000, 7).

Creative Collaboration in the Social Sciences

The myth of the "lone genius" serves as the beginning metaphor for social science-based creative collaboration research, as it often does for the arts-based writings. The body of literature on creative collaboration is relatively small, and case studies are the main methodology used for examining and describing the phenomenon. Both scientists and artists usually are featured, and most of the writings include technology as a key aspect or player.

Five books relate most directly to my research: three are written by business consultants, one is a hybrid work by a musician and academic psychologist, and one is the work of a psycholinguist and creativity scholar. These works describe in greater detail and depth the ephemeral, mostly invisible processes and practices of creative collaboration by deconstructing and describing the building blocks of successful collaborations, and defining the key characteristics and behaviors of individuals in a collaborative group. This is new scholarship that has not been mapped onto the *9 Evenings*, or any of the early Art & Technology collaborations.

In their 1997 *Organizing Genius: The Secrets of Creative Collaboration,* business consultants Warren Bennis and Patricia Biederman describe the 20th century as "a golden age of collaborative achievement in America." They examine six case studies of "Great Groups" of politicians (Carville and Clinton), artists (Disney, Black Mountain College) and scientists (Manhattan Project, Xerox PARC & Apple, Lockheed Skunk Works). They argue for their particular selection of creative Great Groups because "excellence is a better teacher than is mediocrity," and they begin their work with the claim that the Great Man theory of history is dead. This is a book written for the business world, however it has relevance to my research because it uses case studies of artists and scientists to

develop a list of lessons learned from successful creative collaborations. The authors describe fifteen "take-home lessons" of Great Groups, such as "greatness starts with superb people" and "great groups and great leaders create each other," and these lessons map well onto the actual accounts of *9 Evenings* (Bennis and Biederman 1997). Most of their case studies include technologies as key players, but don't examine the technologies' roles in the collaborations.

Robert Hargrove published *Mastering the Art of Creative Collaboration* (1997) the same year as Bennis & Biederman. In it, he characterizes collaboration as a 21st century expansion of what it means to be human, where the Great Man theory of history is giving way to a global economy of networks, not hierarchies, and the spread of technology has created a knowledge society that demands teamwork and sharing.

Hargrove and the others mentioned in this section are some of the first writers to look at collaboration as part of worldwide socioeconomic processes, within ever-more pervasive communication-based technological systems, that are changing the way we all live, work and create. He describes the characteristics of a collaborative person, such as a "master at building relationships" and a "good listener" that identifies traits exhibited by the *9 Evenings* artists and engineers (Hargrove 1997).

Hargrove interviewed John Seely Brown, who directed the Xerox PARC laboratory in the 1980s when artists were paired with engineers to discover successful elements of those collaborations. Brown emphasized the importance of dialogue and "generative active listening" to move ideas to higher levels. Hargrove introduces Peter Galison's concept of "trading zones," also mentioned by Turner (2006), in which people from different domains who speak different "languages" can find ways to communicate

and work together. This also references the "boundary object" concept that connects the collaborative process to the use of technologies (Hargrove 1997, 122).

Michael Schrage, in *No More Teams: Mastering the Dynamics of Creative Collaboration* (1995), reinforces the need for translation among different subculture languages. He emphasizes that "since collaboration fuses multiple perspectives to address a task, it must use multiple representations to manage those perspectives…. collaborators require a repertoire of different languages to hone in on the problem to be solved or the innovation to be created." He identifies the need for developing a shared language that includes different forms of communication and levels of representation, "mathematical, structural, conversational, visual," to provide multiple lenses through which to view the collaborative tasks and ideas (Schrage 1995, 160).

Schrage goes on to say that language is the "raw material" of collaboration by citing anthropologists Edward Sapir and BenjaminWhorf's hypothesis that "language molds the form and texture of thought," meaning that our use of language shapes how we see reality and the world around us. He explains how we all see the world a bit differently because our unique upbringings provide us with different combinations of words and images to describe what we were seeing and thinking. Therefore, language shapes thought. And with collaboration, different languages of different subcultures or domains of thought such as those found in the arts or sciences can mean artists and scientists perceive, think, and communicate about the world in very different ways. Schrage also emphasizes and describes the uses of electronic media to communicate and work collaboratively from different locations (Schrage 1995).

In her book *Creative Collaboration* (2000), psycholinguist and creativity scholar John-Steiner uses case studies of artists and scientists to identify and describe many of the key elements of all creative collaborations. Each of these elements defines an essential aspect of collaboration that is crucial to its success. These include: developmental linguistic theories of how we learn to view the world; the feminine, nurturing dimensions of collaboration, including empathy; the need for complementarity and diversity in all its dimensions; the importance of communication and how it is achieved among diverse domains of knowledge and personalities; shared vision and its support system; and the "zone of magic" that occurs through transformative, integrative collaboration (John-Steiner 2000).

John-Steiner initially frames her research by citing Lev Vygotsky, a Russian psychologist who in the 1920s and '30s developed a concept of "dynamic interdependence of social and individual processes" focused on how a child's intellectual development is rooted in a "thought community" of caring adults. She contrasts this collective approach to human development with the predominant individualistic concepts of Piaget and Freud, and makes a case for collaboration as a basic human activity that is highly valued and crucial to our survival in the 21st century (John-Steiner 2000).

Keith Sawyer, a colleague of John-Steiner's and a jazz musician, also makes a strong case for creative collaboration as a key to survival in an electronically networked world. Sawyer, who studied with Mihalyi Csikszentmihalyi, the first person to describe the "flow" process in creativity (Csikszentmihalyi 1999), spans the disciplines of the arts, psychology, education and creative collaboration research. His 2008 book, *Group Genius: The Creative Power of Collaboration*, was written for the business world, but it

is based on academic research around creativity, collaboration and innovation grounded

in the arts and applied creative industries (architecture, design, film industry, etc.).

Sawyer also contends that the myth of the solitary genius is dead. His research shows that

innovations once believed to be the result of one person actually emerged from invisible

collaborations, and that "collaboration was responsible for famous creations throughout

history." He states that "collaboration drives creativity because innovation always

emerges from a series of sparks - never a single flash of insight." His research suggests

that the secret to understanding successful collaboration is examining what happens

inside the collaborative process, the "moment-to-moment interactional dynamics"

(Sawyer, 2008, 13).

Summary of Findings

Digital Culture and Collaboration

My review of the literature for my research into the *9 Evenings* project includes

readings from two large domains of knowledge: digital culture and creative collaboration

as a sociocultural phenomenon. The digital culture readings in general support my

argument for considering the *9 Evenings* event as a unique case study because of its

transformative scope and scale of collaboration; its lineage from earlier 20th century

avant-garde collectives focused on technology; its collective revolutionary vision, set of

values, and cybernetic worldview; and its successful attempt to bring the worlds of

experimental art and science/engineering together, especially through the subsequent

establishment of E.A.T. as an evolving model for supporting creative collaboration.

I categorize the digital culture writings into historical and current works. The

historical works were written at the time of *9 Evenings*, in the 1960/70s, and collectively

include descriptions of early to mid-twentieth century technology-based art, art/science collaborations generally categorized as the Art & Technology movement, and the *9 Evenings* project more specifically. Many of the writers explored the early twentieth century avant-garde collective movements such as Dada and Constructivism that focused on the relationships of art, science, and technology and also influenced the *9 Evenings* artists' practices. In addition, the collaborative aspects of *9 Evenings* were emphasized and described at the time by some of the writers (Davis 1973; Rose 1972; Krantz 1974). However, those aspects were, for the most part, *not* examined further as a key aspect of digital culture in the *contemporary* writings. This is a knowledge gap I address in detail in my research findings.

I classify the 20 contemporary writings about digital culture dating from the late 1980s into three broad categories. They focus either on the performing arts and technology or on the connections between the sciences and the arts, including technology, cybernetics, and the "Two Cultures" metaphor, or they are about *9 Evenings* specifically.

The performing arts and technology writers examine the collaborative and ephemeral body-centric practices that also were central to all the *9 Evenings* performances. Collaboration is a key topic in these writings, but it was not explored in any depth as a social phenomenon. Dance historian Sally Banes (1993) best articulates the larger socioeconomic and cultural ideas and issues influencing all of the *9 Evenings* artists. Her descriptions of the Cold War era's avant garde experiments in democratic, collective art practices also map to some of my key aspects of collaboration found in Chapter 3. Goldberg (1988) and Sayre (1989) re-emphasize the historical links to the ideas and practices of earlier performance-based avant garde collectives who influenced

Cage and Rauschenberg, but they don't address technology. Dunn (1992), Kahn (1999), and Bernstein (2008) provide additional historical links to collaborative practices between twentieth century electronic musicians, sound artists, and engineers, including Cage and James Tenney who collaborated earlier with Bell Labs engineers.

Contemporary writings about the connections to and differences between the arts and sciences are by far the largest category of contemporary writings about new media or digital culture. The "Two Cultures" that C.P. Snow wrote about at the end of the 1950s is still a powerful metaphor that haunts the majority of these more recent writings. In addition, Billy Klüver's metaphor of a triangle representing the relationship between the *9 Evenings* artists, engineers and their "hardware" still dominates as a general starting point for writers approaching the multiple 20th century digital culture histories from a variety of perspectives. As a result, they support my argument for emphasizing further exploration of the collaborative process as a bridge between the two cultures and the important roles of technology as a third partner.

Art historian Marga Bijvoet's writings about the Art & Technology movement (1990, 1997), with their focus on collaboration, were one of the key starting points for my research because of her unique historical research into how the arts and sciences influenced each other and because of her range and depth of findings about collaboration, including *9 Evenings*. Based on her rare (at that time) access to historical writings, she identifies the transformational aspects of the collaborations that changed the thinking of both the artists and engineers about art as process, not product. She also focuses on the ideas emerging in the sciences about cybernetics and how they influenced artists'

worldviews. However, her forward-looking research is not referenced in many of the more contemporary digital culture works.

Three other writers from this group - Century, Gere, and Turner - prove to be most important to my findings. Century (1999), in his report on twentieth-century "studio-laboratories" of art and technology, expands the historical sites of the art/science collaborations beyond the art world to the domains of science and technological research, indicating its growing importance. He also introduces S. Leigh Star's sociological concept of a translator or "boundary object" and applies it to technology, providing a means for explaining one of technology's key roles in collaboration not previously identified. In addition, he and Charlie Gere (2000, 2006), whose first book is titled "Digital Culture," both emphasize the late twentieth-century cultural studies' movement away from just art history towards the more intertwined histories of art, science and technology.

Fred Turner's book (2006) about cyberculture's roots in mid-twentieth century arts, sciences, and counterculture, with its strong argument for how both artists and engineers embraced cybernetics and collaboration, supports my argument that the *9 Evenings* artists and engineers had similar worldviews. He is one of the first historians to uncover and describe the common values and ideals of two very different subcultures that shared a celebration of technology and collaborative practices rooted in the economic and technological abundance of post-World War II America. His research inspired me to link the *9 Evenings* project to the newer body of creative collaboration research, and supports many of my findings.

Turner's essay "Romantic Automatism" (2008) describes how some of the *9 Evenings* artists helped industrialists see past their fears of automating society by redefining automation and technology as self-empowering *through the use of collaboration* as a new mode of communal, self-less creativity. He traces the avant garde cultural origins of the now-common but then-revolutionary belief that personal agency and creativity can be enhanced, not shut down with technology, but *only through collaboration with machines and other people.* His research supports my argument for the emerging importance of collaboration in a technological-saturated society, and reinforces how revolutionary the *9 Evenings* collaborations actually were.

The final group of contemporary digital culture writings, which are the result of very recent access to Klüver's vast E.A.T. archives, provide more proof of the importance of my collaboration-focused research and the uniqueness of the *9 Evenings* project. These researchers uncover more historical and contemporary descriptions the *9 Evenings* collaborations, especially Schneider's diagrams of each of the performances that were heretofore unrecognized as a key to the collaborations' success. In addition, Bardiotte (2006) and Morris (2006), in their respective essays, present more evidence, without specifically naming it as such, for the "boundary object" concept of technology initially introduced by Century.

Creative Collaboration Research

This body of work includes a variety of writings from across the social sciences, business world and the arts. The art world seems mostly unaware of this collaboration research and the social sciences appear unaware of the Art & Technology movement. Only some of the business writers connect to all three worlds, but mostly through the

work of artists collaborating with other artists or the artist/engineer collaborations that happened decades later at Xerox PARC. What *does* link all the creative collaboration writings is their overwhelming choice of scientists and/or artists as their creative subjects and their use of case study research methods.

Out of the three domains of knowledge, the art world has the least to say about creative collaboration as a phenomenon. In the 1984 Hirschhorn Museum catalogue for an exhibition about artistic collaboration in the twentieth century, David Shapiro briefly explores Rauschenberg, Cage, and Cunningham's collaborations. He describes key elements such as collaboration as collage, as dialogic process, and as cybernetic communication system. He also describes a "theory of pluralist aesthetics" that anticipates Kester's "collaboration aesthetic." Other sources make little or no mention of the Art & Technology movement before describing in any detail artists-only or artist-engineer collaborations.

It is in the business world and social sciences where creative collaboration, along with the roles of technology, are more thoroughly examined and explicated. Most of the industry-initiated collaboration research emerged during the technology boom in the 1990s so it runs parallel to the historical trajectory of creative collaborative projects traced in more recent digital culture writings. Michael Schrage's book (1995) contains the most useful and relevant description of the creative collaboration process because of his emphasis on technology and his research into language as the shaper of reality. His work identifies several of my key elements focused on communication, dialogic processes, and different perceptive modes of describing concepts.

In addition, Schrage's observations about how different views of the world are shaped by language connect to John-Steiner's concept of "complementarity" and her emphasis on the importance of both verbal and visual languages in collaboration. It is John-Steiner's *Creative Collaboration* (2000) that maps most comprehensively to the words of the *9 Evenings* artists and engineers. She alone examines the phenomenon as it occurs socially and developmentally from birth, and her case studies of artists and scientists build a strong foundation for describing a wide range of elements and aspects of collaboration not found elsewhere.

The other social scientist, Keith Sawyer (2006, 2007), examines the collaborative origins of creativity and innovation through musical improvisation that connect to Cage's ideas around the use of chance in his collaborations. His research supports my approach to looking at what happens inside the collaborative process, the "moment-to-moment interactional dynamics."

All of the creative collaboration researchers make similar observations about collaboration marking the end of the Great Man theory that echo the myth of the lone genius artist the *9 Evenings* artists were also trying to dispel. In addition, this research further defines the traits, including shared values and goals, of a good collaborator, and collaboration as a phenomenon that can be mapped onto *9 Evenings* based on the artists' and engineers' extensive first-hand accounts. The researchers talk about the importance of clear communication and finding a common language between diverse collaborators that points to a role for technology as translator, and introduces the concept of the "boundary object" as illustrated in the technical diagrams produced by engineer Herb Schneider.

CHAPTER 3: RESEARCH METHODOLOGY

Introduction

The chosen research methodology is the Case Study. In this chapter, evidence is presented for how and why the case study is the most appropriate qualitative methodology for my research. After defining case study methodology in general, I present my rationale for using it to analyze the *9 Evenings* project and support my thesis. I then describe my specific case study design, instrumentation, data collection, analysis strategy, and trustworthiness of my findings.

I propose that the 1966 *9 Evenings* event is an important case study of successful creative collaboration bridging the domains of art and science that begins to define a new "collaboration aesthetic" through its use of new technologies. This emerging aesthetic of working collectively rather than independently to produce knowledge is a new way of understanding creativity as a function of communication and dialogic processes than about creating objects. My research is framed by the following two questions: How did the *9 Evenings* artists and engineers communicate and collaborate? And what was the role of technology in those creative collaborations?

Case Study Defined

Case study researcher Robert K. Yin says a case study is the preferred research method to use when asking "how" and "why" questions. He goes on to add that "in general, case studies are the preferred method when… the investigator has little control

over events, and the focus is on a contemporary phenomenon within a real-life context"
(Yin 2009, 13).

Yin defines the case study research method as "empirical inquiry that investigates
a contemporary phenomenon within its real-life context when the boundaries between
phenomenon and context are not clearly evident and in which multiple sources of
evidence are used" (Yin 2009,18). He and Robert Stake are the leading authorities on
case study methodology, and they both emphasize the case study's unique focus on
examining the interplay of the *particular* and *diverse* variables in contemporary real-life
situations in order to provide an understanding of an event.

Stake adds that case studies concentrate on experiential knowledge and the
influence of social, historical and other contexts, enabling the researcher to emphasize the
study's *particularities*, which often are undervalued in favor of *generalizations* in other,
usually quantitative research methods. He further delineates the different categories of
case studies: the *9 Evenings* project fits neatly into the "instrumental" category, which he
defined as a single case studied "to provide insight into an issue or redraw a
generalization in order to facilitate understanding of something beyond the individual
case" (Stake 2005, 440).

Rationale For Case Study as Methodology

Unlike more specifically directed, quantitative experiments, case studies require a
problem that uses inductive logic, or reasoning from specific to more general terms, in
order to get at the broader significance of the case's particularities. This is the logic my
research follows in order to develop an overarching theory about creative collaboration
and technology from a single set of events. *9 Evenings* is a contemporary real-life event

happening over forty years ago that requires a holistic understanding of all the key players and complex historical time period in order to make sense of how the collaborations happened and the role(s) of technologies.

The question of the objectivity of the researcher sometimes is raised about case study methodology. According to qualitative research scholar Alison Pickard, "qualitative research combines the individual research participant, the researcher as research instrument, and appropriate data collection techniques in a collaborative process of producing meaning from data and using that meaning to develop theory." She goes on to explain that "when human experience and situations are the subject of the research, then the human as instrument is the only instrument which is flexible enough to capture the complexity, subtlety, and constantly changing situation which is the human experience" (Pickard 2007,14).

As Pickard implies, when a researcher is dealing with human beings and their actions as the object of study, it is not an issue of "objectivity," but of flexibility and human intelligence applied to a complex historical event. I am not working with numbers or other "neutral" data, but with human beings and their multifarious inner thoughts and external actions.

Yin further validates the human as research instrument, citing it as a strength of case study methodology. He states that "if you know your subject matter as a result of your own previous investigations and publications, so much the better" (Yin 2009, 161). I bring prior knowledge, experience, and wisdom to this project that enables me to sift through, scrutinize and ultimately arrive at conclusions that encompass a deep understanding of the complexities of this case study. As a human researcher, I also trust

my instincts and experience while keeping any preconceptions at bay as I interact with my subject.

9 Evenings Case Study

My case study is the October 1966 *9 Evenings* event that included ten artists and over thirty Bell Labs engineers who created ten large multimedia performances utilizing the "new" technologies of the day. These diverse interactive performance events, attended by more than 10,000 people over nine mostly-consecutive evenings, were well documented in sound, still and moving images, and written about extensively at the time and over the next forty years. It is this substantive amount and variety of documentation that distinguishes the *9 Evenings* as a particularly rich source of data about the normally ephemeral, invisible collaboration process, including the uses of technologies.

Each of the ten artists collaborated with at least one Bell Labs engineer, so there are ten distinct collaborations to explore, along with other engineer-heavy collaborations to develop or invent new technologies to support one or all of the performances. Not every collaboration was equally documented, so data analysis was based on an aggregate of all the relevant accounts of the artists' and engineers' collaborations. A complete list of each of the ten performances, with the artist and key engineers named under the title that is copied from the original *9 Evenings* program, is found in Appendix A.

The performances themselves represent the most visible and documented results of the artist/engineer collaborations. They include a range of technologies and their creative applications visually represent each collaboration's unique and wide-ranging diversity of style and subject. Examples of that diversity include:

1. *Open Score*, Rauschenberg's tennis match that utilized wireless transmitters and infrared video (a light went out in the huge armory space every time a tennis ball was hit by a racket, eventually leaving the space in darkness that then filled with ghostly video-projected images of people heard moving in the dark but seen only on large screens).

2. *Physical Things,* Steve Paxton's gigantic air-inflated clear plastic tunnels on the armory floor where people walking inside the structure tripped different kinds of pre-recorded sounds and flashing lights.

3. *Two Holes of Water – 3,* Robert Whitman's performance of seven cars driven onto the armory floor, with film and video projectors showing a mix of stock and original footage and live video feeds of actors performing in the balcony.

Each of the ten performances was presented on two different evenings, and each was unique in its concept, execution, activities, and mix of technologies.

In addition to the ten performance pieces, the engineers also collaborated to invent an entirely new piece of technology modelled loosely on a telephone switchboard. Audio historian Frances Dyson describes the Theatre Environmental Modular Electronic, or TEEM, technology with a quote from the event's press release: "the first electronic environmental system ever developed for theatre use; [it consisted of] 289 components – portable electronic amplifiers, equalizers, transmitters, receivers, distant control equipment, and proportional control equipment. It permits simultaneous remote control of multiple sounds, lights, and movement of objects" (Dyson 2006,4). This was the master control system that allowed all the technological components of each of the different performances to be reconfigured every evening, and it represents a mostly-engineer-

driven collaboration described in numerous documents (Schneider 1966; Bardiotte 2006; Morris 2006; Dyson 2006).

The collaborations began face-to-face and continued long-distance as the artists lived and worked in New York City and the engineers worked in a New Jersey suburb. Starting in January 1966, they initially met at Rauschenberg's large loft in downtown Manhattan. After a few months of regular meetings (probably six) to brainstorm ideas and pair up, the artists continued working on their projects in the city and talked to the engineers mostly by phone. In September, they secured a school gymnasium for testing the technologies. They spent three weekends together before the October performances. The earlier lack of proximity and shared workspace was mentioned by some of the participants as a challenge to clear, regular communication between the artists and engineers.

Bell Labs did not officially sanction this project, but they indirectly supported it through the involvement of managers such as Kluver's boss, John Pierce. The engineers worked on it nights and weekends, utilizing the labs' rarified resources. As the performance date fast approached, they were given time off to devote all their time to the project. A month before the performances, engineer Herb Schneider spent about six hours with each artist to diagram how to wire the technologies for each performance as a system. These drawings served as a blueprint or "boundary object" previously described in Chapter 2 for the artists to translate their ideas non-verbally and the engineers to then interpret and develop the technical aspects. These diagrams proved crucial to the success of the collaborations.

Singly and collectively, the collaborations were challenging, and the event was deemed a failure by art critics. However, the collaborations were considered successful and even transformative by both the artists and engineers. As an instrumental case study, it will be demonstrated in the next two chapters that many of the aspects of their collaborations match up to later, more generalized findings by creative collaboration researchers across three domains of knowledge.

9 Evenings **Case Study Design**

A research design is a logical plan for moving from beginning to end of a study. It connects empirical data to a study's initial research questions and conclusions. Yin describes it as a "blueprint…dealing with at least four problems: what questions to study, what data are relevant, what data to collect, and how to analyze the results." Yin further identifies 5 components of case study research design: 1) key questions; 2) propositions; 3) unit(s) of analysis; 4) the logic linking the data to the propositions; and 5) criteria for interpreting the findings (Yin 2009, 27).

I incorporated Yin's five components of research design as follows:

1. Key questions: my two research questions provided the basic framework for all my data collection and analysis. I asked how the artists and engineers collaborated and communicated, and what were the roles of the technologies in those creative collaborations;

2. Propositions: my research proposition is that the *9 Evenings* event modelled a successful creative collaboration process, or set of elements, characteristics, and behaviors, that also begin to define "collaboration aesthetics" between the worlds of art and science using new technologies;

3. Units of Analysis: my units of analysis were the first-hand writings of the *9 Evenings* participants and other related documents from and about the collaborations; and

4. Logic linking Data: I used "pattern-matching" as a technique for linking data to the propositions; and

5. Interpretation Criteria: My creative collaboration research provided criteria for interpreting my data.

Data Collection

Artists and Engineers as Primary Sources

My data collection process included locating, organizing and filtering two different types of data. These data enabled me to connect the *particular* findings around creative collaboration in my case study to more *generalized* aspects of creative collaboration and technology uses. Since this was an historical event that couldn't be witnessed directly, only first-hand accounts written, spoken or recorded by others from all the *9 Evenings* artists or engineers were selected as data sources. This was a choice intended to distance me as a historian and researcher, being one step removed from my findings and relying on their direct words.

Yin cites six major sources of evidence that can be used in case study research, with no single source being better or preferred. In fact, he emphasizes that a good case study will want to use as many kinds of sources as possible (Yin 2009). Out of the six, I collected and/or viewed data from three: documentation, archival records, and physical artifacts. The majority of evidence was drawn from the first two: documentation and archival records.

38 separate writings were located (19 for the artists and 19 for the engineers),

including the following:

- 12 primary historical documents (unpublished and published) written soon after
  the event by some of the artists (especially Paxton) and engineers (especially
  Klüver) about their collaborations;

- 16 primary historical, mostly archive-based documents (including books, articles,
  a PhD dissertation, an unpublished book, films and audiotapes) that include
  interviews and/or lengthy quotations from some of the artists and engineers about
  their collaborations;

- 10 contemporary documents (including videotapes) that include quotations and/or
  interviews with some of the artists and engineers over the last 15 years.

Most of these documents are in printed form, found online and in libraries, archives,

and out-of-print books, with a few found in more recent scholarly publications and

museum exhibitions. Some of the key documents, including audiotapes, films and still

photos of the *9 Evenings* event, along with a large volume of historical written

documents, have just recently become available to researchers.

To extract the relevant parts of all the documents that directly pertained to the

collaborations, I collected copies of the 38 first-hand writings of the artists and engineers.

These include transcriptions of audio recordings and my transcription of selected

audiotape interviews of some of the artists and video interviews of some of the artists and

engineers that are part of the newly-released *9 Evenings* DVDs of three of the

performances (Rauschenberg, Cage and Tudor). A large collection of quotes from these

documents focused on ideas, descriptions, and themes about collaboration. This

information was compiled into two master documents entitled Quotations & Ideas about Collaboration (Appendices E & F). These documents were my "raw data" for discovering ideas, actions, and descriptions of the collaborations, and each contain a list of footnotes linking quotes to their original written sources.

Creative Collaboration Data

Another type of data used writings about the creative collaboration process. This document called Elements of Successful Creative Collaboration (Appendix C) was culled from a wide spectrum of research literature grounded in three sectors: business, the social sciences and the arts.

My original two research questions were focused on the collaborative process as a key outcome of the event, and were a catalyst for other, broader questions on the nature of creative collaboration, including:

- How does collaboration work?

- What actions, human behaviors and attributes, and other elements make up and determine a successful collaboration?

- What are all the possible roles of people and/or technologies that relate to collaboration and the communication processes that occur within its practices?

From my study of creative collaboration, I discovered a body of research that yielded a long list of characteristics, behaviors, and practices.

Data Analysis Strategy

Yin describes data analysis as consisting of "examining, categorizing, tabulating, testing, or otherwise recombining evidence, to draw empirically based conclusions." Data

was collected that described or commented on the elements of successful creative collaborations, and more specifically on the uses of technologies in creative collaboration. Based on the writings of 2 social science researchers: John-Steiner (2000), Sawyer (2007), 3 business writers: Bennis & Biederman (1997), Hargrove (1997), Schrage (1995); and 3 contemporary art historians: Hobbs (1984), Candy & Edmonds (2002), Kester (2000), I identified 17 successful creative collaboration elements. All have studied this phenomenon in the past twenty years, and collectively represent a spectrum of research ranging across three domains of knowledge. My choices of elements were based on frequency (how often the same concepts appeared in the different writings), resonance (those concepts that resonated with the *9 Evenings* data), and the mention of technologies as objects or tools of collaboration.

A matrix of categories was created within a grid of the 17 elements (later reconfigured into 9) spread across the 8 authors to analyze which key elements were more or less dominant (Appendix B). At the same time, two master lists of all the first-hand accounts of the collaborations written or recorded by either the artists or the engineers were created. The accounts came from my collection of 38 first-hand documents mentioned earlier (Appendices E & F). From those dual master lists, appropriate excerpts (phrases, sentences or even whole sections) were selected and assembled that matched the list of 9 key elements of creative collaboration. This document was called Artists & Engineers Successful Creative Collaboration Elements QUOTES (Appendix G). It became a tool for teasing out recurring concepts, ideas, themes and other findings related to successful collaborations.

Similarly, a master list of the artists' and engineers' quotations that specifically mentioned the uses of technology in the collaborations was created called Artists & Engineers Roles of Technology QUOTES (Appendix H). Based on research and experience with technology-based collaborations, two general and distinct uses of technologies in collaboration were identified and defined: technology as the **object** of the collaboration (i.e. an invention), and technology as a **tool** for specific activities during the collaborative process (i.e. communicating, learning, and making art). A new document then was drafted matching appropriate quotes from the artists and engineers with the categories of technology uses.

These 2 data documents became the basis for my case study analysis in Chapter 4. They reveal, among other things, how the basic "materials" of the collaborations were communication and dialogic processes that were often difficult because the artists and engineers came from two different worlds.

Trustworthiness of Results

Within qualitative research methodology, there are a variety of ways to test the trustworthiness of research findings. Pickard describes four methods: Credibility, Transferability, Dependability, and Confirmability. **Credibility** involves triangulation, or the use of multiple data collection techniques and sources as part of the research process, and acknowledges the impossibility (and undesirability) of removing all subjectivity from this type of methodology. The goal of qualitative research is to allow for **Transferability** of findings rather than "wholesale generalization of those findings." It does this by providing a "rich picture" or "thick description" of the individual or situation level. **Dependability** refers to the role of the outside examiners or experts who validate

research. Lastly, **Confirmability** ensures that the results of any research, while accepted as subjective knowledge, "can be traced back to the raw data of the research, that they are not merely a product of the observer's worldview, disciplinary assumptions, theoretical proclivities and research interests" (Pickard 2007, 20). My research contains all 4 of these elements.

Yin lists three principles important to any data collection effort. They are "the use of **multiple sources of evidence** (evidence from two or more sources, converging on the same facts or findings), a **case study database** (a formal assembly of evidence distinct from the final case study report), and a **chain of evidence** (explicit links among the questions asked, the data collected, and the conclusions drawn" (Yin 2009, 114).

As described earlier in this chapter, the multiple sources of data were compiled into 7 master documents that serve as my case study database:

    a. A grid of the key creative collaboration elements called **Distribution of Successful Creative Collaboration Elements Based on 8 Authors** (Appendix B);

    b. A master list of the 9 elements of successful creative collaboration extracted from the research of eight collaboration researchers called **9 Elements of Successful Creative Collaboration** (Appendix C);

    c. All the relevant statements by the 8 writers that define the uses of technologies called **Roles of Technology in Creative Collaboration** (Appendix D);

d. All the artists' and engineers' statements about the collaborations called *9 Evenings* **Artists (or Engineers): Quotations & Ideas about Collaboration** (Appendices E & F);

e.   Appropriate quotes from the artists and engineers listed under each collaborative and technological element called **Artists & Engineers Successful Creative Collaboration Elements QUOTES** and **Artists & Engineers Roles of Technology QUOTES** (Appendices G & H).

"Triangulation" is using multiple converging sources of evidence, and it is the preferred strategy of data collection in case studies. I used triangulation with my different sets of data as part of my research findings in Chapter 4. Yin explains that "when you have really triangulated the data, the events or facts of the case study have been supported by more than a single source of evidence [providing] multiple measures of the same phenomenon…" that develop "converging lines of inquiry, a process of triangulation and corroboration" (Yin 2009, 114).

CHAPTER 4: RESEARCH FINDINGS

In this chapter I restate and respond to my original two research questions about the *9 Evenings* collaborations in order to describe my research findings:

- How did the *9 Evenings* artists and engineers collaborate and communicate?

- What role(s) did technology play?

Research Question #1: How did the *9 Evenings* Artists and Engineers Collaborate and Communicate?

A starting point for analyzing my data was in asking questions about the specific nature of creative collaboration, with the intent of identifying the complex actions and practices within the larger process; specifically, how does collaboration work, and what actions, behaviors, needs, etc. make up and define a successful collaboration?

The 9 Elements of Successful Creative Collaboration

From the literature, 9 key elements of the creative collaborative process were identified and defined. These choices were made based on triangulating the key findings of each of the writers with at least two different sources. The 9 elements are listed in an order that forms a kind of operational narrative starting from the initial impetus for creative collaboration – a shared vision – through the larger systems, attributes, and processes that support the creation of that vision by all the individuals, and finally to outcomes. All the elements define distinctive aspects of a complex process involving communication among participants that constructs a "thought community" (John-Steiner

2000) of new ideas and knowledge. The thought community is collectively constructed

by the participants, with the engagement of 8 distinct activities and attributes listed under

the dialogic process (element no. 6). When all these elements are engaged by the

collaborators, the result is something that is both beyond their individual abilities and

potentially transformational for every participant. The 9 elements of creative

collaboration are defined as follows:

1. Creative collaboration starts with two or more individuals with a **shared vision** that is the driving force behind the collaborative process.

2. Creative collaboration succeeds when the **individual is part of larger support systems** (people, ideas, technologies, communities): a **"dynamic interdependence of social and individual processes."**

3. Creative collaboration's basic material is **communication**, which is a complex **process** that is just as, if not more important than the final product or outcome.

4. **Communication** within creative collaboration involves constant, continuous **dialogic processes among individuals** who often choose to use various kinds of **technologies** to facilitate or enhance their collaborative practices.

5. The **dialogic processes** operate best within **shared workspaces** (either virtual or in a real place).

6. Dialogic processes **generate new knowledge** by collectively constructing a shared **"thought community"** through the following practices and actions:
   - deep, active **listening**;
   - continuous, clear **communication**;
   - egalitarian, **non-hierarchical leadership**;

- mutual **respect and trust**;

- **empathic, nurturing**, **feminine** "self-in-relationship" **behaviors**;

- doing what each person knows and does best **("flow");**

- a **diverse mix** of talent, skills and temperaments called

    "**complementarity**;" and

- **diverse approaches to representing ideas, concepts, and other creative**

    outcomes (visual, verbal, kinesthetic, etc.).

7. **Failure** is part of the successful collaborative process.

8. Collaboration succeeds when everyone does his/her best work to **create**

    something bigger than they can alone**.**

9. Collaboration is **transformative**: participants see the world differently afterwards

    and **stretch themselves intellectually, emotionally and socially.**

Distribution of Successful Creative Collaboration Elements Based on 8 Authors Grid

The Distribution Grid is composed of the 17 individual elements of creative

collaboration on the vertical axis and the 8 researchers who identified them on the

horizontal axis (Appendix B). This grid enables one to analyze the frequency of each

element, and discover similarities and differences about the elements and the researchers.

The names of 8 researchers were listed in order, moving from left to right,

representing the domains of business, the social sciences, and the arts. This order

facilitates examining which domains of knowledge focused on certain elements with

more or less frequency. Each of the elements is placed in the order described above, with

no single element being any more or less significant than another.

General observations based on the frequency of elements found in the grid include:

- All but one of the elements are identified by at least 2 writers, with most of the elements (11) identified by at least 4 writers.

- The business writers and social scientists identify more elements (7, 10, 13, 12, 10) while the arts writers describe much fewer (8, 4, 3).

- The business and social science researchers define a broader range of elements, whereas the arts researchers identify fewer (and tend to focus mainly on dialogue, communication, emotions, and the workspace).

The grid as a whole indicates many of the researchers described the same or similar elements of successful creative collaboration, with the social scientists and business writers identifying and describing a wider range of elements than the arts writers. There was a general consensus among all the researchers that communication and dialogic processes are central to a successful collaboration because they enable the individuals to generate a shared vision and new kinds of knowledge. This becomes the "thought community" described by John-Steiner linking to larger systems or worlds of ideas and knowledge. These knowledge systems bring diversity and different ways of representing ideas and concepts into the process, along with personal and social values such as respect, empathy, trust, and a lack of hierarchy that enable everyone to do their best work, which is also called "flow" (Csikszentmihalyi 1990).

All the researchers looked at a diverse spectrum of historical and contemporary collaboration case studies. This spectrum ranged from 2 people (including married couples) to larger groups composed mostly of artists, including jazz musicians and other

performance-based artists, and/or other types of scientists like engineers or physicists. For example, Bennis and Beiderman (1997) examined 6 "Great Groups" in depth, including Disney animators, Black Mountain College artists, and the scientists involved in the Manhattan Project.

All the researchers examined *successful* collaborations, but not all of them addressed in any detail the role(s) of technology in collaboration. As was mentioned in the literature review, none of them acknowledged the Art and Technology movement in the 1960s, the focus of this research.

Elements Matched to *9Evenings* Artists & Engineers Quotes

As described in Chapter 3 (Research Methodology), two master lists were created of the historical, first-hand accounts of the collaborations written or recorded by the *9 Evenings* artists or the engineers from my collection of 38 primary source writings and recordings (Appendices E & F). From those dual master lists, excerpts were selected that matched up to the list of 9 key elements of creative collaboration (i.e. phrases, sentences or even whole sections). The resulting data document is entitled Artists & Engineers Successful Creative Collaboration Elements QUOTES (Appendix G). It contains a list all the *9 Evenings* artists and Bell Labs engineers who wrote something about the collaborations in the 38 texts. Each of their relevant quotations is matched under each of the 9 elements, in random order. The reader is urged to review these appendices for more quotations not incorporated in the paragraphs that follow.

The following are summarized findings for each element:

1. Collaboration begins with shared vision

Billy Klüver was consistently clear that the artists and engineers wanted to collaborate because they would "actively confront and shape new technology" (Klüver 1994, 218). He described the shared vision that emerged from his work with Rauschenberg, explaining "what happened was that Robert Rauschenberg saw the whole operation as a collaboration between the artist and the engineer. And that was a new starting point, because I immediately understood that if an artist and an engineer collaborate on a project on an equal basis, then something interesting and unexpected might really come out of it" (Obrist 2001, np)

This vision is echoed indirectly in many other quotes not listed here, especially from Rauschenberg, Whitman, Paxton, and A. Hay, all of whom admittedly wanted to learn how to think and/or work and/or see the world differently as an outcome. It is reaffirmed in secondary writings by Rose (1972), Davis (1973) and others who emphasized the main goal of the *9 Evenings* was to collaborate and use new technologies to create new types of art.

2. Individual is connected to larger support systems

Klüver described several times how both scientists and artists were influenced by ideas from the larger worlds of science and art. "Fifty years ago, Max Planck resisted quantum mechanics on the grounds that it was not morally right. If the physicists had not outgrown this extra-scientific criterion, modern science could not have developed. Today the criterion for good physics comes from Dirac who insists on the measurable, observable reality rather than the validity of abstract mathematical concepts. Dirac has been to physics what Duchamp has been to art. The legacy of Duchamp and Dirac says

that we are beginning to enjoy the complexity of the world rather than be terrified of it" (Klüver 1969, 4).

Other artists and engineers acknowledged the connections to those larger domains in terms of influences, specialized languages, and ways of thinking and working. Steve Paxton acknowledged "I've always been interested in finding out whole new ways to think. Like whole new attitudes, however slight a shift it is from say, an attitude I already hold, often a problem that looms very large in life can be solved by a very small shift of attitude." (Whitman 1966, transcription) Secondary sources such as Banes (1993), writing about Greenwich Village as a supportive physical and intellectual community of artists, and Turner (2006, 2008) writing about the cybernetics' collaborative community of diverse scientists, also support this element.

3. Collaboration's basic material is the communication process

Rauschenberg specifically described "information as though it were a material" (Kostelanetz 1968, 98), and he wrote repeatedly about his artmaking "materials" that ranged from objects found in the street to paint and the body. Paxton clearly understood the importance of communication as their "medium" when he explained that "we're forced into that as part of this situation which I think is very interesting, which doesn't have anything to do with science or anything, it's that we're working… through the same medium in this particular instance. If we all went out and got our own corps of scientists and developed our own communication lines, then it would be a very different situation. But we haven't done that, we're working through Billy and we seem to be constantly discussing our ideas with each other…" (Whitman 1966, transcription).

Schneider, the engineer who worked most closely with the artists, stated that "What was important was that the artists and engineers communicated, that their ideas merged and produced a 'piece'" (Schneider 1966, np). He initiated conversations with all the artists in order to create diagrams for each performance described elsewhere in this dissertation.

4. Communication involves a dialogic process among individuals, who often choose to use technologies

This element addresses the difficulties encountered when the artists and engineers attempted to speak with each other. It was in the "dialogic process" that they discovered their different languages and their inabilities to understand each other. Cage and Tudor talked about how "both the artists and engineers ideally had to follow each other's thinking and develop some peripheral understanding about the differences between alternative solutions to a given problem" (Loewen 1975, 60).

Paxton learned how hard it was to materialize, or physicalize ideas, to make real things do what his ideas called for. He described how ideas were changed and shared during collaboration: "You're concentrated to accept ideas and see differences in a way that you don't at other times….So that stepping into a scientific attitude I knew was going to jerk me around a little bit. Mess up some of the ideas I've held and introduce new problems…In this particular set-up a lot of things go against a fairly average artistic idea about conception. Which is something about the artist being a solitary conceiver of something… people are influenced, or do take ideas and use ideas which aren't strictly speaking their own" (Whitman 1966, transcription).

5. Dialogic processes operate best in shared workspaces

Klüver described a shifting from the artist's studio space to "a new unknown place somewhere between the engineers and themselves." He revealed that "The engineers had never seen any of the artists' performances before moving into the Armory, and most of the artists had never spoken to the engineers. Most of the engineers, in fact, were without any previous contact with contemporary art. They worked hard in their spare time, and tried to communicate with the artists who lived in New York. It was not until the second night of the performances that the engineers, enclosed in the control booth, really understood the position of the artist and what he was trying to accomplish" (Klüver and Whitman 1967, 9).

Bell Labs' Robertson lamented that the artists and engineers didn't have a workshop where they could have spent time together. Several other artists and engineers revealed that not being able to communicate was one of the biggest problems, and according to Schneider, "the dialogue started much too late and … few of the engineers realized their function until it was nearly too late" (Schneider 1966, np).

It is ironic that both the artists and the engineers were used to working collaboratively in shared physical spaces (lofts and labs). However, no face-to-face meetings and working in two separate places until near the end of the project was mentioned by several artists and engineers. The artists and engineers lived and worked in two different places – New York City's Greenwich Village and the suburbs of New Jersey, which are a long train ride apart.

6. Dialogic processes support mutually constructed "thought community" of new knowledge

"Thought community" is a term initially coined by John-Steiner (2000) to describe the larger social structure in science that enables the creation of collective knowledge beyond the capacity of one person. In the case of the *9 Evenings*, this concept apparently was not recognized or named, nor was it specifically described. Eight of the original 17 elements proved to be a subset composed of distinct attributes and actions enabling collaborating participants to construct a thought community of new knowledge. This subset included specific behaviors and attributes such as active listening, clear communication, empathy, trust, complementarity or diversity, and different ways of representing ideas and concepts. Once they were isolated and collected, quotations were found that matched up to most of them. They include the following attributes of a thought community's construction:

- **Deep, active listening & Continuous, clear communication**

Engineer Schneider's discussion of how he created the diagrams for each performance match up to both of these attributes. There are other descriptions by the artists or engineers citing the lack of communication, indicating this element was problematic. What *isn't* well-documented is the amount and quality of conversations that must have occurred among just the artists and just the engineers as both groups worked separately on their parts of the individual projects and the TEEM technologies development.

- **Egalitarian, non-hierarchical leadership**

Whitman described how all involved wanted a non-hierarchical structure, saying "…we wanted a more even, democratic relationship. The point is that somebody does something and somebody does something else. There shouldn't be a hierarchy of value to what each person does" (Whitman 2008, 430). Klüver described how the artists had no institutions, unlike the engineers' employer, Bell Labs, which meant they were freer to experiment. Banes emphasized this egalitarian aspect of the artists' collaborations in the Judson Dance Theater works that had been created by many of the *9 Evenings* artists such as Rainer, Paxton, and Rauschenberg (Banes 1993).

- **Mutual respect and trust**

Loewen wrote how "Cage recalls the project proceeded on a certain faith in the imagination of the artists, that they would dream up something to do, and a faith in the technical abilities of the engineers and in the technology itself that these things could be done. Both artists and engineers ideally had to follow each other's thinking and, as David Tudor recalls, develop some peripheral understanding about the differences between alternative solutions to a given problem" (Loewen 1975, 60). Coker described how "In *Nine Evenings* I got very different impressions from the various projects. In some – especially the smaller ones – there was an attitude of give-and-take, of mutual respect between artist and engineer. Other projects, especially the ones with a large engineering effort, were less successful..." (Krantz 1974, 122).

Klüver used the term "respect" and went into more detail about how the two groups worked together from different worlds and perspectives. He wrote "Collaboration can yield a lot more, has greater potential than working alone, but it is also much harder.

It will have to evolve its own form. There isn't any form for the collaboration yet. It happens on a personal level and when it is successful we don't know why. In dealing with unknowns and experimental projects, you always have problems, and they are always different. You tend to assume good will and respect for the artist; then you find that people generally misunderstand what he is doing and how he behaves. You either have to start defending him, or explaining what he's really doing. And you get into any number of jams" (Krantz 1974, 55).

- **Empathic, nurturing behaviors**

Four different engineers described the compassionate support they experienced from the artists, including a lack of competition. Cecil Coker wrote "There finally started to be some feeling of empathy between the artists and engineers just about the time the show was over….Towards the end, the main drive was making good on the commitment" (Loewen 1974, 88). Dick Wolff described how "In working on the project there was less of a sense of competition than usual. And people had less tendency to hoard a problem to solve it alone. A lot of people who were not involved, when asked a question on the phone, would offer suggestions. And some got involved in that way. For me there was a lot of satisfaction in the show" (Whitman 1966, transcript).

- **Achieve "flow" doing what they do best**

The concept of "flow" was described thirty years later by Csikszentmihalyi (1990) as a psychological state where a person is fully immersed and focused on an activity or task, and the quotes matched to this element get at some of those key aspects, including experiencing calm, freedom, and personal control through achieving flow's optimum dynamics of personal challenges versus personal abilities.

Robertson wrote "Being more productive means having a freer mind or a looser one. A more highly adaptable mind…there is a whole group of engineers who want a challenge. The space program is an excellent example…I think E.A.T. has shown a lot of them that here is another exciting way to think in terms of engineering, rather than just a highly stylized way….[*9 Evenings*] was more than just a change of scene. It was something that really had a genuine challenge to it" (Paxton and Robertson 1967, 19).

Paxton, in the same interview, wrote "It [*9 Evenings*] was beautiful in terms of the energy, kinds of focus, concentration and generosity that the whole situation motivated….It was a question about whether they (artists and engineers) *would* collaborate, not whether they *could* collaborate" (Paxton and Robertson 1967, 20).

- **Diverse mix or complementarity**

Paxton evoked complementarity and diversity when he said "we admire the way they can solder and they admire the way we can paint or dance…" (Whitman 1966, transcript). Whitman also described some of the differences between the artists and engineers, such as the engineer's lack of understanding of issues around performance deadlines. He wrote "The big discovery was the difference between artists and engineers: Engineers have an idea about proper design, for instance, but they don't have the same concept of a deadline. They work with a more open-ended schedule, typically. They don't realize that when tickets get printed, you've got to have it done on time. But my favorite example was this [automatic] stepping switch for Bob's piece [*Open Score*] that required intense wiring, which took a huge number of man-hours. The artist's solution to the problem would have been to just have a guy turn the switch during the performance –

that's just a person hanging out, and that guy's going to be hanging out anyway. So you're not creating more work" (Whitman 2008, 430).

Klüver predicted how the artist and engineer roles "might be exchanged" in the future. He wrote "…Artists would destroy whatever aesthetics that engineers tried to impose….Whatever the difficulties, the situation would 'settle itself' once artists and engineers made an effort to work together. A rapprochement of the 'two worlds' seemed promising, if not inevitable. In the future, the traditional roles of the artist and engineer might be exchanged" (Klüver 1965, unpublished manuscript).

- **Diverse ways of representing ideas, concepts (visual, verbal, etc.)**

Schneider raised the issue of how the artists and engineers had trouble understanding each other because they had different ways of describing and visualizing their ideas not easily understood by the other. Here, again, is where the concept of being a translator or "boundary object" emerges, with Schneider describing how he spent about 6 hours with each artist to visualize and draw their ideas. He described how "David Tudor was asking for functions I couldn't visualize. Then I made the drawing. We talked back and forth making corrections till we finally beat it into shape. I couldn't understand what he wanted until I could visualize it and he couldn't communicate it to me in those terms because he's not used to visualizing functions" (Whitman and Klüver 1967, 5).

A quote is included from Bell Labs engineer Ken Knowlton, who worked on the *9 Evenings* as well as with artist Stan VanDerBeek. It reinforces the idea of different ways of seeing and knowing the world that are found in the arts and sciences. He described how "Vanderbeek thinks in visual terms. He's interested in color, motion, after-images, patterns; in making a film he has to consider all these. When I began making films with

the computer I was not aware of these considerations. Vanderbeek is teaching them to me – I now appreciate their importance in communicating visually, whatever the content of the film. I think that any scientist using the computer to make movies can profit from the seasoned film maker's knowledge and experience" (NA 1967, 14-5).

7. Failure is part of successful collaboration

Failure is the only element that didn't triangulate among the 8 writings. I included it because it often appeared in the *9 Evenings* writings since the event was not well received by the art world critics. At the time they declared it to be a failure mostly due to equipment failure and lack of information about the collaborations that was purposely withheld by Klüver. Some of the artists and engineers who subsequently wrote about the *9 Evenings* refer to this and usually disagree because they knew from their experience that it was really a success.

Cage talked about how the engineers kept hanging up his open phone lines during his performance. Other problems or "failures" before and during the performances were openly described by some of the artists and engineers. The failure of the two groups to significantly communicate with each other until they all got to the rehearsal space in New Jersey is significant. When they did get together, it had an impact. Dancer Rainer acknowledged that "… it was a very unusual coming together of people and events. Nothing like it has ever happened before, and this in itself is of value, whether it succeeded or not, and the amount of outrage it generated" (Schilling, n.d., audio transcript).

Engineer Robertson referenced the perceived failure of the *9 Evenings* due to the critics' lack of understanding about the collaborations. He wrote "We all knew that we

were involved in a 'real situation.' No one ever suggested a compromise. We were committed to a purpose, and we would see it through. The really important thing about the 'Nine Evenings' was that it was done. If the critics and the public had no understanding of this, then they missed the beauty of seeing a real creative venture in the making" (Loewen 1975, 88).

8. Collaboration creates something bigger than working alone

Rauschenberg and Klüver were the most prolific and outspoken about the collaborations. Rauschenberg was clear about collaboration as "a prescription or device that keeps one from getting hung up on a strong single intention that blinds" and "a good collaboration produces universal thinking." He noted that "every individual you add to a project will result in ten times as many new possibilities" (Rose 1987, 85).

Kluver saw the artist as the visionary, leading the engineer to new uses for technology. "This is to sum up: First the artists have to create with technology because technology is becoming inseparable from our lives. 'Technology is the extension of our nervous system,' as McLuhan says. Second, the artists should use technology because technology needs the artists…The artist's work is like that of a scientist. It is an investigation which may or may not yield meaningful results; in many cases we only know many years later. What I am suggesting is that the use of the engineer by the artist will stimulate new ways of looking at technology and dealing with life in the future" (Kluver 1966, 38). Klüver, looking back later in life at the impact of E.A.T. on contemporary 20th century culture, said that it was "the idea of one-to-one collaborations between artists and engineers" and that "together the artist and the engineer went one step beyond what either of them could have done separately" (Klüver 1994, 218).

9. Collaboration is transformative intellectually, emotionally, socially

The large number of quotations (14) that describe a transformation or revolutionary act emerging out of the collaborations is the single most remarkable finding in my research. Only 2 of the 8 researchers (Schrage and John-Steiner) describe this transformational characteristic in any detail, but it proves to be the element that is the most-often described in my matches with the artists' and engineers' quotations.

Cage called engineers "possible revolutionary figures" because of their collaborations with artists, who he thought were already revolutionary (Shilling 1966, film); Paxton described the collaborations as "the explosion, the evolution of something for the future" (Klüver and Martin 1996, film), and Robertson was amazed to find common ground with the artists and that "here not only was a common ground, but a ground out of which at least the engineer got a great deal of inspiration" (Paxton and Robinson 1967, 20). Coker added that "the payoff for the engineer is intellectual, social, and psychological" (Krantz 1974, 122).

Several other artists and engineers described their personal revelations and transformations, including Bjorn, who said, "For some of us like me, it was like opening up a window to a whole new world, and once we saw this, we didn't want to let it go! I missed the intellectual challenge – trying to make the artist's vision come through" (Klüver and Martin 1996, film).

Paxton also spoke of personal revelations that came out of the collaborations. He wrote "What I think was most electric and most valuable about the whole *Nine Evenings* was the personal experience…. The exchange of attitudes is one of the most valuable by-products of any kind of interaction…. The great thing about new things is that you know

they didn't exist before and you didn't fully know when it started what the limitations were and what the possibilities were and you see it grow in front of your eyes" (Paxton 1967, 17).

Nils Lindgren, an engineer who wrote about the event, described the collaborations' ability to transcend the stereotype of artists as special people when he said "The very mode of collaboration attacks the old-fashioned idea that the artist is a very special kind of person, in the sense that he is mystical, unreachable, or incommunicado on his pedestal" (Lindgren 1969, 49) He also wrote "…The Evenings were still, as John Cage suggests, like the early movies in which the traditional stage, the new camera, the literary content, and the acting were identifiable components not yet integrated. But for those who participated, the Evenings were an achievement full of anguish and joy. For them, the experiment was a success – they had discovered, and came away convinced, that they could work together, and that a lot of energy has been wasted in the past in sustaining a supposed conflict between cultural specialists" (Lindgren 1969, 50). This theme turns up in other quotes as well, indicating that preconceptions of artists and engineers had changed after the *9 Evenings*.

Klüver and Rauschenberg have the most quotations. Rauschenberg saw in the collaborations the power to raise the consciousness of people in industry "…leading to more realistic structuring of the earth and its activities" (Davis 1973, 145). He also said that the artists' "thinking became different" because of the engineers, and that "the engineers' sensibilities changed…it opened things up instead of closing them down…" (Moyano 1968, 30).

Klüver was just as expansive and utopian in his assessment of the collaborations. He said in a later interview "If the engineer gets involved with the kinds of questions that an artist would raise, then the activities of the engineer goes closer towards that of humanity" (Hertz 2001, website). He and Rauschenberg wrote jointly at the founding of E.A.T. that "engineers are becoming aware of their crucial role in changing the human environment. Engineers who have become involved with artist's projects have perceived how the artist's insights can influence his directions and give human scale to his work. The artist in turn desires to create within the technological world in order to satisfy the traditional involvement of the artist with the relevant forces shaping society. The collaboration of artist and engineer emerges as a revolutionary contemporary sociological process…" (Klüver and Rauschenberg 1967, np).

Summary

My findings indicate that there is much evidence to suggest that the *9 Evenings* was a successful creative collaboration:

1. There are many appropriate quotations found that match up to all the 9 elements.

2. There is a predominant focus in most of the quotes on describing how conversations worked or didn't work; how different aspects of the collaborations supported a growing rapport and mutual understanding on both sides culminating in the performances; and how the collaborations were considered successful by most of the participants despite the internal failures and bad press.

3. Communication and dialogic systems and processes prove to be the "materials" at the heart of the collaborations. There is evidence that the participants found them to be inspirational, educational, even transformative.

4. As the two original instigators of *9 Evenings*, Klüver and Rauschenberg were the most prolific, outspoken chroniclers of the collaborations. Together, they presented a utopian vision of the collaborations focused on transforming not only all the *9 Evenings* artists and engineers, but also *all of society* through their mutual revolutionary views and new, experimental uses of technology by the artists that also transformed the thinking of the engineers.

5. The subsequent founding of the E.A.T. organization by Klüver, Rauschenberg, Whitman and others directly after the *9 Evenings* was endorsed by many of the other participants who joined to work on large-scale collaborations with engineers such as the Osaka Expo 70 Pavilion.

Research Question # 2: What Role(s) Did Technology Play in the Collaborations?

My second research question is intimately connected to the first because technology, as a predominant economic, scientific and cultural phenomenon in the mid-twentieth century, was central to the shared vision of the *9 Evenings* collaborations. Technology also played a more specialized role in the design and implementation of each of the individual collaborations. In fact, I found that many of the quotations matched to the 9 Elements included ideas and observations about technology as a societal phenomenon and to the specific technologies created and used during the *9 Evenings* performances. Therefore, some of the quotations are found in both Artists & Engineers Successful Creative Collaboration Elements QUOTES (Appendix G) and Artists & Engineers Roles of Technology QUOTES (Appendix H).

In Chapter 3 (Research Methodology), I identified and defined two general, distinctive uses of technologies in collaboration: 1) as the **object** or outcome of the collaboration (an invention or modification of an existing technology) and 2) as a **tool** for specific activities during the collaborative process, including communicating, learning, and creating art. The idea of technology as a predominant socioeconomic and cultural **phenomenon** driving and defining a collaborative vision was not found in any of literature, so I incorporated it into the first category, calling it both an **object and subject** of collaboration. As I did with the 9 elements of creative collaboration, I matched quotations with the different applications of technology, and created a second data document called Artists & Engineers Roles of Technology QUOTES (Appendix H). In this process I discovered:

- **Technology as Object/Subject of collaboration: Invention or adaptation of existing technology & socioeconomic and cultural phenomenon**

This category indicates a dual role for technology found within the creative collaborative process in general, and specifically in the *9 Evenings*. Technology is both the *object* of the collaboration because it is something that is invented or adapted as an actual object, and also as the focus or *subject* of the collaboration as a topic, force or concept operating in larger socioeconomic and cultural systems of discourse. Therefore, technology is conceived of *simultaneously* by the collaborators as being both concrete and abstract, with an actual, physical technology often standing in for, or representing the larger abstract concept as it is discussed and described in the quotations.

When the technology is an object, it can take the form of a new invention or an adaptation or variation of an existing technology, such as Cage's use of open telephone

lines to create ambient amplified sounds. I placed 15 quotations under this category, a number comparable to the 14 found under the transformational element of creative collaboration. Klüver's writings dominate, but several other artists (especially Rauschenberg) and engineers had interesting and distinctively different insights and observations.

Cage observed that, initially, conversation didn't work because of the "profound differences" between the artists and engineers, but that what "made conversation possible, produced cooperation,…were *things*, dumb inanimate things (once in our hands they generated thought, speech, action)" (Cage 1969, *Techne*). Here, again, is the "boundary object" concept of technology acting as a translator. This will be discussed further in the next chapter.

Fahlstrom talked about technologies being used to connect to the artistic or creative process, and within that process they became part of the works of art. He said the idea behind *9 Evenings* was to "put technology in touch with poetic disorder and human insight, things that were irrational in terms of technique. The inventions to come out of the show can be developed as elements for works of art…" (Moyano 1968, 30). This is a different use of technology. Here it becomes incorporated into a larger aesthetic object or other type of artwork like Fahlstrom's performance, *Kisses Sweeter Than Wine*. His performance used audio recordings and films as well as new inventions of floating "snowflakes" and mylar helium-filled missiles.

Rauschenberg focused on a bigger picture. He saw the artists pushing the limits of technology so that it didn't control people "and we ended up as monkeys" (Rose 1987, 98). His and Klüver's vision for the collaborations included similar utopian ideas about

the importance of artists expanding the limits of technology to actively confront and shape it through their collaborations with the engineers. Years later, Klüver stated "those of us in the technical community in the early sixties who were worried about the direction of technological change believed that artists' ideas, approaches, and concerns could influence the way engineers approach technological or day-to-day social problems. Our collaborations, we hoped, could lead technological development in directions more beneficial to the needs, desires, and pleasures of the individual" (Klüver 1994, 219).

Klüver, as the most prolific chronicler of the *9 Evenings* collaborations, was consistent in his multitudinous descriptions of the project that extend from his first encounter with Rauschenberg in 1960 to his death in 2004. For him, technology really was an interchangeable subject and/or object of the collaborations, and his metaphor of the artists, engineers and technology as a triangle indicates the pivotal role of technology as the "boundary object" or translator that in his mind enabled communication and new ways of thinking between the artists and engineers. Right after the event he wrote "the amazing thing is that it's possible for artists and scientists to talk together at all. The first meeting I was scared. Then, the minute it came down to the hardware it was working. It's like a triangle between the scientists and the artists and the hardware. The main thing is to establish a working relationship and the hardware is the basis for this" (Klüver and Whitman 1967, 1).

A quote made near the end of his life connects to one that matched to the Technology as Subject/Object category. In it, Klüver summed up the transformational dynamic of the triangle's three elements when he wrote " I believed that the artists would

influence the engineers and then change the technology. Of course, the point is that the artist would work with engineers and change the engineers" (Shanken 1996, 177).

Several engineers told stories of the specific technologies they invented or modified as they worked to create a new application for an artist's performance. Wolff described how they invented a wireless radio transmitter and receiver for Rauschenberg's performance, then modified it for different purposes by Cage and Tudor. In the same essay, Schroeder explained how Lucinda Childs "asked for things to translate body movements directly into sound." This led to his idea to use his earlier research in public address systems that made feedback noises in Childs' performance. As a result of his experiences in *9 Evenings*, he speculated that one day, artists would emerge from the engineering profession (Whitman 1966, transcription).

- **Technology as tool for collaboration: communication**

Most of the 8 creative collaboration writers focus at some length on technology as a communication tool for collaboration. They write about electronic communication technologies such as personal computers and software that were routinely being used but didn't exist in the 1960s. In some of the archival photos and films of the *9 Evenings*, engineers are seen using audio headsets to communicate, and some of the artists used them during their performances. Other technologies such as telephones were used during the *9 Evenings* to communicate but they are not described specifically in any of the 38 primary data documents. This is a potential area of further research that could be pursued.

- **Technology as tool for collaboration: learning**

Technology can empower collaborators to learn something new or different, or have new insights into existing ways of thinking or working as a result of using a specific

technology. One example of this would be using a computer to translate a foreign language.

In the case of the *9 Evenings*, the selected quotations draw out some interesting variations on this theme. Alex Hay found that his original ideas didn't work because he initially didn't know enough about the technologies and their physical limitations. Loewen wrote about Hay's new awareness in this way: "Talking to the engineers about what was available, feeling responsible not only to oneself but now also to the engineers, one began 'to think about it in almost engineering terms,' the ideas having to be concrete before any equipment could be started" (Loewen 1975, 53). This quote indicates that Hay was learning to think more like an engineer, changing the way he understood the physical properties of his materials and generating new ways of working. Rauschenberg, on the other hand, characterized his new approach to using technology as moving in the opposite direction, from knowing his physical materials, such as paints, to dealing with abstract theories about technology, "like being handed a ghost bouquet of promises" (Rose 1987, 67).

- **Technology as tool for collaboration: creative art making**

This application of technology has the most quotations (14), which is to be expected since the main focus for the collaborations was to use technology to make art. There are some overlaps of quotes that also appear in the 9 Elements data because, again, technology was so intimately tied to the vision, and therefore, to the outcomes of the collaborations. One of the most surprising findings in this set of quotations is the unique insights about the relationships among technology, art (especially aesthetics) and science that emerge. It is apparent that both the artists and engineers were deeply engaged from a

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variety of perspectives with technology as their creative "material," and they individually and collectively learned how this project was not just about their specific uses of technology, but the larger implications of technology used by artists, engineers, and society as a whole.

All the artists' quotes (except Giorno) specifically use the term "aesthetics." Paxton defined two "attitudes" toward the use of technology, as either a "servant," which he considered "closed-minded," or as "an open esthetic investigation where it almost doesn't matter whether one makes art out of it or not, in which *an art object may not even be produced*" (my italics). The rest of his quote emphasized the dialogic aspect, as well as the focus on process, rather than needing to produce an art object. He said to Lindgren "if from the beginning, if you have some curiosity about what would happen if you could do *this*, and then you share that curiosity with someone else and make him curious, then that's the beginning of the piece…and it grows and grows…the whole world then is the medium, if you can relate in your esthetic to something other than the finished product" (Lindgren 1969, 47). This is a significant finding I discuss in the next chapter.

Rauschenberg reinforces Paxton, Hay, and others' new understanding of technology as a material with very limited, defined, and concrete characteristics. He said, "When you're working with something that's as physical as radio equipment, what's absurd to do is very quickly determined. The machine has no tolerance for getting outside a particular radio wave or whatever it is you're working with. The kind of equipment we're inviting has its own integrity built into it. Whereas an artist has to somehow assume integrity or not. I think just that experience of dealing with these kinds of materials that have this particular character is probably going to end up being an

enormous influence on the work esthetically" (Klüver and Whitman 1967, 2). He made similar observations about the specific material and nature of technology elsewhere, indicating his awareness of the future transformative properties of technology for artists.

Whitman was interested in the idea of collaboration because it enabled him to be "socially involved with art… through the back door," which seemed to him to be more revolutionary than even civil rights or wars. He thought that only the beginning of this kind of relationship (between art and technology) happened in the *9 Evenings*. He felt both the artists and engineers had pride in the aesthetic of their craft. He also liked the fact that both "technique and esthetics [were] being experimented with" in the project through the use of technology (Whitman 1966, transcription).

Whitman's final observation is interesting because it reveals that he was wrestling with the "communal" aspect of the collaborations in terms of how machines can drive the creative collaboration process. He said, "I am not interested in that [communal] form of orientation though. I think it is important for individual people to keep on being themselves and finding new ways of doing it. Instead of letting the machine determine what is going to happen, the thing is to find what is in the nature of the machine – what is the form of the machine that one can appreciate as an individual. What the form is that we have to deal with in that world – the world of technology" (Whitman 1966, transcription). This is an issue that comes up for other artists and is explored further in my next chapter.

I included John Giorno's quote about the influence the *9 Evenings* had on artists in my data because it supports the importance of this case study. Though he was not historically accurate, he stated "…it is literally the first time that artists formally used

technology and electronics in their work. It was the seed from which I began, along with the many other people (who) now number in the millions, using technology in our art, with other people. But Bob [Rauschenberg] originated the idea – it arose in his heart, and Billy's and everyone else's" (Klüver and Martin 1996, film). Other artists, especially musicians and filmmakers, had been using electronics and technology in their work for decades before *9 Evenings*. But he does address how the *9 Evenings* project and the resulting E.A.T. organization provided a shared vision that helped many artists see the potential for using technologies.

Along with the quotes from 5 artists, there are 4 engineers who spoke to the creative use of technology. This is a significant number because it indicates the centrality of technology to the creative and transformational outcomes of the collaborations for *both* groups. Flynn admitted that it was the "sophistication" of the artworks and the ability to use his schooling as an engineer "in something that turns into an interesting creative project" (Krantz 1974, 124). Hodges reiterated his appreciation for the artists' different ways of working and thinking: "I think when you get on the technical side of things, you tend to look at things in just a certain way, because of the technical limitations of it. And here is this whole bunch of people who came along who wanted to do something *else* with the technology" (Klüver and Martin 1996, film).

Schneider, the engineer who spent the most time with each artist as he drew the diagrams for their performances, wrote an unpublished essay called "9 Evenings – a View From Central" (1967). In it, he described the *similarities* between scientists and artists, an unusual focus indicating how much he learned from the artists. In it, he described how the engineer deals "in facts and figures" while the artist "deals more with

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images and impressions," but they both initially conceive ideas, create things, and test them for use by others. He acknowledged that artists as well as engineers have to deal with the market place, but the engineer can blame his product's failure on the "sales department which didn't put it into the right box" whereas the artist "attempts to stimulate reactions which are not only much more difficult to define, but…for the many whose reactions are never identical." His final statement about a "voluntary association of a wide variety of people…proving C.P. Snow wrong" echoes Klüver and others who saw the *9 Evenings* as a way to bring the worlds of art and science together (Schneider 1967, np).

Klüver once again had the most to say about the creative, aesthetic applications of technology as he described its function as "not to put previous esthetic concepts into new forms but to provide the basis for a new esthetic, one that has an organic relationship with the contemporary world" (Davis 1973, 139). As Loewen explained in her 1975 PhD dissertation, "Klüver anticipated the artists would use technology as another material in ways consistent with their previous work but with new freedom as to things possible, that they would deal not only with the aesthetics of technology or use its external qualities to create new forms which he thought belonged in the realm of engineering, and that their work would not be dependent on the quality of the material per se but its use in relation to their ideas of content" (Loewen 1975, 48).

Summary

My research findings about the roles of technology in the *9 Evenings* collaborations initially revealed the meaning of the word "technology" to be slippery and fluid. It could have multiple meanings, even within a single quotation, because the artists

and engineers were working with both concrete technologies as objects and with the abstract concept of technology as a growing, even threatening socioeconomic and cultural phenomenon or force in the Cold War world of mid-twentieth century America. Technology was central to the shared vision of the collaborations as both a subject/object and a tool, so its fluid multiple meanings enabled everyone to use the word interchangeably and talk about it both specifically and more broadly.

My findings also indicate that technology as an object/subject proved to be a kind of translator, or "boundary object" serving to focus their conversations simultaneously on a material "dumb thing" (Cage and others), that had very limited, concrete properties but also broader, abstract connotations of a socioeconomic and cultural force or phenomenon. The resulting communication and dialogues between the artists and engineers around technology led not only to the creation of 10 unique, complex, technology-driven performances, but also to new ways of thinking and seeing technology and the world, including the future of art and technology. These accomplishments would not have been possible outside of the collaborations. The collaborations also instigated the formation of E.A.T., which further proved the importance of connecting the worlds of art and science using technology through creative collaboration.

CHAPTER 5: CONCLUSIONS

"The collaborative process … may be a model for social interaction. Such an ideal of collaboration and decision through consensus may indeed be impossible to generalize in terms of a whole society because it demands on the part of any participating individual the ability to think freely as well as comprehensively, to understand an operation of great complexity in which he must play a highly specialized role" (Rose 1972, 102).

Art historian Barbara Rose, writing about the 1970 E.A.T. Pavilion project, anticipated by 40 years the growing importance of creative collaboration as a model for optimizing global electronic networks' potential for social interaction. Her experience as a participant in one of E.A.T.'s most complex and controversial collaborations that occurred soon after *9 Evenings* helped her see the ongoing tensions and contradictory dynamics between the individual and the larger systems involved in the collaborative process. In this final chapter, I connect my research to this increasingly important subject, discuss the significant implications of my research and make recommendations for further study.

This dissertation is the story of the *9 Evenings: Theater & Engineering* as a revolutionary collective vision for the future roles of technology and the transformative outcomes of creative collaboration. Forged from a collaboration between one artist and engineer in the early '60s, this event brought together two disparate worlds to intentionally collaborate using new technologies to create art. This was a synergistic time in the history of both the arts and sciences, when most of the major communications technologies we now use everyday were becoming accessible and affordable. It was a

time in the aftermath of World War II and the invention of the atomic bomb when science and technology both were valorized and feared. The avant garde art world, centered in New York City, was exploding the boundaries of traditional art forms through collaborative practices that brought together painters, dancers, musicians and other creative types to explore new kinds of artmaking processes. All these forces came together in the 1966 *9 Evenings: Theater and Engineering* project.

In this paper, I have shown that both the *9 Evenings* artists and engineers came from collaborative experimental subcultures with similar values and practices. These included open, egalitarian approaches to experimentation; discipline boundary-crossing and respect for diversity; concern about technology as both a tool and a sociopolitical and cultural phenomenon; and a process-based approach to creative production influenced by new ideas that included cybernetics theory of man/machine communication systems.

I have demonstrated how the *9 Evenings* project, though initially proclaimed a failure by the local press, was successful because the collaborations were both revolutionary and transformational:

- **They were revolutionary** in their intentional focus on dialogic processes utilizing technology as tools and boundary objects to generate new knowledge, and

- **They were transformational** emotionally, intellectually and professionally for many, if not all of the participants.

My research points the way for deeper understanding of the underlying elements of successful creative collaborations and emphasizes the central role played by technology in helping connect two historically separate worlds - worlds that now are even

more intimately linked together through their dependence on and shared uses of complex electronic networks and technology-driven systems.

Study Summary

In my introductory chapter, I contend that the *9 Evenings* artists and engineers, by intentionally attempting to bridge C.P. Snow's iconic "Two Cultures" through their collaborations using new technologies of their day, unknowingly created the conditions for successful creative collaboration. I examined how the historically separate worlds of art and science, with their distinct cultures and epistemologies, began to converge as artists gained access to new technologies to make art. I questioned how today, as we enter the second decade of the twenty-first century, it is almost commonplace for artists, scientists, engineers and other creative types to collaborate using electronic technologies. And I asked what can we learn from early creative collaborations between artists and scientists that can help bridge a still-existing centuries' old cultural chasm, and how can we use that insight to define a new collective approach to electronically based communication and creativity?

I argue that the 1966 *9 Evenings* project is a unique historical case study of technology-based collaborations created by Cold War avant-garde artists and Bell Labs engineers. They pioneered a key aspect of today's digital culture - creative collaboration - that to date has not been sufficiently examined, especially through the dual lenses of the more recent research into collaboration and digital culture. I argue that technology had, and increasingly has, significant roles to play in an emergent collaboration aesthetic foregrounding dialogic processes and generating new knowledge rather than creating art objects.

My research connects the historical *9 Evenings* collaborative practices to recent research on creative collaboration and contemporary digital culture to better understand the application of successful collaborative practices using media technologies now and in the future. It begs the question: Is there some sort of recipe for successful creative collaboration using technology? Two major questions initially emerged from my research into the *9 Evenings* collaborations: How did the artists and engineers collaborate and communicate their ideas and practices to each other? What role(s) did technology play in those collaborations?

My research methodology was the case study. After defining case study methodology and presenting evidence for how and why it is most appropriate for my research, I described its use in analyzing the *9 Evenings* project. My specific case study, research design and instrumentation, data collection, analysis strategy, and the trustworthiness of my findings are all explained in detail.

As part of my research design, I analyzed data about how the artists and engineers communicated and collaborated by creating a matrix of 9 Elements of Successful Creative Collaboration derived from the findings of the 8 selected researchers in 3 domains of knowledge: business, social sciences, and the arts. I then matched those Elements to quotations from a diverse collection of 38 mostly historical, primary documents that were written by, or recorded or quoted from all 10 of the *9 Evenings* artists and many of the engineers. Then, I analyzed data about the uses of technology in collaboration by defining the key uses of technology in collaborations based on the writings of the 8 selected researchers, again matching first-hand quotations by the artists and engineers in the 38 documents.

Major Discoveries

Based on my findings, I found significant evidence that the *9 Evenings* was a successful creative collaboration that was also revolutionary and transformational for the participants. There was little disagreement among participants regarding success. They reported profound and lasting positive effects from the collaborations despite the overwhelmingly negative evidence from the press at that time. There is substantial evidence that Klüver and Rauschenberg drew on their 6 years of prior collaborative experiences to fashion a larger, more utopian vision for transforming society by changing the way technology is created and used that was the basis for *9 Evenings*. Their expansive vision dominated their writings and reverberated through many of the other participants' descriptions. It also resonated with larger socioeconomic and cultural concerns and issues related to science, media, and technology that were circulating in the mass media as well as in both the artists' and engineers' respective communities of practice. Individually and collectively, many of the artists and engineers saw themselves as revolutionary agents making not just a series of ephemeral, technology-driven performances but societal-level change. Therefore, it is not surprising that the idea for creating E.A.T. as a vehicle for continuing and expanding those collective, transformative collaborations emerged from *9 Evenings*.

Another discovery is the emphasis on communication and dialogic processes in the discussions about collaboration. Several of the artists (Paxton and Whitman) and engineers (Robertson and Biorn) acknowledged that they intentionally participated in the project primarily to learn from and communicate with people who had other ways of working and seeing the world. Paxton admitted that "I've always been interested in

finding out whole new ways to think" and that "stepping into a scientific attitude" was

going to "jerk me around a little bit" (Paxton and Robertson 1967, 19). There was an

emphasis in many of the quotes on conversations that worked or didn't work, reflections

on how those conversations supported a growing rapport and mutual, empathic

understanding on both sides, and an understanding that the collaborations ultimately

changed the participants emotionally, intellectually and professionally. This indicates the

importance of communication and dialogue to successful collaborative processes,

connects to the shared acknowledgement of translation difficulties that still persists

across the worlds of art and science, and leads to the recognition of the vital roles

technologies, especially information and communication technologies, continue to play in

collaboration.

Uncovering the different roles of technology in the collaborative process from

findings revealed slippery, fluid definitions of technology used by the participants, even

within a single quotation. The artists and engineers were working both with concrete

technologies as *objects* as well as with the abstract *subject* of technology as a growing

socioeconomic and cultural force in Cold War mid-twentieth century America.

Technology was central to the shared vision of the collaborations as both object/subject

and as a creative tool for learning and making art, so its fluid multiple meanings were

used interchangeably and talked about both specifically and concretely, as well as more

abstractly and universally.

Technology proved to be a kind of translator, or "boundary object" serving to

focus conversations simultaneously on a material "dumb thing" as Cage and others

described it, with very limited, concrete properties, along with broader, abstract

connotations of technology as a socioeconomic and cultural force. The resulting

dialogues between the artists and engineers about technology led to much more than just

the creation of 10 complex performances using concrete technological objects with

specific properties - they led to new ways of thinking, seeing, and ultimately changing the

world.

Finally, several of the artists' and engineers' quotes about technology specifically

included discussions about aesthetics. Paxton defined two "attitudes" toward using

technology, as either a "servant," which he considered "closed-minded," or using it as

"an open esthetic investigation where it almost doesn't matter whether one makes art out

of it or not, in which *an art object may not even be produced"* (my italics). Klüver also

talked about how artists were focusing more on aesthetics rather than objects. Here were

artists and engineers in 1966 who anticipated Kester's definition of a "collaboration

aesthetic" described 34 years later, indicating how powerful and forward-thinking the

artists' and engineers' ideas were about the future direction of art, science, technology,

and collaboration as a direct outcome of this project.

Unexpected Discoveries

My research findings support my initial theory about the importance of the *9

Evenings* project as a creative collaboration, but there were also unexpected discoveries. I

began this dissertation knowing that there was much historical and contemporary

scholarship already written about art and technology and "new media." My first surprise

was how little access there had been to the E.A.T. archives prior to my first meeting

Klüver (2002) and his subsequent death (2004). It has been exciting and daunting to be

among the earliest scholars to access a rich lode of historical, original documentation and construct a case study methodology that might also serve future researchers.

I was surprised to find myself in the first wave of graduate students getting a PhD in an arts-related academic field that previously terminated in an MFA. The implication for my work was that I had to merge largely social science-based case study methodology with art historical research of the *9 Evenings* project. Luckily for me, the event was uncharacteristically well documented. I made the decision to use mostly historical writings by the artists and engineers, in part, because there were so many documents, but also because so many of the participants were deceased or not easily accessible. It is my hope that this work, collaboratively built on the shoulders of the many scholars mentioned in this dissertation, will support the work of future media arts and digital culture researchers.

My biggest surprise was discovering so much evidence of the revolutionary and transformative nature of the collaborations as revealed through the words of the artists and engineers themselves. It was unexpected to find that *both* groups wrote so much about how they had changed personally in significant ways, and how they experienced the collaborations as something that could change the way technology was used in the future.

I now recognize how important the initial collaborations between Rauschenberg and Klüver were because they laid the groundwork for focusing the *9 Evenings* project on the collaborative *process* rather than on creating technology-driven performances. Their early explorations in collaborations enabled Rauschenberg and Klüver to construct a larger, more ambitious vision for the *9 Evenings* event that captured everyone's

imaginations. Their expansive, utopian vision was powerful enough to catalyze the creation of E.A.T. even after the 10 months of hard work and negative public reactions to *9 Evenings*.

Another discovery was the predominance of reflections about communication, dialogue, and the acknowledged need to translate ideas between the artists and engineers - a complication due to their different community locales and specialized languages. I had not anticipated how the historical, more metaphorical art/science divide that Klüver and others referenced, and that continues to haunt contemporary digital culture to this day, would be so palpable in their writings. Therefore, the "boundary object" concept of technology as translator between diverse collaborators became more central to my findings, with important implications for the future.

I didn't initially recognize the word "technology" would have so many different meanings for the artists and engineers. I had not realized their collective vision of the *9 Evenings* involved so many approaches to technology, from specific concrete physical things made of transistors to huge, world-changing concepts equivalent to the atom bomb and the Space Race. The term's slipperiness as well as its predominance in the project's vision emerged only when I tried to match their words to specific uses as well as to abstract concepts of technology. Today, the word has even more meanings as our world has become immersed in an electronic mediated environment filled with vastly different and diverse technologies.

Lastly, I was surprised to discover, in the words of Paxton, Klüver, and others, explicit evidence that anticipated by 40 years Kester's contemporary "collaboration aesthetic." These concepts are still considered somewhat radical in the art world because

of their emphasis on dialogic processes, shared ideas, and transformative experiences rather than on making art objects. When I met Billy Klüver and Julie Martin, they told me repeatedly that there was nothing new emerging from the art world since the 1960s. I no longer am puzzled by their remark. Fifty years ago they had seen the future in which creative people from different backgrounds, ideas and experiences use technologies to communicate and collaborate and, hopefully, humanize and change the world for the better. That optimistic future is yet to be, but my research adds to our understanding of the growing importance of collaboration and creativity for its realization.

Conclusions & Future Research

In 1996, Rauschenberg asserted that the *9 Evenings* "couldn't be done today. It was done before its time, and it's too late now" (Klüver and Martin 1996, film). It's hard to know precisely what he meant by being "too late now," but perhaps he was referring to the fact that it is no longer just artists and engineers who use technology. Today all types of creative people collaborate everyday. This is not a special or rare occurrence, and the art world has embraced technologies as creative tools that are as ubiquitous as paintbrushes or pencils (as media artist Nam June Paik infamously predicted). The newer electronic frontiers of virtual reality, Second Life, and electronic games involve complex real and virtual collaborations between people with wildly diverse knowledge and expertise. Through social networking sites like Facebook and Youtube, we all are becoming proficient at creating and circulating electronic images, words and stories that incorporate technologically-based collaborative practices.

However, as my literature review revealed, many media art historians and digital culture researchers continue to view the worlds of art and technology through the

historical lens of C.P Snow's "2 Cultures" metaphor. It is time to move to a more expansive, less polarized frame of reference. Creativity is not the sole property of artists or engineers. As evidenced in this dissertation, creative collaboration can connect people from across very diverse sectors and disciplines.

By reaching outside the art world and drawing on creative collaboration research from the business world and social sciences, I hope to contribute to a deeper understanding of the power of collaboration and how profoundly interconnected and interdependent our technologically-driven world has become. An emerging "collaboration aesthetics" can serve, as Rauschenberg said to "open up things instead of shutting them down" (Moyano 1968).

Based on this dissertation, future research could take several directions. One would be to continue research into the E.A.T. histories, beginning where *9 Evenings* ended in 1966, at its founding as a non-profit support organization for artists working with scientists and industry. Very little research has been published to date about the multiple histories from after the formation of E.A.T. that are now more accessible. To examine those histories through the lens of creative collaboration could lead to deeper understanding of the definition and practices of the collaboration aesthetic.

One example: the 1970 Osaka Expo '70 pavilion redesigned by E.A.T. has many stories, images, and new ideas yet to be examined. It could reveal new knowledge about art, technology, industry and collaboration, especially regarding E.A.T.'s complex relationship with Pepsi and other corporations. The book written by Klüver and many other collaborators from that project (*Pavilion*1972) captured some of the collaborations in great detail. It is part of E.A.T.'s legacy of collaborative practices astonishing in its

large number of artists and engineers involved. The project was another declared "failure," mostly due to cost overruns that shut it down prematurely despite its popular success with Expo audiences and its many artistic and engineering achievements.

I have completed research into the 1968 Seattle and Portland chapters of E.A.T., but there are other chapters founded in cities such as Los Angeles, Washington DC, Vancouver, and around the world that have not yet been adequately studied. The projects undertaken by E.A.T. into the 1980s follow the technological development trajectories of video, satellite communications, cable TV, computers and other newer technologies, and I'm sure they would have much to teach us about the future of creative collaboration, art and technology.

Another possible research direction would be further examination of the work of David Bohm, a British physicist who wrote about creativity and the relationship between art and science. He believed we should pay more attention to how we communicate with each other in order to help solve all the crises facing humanity. His writings about creativity and dialogic processes might connect to my research around collaboration and technology and reveal new ideas about better utilization of technology's communication-based roles as grounded in new forms of electronic collaboration and social networking.

I also am interested in researching the next historical wave of artist/engineer collaborations that occurred in the late 1960s and 1970s focused on emerging video technologies. The work of Woody and Steina Vasulka, Nam June Paik (a student of Cage) and Shuya Abe, the engineers at WGBH-TV and WNET-TV working with early video artists, Bill Viola (who worked with David Tudor) and SONY engineers, and many others are an expansion of the types of *9 Evenings* collaborations that were intended to

change the way video technology was developed to support artistic experimentation. I have been researching the history of video art for over 30 years, but this would apply a new lens to the next generation of art/technology collaborations.

Finally, I believe this research can be applied to the newest forms of social media networks such as Facebook and Second Life where creative collaboration on a massive scale is developing in a nascent, primitive stage. Collaboration's personal and collective powers of revolutionary change and transformation are not yet fully realized or understood in this emerging electronic networked environment, and its applications are focused currently on generating and maintaining friendships, finding partners or work, building commerce, and playing games. Global thinkers like Henry Jenkins (*Convergence Culture* 2006) and Jeremy Rifkin (*Empathic Civilization* 2010) can already see the collective empathic power of collaboration and they have much to say about how to use social networking technologies to revolutionize education and begin reversing the destructive forces of global warming and other socioeconomic disasters. Connecting new research about creative collaboration to their ideas might lead to finding new ways to apply successful collaboration tactics on a global scale to enhance our ability to survive and thrive as humans electronically connected on our planet.

APPENDICES

Appendix A

***9 Evenings* List of 10 Performances**

Variations VII
John Cage
Cecil Coker

Kisses Sweeter Than Wine
Oyvind Fahlstrom
Harold Hodges

Grass Field
Alex Hay
Herb Schneider

Vehicle
Lucinda Childs
Peter Hirsch

Solo
Deborah Hay
Larry Heilos

Physical Things
Steve Paxton
Dick Wolff

Carriage Discreteness
Yvonne Rainer
Per Biorn

Open Score
Robert Rauschenberg
Jim McGee
Bill Kaminski (racket transmitters)

Bandoneon! (a combine)
David Tudor
Fred Waldhauer

Two Holes of Water – 3
Robert Whitman
Robby Robinson

Appendix B

<table>
<tr><th colspan="9">Distribution of Successful Creative Collaboration Elements Based On 8 Authors
Ph.D. Dissertation Data by Robin Oppenheimer</th></tr>
<tr><th>Elements of Successful Creative Collaboration (CC)</th><th>Bennis & Bied-erman</th><th>Har-grove</th><th>Schrage</th><th>John-Steiner</th><th>Sawyer</th><th>Candy & Edmonds</th><th>Kester</th><th>Hobbs</th></tr>
<tr><td>Dialogic process: new knowledge</td><td></td><td>X</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Shared vision</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>Individual part of larger systems</td><td>X</td><td></td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>Create something better than working alone</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>Part of "thought community"</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td>Few barriers or hierarchies: Egalitarian</td><td></td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>Diversity and Complementarity encouraged</td><td>X</td><td>X</td><td>X</td><td>X</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>Nurturing, empathic, feminine values</td><td></td><td>X</td><td>X</td><td>X</td><td></td><td></td><td></td><td>X</td></tr>
<tr><td>CC's "raw material" is communication</td><td></td><td></td><td>X</td><td>X</td><td></td><td>X</td><td>X</td><td>X</td></tr>
<tr><td>Achieve "flow" & do best work</td><td>X</td><td>X</td><td></td><td>X</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>"Deep" active listening</td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>Continuous, clear communication</td><td></td><td>X</td><td>X</td><td></td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td>Failure is part of process</td><td></td><td></td><td></td><td></td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>CC transformative: Intellectually, Emotionally, Socially</td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Shared workspaces</td><td>X</td><td></td><td>X</td><td></td><td></td><td>X</td><td></td><td></td></tr>
<tr><td>Different ways of representing ideas, concepts</td><td></td><td></td><td>X</td><td></td><td></td><td></td><td>X</td><td></td></tr>
<tr><td>Mutual respect and trust</td><td></td><td></td><td>X</td><td>X</td><td></td><td>X</td><td></td><td></td></tr>
</table>

Appendix C

Elements of Successful Creative Collaboration
NOTES from B&B, Hargrove, Schrage, John-Steiner, Sawyer, C&E, Kester, Hobbs

BENNIS & BIEDERMAN
"Take-Home Lessons" PP. 196-218
This is a summary listing of fifteen take-home lessons of Great Groups. This list helps define the key elements, aspects, and qualities of the members that are necessary for groups to successfully collaborate.

1. Greatness starts with superb people – people who are talented, intelligent, original problem solvers, and tenacious. "They see things differently. They can spot the gaps in what we know. They have a knack for discovering interesting, important problems as well as skill in solving them."
2. Great Groups and great leaders create each other. "The leader of a Great Group has to invent a leadership style that suits it…by devising and maintaining an atmosphere in which others can put a dent in the universe…"
3. Every Great Group has a strong leader. They help "organize the genius of the others…and realize his or her dream only if the others are free to do exceptional work. Typically, the leader is the one who recruits the others, by making the vision so palpable and seductive that they see it, too, and eagerly sign up." They are curators whose job it is to choose, not make, by recognizing the excellence in others, like orchestra conductors. They are also trustworthy.
4. The leader of Great Groups love talent and know where to find it. They create networks of people who are talented. They also set high benchmarks that attract self-motivated, talented people who want to be part of a group of high-achievers who are really only competing with themselves to be better.
5. Great Groups are full of talented people who can work together. These people don't have to be amiable or even pleasant, but they have to be tolerant, not afraid to question others, and focused on the work itself.
6. Great Groups think they are on a mission from God. "Their clear, collective purpose makes everything they do seem meaningful and valuable."
7. Every Great Group is an island – but an island with a bridge to the mainland. They tend to be isolated, but still connected to the larger world. They form their own rules and language that binds them together and keeps nonmembers out, have a lot of fun together, and have intensely intimate relationships within the group.
8. Great Groups see themselves as winning underdogs. David and Goliath is their guiding narrative.
9. Great Groups always have an enemy. There is a need for the group to see themselves as competing against an enemy, even if it is imaginary or abstract.
10. People in Great Groups have blinders on. They aren't easily distracted by the rest of life, and often forego family and friends to work on the project at hand.
11. Great Groups are optimistic, not realistic. "…optimism is a better predictor of productivity than any of a company's standard measures." Members of the group have to believe they can do amazing things.
12. In Great Groups the right person has the right job. The person and the task are properly matched.
13. The leaders of Great Groups give them what they need and free them from the rest. "The right tools become part of the creative process." Non-essentials are eliminated – casual

dress, personal autonomy, protection from distractions and unnecessary stress by the leader.
14. Great Groups ship. They are productive, they make things, and stay focused on accomplishing the task at hand.
15. Great work is its own reward. The creative process is like a drug.

ROBERT HARGROVE
Characteristics of a collaborative person pp. 50-1
1. leader with a vision;
2. passionate about opportunities;
3. master at building relationships;
4. good listener;
5. good organizer;
6. creates "rolodex" network of diverse people with different kinds of skills;
7. beginner's mind – love of learning

Rules for succeeding in a collaborative world: pp. 56-8
1. create or find a project that makes a difference;
2. Be a great collaborative team player and colleague;
3. Be an extraordinary expert in a distinct area that creates solid value

7 building blocks of collaboration pp. 92-109
1. Reinvent yourself as a lateral leader;
2. Seek out competent people and strategic partners;
3. Build a shared 'understood' goal;
4. Designate clear roles and responsibilities, but not restrictive controls or boundaries;
5. Spend time in dialogue, grounded in real problems;
6. Create shared work spaces;
7. Load the project with 'zest factors'
   a. enroll passionate people
   b. create a breakthrough goal that can be achieved in weeks, not months;
   c. focus on what's possible to do with existing resources, authority, and change readiness;
   d. get going and produce a result right now.

Xerox PARC ideas - John Seely Brown pp. 121-6
1. Creatively explore the 'white space' between disciplines to solve problems. Lateral communication, no hierarchy.
2. Search for new metaphors – the Trading Zone (Peter Galison – exchange information of value without speaking the same language), and 'pidgen' or 'creole' languages between disciplines: "knowledge ecologies" that focus on areas of overlap, not differences.
3. Role of dialogue and conversation as a way to "scaffold" understandings together to reach higher levels – "create the opening to a moment of true insight"
4. Authentic communication – ongoing dialogues with all parts of team/organization with commitment from each person 'to move from his or her position and to construct the best guess (interpretation) on how to view something' – be willing to be influenced.
5. Generative active listening – help other person get clearer and take ideas to higher level – generate and build.

The 5 phases of collaborative conversation pp. 165-199
1. Clarify the purpose of the conversation – purposeful, with people with different views and backgrounds thinking and interacting together but also creating and generating something that never existed before. Purpose as focusing laser beam; purpose as a container that holds whatever happens in the conversation;
2. Gather divergent views and perspectives – divergent views as source of strength; speak up with authenticity and vulnerability; shared pool of information; don't need to be in agreement; disagreement needed to light the spark of creative collaboration; dissonance leads to new harmonies; period of confusion leads to uncovered final product.
3. Build a shared understanding of divergent views and perspectives; inquire into everyone's thinking, express emotions constructively; recognize and disperse defensive routines; come with spirit of curiosity, asking questions and listening deeply to share understanding; emotions act as superconductors of communication that penetrate a closed mind or heart; balance advocacy and inquiry; make statements then explain reasoning and invite questions; establish a trading zone of a shared work context without having to completely understand or agree with each other's basic assumptions; see what it is like to be 'them' (empathy); discuss the undiscussable, stepping aside and letting hostile energy pass by without reacting;
4. Create new options by connecting different views and perspectives; work in shared space. "Creativity occurs when a person (or group of people) can relate what are normally different views and perspectives in a flash of insight – an act of liberation-the defeat of habit by originality." Focus on areas of overlap and forget areas that cannot be resolved. Creative process as loop of formulation, preparation, illumination, and verification. Use metaphors (that combine 2 distant and different areas of perception into one embrasive image or symbolic representation) to incubate, care and feed ideas. Use analogies to distinguish what is missing and solve practical problems.
5. Generate a conversation for action. Creative process as spiral originating with new ideas that cannot quite be expressed, that are then developed through metaphors and analogies and finally culminate in a sketch, prototype, or scale model – shared work space that can be tested.

MICHAEL SCHRAGE
"A collaboration is supposed to produce something. Collaboration is a purposive relationship. At the very heart of collaboration is a desire or need to solve a problem, create, or discover something within a set of constraints." The constraints include expertise, time, money, competition, and conventional wisdom. p. 29

Some collaborations involve people with compatible interests, but others fuse radically different perspectives – complementarity that "produce the friction that generates creative sparks as well as emotional heat." P. 31

"In practice, collaboration is a far richer process than teamwork's handing off on an idea or blocking and tackling for a new-product rollout or attempting a slam-dunk marketing maneuver. The issue isn't communication or teamwork - it's the creation of value. Collaboration describes a process of value creation that our traditional structures of communication and teamwork can't achieve." p. 32

"We don't just collaborate with people; we also collaborate with the patterns and symbols people create." Artists and scientists are influenced by those who came before them. p. 34

Collaborative themes and characteristics – patterns of interaction that have consistently led to successful outcomes and transcend business, the arts, and the sciences as well as language, culture and time (pp. 153-165):

1. Competence for the task
2. A shared, understood goal – collaboration is means to an end
3. Mutual respect, tolerance, and trust – don't have to like each other, just need each other
4. Creation and manipulation of shared spaces – becomes partner in collaboration, serving as references and touchstones for the act of collaboration – technique to manage conversational ambiguity
5. Multiple forms of representation – helps overcome confusion over language – use other forms of representation (images, models) to triangulate their perceptions and impressions. "…since collaboration inherently fuses multiple perspectives to address a task, it must use multiple representations to manage those perspectives." Create web of information that makes it easier to construct meaning – different lens through which to view the collaborative task and collectively grasp the key elements
6. Playing with the representations – uncertainties fuel sense of play and experimentation; multiple representations and shared spaces serve as a conceptual and technical playground for the collaborators
7. Continuous but not continual communication – create rhythm and flow of communication (NOT structure) that helps move things forward and that are appropriate to the relationship and task – maximizes flexibility and spontaneity
8. Formal and informal environments – creative communities meet in a variety of environments, and it is often the informal café or wilderness trips that are pivotal in the creative cycle. Tools need to be robust enough to cope with changes of environments
9. Clear lines of responsibility but no restrictive boundaries – individuals have both defined functional roles and a charter to go where the task takes them – expected to ask each other tough questions.
10. Decisions do not have to be made by consensus – argue because they come to the tsk with different perspectives and backgrounds – depersonalized and focused on genuine areas of disagreement
11. Physical presence is not necessary – letters used to serve as shared spaces, now it is the internet and teleconferencing
12. Selective use of outsiders for complementary insights and information – network of outside advisers are intentionally solicited by collaborators, who are always looking for just the right sources of needed information. They rarely become part of the collaborative team.
13. Collaborations end – purposeful, task specific. Long-term collaborations are rare because they are dynamic relationships that respond to changes in the environment, expectations and individual interests.

VERA JOHN-STEINER
Need to go beyond a shared vision to change a discipline or transform a paradigm. Need to have "multiple perspectives, complementarity in skills and training, and fascination with one's partner's contributions."

Emotional needs are supported

self develops in the context of important relationships

Trust and risk-taking

"slow process of mutual appropriations" – learn from each other and expand their own capacities and skills

Think of each other as family

"During the early stages of an integrative collaboration, mutual discovery and a certain temporary fusion of individual personalities take place."

A community of practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretive support necessary for making sense of its heritage."

Integrative collaborations of artists – transform both artistic work and personal life

"Transformative contributions are born from sharing risks and challenging, appropriating, and deepening each partner's contribution….In transforming what they know, they construct creative syntheses."

The collaboration context provides a mutual zone of proximal development where participants can increase their repertory of cognitive and emotional expression."

"Through collaboration we can transcend the constraints of biology, of time, of habit, and achieve a fuller self, beyond the limitations and the talents of the isolated individual."

Stretch identity through partnership

Each individual only realizes a subset of the human potential – value of complementarity

"Verbal thinkers learn to visualize when working with partners who rely on diagrams, flow charts, and 3D models."

"A joint, passionate interest in a new problem, art form, or societal challenge is crucial to collaborative success."

"Living in the other's mind requires trust and confidence."

"The interdependence of the players, and their achievement of a 'zone of magic' takes place in a broader supportive community. This involves mentors and friends, critics and managers,…"

"The relationship between the 'cultural organism' and the development of persons is another manifestation of the dynamics of collaboration, of the interdependence of the social and the individual, of their shared growth."

"'Knotworking' involves solving urgent tasks where the 'combinations of people and the contents of tasks change constantly." – distributed decision-making, no central authority – "collective sensemaking"

"teams share many other features of communities, including interaction and mutual dependence, expressive ties through numerous symbol systems, mutual and common sentiments, shared beliefs, and an ethic of individual responsibility to the communal life."

Thought communities - "a well-organized collective harbors a quantity of knowledge far exceeding the capacity of any one individual."
- "Thought collectives" – well-established groups; "thought communities" – "individuals with common concerns during focused collaboration."
"Thought communities enable participants to engage in the co-construction of knowledge as interdependent intellectual and emotional processes."

4 Patterns of collaboration (with Roles, Values, and Working Methods):
1. **Distributed** – conversations at conferences, electronic communities, etc. Roles: informal and voluntary; Values: similar interests; Working Methods: spontaneous and responsive
2. **Complementary** – Roles: clear division of labor, knowledge, temperament; Values: overlapping; Working Methods: Discipline-based approach. Common vision – translation of one's thoughts into a new language or mode of expression – mutual appropriation (Bakhtin), stretching of human possibilities, human interdependence, empowerment. The Curies, Sartre and de Beauvoir
3. **Family** – Roles: fluid, change over time (Group Theatre); Values: Common vision and trust. Working methods: dynamic integration of expertise. Become their own worlds with distinctive customs, language (Bennis and Biederman). Sustainability dependent on larger social and economic structures like marriage or other institution
4. **Integrative** – Roles: Braided; Values: Visionary commitment; Working methods: Transformative co-construction. Prolonged period of committed activity, thrive on dialogue, risk taking, and a shared vision – desire to transform existing knowledge into new visions (Braque and Picasso)

Collaboration results in both individual growth and shared efforts. "It requires the shaping of a shared language, the pleasures and risks of honest dialogue, and the search for a common ground."

KEITH SAWYER
7 key characteristics of effective creative teams that coincide with, and add to my findings from other creative collaboration research (Pp. 14-17):
1. Innovation emerges over time
2. Successful collaborative teams practice deep listening
3. Team members build on their collaborators' ideas
4. Only afterwards does the meaning of each idea become clear
5. Surprising questions emerge - ideas are transformed into questions and problems
6. Innovation is inefficient
7. Innovation emerges from the bottom up - self-organizing emergence

10 conditions for group flow, which is the optimum, peak performance experienced by creative people that happens in collaboration (Pp. 44-56)
1. The group's goal is shared and understood
2. Close listening, or "deep listening" happens
3. Complete concentration with low pressure
4. Being in control - autonomy in actions and thoughts
5. Blending egos submerged in group mind
6. Equal participation - each does their part
7. Familiarity - share common language and "set of unspoken understandings" - "tacit knowledge"
8. Communication is constant
9. Moving it forward toward new ideas and actions

10. The potential for failure - no creativity without failure

5 key features of collaborative webs (191-4):
1. Each innovation builds incrementally on a long history of prior innovations (avant-garde ideas and scientific ideas)
2. A successful innovation is a combination of many small sparks
3. In collaborative webs, there is frequent interaction among teams
4. In collaborative webs, multiple discovery is common
5. No one company can own the web

CANDY & EDMONDS
5 features of collaborative communication (pp. 50-3):
1. whether openness of communication was adopted by both parties or was restricted to one or none:
2. whether the relationship existed for the residency or was ongoing; whether the language as demonstrated by terminology used, was shared or restricted to one or other individual;
3. whether the exchanges took place in a continuous manner or only intermittently;
4. whether there was mutual flexibility in respect of the way communication was used;
5. whether the process of arriving at an agreement involved affirmation of each party towards one another or was an agreement to differ.

Shared language is an issue, as is use and acquisition of knowledge about the technology and level of support during the residency.

Success Factors for Collaborative Creativity (pp. 60-5)
1. Seeking a partnership. Artists want technologists to be engaged in the creative work, and artists need to be more open and communicative;
2. Complementary interests for mutual benefit, with differentiated but complementary roles.
1. Art-led rather than technology-led partnership works best;
2. Sharing knowledge helps facilitate collaboration
3. Good communication and high level of trust
4. Devise a shared language
5. develop a common understanding of artistic intentions and vision
6. engage in extensive discussions and 'what if' sessions
7. give time to establish the relationship and recover from mistakes

GRANT KESTER
"Collaborative art practices express this same capacity for indeterminance through an open-ended process of dialogical engagement, leading to new and unanticipated forms of knowledge..."

"What would a 'collaborative aesthetic' consist of? ...challenge some very basic assumptions about the art-making process, leading us to acknowledge aspects of collaborative interaction that are not typically valued by the discourses of art history and criticism. It is often the case that collaborative artists are as concerned with the experience of collaborative interaction itself, the new insights and new forms of knowledge that are catalyzed through this interaction, as they are with the creation of a physical product. Here the 'work' of art refers as much to a process as it does to an object...a network of discursive and dialogical relationships among and between the artist and their co-participants. Primary empahsis is placed on the character of this interaction rather than on the physical or formal integrity of a given artifact, or the the artist's experience in producing it." p. 5

"Here the creative process is exploded outwards to accommodate any number of potential levels of collaboration and creative interaction….the physical form of the image is simply one manifestation of a larger process, and it is this larger process that constitutes the 'work' of art. The creation of the image serves as the occasion for a series of social interactions among collaborators that can operate on a number of different levels: aesthetic and compositional questions, political strategy, and so on. In this sense the resulting image might be said to function as the token or 'evidence' of dialogical exchange." p. 7

ROBERT HOBBS
"I believe that collaboration in the 1960s was largely modeled on corporate types. When it was successful, it depended on artists working in committees and coming to a consensus about specific problems. When functioning on the corporate model, artists were more think tanks than individualized egos; their aim was to change and mold society, to envision new possibilities, and then to attempt to implement them. These artists were less concerned with discovering themselves than with learning about the world. This collaborative type was epitomized, I think, in the innovative but miscalculated Experiments in Art and Technology, or E.A.T., as it was known, which was co-founded in 1966 by Robert Rauschenberg and Billy Kluver, a scientist working with Bell Laboratories. In their newsletter of June 1967, this group's intentions were concisely enumerated: 'E.A.T. is founded on the strong belief that an industrially sponsored, effective working relationship between artists and engineers will lead to new possibilities which will benefit society as a whole.' ....The main problem, as I see it, was that connections between art and science were either forced or trivialized, and neither group really knew enough about the other's agenda to be able to bridge differences and forge a new type of work that was neither art nor science but something in between." (p. 76)

"How much easier and satisfactory is the collaboration idea! A concept of creating that does not separate but instead integrates, that does not make ego the subject but instead is attuned to some function outside the individual, isolated self. Collaboration, as it has been structured since the 1970s, is ot my way of thinking largely responsible to the tenets of the feminist movement, to the desire to find a new model for successful human behavior that does not depend on aggression and booty but instead is concerned with more human and fulfilling needs that can be grouped under the terms 'nurturance' and 'community.'" P. 79

"…With collaborative art, we can no longer assume that we are having an aesthetic and private meditaion on the distilled sensibility of another person. When we look at a collaborative work of art, we are examining a dialogue or conversation between artists. And we do not dumbly gaze, awestruck with aesthetic pleasure; we must participate by thinking about the interaction that takes place and actually start interacting with the art ourselves." P. 85

Appendix D

Roles of Technology in Creative Collaboration
NOTES from B&B, Hargrove, Schrage, Sawyer, C&E

Roles that technology can play in collaboration:
1. **Object of collaboration** – what is being created, invented, adapted, "hacked" (unexpected use)
2. **Tool for specific activities** in collaboration process:
    a. **Communication** – used by team members in collaborative processes
    b. **Learning** - enhance learning to create new things and ideas
    c. **Creativity and making art**

BENNIS & BIEDERMAN
Most of the Great Groups in B&B include technology as inventions, or objects of collaborations. There is no in-depth discussion of how technology enhances or suppresses collaboration, or its additional role as a tool for communication, learning, and creating. It plays no specific role in the 15 "Take-Home Lessons" that summarize the main elements of successful collaborations.

HARGROVE
Hargrove focuses mainly on the collaborative process and the human elements of successful collaboration, with an emphasis on communication processes. He only mentions technology briefly, and mostly as tools for collaborating and communicating more effectively.

SCHRAGE
Collaboration matrix of conceptual and technical – "crude metric to evaluate collaborative relationships…and view collaborative aspirations." p. 54-7
"Conceptual collaboration occurs when people work together to devise concepts, ideas, themes, metaphors, analogies, and so on that frame the overarching goal of the collaboration….Conceptual collaboration yields insights into fundamental notion of the problem, innovation, or discovery that is the focus of the collaboration"
"…technical collaboration is not unlike the key that fits into the lock; it's the way people physically represent the conceptual aspects of the task at hand. Technical collaborations are the attempts to solve the problems the conceptual collaborations identify….Technical collaboration involves people with complementary skills bringing them to bear on a specific task. People with similar skills can also collaborate on a technical level, but that's usually done for the sake of speed rather than innovation or creativity" P. 55-6

Appropriate Tools: Ones That Work p. 58
"…symbiosis of scientist and instrument is essentail to discovery." P. 61
good tool becomes extension of self
Convivial tools – collaborative tools. Raises questions about such tools, cites language as a collaborative tool – at core of all communication media

Collaborative Tools: A First Look p. 85
Blackboard/whiteboard is most pervasive collaborative tool
Conceptual models, prototypes – learning and design tools that are visual and conversational stimuli

"The issue isn't automating collaboration; it's using technology to enhance the collaborative relationship. Technology here doesn't substitute for people, it complements them." P. 92
Conversation in collaboration – ephemeral, hard to track. Shared space of collaboration adds a new dimension to conversation "It takes shared space to create shared understandings" p. 94
Shared spaces P. 94-5
    -provoke the senses as well as the mind. Collaborators can literally experience what they're doing while they think about it.
    are dynamic, like the keyboard of a piano or a personal computer
    - highly malleable and manipulable – easy to tinker with, edit or alter
    - highly interactive – what-if scenarios
    - easy to make and discard
    - create an aura of copresence – feels like collaborators are in same space even if they aren't
    - easy to play in
    - allows for curiosity and serendipity, which enables discovery and innovation
    - becomes a frame of reference, a medium, as much as a tool - environment
    - heals rift between spoken language and visual language – still in "silent movie era" of shared spaces and collaboration
"…shared spaces shape the process of collaboration. Technology will not only remove the obstacles but it will amplify the power of shared spaces. New collaborative tools and techniques will transform both the perception and the reality of conversation, collaboration, innovation, and creativity."p. 96

Computer-augmented collaboration – next generation of tools
Xerox PARC – interpersonal computing – collaborative computing will be much more pervasive than personal computing
p. 98 John Seely Brown "…the meaning of conversational terms shifts from being internalized [inner speech] and fixed to externalized and negotiated; our view of language shifts from a kind of description to a kind of action….The new technologies enable conversations with new kinds of properties; ne need new concepts to understand their nature."

Colab Scenario: What You See Is What I See (WSIWIS) (show video of future scenario)
Large screen becomes community computer screen where everyone can write,draw, scribble, sketch, type or otherwise toss up symbols for community viewing – shared space. This changes contexts of interactions – parallel communication venues – voice, screen can be used simultaneously.

p. 171 "Tools for collaboration should allow a seamless transition between individual work and collaborative efforts."

p. 172 "Documedia" – computer-based collaborative media and environments – helps collaborators learn what they really want to do and how best to do it… by producing a media hybrid of information, communication, and results." Integration of visual, textual and audio media.

p. 173 In the future, documedia "will become lenses, tools, and templates that evoke- even provoke – collaboration….the idea is to present visual and textual patterns – templates and molds – that can induce appropriate conversations."

p. 178 "Collaborators will work in a shared space of a virtual reality that gives them the power to probe a variety of design options. The shared space will become a test-tube medium for new processes and products designed by collaborative teams."

"The computer *democratizes* visual thinking." Workspaces generate a vocabulary all their own…people will learn a lot about themselves as they create the new semiotics of collaboration.

p. 180 "Perhaps some documedia will be imbued with some degree of artificial intelligence and so-called expert systems that would be capable of interjecting comments and questions into a collaboration."

"…design imperative is to assure the feeling of copresence, the feeling that one is always adding value to and building on the contributions of others. Time and distance are dimensions that shouldn't define the limitations of documedia."

"…the real challenge of collaborative architectures is to design structures that not only endure and are useful but that *inspire*. Curiosity, excitement, intensity, surprise – collaborative designers must try to evoke all these sensations."

Collaborative Futures pp. 182-5
Discussion of Ted Nelson's descriptions of collaborative systems.
p. 183 "The emerging generation of collaborative tools will inevitably have as big an impact n the style and nature of personal and professional relationships as, for example, the telephone and television have had. These technologies fundamentally change the things people take for granted in a relationship."

Predictions of the future collaborative tools:
Computer screen will be a shared space
Graphics software will enable animation of text and images that enable collaborative efforts to be more like shooting and editing a movie.Vision can be constructed like a film.

Collab. tools with AI can learn about the cognitive strengths and weaknesses of the people who use them and adjust themselves – cooling down heated discussions, for example.

"successful technology reframes human experience"
p. 191 "New collaborative skills will evolve side by side with collaborative sensibilities."
p. 192 design and implementation of collab. tools changes 3 dimensions of personal interaction:
1. the role of language
2. the task of modeling processes and ideas, and
3. the perception of how others add value.

Spoken language will change – away from transmitting ideas toward construction of meaningful models – used to compliment visual imagery and displayed text.

Brainstorming will be easier and more pervasive.

Collab. technology focus shifts from assigning work to doing work, with shared understandings happening more quickly.

Any technology that reshapes collaboration will also reshape the fields where collaboration is important – sciences and arts – p. 198

SAWYER
Sawyer does not address the roles of technology in collaboration and rarely mentions the uses of technology as either the objects of collaboration or the tools of collaboration. His focus is on the collaborative process and its inner workings around improvisation and creativity.

CANDY & EDMONDS
This book is focused on researching creative collaborative practices by artists using digital technologies. It makes use of case study methodology and selects 7 artist/technologist teams. The role of technologies in these collaborations is both as an object to be created, invented or in other ways changed or "hacked" to make art, and as a tool for communication and creativity.
Case study report structured according to the topics (p 17). :
- goals, outcomes and achievements
- support implications of artists using digital technology
- opportunities for digital technology
- impact of technology on art practice

"Art practice is an evolving creative process. By the same token, art practice using digital technology is also creative. Therefore, it is not surprising to find that, whilst working with the computer, artists often come up with new ideas and approaches that have no direct derivation from what they were originally trying to do." P. 29
"Do artists reconceptualize one medium when they use it in relation to another? Technologists are often taken by surprise to find that their world can be looked at in unfamiliar terms." P. 32

Appendix E

9 Evenings Artists: Quotations & Ideas about Collaboration

JOHN CAGE
(from *Techne: A Project and Process Paper*, published by E.A.T., vol. 1, no. 1, 4/4/69)
"(They) bring people together (world people), people and their energies and the world's material resources, energies and facilities together in a way that welcomes the stranger and discovery and takes advantage of synergy, an energy greater than the sum of several energies had they not been brought together…not just inside our heads, but outside of them in the world where our central nervous system (electronics) effectively now is."[…]
Art is in the process of coming into its own: life. Life includes technology.
The purpose of art is not separate from the purpose of technology.[…]
"Tried conversation (engineers and artists). Found it didn't work. At the last minute, our profound differences (different attitudes toward time?) threatened performance. What changed matters, made conversation possible, produced cooperation, reinstated one's desire for continuity, etc., were *things*, dumb inanimate things (once in our hands they generated thought, speech, action)."

(from 9E film by Alphons Schilling, 1967)
As art becomes so social as this, it becomes used and formed and structured and everything in each individual.
I want to remove the notion of a separation between the artist and the engineer.
I think that the engineer is separate from other people simply because of his very specialized knowledge.
Very shortly, because of the continued use of those specialized knowledges.
If on the one hand, the artist, can become, so to speak, aware of the technology, and if the technologist can become aware, so to speak, of the fact that the show must go on, we can expect not only interesting art but we can also expect a an interesting change in the social order.
The most important thing at the moment is the position of the engineer as a possible revolutionary figure.
And it may very well come as a result of the artists and the engineers collaborating.
because the artists, for years now, have been the repository of revolutionary thought.
Whereas, the engineers, in their recent history, have been the employees of the economic life, but in relating to the artists, they become related to a revolutionary factor.

(from Norma Loewen 1975 Ph.D. dissertation – see bibl.)
"John Cage recalls the project proceeded on a certain faith in the imagination of the artists, that they would dream up something to do, and a faith in the technical abilities of the engineers and in the technology itself that these things could be done. Both artists and engineers ideally had to follow each other's thinking and, as David Tudor recalls, develop some peripheral understanding about the differences between alternative solutions to a given problem." Pp. 59-60

(from Off the Wall, Tomkins, p. 246)
"I thought those engineers should be tied up,' JC said later. 'They were so unable to conceive of a performance situation, so committed to the laboratory where you have endless time to solve a problem. they ruined the performance of my piece. I'd arranged to have telephone lines opened in several places, but when an engineer saw a phone off the hook he went and hung it up. And when I'd ask them, during the performance, to go and do something, they were so stagestruck they didn't even hear me."

OYVIND FAHLSTROM
(from *Theater and Engineering*, Moyano, p. 30)
"The idea was to bring theater and dance up to the level of technology, and put technology in touch with poetic disorder and human insight, things that were *irrational* in terms of technique. The inventions to come out of the show can be developed as elements for works of art….I think artists are either cool and purist, like Cage and RR, or like Leary and Metzner, who have a fuzzy outlook, using art for their special

aims. There is a third group, involved with activities in the world as it is today….I feel in between all three, because I'm attracted to all three and have elements of all three in my work. One thing I have in common with the last group is the approach toward using material from the world-as-it-is: the tape I used with the drug addict, or the articles about the *idiot savant*."

ALEX HAY
(from Norma Loewen 1975 Ph.D. dissertation – see bibl.)
        "Alex Hay said his 'first ideas were fantasy, dreams, superhuman, science fiction type,' and still had this sort of vision of works he would do under the new influence. Talking to the engineers about what was available, feeling responsible not only to oneself but now also to the engineers, one began 'to think about it in almost engineering terms,' the ideas having to be concrete before any equipment could be started. Given what he found available, he had rejected his initial ideas, one being for a mechanical environment to deal with the human body in various ways. As in his earlier works except for "Leadville,' Hay thought is imagery had usually been 'very simple and related to a very common place activity,' with the 'clarity of a single idea,' his material exiting as a 'function of his activity.'
        (AH) 'For the most part, what they've been talking about, what seems to be more available are materials and processes and methods in communication. I really have to start dealing with physical things before I start coming to grips with them. This is going to be a little difficult because just to start dealing with these things, expensive equipment has to be built." p. 53

(from Getty CD's of A. Schilling interviewing AH)
"I love science and studied natural sciences more than art in school. I don't think what I did in 9E was science…that is not unique in science. My interest in science is on the inventive level – I like theoretical science. I wish I understood the mathematical language…you just get the gist of it through 'lay language' but you can't really understand it."
"…I'm not too aware of McLuhan – haven't been interested to read him."

DEBORAH HAY
(from *Theater and Engineering*, Moyano, p. 30)
"Engineers are much more stable than artists. And they were always *there*. They were very dependable in temperament. Maybe that's the difference: temperamentally, they were *there* all the time, whereas artists have more difficulty in being there…I'm not a humanitarian. I'm not there to *bring* something to someone. I'm just there for it to make its way to them. I don't want to offer any solutions. I could work happily in my room, that could be my personality, but I'm bringing the work out. It's not a quirk. I'm not a painter. Painters do that. A dancer needs an audience. Theater happens in front of an audience. It's that confrontation that makes what we're doing *more* than what the established theater is doing. It's one of the most basic things that is changing. What we're doing is depending a lot on the confrontation. We're putting a lot in what we expect from the audience, and I think we're way ahead of the audience. I think people came out of their rooms before to *present* themselves in the theater, to show something done and mastered. We're coming out of our rooms to invite people in."

(interview with Schilling and YR, Getty tapes)
"The kind of materials and engineering equipment [involved were] very masculine. Engineers and the whole science and technology thing is a very masculine thing. […] It was a revolutionary thing, it didn't just evolve, it was pushed and shoved and brought together."

STEVE PAXTON
(from 9E film "Open Score")
"We had become interested in the process we were involved in, which was the meeting, marrying, and mating of artists and scientists that was a kind of coupling that was some form of, hopefully, a synergistic new wrinkle in artistic thought and scientific thought. That they would repel each other, and attract each other in some strange dance, and we would get out of that the flowering, the explosion, the evolution of something for the future."

(Box 3.15 from Getty Archives)
(Transcriptions of tapes for ArtForum article by S. W. and BK: 7/13/66 Paxton tape (40 min.) – Simone, Steve (14 p))
Steve: …I'm learning a lot of things about material which I hadn't heard before.
S. You mean like physical material?
Steve: Yeah, like physical material which I'm very interested in…It seems to me, like I spent a lot of time thinking of things, and the difference between thinking of things or talking about things and materializing them is an extraordinary difference. And these guys seem to be having the same trouble actually like the scientists and technicians can talk a very interesting set up for a sound system, for instance, but when it actually gets down to making it ….turns out to be the complicated part of it. And that is the physicalizing of this idea. And so I'm very interested in, instead of talking about things, I'm interested in seeing them executed….
S. So you've been thinking about things that you couldn't do. You've been imagining pieces that you didn't have the material for.
Steve: Yeah, I don't even have words for some of the pieces…
S. So in a way, I was thinking that the most exciting thing about this is not necessarily the solving of old problems but that it would get you thinking in a whole new way.
Steve: Right.
S. And you were on to that already last year ….
Steve: I think that basically it's something that's always interested me. I think not just like…I've always been interested in finding out whole new ways to think. Like whole new attitudes, however slight a shift it is from say, an attitude I already hold, often a problem that looms very large in life can be solved by a very small shift of attitude. And attitudes seem to change with experience. The experience of somebody telling you about a different attitude being one of the experiences, or seeing something that the new attitude comes to you as a revelation, or something like that. And so having new ways to experience things or re-experiencing old things or listening carefully while somebody describes something you already know and finding that it is an extraordinary revelation to you in this boring situation, some slight emphasis just your boringness and a change therefore in the way you think about the material, whereas before you've been very interested in it, now because of the way it's presented, you're bored, and so all of a sudden your mind wanders in a different way then when you were in the more interesting situation, and you think of something else. I feel that this is happening all the time anyway, but that like in theater or art in general, you're sort of concentrated to let it happen. You're concentrated to accept ideas and see differences in a way that you don't at other times….So that stepping into a scientific attitude I knew was going to jerk me around a little bit. Mess up some of the ideas I've held and introduce new problems. New things to have to deal with….

In this particular set-up a lot of things go against a fairly average artistic idea about conception. Which is something about the artist being a solitary conceiver of something. It's pretty rare in this country I think the Once Group does it, where a group of people work together to conceive things. But they're just about the only group I know of that doesn't bill itself as individuals….Every place else, although people are influenced, or do take ideas and use ideas which aren't strictly speaking their own, there remains this single directing figure at least.
S. Do you feel that one of the things of this situation is a sort of a collaborative conception of things?
Steve: That we're forced into that is part of this situation which I think is very interesting, which doesn't have anything to do with science or anything, it's that we're working, we're all working through the same medium in this particular instance. If we all went out and got our own corps of scientists and developed our own communication lines, then it would be a very different situation. But we haven't done that, we're working through Billy and we seem to be constantly discussing our ideas with each other and we're going to be like stepping on each other's toes 'cause in the end I think we want to resolve this back out to the situation where one person is responsible for a piece, so it's going to have to be sifted out in the end….and everybody I've talked to's been very aware of this, that they were giving up some way of working that they had been working to step into this because they thought it was a worth-while thing. Like it's going to change everything. Which everybody apparently is perfectly happy to do. (laugh)
S. Probably everybody thinks afterwards they can get back. (laugh)
S. Would you be interested in talking about what way you might be giving up or maybe in terms of a particular thing that you had been thinking about? What had you been thinking in terms of before this came

up, before Billy asked you to write that, so that we could get an idea of the switch to the sort of collaborative sort of project thing.

Steve: "I think the main thing that I'm giving up is not a particular piece or a particular idea, but an idea I had about the way I work. Which is that, which is difficult to describe, it's very personal. I seem to think that I work this way…. That you know I make a way to work which appeals to me, that is, I make like a chance machine was one way I did that, or… And the other way is that I wait for an idea to really appeal to me, that I have. That it really becomes a focus or an obsession. And then I generally for awhile tend to keep the two things separate – or sometimes in the end mix them up, you know like put a chance dance or a picture score or some other thing with the idea that appeals to me. And mix it up. I've, you know like, because I've done this fairly consistently, even when I wasn't planning to do it, I've come to think of it as the way I work. Now in this situation I may in the end be able to work that way but the whole procedure is going to force me possibly into different attitudes. So that I may be giving that up. I feel as though I..I feel as though I'm already sort of exposed to this group of people in terms of interests and attitudes and things that it no longer is a private way of working. I feel like I'm working in public, sort of. I'm working with seven other people. Or in view of seven other people who are keeping track of the whole process. In a kind of unofficial, offhand, friendly way."

SFWhitman (do you tend to think in terms of imagery, and think of imagery as a private thing?)

SP "I do basically, which gives me an emotional problem every time I find that it's duplicated in some way. The problem being that, like if I have an image in my head, for instance that has never been out of my head, I've never even talked about it to someone, and it's exposed as being shared in one of two ways, I always (with someone else?) with someone else, right, that is to say if, see, I have this image and I see someone else use it in somebody's old work, or hear about it in somebody's old work, I realize that I've been influenced to think of this image, in effect stolen it, if unconsciously, that upsets me. I deal with this upset in one of two ways: I either ignore it, and go ahead and use the image – maybe I alter it in some way so that it doesn't quite seem, when you look at it, which I think is an important consideration, you know, that it isn't the same, or else, throw the image away, you know, get rid of it, which is a difficult thing to do. Generally they're not really thrown away, they're used some other time, more or less forgetting the whole emotional upset and the information that I learned and everything."

S. What do you think of the scientists at Bell Labs?

Steve: "I think that they're a very strong minded bunch. They tend to have a lot of…they not only tend to do their jobs well, I suppose, or else they wouldn't be at Bell labs, but they have a lot of funny outside interests and kind of really initiative. I wonder if they're not interested in this just out of …because curiosity must be one of their main factors. And so they want to see how it all comes out. And they sort of understand the implications…I also wonder if they aren't having fun, if they don't find the meetings interesting and the people amusing, just as we do them. And the things they say are curious, and the attitudes they take strange…and also I expect like if they have any knowledge of art at all that they admire our facility, you know that like we have done so many concerts and things like that just as we would admire that they had made so many inventions…We admire the way they can solder and they admire the way we can paint or dance or whatever we do."

(talking to 9E engineer Robby Robinson from "Art and Technology: A Dialogue" in IKON – see List of References)

"…in art there's been a lot of theatre and a lot of music and other kinds of time arts where the situation created is what's desired. You can have a broader end in sight instead of a perfectly mapped out and pre-determined situation. Do you think this attitude was known to the engineers – that many of the artists' attitudes were free in that way – or did you think hey were trying to make a product?" p. 16

"What I think was most electric and most valuable about the whole "Nine Evenings' was the personal experience, not any other kind of statement about it. The exchange of attitudes is one of the most valuable by-products of any kind of interaction, and I think the whole thing has to get as broad as possible and that the communication and cataloguing methods have to keep up with that growth so we can know what has to be added and subtracted and we know what's being done and created….The great thing about new things is that you know they didn't exist before and you didn't fully know when it started what the limitations were and what the possibilities were and you see it grow in front of your eyes." Pp. 17-18

"Isn't it really a matter of certain kinds of temperaments dealing with each other rather than engineers and artists automatically making it?" p. 18

"Engineering and art are both known to the public by the product, not by the process. And both of them, if you are involved in them, seem to be very much about the process of what you do. The process of putting on the 9E was absolutely beautiful and the artists gave more I think to that performing situation than they previously had impetus or motivation to give….It was beautiful in terms of the energy, kinds of focus, concentration and generosity that the whole situation motivated….It was a question about whether they (artists and engineers) *would* collaborate, not whether they *could* collaborate."(19-20)

(from RR: A Retrospective, Rauschenberg for Cunningham and Three of His Own by S. Paxton)
"Cage said that he wanted to stretch people's ears; Cunningham stretched our bodies; Rauschenberg stretched us between an array of visual images and their multiple interpretations: so many kinds of inventions occurring at once in this bus, as the culture rolled by, rather slowly." P. 263

(from *Art and Technology II A call for collaboration* by Lindgren)
"I do think there are definitely two attitudes toward technology, and the one using technology as a servant I find very dull and outdated. It seems to me closed-minded…However, in an open esthetic investigation, where it almost doesn't matter whether one makes art out of it or not, in which an art object may not even be produced,"(the purpose is not to move in a single direction.)…if from the beginning, if you have some curiosity about what would happen if you could do *this*, and then you share that curiosity with someone else and make him curious, then that's the beginning of the piece…and it grows and grows…the whole world then is the medium, if you can relate in your esthetic to something other than the finished product."

YVONNE RAINER
(from Getty Schilling telephone interview with Rainer, D and A Hay, and Falhstrom)
"….I became interested in what it (TEEM) could do with time and durations….I think it was a very unusual coming together of people and events. Nothing like it has ever happened before, and this in itself is of value, whether it succeeded or not, and the amount of outrage it generated."
"…I went through several stages (of working with engineers): they were advisors in the beginning, then I talked to someone out there and they kept pointing to impossibilities, then I came up with 3 crude things with wires…I had a foolproof system – even if the things didn't work I still had the piece, the dance…"

ROBERT RAUSCHENBERG
(from 9 Evenings film "Open Score")
"An area of intellect that was so isolated, colliding with something that had no direction, which is what I think art should, that's the way it should be going. Both of them shared their infinite possibilities, and impossibilities. I think the engineers liked the spirit, and I think the artists liked the mind. And the guys were working for nothing, we were working for nothing – what a way to run a business!"
"It couldn't be done today. It was done before its time, and its too late now. That's a rare moment."

(from *Theater and Engineering* by Maria Clara Moyano)
(p. 30) "Our thinking became different and very much influenced by the engineers' approach to the subject, but I think their sensibilities changed. That's the thing about this project: it opened up things instead of closing them down and refining them. Most art activity just builds up barricades that have to be overcome by the next group of artists."

(from "Theater and Engineering: An Experiment" in Artforum – see List of References)
"When you're working with something that's as physical as radio equipment, what's absurd to do is very quickly determined. The machine has no tolerance for getting outside a particular radio wave or whatever it is you're working with. The kind of equipment we're inviting has its own integrity built into it. Whereas an artist has to somehow assume integrity or not. It think just that experience of dealing with these kinds of material that have this particular character is probably going to end up being an enormous influence on the work esthetically." P. 2

(from *An Interview with R. Rauschenberg* by Barbara Rose)
"All material has history. All material has its own history built into it. There's no such thing as 'better' material. It's just as unnatural for people to use oil paint as it is to use anything else. An artist manufactures his material out of his own existence – his own ignorance, familiarity or confidence.

I come to terms with my materials. They know and I know that we're going to try something. Sometimes it works and sometimes it doesn't, but I would substitute anything for preconceptions or deliberateness. If that moment can't be as fresh, strange and unpredictable as what's going on around you, then it's false. The nature of some of my materials gave me an additional problem because I had to figure out how they could be physically supported on a wall when they obviously had no business being anywhere near a wall. That was the beginning of the combines." P. 58

"I had met Billy Kluver, the Bell Labs physicist, both here and in Sweden. He gave me the suggestion that the possibilities in technology were endless. Of course he was right. It was a difficult transition to make because I normally work very much by hand. I rely on the immediate sight and actuality of a piece. Moving on to theory and its possibilities was like being handed a ghost bouquet of promises." P. 67

BR: what happened to EAT?
RR: "…The experimentalists – researchers – were very excited about having a new guy on board. Top management was ambitious for one reason or another about results, but middle management didn't know how to get information from the researchers and experimentalists….We had poets, painters, movie people, video. I recognized that there was a lot of research going on that would not yield any kind of real benefit if the end result would be something like the Princess phone. The equipment that technology had produced should be used for more than that. It should be used as a creative palette." P. 67

BR: what happened?
RR: "We frightened everyone. It wasn't economics….it was fear. Fear of creation. Insecurity about change….Something like nineteen brand-new patents that were direct results of event in 9E went to the credit of the engineers of the respective companies" 70

"I think collaboration is a prescription or device that keeps one from getting hung up on a strong single intention that blinds. Even two people doing something together is important. With collaboration, as complex as it may be, the directions can change. I suppose there must be a cutoff point, or you get total chaos. It seems that in theater and printmaking, every individual that you add to a project will result in ten times as many new possibilities. A good collaboration produces universal thinking." P. 85

BR: Let's return to your involvement in art and technology.
RR: "Originally it was to try to get different hybrids involved in art which had to do with humanity instead of just letting technology get so wrapped up in itself that it controlled us and we ended up as monkeys…." P. 98

 (from *Art and the Future* by D. Davis)
"We didn't want the artist to use an engineer or an industry merely to execute preconceived ideas but to conduct research in which both sides would share and grow."
(DD: Isn't that kind of collaboration rare?)
"It always happens. It's very hard to initiate one of these projects, but when they do happen the individuals involved share and change. The forces implicit in the collaboration are stronger than the competitive instincts that flourish in the art community. It flattens the ego."
(DD: You're obviously talking about a collaboration that goes on for a long time, as did yours with Kluver, rather than a one-time project…)
"Yes. The one-shot collaboration usually does not insist on enough commitment to involve industry in any depth…It's almost like a wild card in a poker game. If you're a research scientist somewhere and you meet a perfectly strange person, the artist, who is asking you to do strange things and you know when he is finished he will go away, I don't think the collaboration will make any considerable change in you….
"Social structures are hard to change, of course. The best things that came of 9E were personal involvements with engineers and scientists, plus some physically important breakthroughs in research…" pp. 144-5

"Harold Rosenberg once said…that the most beautiful instrument an artist has to work with is a pencil. Well, he certainly knows more about a pencil than he does anything else. I think that in the beginning collaborative work is going to be necessarily self-conscious about the technology, no matter who the artist

is; parallel to the first drawings he made, when he was admiring what he did with the pencil. A mature esthetic is the result of familiarity with, and accomplishment in, your medium."

(DD: As I listen to you, though, I get the impression that you value the art-technology collaboration for reasons beyond esthetics.)

"I'm talking about conscience in industry, and individual responsibility among artists, scientists, engineers, bankers, politicians, and doctors, leading to more realistic structuring of the earth and its activities."

(DD: What about art?)

"Art is a natural result of society." P. 145

(from *Theatre of Mixed Means* by R Kostelanetz)

""At the same time I was getting interested in what the dancers at Judson Church were doing. Before I did any real theatre of my own, Jean Tinguely and Jasper Johns and myself collaborated with David Tudor to do a concert in Paris in 1961, and we also worked on Kenneth Koch's The Construction of Boston [1962]. I don't find theatre that different from painting, and it's not that I think of painting as theatre or vice versa. I tend to think of working as a kind of involvement with materials, as well as a rather focused interest which changes." P. 80

"I don't want to be in full control. In fact, a lot of the obstacles I bring in function to make sure that I'm not in full control. I very rarely tell my people exactly what to do. What my pieces tend to be are vehicles for events of a particular nature that can embody and use the personalities and abilities of the performers. Still, I have never been particularly interested in improvisation, because trusted to improvise, people very rarely move out of their own particular clichés and habits. Or, if they do, they are using their own pre-manufactured disguises of those habits." P. 88

"In most cases, my interest is in acknowledging the fact that man is able to function on many different levels simultaneously. I think our minds are designed for that, and our senses certainly are. We can be sitting here, and our noses can tell us that something is burning in the kitchen; yet intellectually for hundreds of years the idea of uninterrupted concentration has been considered the most serious attitude to have in order to use our intelligence.

I think when we are relaxed, all these things happen naturally. But there's a prejudice that has been built up around the ideas of seriousness and specialization. That's why I'm no more interested in giving up painting than continuing painting or vice versa. I don't find these things in competition with each other. If we are to get the most out of any given time, it is because we have applied ourselves as broadly as possible. I think, not because we have applied ourselves as single-mindedly as possible."

(RK: Do you have a moral objection, then, to those dimensions of life that force us to be more specialized than we should be?)

"Probably. If we can observe the way things happen in nature, we see that nearly nothing in our lives turns out the way that, if it were up to us to plan it, it should. Thre is always the business, for instance, that if you're going on a picnic, it is just as apt to rain as not. Or the weather turns cold when you want to go swimming."

(RK: so then you find a direct formal equation between your theatre and your life?)

"I hope so, between working and living, because those are our media."

(RK: You would believe, then, that if we became accustomed to this chancier kind of theatre, we would become accustomed to the chancier nature of our own life)

"I think we are most accustomed to it in life. Why should art be the exception to this?" Pp. 93-4

(RK: One of the myths of modern culture – I associate it particularly with Lewis Mumford's *Art and Technics* (1952) – is that art and technology are eternally opposed to each other and that one succeeds only at the decline of the other.)

RR: "I think that's a dated concept. We now are living in a culture that won't operate and grow that way. Science and art – these things do clearly exist at the same time, and both are very valuable. We are just realizing that we have lost a lot of energy in always insisting on the conflict – in posing one of these things again the other.

(RK: It seem to me that technology has had a huge impact on modern art – the creation of new paints, the impact of media – all of which has never been fully explored.)

RR: You can't move without encountering technology. Just think of what it would be like to go out into the field and pick your supper; now we have it deep-frozen in our kitchen after it was gathered from all over the world. It is only habits in thinking that have tended to make us callous to our actual surroundings.
(RK: How do you look upon working with technicians – as a division of labor, as a division of mentality?)
RR: "I've never questioned paints, since I've never ground my own pigments or mined for the chemicals that made them. I assume a certain amount of information in a tube of red paint. I think that one works with information as though it were a material. I think that somehow it is richer if you are in a live collaboration with the material; that's our relationship to engineers." P. 98

(RK: As an artist, do you feel in any sense alienated from America today or do you feel that you are part of a whole world in which you are living?)
RR: I feel a conscious attempt to be more and more related to society. That's what's important to me as a person. I'm not going to let other people make all the changes; and if you do that, you can't cut yourself off. This very quickly gets to sound patriotic and pompous and pious; but I really mean it very personally. I'm only against the most obvious things, like wars and stuff like that. I don't have any particular concept about a utopian way things should be. If I have a prejudice or a bias, it is that there shouldn't be any particular way. Being a complex human organ, we are capable of many different things; we can do so much. The big fear is that we don't do enough with our senses, with our activities, with our areas of consideration; and these have got to get bigger year after year."
(RK: Could that be what the new theatre is about? Is there a kind of educational purpose now – to make us more responsive to our environment?)
RR: I can only speak for myself. Today there may be eleven artists; yesterday there were ten; two days ago there were nine. Everybody has their own reason for being involved in it, but I must say that this is one of the things that interests me the most. I think that one of my chief struggles now is to make something that can be as changeable and varied and alive as the audience. I don't want to do works where one has to impose liveliness or plastic flexibility or change, but a work where change would be dealt with literally. It's very possible that my interest in theatre, which now is so consuming, may be the most primitive way of accomplishing this, and I may just be working already with what I would like to make."
(RK: how will our lives – our ideas and our responses – be different after continued exposure to the new theatre?)
RR: What's exciting is that we don't know. There is no anticipated result; but we will be changed.

(from *Theater and Engineering*, Moyano, p. 30)
"…Sociologically and politically, the show was an extraordinary success; financially, definitely not. Society has the strangest idea that artists are outcasts and should be poverty stricken. It's almost revenge: the artist has to be an outcast or a luxury in society, because he's doing what he likes to do and other people have made decisions they're unhappy with…Our thinking became different and very much influenced by the engineers' approach to the subject, but I think their sensibilities changed. That's the thing about this project: it opened up things instead of closing them down and refining them. Most art activity just builds up barricades that have to be overcome by the next group..."

ROBERT WHITMAN
(March 27, 1966, interview with Simone Whitman – C27 – Getty Archives)
S. If I understand you, the scientist can make things easier?
R. So far, that's the way it appears to be. I also had an idea that scientists thought differently from anybody else. There would be whole new ways of approaching problems and a whole new way of thinking about approaching them that would be more interesting and with a lot more freedom. If you have an image – there might be ways to discover images that, that their way might be somehow more interesting and less arbitrary.
        I might be able to find out some things that concern me that I did not know about using their startling technique or startling way of thinking. This however does not appear to be what is happening.
S. Was that generally in your mind or did you have something specific?
R. No it was that general. I thought there would be some secret mode that they were involved in. I think the scientists we are dealing with think the same way anybody else does so far. There does not seem to be any secret discipline that they know about that we do not know about. Right now none of the images I am thinking about seem to be on account of being related to the scientists of on account of some technological

orientation. They seem to be the same old images. Thought that may not be entirely true, there does seem to be some kind of change going on but I do not know if it has to do with nature or this business.

S. By nature you mean something that would be happening anyway?

R. Yes.

R. I think I was interested in the idea. That's why I was interested in being in the project. At first I had a fantastic vision of what this so-called technological world was going to mean and so I thought it would be interesting and important to be in the project. Also, it would be a terrific way to excite a new way of thinking. I mean, all those ideas that we were talking about – social – I think it is an interesting way to be socially involved with art. You know, get at that social involvement through the back door. It seems to be a lot more revolutionary – the things that might be happening more revolutionary than wars of that stuff, civil rights. This is more exciting. A little more important. But I do not think we are doing it in this project and I do not think this project is going to do it. I think this project is an interesting beginning for opening the doors for this kind of relationship between what kind of pure…what art thinks of itself as pure esthetic and that the scientists have a kind of pride in their esthetic of their craft and I think that its possible for both groups of people to appreciate each other and maybe it will make it available for more communal orientation. I am not interested in that form of orientation though. I think it is important for individual people to keep on being themselves and finding new ways of doing it. Instead of letting the machine determine what is going to happen, the thing is to find what is in the nature of the machine – what is the form of the machine that one can appreciate as an individual. What the form is that we have to deal with in that world – the world of technology.

S. Has there been any change in how you go about conceiving an idea because of the existence of technology?

R. No. I think that is one of the problems. I think I expected immediate flashes of insight and that did not have any thing to do with it. This actual work did not have anything to do with it.

S. You mean this piece you are working on?

R. No. The actual relationship with the specific project. I do not think it's going to produce that. I do not think anybody is going to discover what it actual means until it's over and we have had a chance to work at it longer than just a few months. I do have an idea that it is kind of a genuine vanguard situation and its more demanding than most situations. The most we can expect to do is approach it tentatively, to find out what it means or like me, step off the deep end and maybe, but I do not think anybody is really going to be able to do that. I think people are going to try but I do not think anybody will discover what it is we meant to do until we have had a chance to figure out what we did.

I think another interesting thing is finally the demands of certain kinds of participation with other people that hadn't been demanded as clearly as it is now – so we all have to be involved with each other. It is necessary we have to be involved with each other. The artists have to be involved in the scientists' work and the scientists have to be involved slightly with the artists and right now the involvement is very tender. It's not really anything deep and consuming at the moment, but it could be.

(from Norma Loewen 1975 Ph.D. dissertation)
"I like our organic collaboration with technical facilities where technique and esthetics are both being experimented with rather than our having a set esthetic to implement with technology." P. 55

(from "Material Witness" Artforum Sept. 2008 p. 430)
"This all leads up to the *9 Evenings* [1966] experience, which was a wholehearted acceptance of all the energy and generosity of people. When we all began working on the *9 Evenings* performances, our understanding was that we wanted to engage engineers as collaborators. We wanted a more even, democratic relationship. The point is that somebody does something and somebody does something else. There shouldn't be a hierarchy of value to what each person does. Of course, this made *9 Evenings* a profoundly stressful situation – really. Everybody got a little crazy. The big discovery was the difference between artists and engineers: Engineers have an idea about proper design, for instance, but they don't have the same concept of a deadline. They work with a more open-ended schedule, typically. They don't realize that when tickets get printed, you've got to have it done on time. But my favorite example was this [automatic] stepping switch for Bob's piece [*Open Score*] that required intense wiring, which took a huge number of man-hours. The artist's solution to the problem would have been to just have a guy turn the switch during the performance – that's just a person hanging out, and that guy's going to be hanging out

anyway. So you're not creating more work. As it turned out, we did manually operate the lights during the performance.

Somewhere in the middle of 9 Evenings is when E.A.T. got formulated. Bob was always supportive of any interest that might help artists, and he was always trying to expand artists' opportunities. Basically, I think Bob was the charismatic attractor for all these characters that got involved in E.A.T. the common ground was our social mission that commitment to some sort of social energy that went beyond just any one thing. Bob had a large-scale involvement in any kind of social activity that came his way that he thought was important, and he managed to create the resource facilities…."

(from *Theater and Engineering*, Motoya, p. 29)
"Technology is a world that's going to become more and more important to the artist, a world he's got to catch up with…This is the first time a body of professional men have been involved in a project of this kind. Now these very important scientists take us seriously, and from this I think that other members of other communities, other corporations, will take us seriously."

Other Artists who participated in 9E
JOHN GIORNO
(from 9E film "Open Score")
"The importance of '9 Evenings' has been largely overlooked because so many things took place right after it. It is literally the first time that artists formally used technology and electronics in their work. It was the seed from which I began, along with the many other people (who) now number in the millions, using technology in our art, with other people. But Bob (Rauschenberg) originated the idea – it arose in his heart, and Billy's and everyone else's."

PONTUS HULTEN
(from Norma Loewen 1975 Ph.D. dissertation)
"…Pontus Hulten recalls the sense of crisis was one of the most interesting aspects of the project: It catalyzed situations, some people crumbling, others managing to pull things together, and was probably the most efficient way to force the breakdown of barriers between people." P. 74

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Appendix F

9 Evenings Engineers: Quotations & Ideas about Collaboration

PER BIORN
(from 9E film "Open Score)
"For some of us like me, it was like opening up a window to a whole new world, and once we saw this, we didn't want to let it go! I miss the intellectual challenge – trying to make the artist's vision come through."

(from *Theater and Engineering*, Moyano, p. 27)
"I've been at this since the first of May, and some have been working longer than that. I don't think a lot of us realized the work involved when we started. But it's a lot of fun. It's a challenge to work with artists, learning what they want, communicating…Yes, I'm on my own time. I have a very strict boss. Right now I'm on vacation."

CECIL COKER
(from "Science and Technology in the Arts")
"The surface reason for an engineer to work with an artist is that it's fun. The work is different from his regular work, but something he can handle easily and that others in the group cannot.

But there is a deeper reason, too. There is a general mood that an engineering education should be broadened – liberalized – for social reasons as well as purely professional ones. In my field – speech – for example, we get involved in linguistics, physiology, and psychology, as well as acoustics and computers. Almost by definition, the new things don't fit into the old boxes.

But on a social level, the technically-educated engineer – up from the farm or some other humble beginning – feels inferior to his cultured new friends. He is hungry for the kind of non-technical broadening experience that the collaboration offers. He is stimulated by interesting new people and surroundings.

At the same time, the engineer, getting his job, and family and house in the suburbs, is pretty well sucked into the establishment. Here is a small way he can break away on his own, without severing any ties or closing any doors. In spite of being committed to mowing the lawn, taking out the garbage, answering the telephone – Monday morning, he can get away and become a seer-artist for a while – a sort of wish-fulfillment.

The project satisfies a curiosity about the non-Establishment world. This may also be an attraction for the artist – to see what's going on on the other side of the fence. Part of my fulfillment in working with artists is being reassured that these guys aren't so different from me after all.

In *Nine Evenings* I got very different impressions from the various projects. In some – especially the smaller ones – there was an attitude of give-and-take, of mutual respect between artist and engineer. Other projects, especially the ones with a large engineering effort, were less successful.

…The payoff for the engineer is intellectual, social, and psychological. Big, impersonal dogwork projects don't have it. Real collaborations do." P. 122

(from Norma Loewen 1975 Ph.D. dissertation)
"There finally started to be some feeling of empathy between the artists and engineers just about the time the show was over….Towards the end, the main drive was making good on the commitment." P. 88

RALPH FLYNN
(from "Science and Technology in the Arts" see bibl.)
"Yes, the sophistication of some of these (9E) works is one of the motivations for the engineer to get involved. The artist is thinking along lines outside the engineer's working patterns at, for instance, Bell Labs or Xerox Corporation. The engineers have an opportunity to use the knowledge they've gained in school in something that turns into an interesting creative project." P. 124

LARRY HELIOS
(from 9E film "Open Score)

"I got a deeper appreciation for the artists per se. I began to realize that, hey, while they were doing things that were different, they were really just people like the rest of us, with some tremendous imagination, some forethought of what they could work WITH. It was very stimulating."

HAROLD HODGES
(from 9E film "Open Score)
"It was very interesting. I think when you get on the technical side of things, you tend to look at things in just a certain way, because of the technical limitations of it. And here is this whole bunch of people who came along who wanted to do something ELSE with the technology. It was a FUN time. The artists seemed to be enjoying themselves when they were working. I'd classify the whole thing as a very fun experience."

RUDY KERL
(from *Theater and Engineering*, Moyano, p. 27-8 – worked on TEEM)
"Doing all the electronic work was especially interesting. I never thought we could…The artists really helped. They caught on very quickly. They always asked 'What can I do now?' if something was finished…I'm sure the engineers and technical people in the audience realized that technical expertness involved in Alex Hay's piece…He was all wired up….that's what they do to the astronauts in advanced space research."

BILLY KLÜVER
(from the *9 Evenings* program notes)
"It has not been as easy as it sounds. The artists had to show an extraordinary amount of patience with the slow rate at which the engineer proceeds. And the engineer had to deal with the vagueness of the artist brought on by the fact that the artist had nothing to lay his hands on and work with. It was like lifting yourself by the hair: if you don't do it all at once it does not work."

(from RR: A Retrospective, *Working with Rauschenberg*)
"I came to believe that a hands-on working relationship between artist and engineer was the best means for providing the artist with access to technology. Rauschenberg's strong commitment to the idea of collaboration shaped my thinking. We evolved the idea of the one-to-one collaboration between individuals, each operating as a professional in his or her own field in contributing to a joint project. This idea of the artist-engineer collaboration was the central force behind 9 Evenings….
…Then one engineer was assigned to each artist depending on the artist's project and the engineer's field of expertise. Other engineers worked on sound and control equipment and systems that would be used by all the performers." pp. 313-4
"None of us wanted E.A.T. to be an idealistic fusion of science and art or an extension of the Bauhaus movement. We also rejected the idea that E.A.T. should set up a technical library, a laboratory, or a workshop 'devoted to 'servicing' the artist.' Because such stand-alone facilities would again cut the artists off from the mainstream of technology as it was developing…" p. 317

 "The basic idea of the artist-engineer collaboration initiated by E.A.T. has become part of the culture. Today, artists do not meet with the same resistance or lack of understanding when they want to incorporate technology in their art….
        Rauschenberg introduced into E.A.T. the kind of morality inherited from John Cage and Marcel Duchamp. He became the checkpoint for does and don'ts. He was always very clear about the character and nature of a good idea and about the boundaries between art and science, and between what is art and what is not art. As guidelines for a foundation operating in the real world, his ideas saved E.A.T, at an early stage, from becoming institutionalized and allowed it to function with all the responsiveness and organic flexibility that both Rauschenberg and I had found so valuable in our own collaborations." p. 325 (same source as above)

(from "Haywire: Major Technological Works of the 1960s" Aktionsforum Praterinsel Munich: Verlag Gerd Hatje, 1997. pp. 93-4)
"By the time Oracle was shown at Castelli in May 1965, I had taken dozens of artists through Bell Laboratories and many of my colleagues and I had worked on individual projects with artists. But I felt this was pitifully small in the face of the seeming explosion in new technical possibilities in the 1960s.

The artist was effectively being shut off from this important area of society. Rauschenberg also had come to feel strongly that artists must have the opportunity to work with the new technology 'to bring more humanity to the development of technology. The fast development of science shortly will unleash an unbelievable revolution. It is the duty of the artist to confront science in a positive way.'" P. 65

"But more important than the technologies themselves is Rauschenberg's notion of creating a work of art in collaboration with people and materials foreign to him. He couldn't 'learn' the process or make immediate hands-on experiments to see what the image would be. He had to be able to sustain decision-making over months since there was long lead time from the moment he articulated an idea until the engineer built and tested the equipment."

"The engineer too was working in a foreign environment. Working in the artist's studio, the gallery or the museum was completely different from the friendly situation of the laboratory, with instant access to machine shops, stockrooms, unlimited test equipment, and technical assistants….While they may have been outside the everyday expectations of the technology, Rauschenberg's ideas always worked within the realistic boundaries of what the technology was capable of, and once formulated, the engineers could bring their expertise to bear on the problems. Rauschenberg could respond to their designs and proposals and work with the systems they made. Through this interchange, the collaboration produced something that could not have been foreseen. The limits of the technology had been expanded."

(Box 4 Getty Archives "Establishing an Interactive Relationship Between the Artist and Technology" by Billy Kluver, June 1969, 25p)
"…The meaning of art is not to communicate what we already know, but what we don't know, to dislocate our vision, to make us aware of our traces and tracks. Art could never be taken seriously if its language was to be confined to paint on canvas, the harmonic scale or certain dance movements. Art is not a comment on, nor a criticism of the world. To quote Susan Sontag, "A work of Art cannot advocate anything at all." Art cannot today be seen in terms of preconceived ideas of what art should be."
(p. 4)   "There exists a parallel development in science. Fifty years ago, Max Planck resisted quantum mechanics on the grounds that it was not morally right. If the physicists had not outgrown this extra-scientific criterion, modern science could not have developed. Today the criterion for good physics comes from Dirac who insists on the measurable, observable reality rather than the validity of abstract mathematical concepts. Dirac has been to physics what Duchamp has been to art. The legacy of Duchamp and Dirac says that we are beginning to enjoy the complexity of the world rather than be terrified of it."
"The contemporary artist is committed to a vision which is solidly anchored in reality. The function of art today is not to make order out of chaos but rather to make us aware of each individual grain of sand on the beach. We live in a period of history when contemporary art is actually becoming part of our lives (as it was during the middle ages) and not something to be revered 50 years later in a museum. Art today is positive, human and sometimes incredibly courageous…."
(p. 5)   "The contemporary artist's exploration of reality has led him to the enormous fortified castle called technology. The castle is closed with a heavy iron door and the artist wants to get inside….The contemporary artist sees the engineer and the scientist as his collaborator, his material and his inspiration. The artist knows that the vital key to technology is the engineer. The artist needs access to the contemporary world and he wants to be part of the world of the future."
(p. 15) "…Experimentation and process become an integral part of the artist's work. The interest is shifting from the permanent finished work to involvement with process and exploration of possibilities.

(from "Artists, Engineers, and Collaboration" in *Culture on the Brink: Ideologies of Technology*, edited by Gretchen Bender and Timothy Druckery, Seattle: Bay Press, 1994, pp.218-19)
E.A.T.s' contribution to the social dialogue of the 1960s and '70s was the idea of one-to-one collaborations between artists and engineers. E.A.T. opened up exciting possibilities for the artists' work by finding engineers willing to work with them in the artists' own environment. Together the artist and the engineer went one step beyond what either of them could have done separately. But perhaps more importantly, the artist-engineer collaboration was the training ground for larger-scale involvement in social issues for both the artist and engineer….
The 'expertise' that artists bring to the collaboration comes directly from their experience in making art. The artist deals with materials and physical situations in a straightforward manner without the limits of generally accepted functions of an object or situation, and without assigning a value hierarchy to

any material. The audacity of Picasso's collages in his time, Meret Oppenheim's surrealist objects, and Rauschenberg's combines and cardboard pieces all illustrate this quality. The artist makes the most efficient use of materials, and achieves the maximum effect with minimum means. Surplus of material leads to decorative work. The artist is sensitive to scale and how it affects the human being. From cave paintings to Persian miniatures, cathedral frescoes, or Christo's *Running Fence*, scale has been a consistent concern of the artist. The artist is sensitive to generally unexpressed aesthetic assumptions, which are based on subjective preference masquerading as "objective," practical, economic, or social factors. The artist assumes total responsibility for the artwork. The artist knows that a work is the result of personal choices; this sense of commitment and responsibility gives the artist and the work a unique quality.

The engineer, of course, brought to these collaborations technical expertise and an interest in problem solving. While the technology needed by the artists might often be "trivial" from the engineer's point of view, its application in a new environment for a new use provided difficulty and challenge. In Rauschenberg's *Oracle*, we had to build a multichannel FM broadcasting system in a single room!

Those of us in the technical community in the early sixties who were worried about the direction of technological change believed that artists' ideas, approaches, and concerns could influence the way engineers approach technological or day-to-day social problems. Our collaborations, we hoped, could lead technological development in directions more beneficial to the needs, desires, and pleasures of the individual.

An interesting comment on my experience in working with artists came from Nam June Paik, when he told me recently, 'Billy, I am working with off-the-shelf technology, you always worked to invent one-of-a-kind technology.' Paik, of course, was understating his extraordinary visual sense in manipulating his material, but he hit the nail on the head about the driving force in the interaction between artists and engineers: what will emerge is something that neither the artist nor the engineer had thought of before. Thus, the artist-engineer collaboration remains a viable model for how we can actively confront and shape new technology."

(from "Theater and Engineering: An Experiment" in Artforum)
"The amazing thing is that it's possible for artists and scientists to talk together at all. The first meeting I was scared. Then, the minute it came down to the hardware it was working. It's like a triangle between the scientists and the artists and the hardware. The main thing is to establish a working relationship and the hardware is the basis for this."

"All the artists were interested in participating in a situation which was too large for them to control as opposed to a studio situation in which the artist privately works as well as he can. Many were interested in shifting the center of where a piece is conceived, from themselves and their studios, to a new an unknown place somewhere between the engineers and themselves." P. 1
"Ideas are interesting when they're still on the abstract plane. But then it takes time to make them. It's a problem because the engineer will lose interest if the artist isn't there. The artist has to take a more active part in the duller aspects of it."p. 2
" There are three elements fighting. The artists, the engineers and the audience. These three will have to come to some resolution. It seems to me that this will take several years. And I think that's good. Because the situation is really new. And it's better to leave problems unsolved until a solution develops through an organic process of experience with this new thing. After all the idea of having 2000 people present as an audience to some end product might have been an obsolete, habitual thing to do which didn't really apply to what had been going on between the artists and the engineers. I don't know. But I'm sure that many, many problems will not so much be solved as abandoned in favor of other problems more pertinent to what can come of this way of working." P. 7
"Science and art are inevitably separated. Any attempt to 'bring the two together' should be looked at with suspicion. Science deals with reality in rational, single-valued terms which are constantly related to a language that is uniquely understood. Art deals with reality in irrational and poetic terms. Art allows for discontinuities that science cannot tolerate. History must have provided us with the separateness of art and science for a reason." P. 7
"Have you ever met a normal, healthy and working engineer who gives a damn about contemporary art? Why should the contemporary artist want to use technology and engineering as material? Only when a working relationship has been established between artists and engineers can we give answers. The 9 Evenings was a deliberate attempt by ten artists to find out if it was possible to work with engineers. Their investment in terms of putting-yourself-on-a-limb was considerable. For ten months they worked with

thirty engineers and were able to make a series of beautiful performances out of the collaboration. I believe it was John Cage who remarked that the 9E 'was like the early movies' where the camera, the stage, the literary content, and the acting were all separate and easily identifiable elements. An unmixed media. The horseless carriage – the wireless microphone – theater and engineering." P. 8

"The growth of contact between the artists and the engineers was the most fascinating aspect of the 9E, one which I can only briefly touch on here. From the engineer's point of view, 9E presented complex technical problems. The engineers had never seen any of the artists' performances before moving into the Armory, and most of the artists had never spoken to the engineers. Most of the engineers, in fact, were without any previous contact with contemporary art. They worked hard in their spare time, and tried to communicate with the artists who lived in New York. It was not until the second night of the performances that the engineers, enclosed in the control booth, really understood the position of the artist and what he was trying to accomplish. The artist was on stage, completely exposed to a large audience, and demonstrating his faith in the engineers. After that second night, everything began to clear up. The vagueness about what the artist was up to had disappeared; the engineer could now evaluate his own contribution to the artists' work and step some distance from his natural commitment to his gear.

It is inevitable that the engineer's work has to precede that of the artist. This makes any collaboration highly imbalanced, but when all is fused together there are great possibilities for give and take. It was on the simple, practical level that the best results of the artist-engineer relationship were achieved: our best experiences came from the projects where the artists had worked with the same engineers from the first idea to its realization." P. 9

(from "Art and Science: Two Worlds Merge")
"The artist's work is like that of the scientist; it is an investigation which may or may not yield meaningful results. The artist and the scientist both work with the world around them; their perception of this world is their material. Their differences lie in the way in which they use this material. The scientist must build on and include previous scientific knowledge in his work. The artist, once he has made his choice as to the essential character of his work (be it painting, sculpture, music), will make very effort to avoid easy associations or connections with other works of art or other known fields of human activity. When you see a good work of art for the first time, it gives you the feeling of not relation to anything else you know – yet you are forced to become aware of it. I am interested in art as an engineer, not as an artist. You do things you wouldn't normally do, because you're in touch with a mind whose vision is totally different from yours. The artist's vision and concern relate to other aspects of human activity, and that's the end that particularly interests me. I'm not so much interested in helping artists as I am in seeing what effect the artist could have on technology. In the future, I see the artist having more and more impact, as he learns more about technical processes. The contribution of the artist could conceivably lead to an increased awareness, a new view of the problems the engineer, designer, scientist has to deal with. For instance, it might reflect on questions like: What should the next mass media look like? We will have the megalopolis; what is it going to look like? I think that the main influence of art and technology together will come in the area of environment." P. 17

(from Norma Loewen 1975 Ph.D. dissertation. These quotes come from an unpublished book by Kluver called "Engineering in Art", summer 65)
"It is hard to think of two professions with such great dissimilarities as the artists and the scientists. Apart from the fact that we call both of them creative (which is like saying that they both sneeze.)…I feel like a man standing with one leg each on an icefloat. The icefloats are drifting apart and I will end up with the fish. C.P. Snow cornered the market with his 'two cultures.' Art and technology, art and science are not two cultures, they are two separate worlds speaking two entirely different languages."p. 41

(Loewen's writing: "Drafts for the book described these differences and suggested how practical working relationships might be established. The artist was considered practical, working in the real world, using materials at hand in an intuitive and immediate way, creating his own language, working with vision not expressed by verbal communication, and when work was 'hot,' finding it impossible to wait before finishing it but not necessarily knowing when it would be finished. The engineer was considered conceptual, working in the abstract world, proceeding in a linear and logical way, sharing a common language with other engineers, knowing how much time and how much work required. And knowing a solution in one form or another would eventually be found.

…It was thought that artists took responsibility for their own art and were the only ones who defined art, there being as many definitions of art as artists. Artists would destroy whatever aesthetics that engineers tried to impose….Whatever the difficulties, the situation would 'settle itself' once artists and engineers made an effort to work together. A rapprochement of the 'two worlds' seemed promising, if not inevitable. In the future, the traditional roles of the artist and engineer might be exchanged." Pp. 41-42

N. L. writing: "The artists had individually accepted different materials for making art, including found objects and hardware, sounds and shadows in the environment, characteristics of people and their commonplace activities, time and comic strips. If artists' materials included these, Kluver asked, why not technology or the engineer? Kluver anticipated the artists would use technology as another material in ways consistent with their previous work but with new freedom as to things possible, that they would deal not only with the aesthetics of technology or use its external qualities to create new forms which he thought belonged in the realm of engineering, and that their work would not be dependent on the quality of the material per se but its use in relation to their ideas of content." P. 48

(from "The Great Northeastern Power Failure [1966]")
"…In this century, artists have also embraced technology as subject matter: the enthusiasm of the Futurists, the experiments of Dada, the optimism of the Bauhaus movement and the Constructivists, all have looked at technology and science and found materials for the artists. But for all this interest, art remains a passive viewer of technology. Art has only been interested in the fallout, so to speak, of science and technology. The effect of technology on art can apparently be even a negative one: the invention of the camera helped kill off representational painting, and we are now witnessing how the computer is about to take care of music and non-representational painting.

The new interface I will define is one in which the artist makes active use of the inventiveness and skills of an engineer to achieve his purpose. The artist could not complete his intentions without the help of an engineer. The artist incorporates the work of the engineer in the painting or the sculpture or the performance. A characteristic of this kind of interaction is that generally only one work of art results. In other words, the engineer is not just inventing a new and special process for the use of the artist. He does not just teach the artist a new skill which the artist can use to extract new aesthetic variations. Technology is well aware of its own beauty and does not need the artist to elaborate on this. I will argue that the use of the engineer by the artist is not only unavoidable but necessary." P. 35

"…But the alternatives that the engineer can imagine for the full use of the fantastic capacity of technology are even so few and limited. He is, as I said, no visionary about life. But the artist is a visionary about life. Only he can create disorder and still get away with it. Only he can use technology to its fullest capacity. John Cage has suggested: Let the engineer take care of order and art (in the traditional sense) and let the artists take care of disorder and life. And I am adding technology. This is to sum up: First the artists have to create with technology because technology is becoming inseparable from our lives. 'Technology is the extension of our nervous system,' as McLuhan says. Second, the artists should use technology because technology needs the artists. Technology needs to be revealed and looked at – much like we undress a woman.

The artist's work is like that of a scientist. It is an investigation which may or may not yield meaningful results; in many cases we only know many years later. What I am suggesting is that the use of the engineer by the artist will stimulate new ways of looking at technology and dealing with life in the future." p. 38

(from "Turning to Technology: legendary engineer Billy Kluver on artist-engineer collaborations" by Hans Ulrich Obrist at www.artnode.se/artorbit/issue3/l_kluver/l_kluver.html accessed 8/3/2001)
"…But what happened was that Robert Rauschenberg saw the whole operation as a collaboration between the artist and the engineer. And that was a new starting point, because I immediately understood that if an artist and an engineer collaborate on a project on an equal basis, then something interesting and unexpected might really come out of it." P. 1

"Yes, the whole philosophy is hands on. It is not about talking. I mean everybody goes out afterwards to have a beer, but first you have to work. As far as the philosophy behind art and science I've gone through it, but it never interested me deeply. If I had been really involved in the philosophy, I wouldn't have been able to understand that an engineer had to be an engineer and the artist had to be an artist. Just listening to Bob Rauschenberg talking about or responding to some of these philosophical ideas, I realized how stupid they were, how ridiculous. It did not have anything to do with what he was doing."

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(from *Science & Technology in the Arts*)
"That,' he says, 'was the first experience of what we now call collaboration.' And then there was *Oracle*, an environmental sculpture on which he worked with R.R. for three years. Both signed the piece. 'In a way, we established a precedent, which I can see now was important because the engineer's contribution is recognized.'" p. 53

"Of course, it's okay for an engineer or scientist also to be an artist; but he has to produce valid works. It is very hard to make art. It's even harder if you have already spent ten or twenty years of your life being an engineer or scientist. First, he discovers he can make art. After a while, he finds out that it isn't really that easy; but there is a genuine desire to be creative. The engineer and the scientist often move into the field with great enthusiasm and generosity, but like everything in life it takes time and it's tough.

Collaboration can yield a lot more, has greater potential than working alone, but it is also much harder. It will have to evolve its own form. There isn't any form for the collaboration yet. It happens on a personal level and when it is successful we don't know why."

In dealing with unknowns and experimental projects, you always have problems, and they are always different. You tend to assume good will and respect for the artist; then you find that people generally misunderstand what he is doing and how he behaves. You either have to start defending him, or explaining what he's really doing. And you get into any number of jams." p. 55

(from "The Godfather of Technology and Art: An Interview with Billy Kluver" by Garnet Hertz, www.conceptlab.com/interviews/kluver.html accessed 9/3/2001)
"…The way I see it is that artists provide non-artists – engineers or whomever – a certain number of things which non-artists do not possess. The engineer expands his vision and gets involved with problems which are not the kind of rational problems that come up in his daily routine. And the engineer becomes committed because it becomes a fascinating technological problem that nobody else would have raised. If the engineers gets involved with the kinds of questions that an artist would raise, then the activities of the engineer goes closer towards that of humanity… Now, this is all sort of philosophical – in practice it has to do with doing it." (GH: So, is technology a transparent medium that artists should be able to use…there's not really a moral side to technology?)

"Well, no, the artists have shaped technology. They have helped make technology more human. They automatically will because they are artists. That's by definition. If they do something it automatically comes out human. There's no way you can come out and say that if art is the driving force in a technological situation that it will come out with destructive ideas. That's not possible. But what happens, of course, is that the artist widens the vision of the engineer." (GH: And so artists can provide a conscience or humanizing element to the technology?)

"Yes, that's what I mean…but that's saying it too much. There might be other consciousness that come from other sources than art. I think there is a huge consciousness inside technology that hasn't been tapped."p.3

(from "The Engineer as catalyst: Billy Kluver on working with artists" by Paul Miller at www.spectrum.ieee.org/select/0798/kluv.html accessed 8/3/2001)
"…To this day he expounds the theory first put forward by Rauschenberg: that the true nature of Art & Technology lies in collaboration, not consultation. 'Engineers are not artists, and artists can't do their own engineering. Artists and engineers are separate individuals, and if they work together, something will come out of it that neither can expect. That's the quote I want to die with.'" P. 8

(from E.A.T. newsletter, first issue, 1967, cover, written by BK & RR)
"Engineers are becoming aware of their crucial role in changing the human environment. Engineers who have become involved with artist's projects have perceived how the artist's insight can influence his directions and give human scale to his work. The artist in turn desires to create within the technological world in order to satisfy the traditional involvement of the artist with the relevant forces shaping society. The collaboration of artist and engineer emerges as a revolutionary contemporary sociological process. Initially, a successful working relationship between artists and engineers will require that each operate freely within his own environment. The function of E.A.T. is to create an intersection of these environments."

(from *Art and the Future* by D. Davis)

"Marcel Duchamp initiated the artist's active commitment to the external world and made it the artist's responsibility to look without prejudice. This involvement in the physical world is the basis for the interest of contemporary artists in technology. Duchamp's commitment to reality is now becoming accepted. EAT is a result. The Bauhaus and the Futurists were, I think, involved with the process of seeing and with preserving certain idealistic notions about the world. The function of technology as a material is not to put previous esthetic concepts into new forms but to provide the basis for a new esthetic, one that has an organic relationship with the contemporary world."

(DD: You seem to see the difference between the old fusion of art and technology and the new in terms of passive versus active. Is this way you once declared yourself a work of art?)

"I did so in an attempt to clarify the relation between the artist and the engineer. We cannot say that the engineer is creative in the artistic sense, nor that he is a performer, like the violinist. Until we understand this, many social and personal attitudes will come into play that have no significance for the ultimate collaboration, where, in fact, the contributions from the artist and the engineer are indistinguishable. Unlike the relation between the scientist and the engineer, the artist-engineer relationship is intimate and has no vertical components. The engineer's work does not follow the artist's, as it does the scientist's. p. 139

"…As our understanding of technology increases, the question of success or failure will disappear. The focus of the interest will then be on the incredibly rich and varied possibilities of technology. We have to live with a work of art or fight it. Technological success or failure cannot be a criterion for judging the work. A work of art loses its interest if it is only judged according to predetermined norms."

(DD: In other words, you want technology in its relationship with art to be adventurous rather than mechanical)

"The relationship should be experimental and intuitive in the same sense that scientific research is – I am not using the word 'experimental' as it is used in connection with art – and therefore full of risks. Whether the technology works or fails is not a very important aspect of this relationship. We know for sure we can always make something work." P. 139

(DD: What…makes such a collaboration successful, from the engineer's point of view?)

"…The collaboration is a success when the artist and the engineer can see each other's works and get stimulated by each other's contributions, so that the work changes organically to something other than what it was in the beginning. The greatest handicap is not knowing how to talk to each other. Professional recognition of the work within the engineering community represents the best 'reward' for the engineer."p. 139

"The engineer and the artist deal with the physical world and work for direct solutions of problems. The scientist is not trained to deal with and handle the physical world. His goal is to understand it in terms of a specific language of little interest outside science. The scientist's dedication to his work has much the same quality as the artist's, but the areas of vision and realization are widely different. They simply cannot understand each other. A relationship between an artist and a scientist would be incestuous today. Let's hope that is not so tomorrow!" p. 140

(DD: what are motives for EAT?)

"My motives are: one, artists are incredibly neglected by society. In spite of all the foundations and publicity, most artists starve or waste their lives on silly projects. We give many billions to scientists; we should give at least a few to artists. Of course, no one would dare tell a scientist what to do. But we hamper the artist with our preconceived notions….Two, pleasure. Technology is for pleasure, variety, change, respect for individual choice and human relationships. Art and technology go well together in a world run by people who consider boredom the greatest virtue." P. 140

(from *Artists as Inventors/Inventors as Artists* see Bibl. pp. 176-81)

"In order to gain access, I brought with me the technology. Other people bring money. Or other people may become collectors. I believed in the art world as the only serious world that existed. And it was the only world that took itself seriously, which had individual freedom and took itself seriously.

I believed that the artists would influence the engineers and then change the technology. Of course, the point is that the artist would work with engineers and change the engineers." P. 177

"The point is, the artists at that time were free and they were expanding in all directions. They were absolutely not closely knit – they were expanding, they did what they wanted….They didn't have any institutions; there were no institutions, there was nothing. So you did what you wanted. So we had the

energy and the enthusiasm to do what we wanted to do. And that is what is important – to do what you want to do. And there were no limits, there were no barriers, because nobody said: 'You can't do that!' Or nobody said: 'That costs too much!'". P. 178

"A couple of years ago, I talked about 9E with John Pierce, one of the pioneers of communication technologies and my boss at Bell Labs. I asked him: 'Why did you let us do all this? Why didn't you stop us?' And he answered: 'There was too much energy there.' Well, think about it: Bell Labs – they have to force people to take vacations there. At least you had to in those days. The selection of people who come to Bell Labs are already extraordinarily intelligent, are already full of energy; they invent things, they do things, they are completely absorbed in their work. So if he had said,'Stop this!' it would have created an enormous negative feeling inside the Labs. Because it would have meant that there is something we cannot do. We can do everything, but there is something we cannot do. He was very smart not to have stopped us!" p. 178-9

"…experiments in art is a contradiction – either it is art or it is an experiment; you can't have both….I'm simply not interested in the aesthetics of art….Engineering has nothing to do with aesthetics. It changes the work, makes the art work different." P. 179

"Art doesn't come out of accumulated knowledge the same way science and technology do. You don't have to go to school to be an artist, except that in art school you learn things like techniques. But if a person says he or she is an artist, one can't say to that person: 'You are not an artist.' You are not allowed to say that, because there are no criteria in society for deciding who is an artist, as there are for engineers and scientists."

L. J. 'ROBBY' ROBINSON
 (from "Art and Technology: A Dialogue" in IKON – see bibl.)
"…we were working with ideas with not enough time to reduce those ideas to perfection from an engineering standpoint. There's always certain stages you have to go through when you consider engineering a job or a project. First it's design work and then it's what we call bench work. After that comes the field testing or the reduction of practice. The first two stages were accelerated – that is, they were accelerated at a faster rate than we normally like to work. And then finally, the important part, the field testing. We just never had enough time to adequately field test what we were doing." P. 16
"…The engineers felt that as far as a theatre situation or art situation was concerned, it was more or less approached the same way we approach our problems. For instance, if you're dealing in a research area where you never get a chance to bring anything to practice, everything has to be very much verified. Your proof has to be positive. Now when you talk about the systems approach and systems always means when you finally take a single object or a lot of objects together and bring them to practice, to use, it's an even greater problem, because you have to go beyond the verification and actually reduce it to practice, understand all of its limitations, its margins, before you dare turn it over to the public – because engineers that have a sincerity about their purpose in engineering never want to insult the public by putting off something that hasn't been completely reduced to practice and made fool proof. We thought that was the way art worked and we also thought that was the way this whole thing was going to proceed. Of course, this was the beautiful thing about the whole experience. Now we've learned about how art proceeds and I think the artists are learning how engineering proceeds. We have found a beautiful ground and an excellent way to solve this problem….now we both understand each other and it's going to be easier, because of this, to work within this framework."
"This is something we learned. You can still get a tremendous amount done, under these conditions….It's kind of wonderful for the first time to realize that it is possible to engineer differently from the way you've been taught out of the books to engineer. I think this is the thing that excites the engineers….the engineer was learning something new. He was learning there's a different way of engineering…" p. 16- 17
"…what do the artist and the engineer have in common….The engineer is always in search of some kind of newness, a new way to do things, a new approach to a problem….and that's why finding a new way to engineer when you're working with artists is so exciting."p. 18
"Being more productive means having a freer mind or a looser one. A more highly adaptable mind…there is a whole group of engineers who want a challenge. The space program is an excellent example….I think E.A.T. has shown a lot of them that here is another exciting way to think in terms of engineering, rather

than just a highly stylized way….(9E) was more than just a change of scene. It was something that really had a genuine challenge to it." P. 19

"…I was skeptical as hell. I just didn't have any idea that there was any common ground the two could meet in. and then to my astonishment and amazement, I found out there was – that here not only was a common ground, but a ground out of which at least the engineer got a great deal of inspiration." P. 20 (talking about E.A.T.) "I'm just as much excited that a technical information system will be developed because I can use it as well as the artist." P. 20

"When the decisions were made for an equipment rehearsal everyone got very excited, now that there were pieces to see and so forth. You see, up to this point there were a lot of little individual things. I think, were a venture like this to be repeated, I would want one central workshop where all the engineers and technicians came to work together. This would be one way to stimulate morale or interest right from the beginning." Pp. 4-5

(from Norma Loewen 1975 Ph.D. dissertation)
"We all knew that we were involved in a 'real situation.' No one ever suggested a compromise. We were committed to a purpose, and we would see it through. The really important thing about the 'Nine Evenings' was that 'it was done." If the critics and the public had no understanding of this, then they missed the beauty of seeing a real creative venture in the making." P. 88

(from Simone Whitman, Getty recording, 9/14/66)
"…the major personalities, from artistic and engineering sides, are inspired by the interface between the engineers and artists. This is the most interesting to me, because I don't think this has been done before. I see it having tremendous potential. I think the theater and the artist needs it, and in turn the engineer will benefit. There is a feedback that will be valuable to both people. For once and for all there would be a foundation endowed well enough to make it possible to match an artist in Texas with an engineer."

"…what we should have had was one central workshop where all the engineers and technicians came to work together. I think this would be one way to stimulate morale from the beginning. I think the engineers are going to have te same kind of stage fright as the artist….[…] …It is strictly about being together. There is a loosening up process going on. There are wonderful personalities involved and no one has told anyone to mind their own business, and I think that time will teach us how to communicate with each other."
"…This is research. For instance, cinema as we know it today, Bell labs was the father of audio and visual elements – just like this project, just happened, and then we found ourselves being the father of the talking pictures, and this change the whole life of the movie theater. Same with television – Dr. Ives, who was the father of television here – it just started out as an interesting thing to do…."

(from *Theater and Engineering*, Moyano, p. 28)
"This group of artists was genuinely interested in searching out technology. When you work with an interested person, you become very interested *in* him. Our objective was never to tell the artists what to do, not to disturb the artist's mood or need, because that would be destructive. We worked with the artist as he put his piece together, and then saw what we could add ot it…Engineering requires cool, logical reactions. Art and engineering are two separate worlds. That's why it's so remarkable that this project works. The most important thing is the fact this is being done, regardless of what the audience thinks."

HERB SCHNEIDER
(from "A Glimpse or more at some technical aspects not seen by the third partner of nine evenings – the public" from Box 4, 4.1, Getty Archives, unpublished and not dated)
(p. 2) "The sampling was arbitrary, and had nothing to do with the aesthetic quality or with a judgment of any of the artistic pieces. While the writer found himself, at times, in many places, his own involvement grew and the magnitude of the task undertaken by the group became clear. From sidewalk superintendent, to the design of the decoder and other components, to the discussion with artists to spell out their requirements, to the realization that a common simplifying system was needed, and finally to the installation and performances during Nine Evenings, meant a continuing change of view. We shall try to give a few of these in the following pages."

(from "Theater and Engineering: An Experiment" in Artforum)

"What really appalled me was that on September 15th no one really knew what we were going to do on October 13th except in a very general way. Then we talked for six hours with each of the artists and then made up the drawings/diagrams of the different combinations of equipment that the different artists were going to require. David Tudor was asking for functions I couldn't visualize. Then I made the drawing. We talked back and forth making corrections till we finally beat it into shape. I couldn't understand what he wanted until I could visualize it and he couldn't communicate it to me in those terms because he's not used to visualizing functions. When I began to get this collection of drawings, I began to realize that we'd better simplify the whole approach. That is, to program the connections, so that we could shift one artist's piece to another's without extensive replugging." P.5

(from "Nine Evenings – A View From Central" 10/66)
"When artist meets engineer, each stalks the other like an animal of another species or from another world. Yet, soon, if patience prevails both can find a new relationship, a common purpose to help and learn from each other. When engineer meets engineer it is assumed that they immediately converse in a common language; but science and technology have expanded and have led to specialized branches so that the terminology of one may be quite useless to another. Still – there is a common thread.

Engineers and scientists attempt to deal in facts and figures to understand, to be able to repeat, and to predict. The artist deals more with images and impressions and up to now his tools have been limited. The engineer visualizes before he tests, and he experiments before he builds. The artist too has a conception, he too creates and attempts to put into a form something that others may see or hear, react to and even appreciate.

The engineer's product, we coldly say, must stand the test of the market place; but so does the artist's. The manufactured product can be called, at least by its designer, a success if it is useful and if it does its job. If it doesn't sell, well, then one can always blame the human factors designer who didn't give it the right shape, or the sales department which didn't put it into the right box. At least the engineer knew that his product worked.

The artist too tests his creation in the market place; but his marketplace is much more restricted, and the appeal is not vital to life and health, except his own. The artist attempts to stimulate reactions which are not only much more difficult to define, but he must also do this for the many whose reactions are never identical. It is exactly these common and varied problems that made the interaction between artists and engineers, and between Art and technology, fascinating.

…here was a voluntary association of a wide variety of people, who believed that it was time to prove C.P. Snow wrong (talking about the 9E)….Let's see how.

…what is important to me is not what went right, or what was wrong. The daring decision to invite the public to an experiment whose outcome was unpredictable was a calculated and a correct one. It made the public the third and necessary partner in this enterprise. In effect it invited the outsider's participation….

What was important was that the artists and engineers communicated, that their ideas merged and produced a 'piece'….

The Dialogue

Looking back, the key issue was the dialogue between artist and engineer. It seems to me that the dialogue started much too late and that few of the engineers realized their function until it was nearly too late. These two must be partners, not client and advisor, even though the original and final direction clearly is in the artist's province….

Yet, to understand Nine Evenings, we must recall that one of the ground rules laid down months earlier was 'not to interfere' with the artist's conception…But an outsider view is not necessarily harmful; it doesn't come from across the footlights but from off-stage, from a collaborator who may be sensitive to both the artist and the audience. The dialogue, then, which should have been initiated shortly after and concurrent with overall planning of the experiment, did not materialize to any significant extent until September, four weeks before the First Night. And, of course, in passing, the burden of overall planning rested largely on one pair of shoulders.

Much was going on; the pursuit of individual tasks such as the design of the Teem equipment was, or could have been a full time job for many. Similarly, the components made specifically for certain artists' imagery, all required further concentrated efforts. Yet the magnitude of the undertaking was not appreciated by either the individual engineer or the one willing to coordinate until each artist had outlined

his conception of his piece. An early dialogue would very soon have exposed some interesting facets of the artist/engineer interaction:

1) the remarkable capability of the artist to visualize the desired effect,
2) the engineer's inability to grasp relationships and requirements on the first go-around,
3) the artist's lack of appreciation of the time scales required for any but the crudest technical accomplishments, and
4) the artist's desire to propose, in a helpful way, a change before, or just as a solution is being approached.

Indeed it seems appropriate to suggest that the engineer stick with a proposal till an answer emerges. If during the struggle modifications seem indicated then it is time to look for alternatives. The artist must realize that the engineer solves his problems not by gross changes in direction, but by repeatedly moving toward the problem at hand, like a mouse in a maze. Changing the maze does not simplify the problem but removes some of the ground already covered.

…No two concepts were anywhere near alike and it was not until October 6, a few days before the move to New York, that the last of 10 system diagrams, each representing an artist's piece, could be completed. As it was, it took some six hours of discussion and two days of preparation to complete each.

A Systems Approach

It became clear already after the second design that the complexity demanded was sufficient to call for special answers. This was no one-night stand in a wooded glen out on Long Island. The rapid changes, two or three times a night, and even discounting the rigging, meant that the system interconnection problem could not be handled by routine direct wiring. Individual functions required were often quite simple; the complexity arose from the number of functions, the need for cued and timed responses, and the variety of locations, stage, balcony and central, which all needed to be served. Reliable and rapid interconnections became a necessity and a patchboard system was the answer.…elated to switchboards as ancestors, the patchboards allowed each artist access to all the equipment and each piece to be preprogrammed and repeated at will.

…It was not until the third day in the Armory…that we had a Black Box to call our own….[…]

It was a good school for some to learn, to handle a new crisis every minute: it was not the elevating experience of artists and engineers joining hands calmly. Yet as we passed the halfway mark, the air of emergency dissipated and an atmosphere of control began to enter. Why – the engineers were even seen in the audience at times to observe the view from the front of the footlights. […]

What the public saw was of necessity only a good fraction of what was desired, a minimal fraction of what had actually gone before, and a fraction of what was actually going on. And none of it was fair to the artist, the public or the engineer. It wasn't fair to the artist for this was part of his livelihood, to the public which had been led to expect entertainment at a price, and the engineer because he knew that he could do better. To charge admission was essential to attract an interested audience. The proposal to open the Armory during the day for a nominal fee, to let the interested view this experiment in action without formalism, was a worthy proposal. It should have been pursued and would have had an even stronger impact than the Nightly performances with their vaguely felt unseen actions behind the walls of the black box. For once, the audience would have learned a bit about the secrets of the paint used, the materials dealt with and the equipment provided. We did not have to sell electronics, and we didn't. But we should have made more of an effort to expose the TEEM gear for what it did, not for what it is. It is not that complex, and the public – invited – would have sampled to its own taste….

It was not visible to the audience, that a clear working relation had been established with the group of artists; and no one could have any doubt. But a similar link might have joined the audience, if time had been on our side. What was done, nevertheless, proved the feasibility of bridging a supposed gap. And yet no critic saw it. Eventually it will become obvious to him too.

This is a continuing experiment, and I want to toast

Billy Kluver – who had the courage
The Artists – who had the faith
The Engineers – who gave freely of themselves
Ralph – who was willing to stick it out
And Bell Lab's Management – who had the patience to support a novel idea

(from "Interview with Herb Schneider")
"My memory is that initially the artists were in total creative control. Then, after months of working, the whole team was having great difficulty getting things to work; there were communication problems between the artists and engineers and there were problems instigating an overall system of organizing and aligning the technical and artistic aspects.

After having watched this chaotic excitement from the sidelines for several months, I was on a trip to Aspen, when I got a call asking me to come back and help with the overall organization of the events. I realized immediately we needed a standardized approach to each of the pieces, consequently the most important aspect of my role became talking to the artists in order to pin down their ideas from the technical end; to put their ideas in a form the engineers could use to realize those ideas. It was essential to get a feeling for what they wanted to present and to be able to describe it in technical detail. So I met with each artist, we talked for several hours…and from my notes I developed a technical drawing for each performance for the engineers' uses."

…"I would call myself a translator between the artists and engineers." P. 56

…"As I saw it, *9 Evenings* was a pleasurable human task that somehow came together after months of very casual, abstract talk and random efforts."pp. 56-7

"When I came back to New York in September I pretty quickly realized that what was needed was a way of communicating between the artists and the engineers. The artists' ideas needed to be pinned down so a plan of action could be established with the engineers. I was not surprised by the ways the artists communicated. My job was to listen to their views and clarify their meaning. When things started, the artists were in control and then months later nothing was working: they would throw ideas at the engineers, expecting them to turn around design while the engineers were having a hard time pinpointing technical notions and their applications."

"They (the diagrams) came strictly from the notes I scratched during my interviews with the artists. I wanted the drawings to satisfy the artists' requirements. The other engineers were not involved; they just received them as the end result."

…"There was only one final version of each drawing. I showed them to the artists and we had very little trouble agreeing on the final versions. They all understood what the drawings were illustrating and what their intended use was: to show the engineers how to satisfy their creative needs. Some of the drawings are labeled 'addenda,' coming as a result of small changes that came up in follow up meetings with the artists. Overall there was very little trouble in agreeing on the drawings."

"Basically, I asked each of them to describe what they had in mind, what they wanted their work 'to do'; it was essential to get a feeling for what they wanted presented. I tried not to tell them something wouldn't work, but at the same time tried to be realistic. I needed to make sure that what they had in mind was practical and possible."

"They (the artists) understood them as maps of their ideas. I didn't look for their signs of approval – the diagrams were understood to be tools for the engineers."

"I think (the diagrams" were essential. The engineers' uses of them confirmed what I thought; there was a missing link in the communication between the two groups. As far as the engineers were concerned: they were just happy to take the drawings in hand and used them as guides." P. 57

DICK WOLFF
Simone Whitman interview 11/17/66 (3p)
(p.1) "In working on the project there was less of a sense of competition than usual. And people had less tendency to hoard a problem to solve it alone. A lot of people who were not involved, when asked a question on the phone, would offer suggestions. And some got involved in that way. For me there was a lot of satisfaction in the show. A sense of recognition for what I was doing. At Bell your efforts get put on paper and filed away and no one ever sees them. No one even ever calls you if they do come across some paper and says 'Say! Does this thing really work?'"

…"The fact that so much work went into communications was largely the influence of the engineers….

(p. 2) "This is how the wireless evolved. Someone asked if we could turn lights on and off by remote control with no connections. This required a radio transmitter to send signals to a receiver connected to the lights. From that we realized what we had and started describing it to the other artists and they started asking more questions and having other ideas. The decoder that Robbie made did something that was never planned or asked for and the artists went and used it. That was the timestepping that Cage and Tudor used. The whole communication system started with the carts. The necessity to remote control the carts. The

necessity for the channels. So we went ahead and used them for controlling other things too. Tudor and Cage used those extensively. Cage, to turn speakers on and off as he walked in front of lights. Tudor to turn lights on and off. We didn't use all the equipment to it's fullest, but that's for the future. After we had built this equipment, Rauschenberg's idea of the rackets came along. And that was a good idea. We tried it out here at the labs and in 15 minutes we knew it worked. Billy came down the hall with tennis rackets and asked me if I had a transmitter and receiver and we hooked it up and stood in the hall hitting the ball back and forth and it sounded just like it did in the show. It just required some smoothing over, hiding the transmitter and making the sound better. But basically it was one of the easiest projects."

(from "Theater and Engineering: An Experiment" in Artforum)
"The artist should suggest, then leave the technology to the scientist. Then he should return with enough flexibility to accept what the technician has solved. When you say remote control this and that, this means hours of work on our part. You have to limit yourself to what you've said, because we're working on it."

NILO LINDGREN (an engineer but not part of 9E)
(from "Art and Technology II. A Call for Collaboration")
(p. 47) "Rauschenberg himself speaks of the waste of possibilities in using technology only to carry out some preplanned work, for the technology is then like a *dead* medium rather than an encounter. 'I do think there are,' he says, 'definitely two attitudes toward technology, and the one of using technology as a servant I find very dull and outdated. It seems to me closed-minded.' However, in an 'open esthetic investigation, where it almost doesn't matter whether one makes art out of it or not, in which an art object may not even be produced.' The purpose is not to move in a single direction. Instead of taking the materials and just executing something preconceived, if 'from the beginning, if you have some curiosity about what would happen if you could do *this*, and then you share that curiosity with someone else and make him curious, then that's the beginning of the piece…and it grows and grows…the whole world then is the medium, if you can relate in your esthetic to something other than the finished product.'"
        "In this light, it is possible to think of the *9 Evenings* as an experiment in which not only artists and engineers were engaged, but in which the audience was engaged as well, an experiment in which the consequences and the significance would not become visible until later…."
(p. 49) "…it was an effort by artists to participate in a large collaborative situation beyond the control of any individual. This new situation, perhaps an uncomfortable and anxiety-making one for both artists and engineers, was to force the acceptance of new responsibilities – the need to state requirements and concepts clearly and to stick by the engineer as he pursued his design and construction, the obligation to wait while engineering work was being completed, and so on. The very mode of collaboration attacks the 'old-fashioned idea that the artist is a very special kind of person, in the sense that he is mystical,' unreachable, or incommunicado on his pedestal."
(p. 50) "…The Evenings were still, as John Cage suggests, like the early movies in which the traditional stage, the new camera, the literary content, and the acting were identifiable components not yet integrated. But for those who participated, the Evenings were an achievement full of anguish and joy. For them, the experiment was a success – they had discovered, and came away convinced, that they could work together, and that a lot of energy has been wasted in the past in sustaining a supposed conflict between cultural specialists."

BELA JULESZ
(from "Art and Science: Two Worlds Merge")
"When the scientist starts to see that some of his creations become artistic and are accepted at more than their scientific value, as a piece of beauty, it's an unusual experience. While these computer movies were intended for a study of visual perception, not as art, I think that visual perception is historically a common area for both the artist and the scientist, a common intersection where there is no gap or artificial bridge. The same kinds of things can be artistic or scientific; the only difference is the motivation.
        The artist is searching for an artistic truth he wants to convey, and I am searching for a scientific truth, which is testable and very defined. The artist is also interested in solving problems, and the computer might be a common tool to bring us together because it helps to execute the problem. It has made us more aware of the interaction between science, technology and art." P. 14

KENNETH KNOWLTON
(from "Art and Science: Two Worlds Merge")
"It is teaching me something about art, about expressing myself, freeing up my own thnking so that I no longer think in nearly so stereotyped a way about the computer and the things one can do with it. Stan Vanderbeek has been using the BEFLIX movie language extensively; he is learning programming technique so that he can push ahead with experimental computer movies. Vanderbeek thinks in visual terms. He's interested in color, motion, after-images, patterns; in making a film he has to consider all these. When I began making films with the computer I was not aware of these considerations. Vanderbeek is teaching them to me – I now appreciate their importance in communicating visually, whatever the content of the film. I think that any scientist using the computer to make movies can profit from the seasoned film maker's knowledge and experience." Pp. 14-5

(from Norma Loewen 1975 Ph.D. dissertation)
Loewen reports that Ken Knowlton gave a lecture about E.A.T. in 1968, where he said that "the two groups shared creativity, energy, competitive drive, and other attributes. From his experience, however, computer programmers – himself included – tended to be 'logical, precise, inhibited, cautious, restrained, defensive, methodological, ritualistic, cold and inscrutable in human terms.' Artists, on the other hand, tended to be 'free, alogical, intuitive, impulsive…bewildered, bewildering,' and otherwise different from programmers. Given their differences, artists and programmers might thus best work in association to develop new, useful tools and procedures. Art incorporating the new technology would come from artists, or from artists working in close association with programmers, rather than from programmers alone 'solely by virtue of their clever gimmicks for doing cute things.' On by-product of the association would be 'better organized artists and more human programmers.' P. 40

MAX MATHEWS
(from "Art and Science: Two Worlds Merge")
"What the technologists get out of art are the same things that anyone else gets out of art, the same thing civilization gets. These are the very important, long-range permanent values; they represent some of our best achievements… As far as unique things are concerned, this depends upon him as an individual: he may get quite a bit of inspiration; he may get new ideas; he may get some idea from the art that he can use directly in his technology. We have, certainly, examples of this in the understanding of speech and speech quality that have come out of our studies in music. Currently, we have been concerned with experiments on tone perception, a new theory of consonance and dissonance, which was primarily studied for music. The sounds and the percepts are the same musically and speechwise, and music is a much simpler sound source, so we can study it in greater detail and understand it better. These tonal studies have given us a new insight which we would not have gotten directly from speech because it is too complicated." Pp. 18-19
"You get inspiration from working with the artists, generally wake up. And this is one of the requirements for doing creative research – to be awake!" p. 19

(Computer Composers: Comments and Case Histories by M. V. Mathews, Bell Telephone Laboratories, Techne: A Projects and Process paper by E.A.T., Vol. 1, No. 2, November 6, 1970, p. 10-11)
"Computer sound processing was developed at the Bell Telephone Laboratories in the mid-1950's in order to study speech coders. When the general power of computer methods was perceived, composers were encouraged to try them in creating new sounds and new music. This bringing new technology to the attention of those in the cultural community who can make use of new tools, and partly because increased understanding of sounds may improve speech communication. Composers are very creative and have very good ears for making and analyzing sounds." p 10
  "If some conclusion must be drawn from these examples, it is that the computer requires its master – requires its Mozart or Bach – before we will have great computer music. At first John Pierce's anecdote was appropriate. He likened the musicians and the computer to a tribe of savages who are suddenly presented with a grand piano. They push down the keys and hear a sound. In a vague way they realize that they could use this machine to make beautiful music. If they only knew how. Today we see another picture. Enough musicians have become hooked on computer music, and enough good music and powerful sounds have been created, so that an epidemic infection has become inevitable. Music can no longer be cured, but there is every prospect that it will survive." p. 11

JOHN R. PIERCE
(from "Art and Science: Two Worlds Merge")
"The first computer-played music was composed by Newman Guttman and programmed by Max Mathews as an experiment in producing and using certain voice and other sounds….I have never untangled the art and the science in living. I certainly wouldn't have bothered to compose little ditties and I never would have gotten them on a record if it hadn't been for the computer. The only think that led me to do this was curiosity – the chance to exploit and play with something entirely new. It was fascinating. It has inspired me, informed me." P. 18
"Deeper understanding has broken down many of the barriers between various fields of science. Perhaps this will become true of the barriers of ignorance and temperament which have divided science and engineering from the arts. This could surely open new opportunities for artists, and I really believe that it can quite as much open the eyes and ears of engineers and scientists – and even their minds."p. 19

MANFRED SCHROEDER
(from "Art and Science: Two Worlds Merge")
"I became involved (in 9E) because I am familiar with all kinds of sound effects. Acoustic is my specialty, and part of the endeavor here was to integrate acoustic effects into these performances. Dancer Lucinda Childs was asking for things to translate body movements directly into sound, so that she could actually create her own accompaniment as she danced. We came up with a device that reflected ultrasonic waves from her body, then converted them to audible sound. I got the idea from work I'd done years ago on stabilizing public address systems, and feedback problems with the Speakerphone, which under certain conditions produced howling or singing noises. It wasn't a very interesting sound. But while we were working with it we discovered that it would make all kinds of funny sounds if you did the right things to it and if people walked through the room. When Miss Childs made her request, I remembered that work. But, it needed some artistic concept to make it worthwhile and enjoyable. We certainly have a great storehouse of scientific information that would allow us to produce a variety of acoustical and visual effects. For example, we could have sounds whirl around in space, or we could have this translation of movement into sound, or light into sound or sound into light….I think it is quite conceivable that we will have mixed personalities here, that artists in these fields will emerge from the engineering profession." Pp. 15-16

Getty Archives notes – no author Box 4
"Nine Evenings – Notes on Evaluation"
"The dialogue between artists and their individual engineering advisors really never started until about two weeks before we moved into NY. Some engineers never really bothered. This dialogue should have started in July. From it, individual engineering requirements and block diagrams should have come. These could then have been coordinated by one person."

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Appendix G

Artists & Engineers Successful Creative Collaboration Elements QUOTES

***9 Evenings* Artists**

John Cage	Yvonne Rainer
Lucinda Childs	Robert Rauschenberg (RR)
Oyvind Fahlstrom	David Tudor
Alex & Deborah Hay	Robert Whitman
Steve Paxton	

Bell Labs Engineers

Per Biorn	Ken Knowlton
Cecil Coker	Max Mathews
Ralph Flynn	Robbie Robertson
Larry Helios	Herb Schneider
Harold Hodges	Manfred Schroeder
Rudy Kerl	Dick Wolff
Billy Klüver (BK)	

Begin with shared vision

BK: "Those of us in the technical community in the early sixties who were worried about the direction of technological change believed that artists' ideas, approaches, and concerns could influence the way engineers approach technological or day-to-day social problems. Our collaborations, we hoped, could lead technological development in directions more beneficial to the needs, desires, and pleasures of the individual.

An interesting comment on my experience in working with artists came from Nam June Paik, when he told me recently, 'Billy, I am working with off-the-shelf technology, you always worked to invent one-of-a-kind technology.' Paik, of course, was understating his extraordinary visual sense in manipulating his material, but he hit the nail on the head about the driving force in the interaction between artists and engineers: what will emerge is something that neither the artist nor the engineer had thought of before. Thus, the artist-engineer collaboration remains a viable model for how we can actively confront and shape new technology."

ROBERTSON: "We all knew that we were involved in a 'real situation.' No one ever suggested a compromise. We were committed to a purpose, and we would see it through. The really important thing about the 'Nine Evenings' was that it was done. If the critics and the public had no understanding of this, then they missed the beauty of seeing a real creative venture in the making."

Individual part of larger support systems

BK: "The artist's work is like that of the scientist; it is an investigation which may or may not yield meaningful results. The artist and the scientist both work with the world around them; their perception of this world is their material. Their differences lie in the way in which they use this material. The scientist must build on and include previous scientific knowledge in his work. The artist, once he has made his choice as to the essential character of his work (be it painting, sculpture, music), will make very effort to avoid easy associations or connections with other works of art or other known fields of human activity. When you see a good work of art for the first time, it gives you the feeling of no relation to anything else you know, yet you are forced to become aware of it."

BK: "…The meaning of art is not to communicate what we already know, but what we don't know, to dislocate our vision, to make us aware of our traces and tracks. Art could never be taken seriously if its language was to be confined to paint on canvas, the harmonic scale or certain dance movements. Art is not

a comment on, nor a criticism of the world. To quote Susan Sontag, "A work of Art cannot advocate anything at all." Art cannot today be seen in terms of preconceived ideas of what art should be." (p. 4)   "There exists a parallel development in science. Fifty years ago, Max Planck resisted quantum mechanics on the grounds that it was not morally right. If the physicists had not outgrown this extra-scientific criterion, modern science could not have developed. Today the criterion for good physics comes from Dirac who insists on the measurable, observable reality rather than the validity of abstract mathematical concepts. Dirac has been to physics what Duchamp has been to art. The legacy of Duchamp and Dirac says that we are beginning to enjoy the complexity of the world rather than be terrified of it.".

BK: "Science and art are inevitably separated. Any attempt to 'bring the two together' should be looked at with suspicion. Science deals with reality in rational, single-valued terms which are constantly related to a language that is uniquely understood. Art deals with reality in irrational and poetic terms. Art allows for discontinuities that science cannot tolerate. History must have provided us with the separateness of art and science for a reason." P. 7

Collaboration's "raw material" is communication process
RR: "I've never questioned paints, since I've never ground my own pigments or mined for the chemicals that made them. I assume a certain amount of information in a tube of red paint. I think that one works with information as though it were a material. I think that somehow it is richer if you are in a live collaboration with the material; that's our relationship to engineers."

Communication involves dialogic process among individuals, often choosing to use technologies
CAGE (Loewen): "John Cage recalls the project proceeded on a certain faith in the imagination of the artists, that they would dream up something to do, and a faith in the technical abilities of the engineers and in the technology itself that these things could be done. Both artists and engineers ideally had to follow each other's thinking and, as David Tudor recalls, develop some peripheral understanding about the differences between alternative solutions to a given problem."

PAXTON: Steve: …I'm learning a lot of things about material which I hadn't heard before.
(S. You mean like physical material?)
Steve: Yeah, like physical material which I'm very interested in…It seems to me, like I spent a lot of time thinking of things, and the difference between thinking of things or talking about things and materializing them is an extraordinary difference. And these guys seem to be having the same trouble actually like the scientists and technicians can talk a very interesting set up for a sound system, for instance, but when it actually gets down to making it turns out to be the complicated part of it. And that is the physicalizing of this idea. And so I'm very interested in, instead of talking about things, I'm interested in seeing them executed….
(S. So you've been thinking about things that you couldn't do. You've been imagining pieces that you didn't have the material for.)
Steve: Yeah, I don't even have words for some of the pieces…
(S. So in a way, I was thinking that the most exciting thing about this is not necessarily the solving of old problems but that it would get you thinking in a whole new way.)
Steve: Right.
(S. And you were on to that already last year)
Steve: I think that basically it's something that's always interested me. I think not just like…I've always been interested in finding out whole new ways to think. Like whole new attitudes, however slight a shift it is from say, an attitude I already hold, often a problem that looms very large in life can be solved by a very small shift of attitude. And attitudes seem to change with experience. The experience of somebody telling you about a different attitude being one of the experiences, or seeing something that the new attitude comes to you as a revelation, or something like that. And so having new ways to experience things or re-experiencing old things or listening carefully while somebody describes something you already know and finding that it is an extraordinary revelation to you in this boring situation, some slight emphasis just your boringness and a change therefore in the way you think about the material, whereas before you've been very interested in it, now because of the way it's presented, you're bored, and so all of a sudden your mind wanders in a different way then when you were in the more interesting situation, and you think of something else. I feel that this is happening all the time anyway, but that like in theater or art in general,

you're sort of concentrated to let it happen. You're concentrated to accept ideas and see differences in a way that you don't at other times….So that stepping into a scientific attitude I knew was going to jerk me around a little bit. Mess up some of the ideas I've held and introduce new problems. New things to have to deal with….

In this particular set-up a lot of things go against a fairly average artistic idea about conception. Which is something about the artist being a solitary conceiver of something. It's pretty rare in this country I think the Once Group does it, where a group of people work together to conceive things. But they're just about the only group I know of that doesn't bill itself as individuals….Every place else, although people are influenced, or do take ideas and use ideas which aren't strictly speaking their own, there remains this single directing figure at least.

(S. Do you feel that one of the things of this situation is a sort of a collaborative conception of things?)

Steve: That we're forced into that is part of this situation which I think is very interesting, which doesn't have anything to do with science or anything, it's that we're working, we're all working through the same medium in this particular instance. If we all went out and got our own corps of scientists and developed our own communication lines, then it would be a very different situation. But we haven't done that, we're working through Billy and we seem to be constantly discussing our ideas with each other and we're going to be like stepping on each other's toes 'cause in the end I think we want to resolve this back out to the situation where one person is responsible for a piece, so it's going to have to be sifted out in the end….and everybody I've talked to's been very aware of this, that they were giving up some way of working that they had been working to step into this because they thought it was a worth-while thing. Like it's going to change everything. Which everybody apparently is perfectly happy to do."

PAXTON: (S:…in art there's been a lot of theatre and a lot of music and other kinds of time arts where the situation created is what's desired. You can have a broader end in sight instead of a perfectly mapped out and pre-determined situation. Do you think this attitude was known to the engineers – that many of the artists' attitudes were free in that way – or did you think hey were trying to make a product?)

"What I think was most electric and most valuable about the whole *Nine Evenings* was the personal experience, not any other kind of statement about it. The exchange of attitudes is one of the most valuable by-products of any kind of interaction, and I think the whole thing has to get as broad as possible and that the communication and cataloguing methods have to keep up with that growth so we can know what has to be added and subtracted and we know what's being done and created….The great thing about new things is that you know they didn't exist before and you didn't fully know when it started what the limitations were and what the possibilities were and you see it grow in front of your eyes."

(S: Isn't it really a matter of certain kinds of temperaments dealing with each other rather than engineers and artists automatically making it?)

"Engineering and art are both known to the public by the product, not by the process. And both of them, if you are involved in them, seem to be very much about the process of what you do. The process of putting on the 9E was absolutely beautiful and the artists gave more I think to that performing situation than they previously had impetus or motivation to give….It was beautiful in terms of the energy, kinds of focus, concentration and generosity that the whole situation motivated….It was a question about whether they (artists and engineers) *would* collaborate, not whether they *could* collaborate."

PAXTON: "…if from the beginning, if you have some curiosity about what would happen if you could do *this*, and then you share that curiosity with someone else and make him curious, then that's the beginning of the piece…and it grows and grows…the whole world then is the medium, if you can relate in your esthetic to something other than the finished product."

RAINER: "…I went through several stages (of working with engineers): they were advisors in the beginning, then I talked to someone out there and they kept pointing to impossibilities, then I came up with 3 crude things with wires…I had a foolproof system – even if the things didn't work I still had the piece, the dance…"

RR: "An area of intellect that was so isolated, colliding with something that had no direction, which is what I think art should, that's the way it should be going. Both of them shared their infinite possibilities, and impossibilities. I think the engineers liked the spirit, and I think the artists liked the mind. And the guys were working for nothing, we were working for nothing – what a way to run a business!"

BK: "But more important than the technologies themselves is Rauschenberg's notion of creating a work of art in collaboration with people and materials foreign to him. He couldn't 'learn' the process or make immediate hands-on experiments to see what the image would be. He had to be able to sustain decision-making over months since there was long lead time from the moment he articulated an idea until the engineer built and tested the equipment."

"The engineer too was working in a foreign environment. Working in the artist's studio, the gallery or the museum was completely different from the friendly situation of the laboratory, with instant access to machine shops, stockrooms, unlimited test equipment, and technical assistants….While they may have been outside the everyday expectations of the technology, Rauschenberg's ideas always worked within the realistic boundaries of what the technology was capable of, and once formulated, the engineers could bring their expertise to bear on the problems. Rauschenberg could respond to their designs and proposals and work with the systems they made. Through this interchange, the collaboration produced something that could not have been foreseen. The limits of the technology had been expanded."

BK: "…Experimentation and process become an integral part of the artist's work. The interest is shifting from the permanent finished work to involvement with process and exploration of possibilities."

BK: "The growth of contact between the artists and the engineers was the most fascinating aspect of the 9E, one which I can only briefly touch on here. From the engineer's point of view, 9E presented complex technical problems. The engineers had never seen any of the artists' performances before moving into the Armory, and most of the artists had never spoken to the engineers. Most of the engineers, in fact, were without any previous contact with contemporary art. They worked hard in their spare time, and tried to communicate with the artists who lived in New York. It was not until the second night of the performances that the engineers, enclosed in the control booth, really understood the position of the artist and what he was trying to accomplish. The artist was on stage, completely exposed to a large audience, and demonstrating his faith in the engineers. After that second night, everything began to clear up. The vagueness about what the artist was up to had disappeared; the engineer could now evaluate his own contribution to the artists' work and step some distance from his natural commitment to his gear.

It is inevitable that the engineer's work has to precede that of the artist. This makes any collaboration highly imbalanced, but when all is fused together there are great possibilities for give and take. It was on the simple, practical level that the best results of the artist-engineer relationship were achieved: our best experiences came from the projects where the artists had worked with the same engineers from the first idea to its realization."

BK: "The collaboration is a success when the artist and the engineer can see each other's works and get stimulated by each other's contributions, so that the work changes organically to something other than what it was in the beginning. The greatest handicap is not knowing how to talk to each other. Professional recognition of the work within the engineering community represents the best 'reward' for the engineer."

ROBERTSON: Of course, this was the beautiful thing about the whole experience. Now we've learned about how art proceeds and I think the artists are learning how engineering proceeds. We have found a beautiful ground and an excellent way to solve this problem….now we both understand each other and it's going to be easier, because of this, to work within this framework."
"This is something we learned. You can still get a tremendous amount done, under these conditions….It's kind of wonderful for the first time to realize that it is possible to engineer differently from the way you've been taught out of the books to engineer. I think this is the thing that excites the engineers….the engineer was learning something new. He was learning there's a different way of engineering…"

SCHNEIDER: "What was important was that the artists and engineers communicated, that their ideas merged and produced a 'piece'…."

SCHNEIDER: "Looking back, the key issue was the dialogue between artist and engineer. It seems to me that the dialogue started much too late and that few of the engineers realized their function until it was nearly too late. These two must be partners, not client and advisor, even though the original and final direction clearly is in the artist's province…."

SCHNEIDER: "Yet the magnitude of the undertaking was not appreciated by either the individual engineer or the one willing to coordinate until each artist had outlined his conception of his piece. An early dialogue would very soon have exposed some interesting facets of the artist/engineer interaction:

5) the remarkable capability of the artist to visualize the desired effect,
6) the engineer's inability to grasp relationships and requirements on the first go-around,
7) the artist's lack of appreciation of the time scales required for any but the crudest technical accomplishments, and
8) the artist's desire to propose, in a helpful way, a change before, or just as a solution is being approached.

…No two concepts were anywhere near alike and it was not until October 6, a few days before the move to New York, that the last of 10 system diagrams, each representing an artist's piece, could be completed. As it was, it took some six hours of discussion and two days of preparation to complete each."

Dialogic processes operate best within shared workspaces
BK: "All the artists were interested in participating in a situation which was too large for them to control as opposed to a studio situation in which the artist privately works as well as he can. Many were interested in shifting the center of where a piece is conceived, from themselves and their studios, to a new an unknown place somewhere between the engineers and themselves."

ROBERTSON: "When the decisions were made for an equipment rehearsal everyone got very excited, now that there were pieces to see and so forth. You see, up to this point there were a lot of little individual things. I think, were a venture like this to be repeated, I would want one central workshop where all the engineers and technicians came to work together. This would be one way to stimulate morale or interest right from the beginning."

Dialogic processes generate new knowledge through mutually constructed "thought community"
WHITMAN: "I also had an idea that scientists thought differently from anybody else. There would be whole new ways of approaching problems and a whole new way of thinking about approaching them that would be more interesting and with a lot more freedom. If you have an image – there might be ways to discover images that, that their way might be somehow more interesting and less arbitrary. I might be able to find out some things that concern me that I did not know about using their startling technique or startling way of thinking. This however does not appear to be what is happening.
(S. Was that generally in your mind or did you have something specific?)
R. No it was that general. I thought there would be some secret mode that they were involved in. I think the scientists we are dealing with think the same way anybody else does so far. There does not seem to be any secret discipline that they know about that we do not know about. Right now none of the images I am thinking about seem to be on account of being related to the scientists of on account of some technological orientation. They seem to be the same old images."

BIORN: "For some of us like me, it was like opening up a window to a whole new world, and once we saw this, we didn't want to let it go! I miss the intellectual challenge – trying to make the artist's vision come through."

- Deep, active listening
SCHNEIDER: "I realized immediately we needed a standardized approach to each of the pieces, consequently the most important aspect of my role became talking to the artists in order to pin down their ideas from the technical end; to put their ideas in a form the engineers could use to realize those ideas. It was essential to get a feeling for what they wanted to present and to be able to describe it in technical detail. So I met with each artist, we talked for several hours…and from my notes I developed a technical drawing for each performance for the engineers' uses…I would call myself a translator between the artists and engineers."

- Continuous, clear communication

- Egalitarian, non-hierarchical leadership

WHITMAN: "This all leads up to the *9 Evenings* [1966] experience, which was a wholehearted acceptance of all the energy and generosity of people. When we all began working on the *9 Evenings* performances, our understanding was that we wanted to engage engineers as collaborators. We wanted a more even, democratic relationship. The point is that somebody does something and somebody does something else. There shouldn't be a hierarchy of value to what each person does."

BK: "The point is, the artists at that time were free and they were expanding in all directions. They were absolutely not closely knit – they were expanding, they did what they wanted….They didn't have any institutions; there were no institutions, there was nothing. So you did what you wanted. So we had the energy and the enthusiasm to do what we wanted to do. And that is what is important – to do what you want to do. And there were no limits, there were no barriers, because nobody said: 'You can't do that!' Or nobody said: 'That costs too much!'"

- Mutual respect and trust
CAGE (Loewen) "John Cage recalls the project proceeded on a certain faith in the imagination of the artists, that they would dream up something to do, and a faith in the technical abilities of the engineers and in the technology itself that these things could be done..." Pp. 59-60

COKER: "In *Nine Evenings* I got very different impressions from the various projects. In some – especially the smaller ones – there was an attitude of give-and-take, of mutual respect between artist and engineer. Other projects, especially the ones with a large engineering effort, were less successful...."

BK: "The growth of contact between the artists and the engineers was the most fascinating aspect of the 9E, one which I can only briefly touch on here. From the engineer's point of view, 9E presented complex technical problems. The engineers had never seen any of the artists' performances before moving into the Armory, and most of the artists had never spoken to the engineers. Most of the engineers, in fact, were without any previous contact with contemporary art. They worked hard in their spare time, and tried to communicate with the artists who lived in New York. It was not until the second night of the performances that the engineers, enclosed in the control booth, really understood the position of the artist and what he was trying to accomplish. The artist was on stage, completely exposed to a large audience, and demonstrating his faith in the engineers. After that second night, everything began to clear up. The vagueness about what the artist was up to had disappeared; the engineer could now evaluate his own contribution to the artists' work and step some distance from his natural commitment to his gear."

"It is inevitable that the engineer's work has to precede that of the artist. This makes any collaboration highly imbalanced, but when all is fused together there are great possibilities for give and take. It was on the simple, practical level that the best results of the artist-engineer relationship were achieved: our best experiences came from the projects where the artists had worked with the same engineers from the first idea to its realization."

BK: "Collaboration can yield a lot more, has greater potential than working alone, but it is also much harder. It will have to evolve its own form. There isn't any form for the collaboration yet. It happens on a personal level and when it is successful we don't know why. In dealing with unknowns and experimental projects, you always have problems, and they are always different. You tend to assume good will and respect for the artist; then you find that people generally misunderstand what he is doing and how he behaves. You either have to start defending him, or explaining what he's really doing. And you get into any number of jams."

- Empathic, feminine, nurturing behaviors
COKER: "There finally started to be some feeling of empathy between the artists and engineers just about the time the show was over….Towards the end, the main drive was making good on the commitment."

KERL: "Doing all the electronic work was especially interesting. I never thought we could…The artists really helped. They caught on very quickly. They always asked 'What can I do now?' if something was finished …"

BK: "It has not been as easy as it sounds. The artists had to show an extraordinary amount of patience with the slow rate at which the engineer proceeds. And the engineer had to deal with the vagueness of the artist brought on by the fact that the artist had nothing to lay his hands on and work with. It was like lifting yourself by the hair: if you don't do it all at once it does not work."

WOLFF: "In working on the project there was less of a sense of competition than usual. And people had less tendency to hoard a problem to solve it alone. A lot of people who were not involved, when asked a question on the phone, would offer suggestions. And some got involved in that way. For me there was a lot of satisfaction in the show."

D. HAY: "The kind of materials and engineering equipment [involved were] very masculine. Engineers and the whole science and technology thing is a very masculine thing. […] It was a revolutionary thing, it didn't just evolve, it was pushed and shoved and brought together."

- Achieve "flow" doing what they do best
ROBERTSON: "Being more productive means having a freer mind or a looser one. A more highly adaptable mind…there is a whole group of engineers who want a challenge. The space program is an excellent example…I think E.A.T. has shown a lot of them that here is another exciting way to think in terms of engineering, rather than just a highly stylized way….[9E] was more than just a change of scene. It was something that really had a genuine challenge to it."

SCHNEIDER: "It was a good school for some to learn, to handle a new crisis every minute: it was not the elevating experience of artists and engineers joining hands calmly. Yet as we passed the halfway mark, the air of emergency dissipated and an atmosphere of control began to enter. Why – the engineers were even seen in the audience at times to observe the view from the front of the footlights."

- Diverse mix: complementarity
PAXTON: (Simone: What do you think of the scientists at Bell Labs?)
Steve: "I think that they're a very strong minded bunch. They tend to have a lot of…they not only tend to do their jobs well, I suppose, or else they wouldn't be at Bell labs, but they have a lot of funny outside interests and kind of really initiative. I wonder if they're not interested in this just out of …because curiosity must be one of their main factors. And so they want to see how it all comes out. And they sort of understand the implications…I also wonder if they aren't having fun, if they don't find the meetings interesting and the people amusing, just as we do them. And the things they say are curious, and the attitudes they take strange…and also I expect like if they have any knowledge of art at all that they admire our facility, you know that like we have done so many concerts and things like that just as we would admire that they had made so many inventions…We admire the way they can solder and they admire the way we can paint or dance or whatever we do."

WHITMAN: "The big discovery was the difference between artists and engineers: Engineers have an idea about proper design, for instance, but they don't have the same concept of a deadline. They work with a more open-ended schedule, typically. They don't realize that when tickets get printed, you've got to have it done on time. But my favorite example was this [automatic] stepping switch for Bob's piece [*Open Score*] that required intense wiring, which took a huge number of man-hours. The artist's solution to the problem would have been to just have a guy turn the switch during the performance – that's just a person hanging out, and that guy's going to be hanging out anyway. So you're not creating more work. As it turned out, we did manually operate the lights during the performance."

HELIOS: "I got a deeper appreciation for the artists per se. I began to realize that, hey, while they were doing things that were different, they were really just people like the rest of us, with some tremendous imagination, some forethought of what they could work *with*. It was very stimulating."

BK: "Science and art are inevitably separated. Any attempt to 'bring the two together' should be looked at with suspicion. Science deals with reality in rational, single-valued terms which are constantly related to a language that is uniquely understood. Art deals with reality in irrational and poetic terms. Art allows for

discontinuities that science cannot tolerate. History must have provided us with the separateness of art and science for a reason."

BK: (Loewen's writing): "Drafts for the book described these differences and suggested how practical working relationships might be established. The artist was considered practical, working in the real world, using materials at hand in an intuitive and immediate way, creating his own language, working with vision not expressed by verbal communication, and when work was 'hot,' finding it impossible to wait before finishing it but not necessarily knowing when it would be finished. The engineer was considered conceptual, working in the abstract world, proceeding in a linear and logical way, sharing a common language with other engineers, knowing how much time and how much work required. And knowing a solution in one form or another would eventually be found.

    …It was thought that artists took responsibility for their own art and were the only ones who defined art, there being as many definitions of art as artists. Artists would destroy whatever aesthetics that engineers tried to impose….Whatever the difficulties, the situation would 'settle itself' once artists and engineers made an effort to work together. A rapprochement of the 'two worlds' seemed promising, if not inevitable. In the future, the traditional roles of the artist and engineer might be exchanged."

- Diverse ways of representing ideas, concepts (visual, verbal, etc.)

SCHNEIDER: "What really appalled me was that on September 15th no one really knew what we were going to do on October 13th except in a very general way. Then we talked for six hours with each of the artists and then made up the drawings/diagrams of the different combinations of equipment that the different artists were going to require. David Tudor was asking for functions I couldn't visualize. Then I made the drawing. We talked back and forth making corrections till we finally beat it into shape. I couldn't understand what he wanted until I could visualize it and he couldn't communicate it to me in those terms because he's not used to visualizing functions. When I began to get this collection of drawings, I began to realize that we'd better simplify the whole approach. That is, to program the connections, so that we could shift one artist's piece to another's without extensive replugging."

SCHNEIDER: "There was only one final version of each drawing. I showed them to the artists and we had very little trouble agreeing on the final versions. They all understood what the drawings were illustrating and what their intended use was: to show the engineers how to satisfy their creative needs. Some of the drawings are labeled 'addenda,' coming as a result of small changes that came up in follow up meetings with the artists. Overall there was very little trouble in agreeing on the drawings.
Basically, I asked each of them to describe what they had in mind, what they wanted their work 'to do'; it was essential to get a feeling for what they wanted presented. I tried not to tell them something wouldn't work, but at the same time tried to be realistic. I needed to make sure that what they had in mind was practical and possible.
They (the artists) understood them as maps of their ideas. I didn't look for their signs of approval – the diagrams were understood to be tools for the engineers.
I think (the diagrams) were essential. The engineers' uses of them confirmed what I thought; there was a missing link in the communication between the two groups. As far as the engineers were concerned: they were just happy to take the drawings in hand and used them as guides."

KNOWLTON: "It is teaching me something about art, about expressing myself, freeing up my own thinking so that I no longer think in nearly so stereotyped a way about the computer and the things one can do with it. Stan Vanderbeek has been using the BEFLIX movie language extensively; he is learning programming technique so that he can push ahead with experimental computer movies. Vanderbeek thinks in visual terms. He's interested in color, motion, after-images, patterns; in making a film he has to consider all these. When I began making films with the computer I was not aware of these considerations. Vanderbeek is teaching them to me – I now appreciate their importance in communicating visually, whatever the content of the film. I think that any scientist using the computer to make movies can profit from the seasoned film maker's knowledge and experience."

Failure is part of successful collaboration

TOMPKINS/CAGE: "'I thought those engineers should be tied up,' JC said later. 'They were so unable to conceive of a performance situation, so committed to the laboratory where you have endless time to solve a

problem. They ruined the performance of my piece. I'd arranged to have telephone lines opened in several places, but when an engineer saw a phone off the hook he went and hung it up. And when I'd ask them, during the performance, to go and do something, they were so stagestruck they didn't even hear me."

RAINER: "I became interested in what it (TEEM) could do with time and durations….I think it was a very unusual coming together of people and events. Nothing like it has ever happened before, and this in itself is of value, whether it succeeded or not, and the amount of outrage it generated."

P. HULTEN (not 9E artist but part of production)"…Pontus Hulten recalls the sense of crisis was one of the most interesting aspects of the project: It catalyzed situations, some people crumbling, others managing to pull things together, and was probably the most efficient way to force the breakdown of barriers between people."

ROBERTSON: "…If the critics and the public had no understanding of this [collaboration], then they missed the beauty of seeing a real creative venture in the making."

Create something bigger than if working alone
RR: "I think collaboration is a prescription or device that keeps one from getting hung up on a strong single intention that blinds. Even two people doing something together is important. With collaboration, as complex as it may be, the directions can change. I suppose there must be a cutoff point, or you get total chaos. It seems that in theater and printmaking, every individual that you add to a project will result in ten times as many new possibilities. A good collaboration produces universal thinking."

BK: "E.A.T.s' contribution to the social dialogue of the 1960s and '70s was the idea of one-to-one collaborations between artists and engineers. E.A.T. opened up exciting possibilities for the artists' work by finding engineers willing to work with them in the artists' own environment. Together the artist and the engineer went one step beyond what either of them could have done separately."

BK: "The new interface I will define is one in which the artist makes active use of the inventiveness and skills of an engineer to achieve his purpose. The artist could not complete his intentions without the help of an engineer. The artist incorporates the work of the engineer in the painting or the sculpture or the performance. A characteristic of this kind of interaction is that generally only one work of art results. In other words, the engineer is not just inventing a new and special process for the use of the artist. He does not just teach the artist a new skill which the artist can use to extract new aesthetic variations. Technology is well aware of its own beauty and does not need the artist to elaborate on this. I will argue that the use of the engineer by the artist is not only unavoidable but necessary."
"…But the alternatives that the engineer can imagine for the full use of the fantastic capacity of technology are even so few and limited. He is, as I said, no visionary about life. But the artist is a visionary about life. Only he can create disorder and still get away with it. Only he can use technology to its fullest capacity. John Cage has suggested: Let the engineer take care of order and art (in the traditional sense) and let the artists take care of disorder and life. And I am adding technology. This is to sum up: First the artists have to create with technology because technology is becoming inseparable from our lives. 'Technology is the extension of our nervous system,' as McLuhan says. Second, the artists should use technology because technology needs the artists. Technology needs to be revealed and looked at – much like we undress a woman.
The artist's work is like that of a scientist. It is an investigation which may or may not yield meaningful results; in many cases we only know many years later. What I am suggesting is that the use of the engineer by the artist will stimulate new ways of looking at technology and dealing with life in the future."

BK: "But what happened was that Robert Rauschenberg saw the whole operation as a collaboration between the artist and the engineer. And that was a new starting point, because I immediately understood that if an artist and an engineer collaborate on a project on an equal basis, then something interesting and unexpected might really come out of it."

NILS LINDGREN (engineer/writer): "…it was an effort by artists to participate in a large collaborative situation beyond the control of any individual. This new situation, perhaps an uncomfortable and anxiety-making one for both artists and engineers, was to force the acceptance of new responsibilities – the need to state requirements and concepts clearly and to stick by the engineer as he pursued his design and construction, the obligation to wait while engineering work was being completed, and so on. The very mode of collaboration attacks the old-fashioned idea that the artist is a very special kind of person, in the sense that he is mystical, unreachable, or incommunicado on his pedestal."

Transformative: intellectually, emotionally, socially
CAGE: As art becomes so social as this, it becomes used and formed and structured and everything in each individual.
I want to remove the notion of a separation between the artist and the engineer.
I think that the engineer is separate from other people simply because of his very specialized knowledge, because of the continued use of those specialized knowledges.
If on the one hand, the artist, can become, so to speak, aware of the technology, and if the technologist can become aware, so to speak, of the fact that the show must go on, we can expect not only interesting art but we can also expect a an interesting change in the social order.
The most important thing at the moment is the position of the engineer as a possible revolutionary figure.
And it may very well come as a result of the artists and the engineers collaborating.
Because the artists, for years now, have been the repository of revolutionary thought.
Whereas, the engineers, in their recent history, have been the employees of the economic life, but in relating to the artists, they become related to a revolutionary factor.

PAXTON: "We had become interested in the process we were involved in, which was the meeting, marrying, and mating of artists and scientists that was a kind of coupling that was some form of, hopefully, a synergistic new wrinkle in artistic thought and scientific thought. That they would repel each other, and attract each other in some strange dance, and we would get out of that the flowering, the explosion, the evolution of something for the future."

PAXTON: "Now in this situation I may in the end be able to work that way but the whole procedure is going to force me possibly into different attitudes. So that I may be giving that up. I feel as though I'm already sort of exposed to this group of people in terms of interests and attitudes and things that it no longer is a private way of working. I feel like I'm working in public, sort of. I'm working with seven other people. Or in view of seven other people who are keeping track of the whole process. In a kind of unofficial, offhand, friendly way."

PAXTON: "Cage said that he wanted to stretch people's ears; Cunningham stretched our bodies; Rauschenberg stretched us between an array of visual images and their multiple interpretations: so many kinds of inventions occurring at once in this bus, as the culture rolled by, rather slowly."

RR: "Our thinking became different and very much influenced by the engineers' approach to the subject, but I think their sensibilities changed. That's the thing about this project: it opened up things instead of closing them down and refining them. Most art activity just builds up barricades that have to be overcome by the next group of artists."

RR: "We didn't want the artist to use an engineer or an industry merely to execute preconceived ideas but to conduct research in which both sides would share and grow."
(DD: Isn't that kind of collaboration rare?)
"It always happens. It's very hard to initiate one of these projects, but when they do happen the individuals involved share and change. The forces implicit in the collaboration are stronger than the competitive instincts that flourish in the art community. It flattens the ego."
(DD: You're obviously talking about a collaboration that goes on for a long time, as did yours with Klüver, rather than a one-time project…)
"Yes. The one-shot collaboration usually does not insist on enough commitment to involve industry in any depth…It's almost like a wild card in a poker game. If you're a research scientist somewhere and you meet

a perfectly strange person, the artist, who is asking you to do strange things and you know when he is finished he will go away, I don't think the collaboration will make any considerable change in you….
"Social structures are hard to change, of course. The best things that came of 9E were personal involvements with engineers and scientists, plus some physically important breakthroughs in research…"

RR: "Harold Rosenberg once said…that the most beautiful instrument an artist has to work with is a pencil. Well, he certainly knows more about a pencil than he does anything else. I think that in the beginning collaborative work is going to be necessarily self-conscious about the technology, no matter who the artist is; parallel to the first drawings he made, when he was admiring what he did with the pencil. A mature esthetic is the result of familiarity with, and accomplishment in, your medium."
(DD: As I listen to you, though, I get the impression that you value the art-technology collaboration for reasons beyond esthetics.)
"I'm talking about conscience in industry, and individual responsibility among artists, scientists, engineers, bankers, politicians, and doctors, leading to more realistic structuring of the earth and its activities."
(DD: What about art?)
"Art is a natural result of society." P. 145

WHITMAN: "Technology is a world that's going to become more and more important to the artist, a world he's got to catch up with…This is the first time a body of professional men have been involved in a project of this kind. Now these very important scientists take us seriously, and from this I think that other members of other communities, other corporations, will take us seriously."

BIORN: "For some of us like me, it was like opening up a window to a whole new world, and once we saw this, we didn't want to let it go! I miss the intellectual challenge – trying to make the artist's vision come through."

COKER: "The surface reason for an engineer to work with an artist is that it's fun. The work is different from his regular work, but something he can handle easily and that others in the group cannot.

But there is a deeper reason, too. There is a general mood that an engineering education should be broadened – liberalized – for social reasons as well as purely professional ones. In my field – speech – for example, we get involved in linguistics, physiology, and psychology, as well as acoustics and computers. Almost by definition, the new things don't fit into the old boxes.

But on a social level, the technically-educated engineer – up from the farm or some other humble beginning – feels inferior to his cultured new friends. He is hungry for the kind of non-technical broadening experience that the collaboration offers. He is stimulated by interesting new people and surroundings.

At the same time, the engineer, getting his job, and family and house in the suburbs, is pretty well sucked into the establishment. Here is a small way he can break away on his own, without severing any ties or closing any doors. In spite of being committed to mowing the lawn, taking out the garbage, answering the telephone – Monday morning, he can get away and become a seer-artist for a while – a sort of wish-fulfillment.

The project satisfies a curiosity about the non-Establishment world. This may also be an attraction for the artist – to see what's going on on the other side of the fence. Part of my fulfillment in working with artists is being reassured that these guys aren't so different from me after all.

In *Nine Evenings* I got very different impressions from the various projects. In some – especially the smaller ones – there was an attitude of give-and-take, of mutual respect between artist and engineer. Other projects, especially the ones with a large engineering effort, were less successful.

…The payoff for the engineer is intellectual, social, and psychological. Big, impersonal dogwork projects don't have it. Real collaborations do."

BK: "…The way I see it is that artists provide non-artists – engineers or whomever – a certain number of things which non-artists do not possess. The engineer expands his vision and gets involved with problems which are not the kind of rational problems that come up in his daily routine. And the engineer becomes committed because it becomes a fascinating technological problem that nobody else would have raised. If the engineers gets involved with the kinds of questions that an artist would raise, then the activities of the engineer goes closer towards that of humanity… Now, this is all sort of philosophical – in practice it has to do with doing it."

BK: "…To this day [Klüver] expounds the theory first put forward by Rauschenberg: that the true nature of Art & Technology lies in collaboration, not consultation. 'Engineers are not artists, and artists can't do their own engineering. Artists and engineers are separate individuals, and if they work together, something will come out of it that neither can expect. That's the quote I want to die with.'"

BK: "Engineers are becoming aware of their crucial role in changing the human environment. Engineers who have become involved with artist's projects have perceived how the artist's insight can influence his directions and give human scale to his work. The artist in turn desires to create within the technological world in order to satisfy the traditional involvement of the artist with the relevant forces shaping society. The collaboration of artist and engineer emerges as a revolutionary contemporary sociological process. Initially, a successful working relationship between artists and engineers will require that each operate freely within his own environment. The function of E.A.T. is to create an intersection of these environments."

ROBERTSON: "…I was skeptical as hell. I just didn't have any idea that there was any common ground the two could meet in. and then to my astonishment and amazement, I found out there was – that here not only was a common ground, but a ground out of which at least the engineer got a great deal of inspiration."

Appendix H

Artists & Engineers Roles of Technology QUOTES

Roles that technology can play in collaboration:
- Object of collaboration – what is being invented or adapted
- Tool for specific activities in collaboration process:
- Communication – used by team members in collaborative processes
- Learning - enhance learning to create new things and ideas
- Creativity and making art

9 Evenings Artists

John Cage	Yvonne Rainer
Lucinda Childs	Robert Rauschenberg (RR)
Oyvind Fahlstrom	David Tudor
Alex & Deborah Hay	Robert Whitman
Steve Paxton	

Bell Labs Engineers

Ralph Flynn	Robbie Robertson
Harold Hodges	Herb Schneider
Billy Kluver (BK)	Manfred Schroeder
Per Biorn	Dick Wolff

Object/Subject of collaboration: Invention or adaptation of existing technology

CAGE: "Tried conversation (engineers and artists). Found it didn't work. At the last minute, our profound differences (different attitudes toward time?) threatened performance. What changed matters, made conversation possible, produced cooperation, reinstated one's desire for continuity, etc., were *things*, dumb inanimate things (once in our hands they generated thought, speech, action.)."

FAHLSTROM: "The idea was to bring theater and dance up to the level of technology, and put technology in touch with poetic disorder and human insight, things that were *irrational* in terms of technique. The inventions to come out of the show can be developed as elements for works of art….I think artists are either cool and purist, like Cage and Rauschenberg, or like Leary and Metzner, who have a fuzzy outlook, using art for their special aims. There is a third group, involved with activities in the world as it is today….I feel in between all three, because I'm attracted to all three and have elements of all three in my work. One thing I have in common with the last group is the approach toward using material from the world-as-it-is: the tape I used with the drug addict, or the articles about the *idiot savant*."

RR: "We frightened everyone. It wasn't economics….it was fear. Fear of creation. Insecurity about change….Something like nineteen brand-new patents that were direct results of event in 9E went to the credit of the engineers of the respective companies"

RR: (BR: what happened to EAT?)
RR: "…The experimentalists – researchers – were very excited about having a new guy on board. Top management was ambitious for one reason or another about results, but middle management didn't know how to get information from the researchers and experimentalists….We had poets, painters, movie people, video. I recognized that there was a lot of research going on that would not yield any kind of real benefit if the end result would be something like the Princess phone. The equipment that technology had produced should be used for more than that. It should be used as a creative palette."

RR: (BR: Let's return to your involvement in art and technology.)

RR: "Originally it was to try to get different hybrids involved in art which had to do with humanity instead of just letting technology get so wrapped up in itself that it controlled us and we ended up as monkeys…."

BK: "While they may have been outside the everyday expectations of the technology, Rauschenberg's ideas always worked within the realistic boundaries of what the technology was capable of, and once formulated, the engineers could bring their expertise to bear on the problems. Rauschenberg could respond to their designs and proposals and work with the systems they made. Through this interchange, the collaboration produced something that could not have been foreseen. The limits of the technology had been expanded."

BK: "Those of us in the technical community in the early sixties who were worried about the direction of technological change believed that artists' ideas, approaches, and concerns could influence the way engineers approach technological or day-to-day social problems. Our collaborations, we hoped, could lead technological development in directions more beneficial to the needs, desires, and pleasures of the individual.

An interesting comment on my experience in working with artists came from Nam June Paik, when he told me recently, 'Billy, I am working with off-the-shelf technology, you always worked to invent one-of-a-kind technology.' Paik, of course, was understating his extraordinary visual sense in manipulating his material, but he hit the nail on the head about the driving force in the interaction between artists and engineers: what will emerge is something that neither the artist nor the engineer had thought of before. Thus, the artist-engineer collaboration remains a viable model for how we can actively confront and shape new technology."

BK: "…In this century, artists have also embraced technology as subject matter: the enthusiasm of the Futurists, the experiments of Dada, the optimism of the Bauhaus movement and the Constructivists, all have looked at technology and science and found materials for the artists. But for all this interest, art remains a passive viewer of technology. Art has only been interested in the fallout, so to speak, of science and technology. The effect of technology on art can apparently be even a negative one: the invention of the camera helped kill off representational painting, and we are now witnessing how the computer is about to take care of music and non-representational painting."

BK: "…As our understanding of technology increases, the question of success or failure will disappear. The focus of the interest will then be on the incredibly rich and varied possibilities of technology. We have to live with a work of art or fight it. Technological success or failure cannot be a criterion for judging the work. A work of art loses its interest if it is only judged according to predetermined norms."
 (DD: In other words, you want technology in its relationship with art to be adventurous rather than mechanical.)
"The relationship should be experimental and intuitive in the same sense that scientific research is – I am not using the word 'experimental' as it is used in connection with art – and therefore full of risks. Whether the technology works or fails is not a very important aspect of this relationship. We know for sure we can always make something work."

BK: " I believed that the artists would influence the engineers and then change the technology. Of course, the point is that the artist would work with engineers and change the engineers."

BK: "The contemporary artist's exploration of reality has led him to the enormous fortified castle called technology. The castle is closed with a heavy iron door and the artist wants to get inside….The contemporary artist sees the engineer and the scientist as his collaborator, his material and his inspiration. The artist knows that the vital key to technology is the engineer. The artist needs access to the contemporary world and he wants to be part of the world of the future."

BK: I'm not so much interested in helping artists as I am in seeing what effect the artist could have on technology. In the future, I see the artist having more and more impact, as he learns more about technical processes. The contribution of the artist could conceivably lead to an increased awareness, a new view of the problems the engineer, designer, scientist has to deal with. For instance, it might reflect on questions

like: What should the next mass media look like? We will have the megalopolis; what is it going to look like? I think that the main influence of art and technology together will come in the area of environment."

BK: "Well, no, the artists have shaped technology. They have helped make technology more human. They automatically will because they are artists. That's by definition. If they do something it automatically comes out human. There's no way you can come out and say that if art is the driving force in a technological situation that it will come out with destructive ideas. That's not possible. But what happens, of course, is that the artist widens the vision of the engineer."
(GH: And so artists can provide a conscience or humanizing element to the technology?)
        "Yes, that's what I mean…but that's saying it too much. There might be other consciousness that come from other sources than art. I think there is a huge consciousness inside technology that hasn't been tapped."

WOLFF: "This is how the wireless evolved. Someone asked if we could turn lights on and off by remote control with no connections. This required a radio transmitter to send signals to a receiver connected to the lights. From that we realized what we had and started describing it to the other artists and they started asking more questions and having other ideas. The decoder that Robbie made did something that was never planned or asked for and the artists went and used it. That was the timestepping that Cage and Tudor used. The whole communication system started with the carts. The necessity to remote control the carts. The necessity for the channels. So we went ahead and used them for controlling other things too. Tudor and Cage used those extensively. Cage, to turn speakers on and off as he walked in front of lights. Tudor to turn lights on and off. We didn't use all the equipment to it's fullest, but that's for the future. After we had built this equipment, Rauschenberg's idea of the rackets came along. And that was a good idea. We tried it out here at the labs and in 15 minutes we knew it worked. Billy came down the hall with tennis rackets and asked me if I had a transmitter and receiver and we hooked it up and stood in the hall hitting the ball back and forth and it sounded just like it did in the show. It just required some smoothing over, hiding the transmitter and making the sound better. But basically it was one of the easiest projects."

SCHROEDER: "I became involved [in 9E] because I am familiar with all kinds of sound effects. Acoustics is my specialty, and part of the endeavor here was to integrate acoustic effects into these performances. Dancer Lucinda Childs was asking for things to translate body movements directly into sound, so that she could actually create her own accompaniment as she danced. We came up with a device that reflected ultrasonic waves from her body, then converted them to audible sound. I got the idea from work I'd done years ago on stabilizing public address systems, and feedback problems with the Speakerphone, which under certain conditions produced howling or singing noises. It wasn't a very interesting sound. But while we were working with it we discovered that it would make all kinds of funny sounds if you did the right things to it and if people walked through the room. When Miss Childs made her request, I remembered that work. But, it needed some artistic concept to make it worthwhile and enjoyable. We certainly have a great storehouse of scientific information that would allow us to produce a variety of acoustical and visual effects. For example, we could have sounds whirl around in space, or we could have this translation of movement into sound, or light into sound or sound into light….I think it is quite conceivable that we will have mixed personalities here, that artists in these fields will emerge from the engineering profession."

BK: "The amazing thing is that it's possible for artists and scientists to talk together at all. The first meeting I was scared. Then, the minute it came down to the hardware it was working. It's like a triangle between the scientists and the artists and the hardware. The main thing is to establish a working relationship and the hardware is the basis for this."

Tool for collaboration (communication)

Tool for collaboration (learning)
LOEWEN/HAY: "Alex Hay said his 'first ideas were fantasy, dreams, superhuman, science fiction type,' and still had this sort of vision of works he would do under the new influence. Talking to the engineers about what was available, feeling responsible not only to oneself but now also to the engineers, one began 'to think about it in almost engineering terms,' the ideas having to be concrete before any equipment could be started. Given what he found available, he had rejected his initial ideas, one being for a mechanical

environment to deal with the human body in various ways. As in his earlier works except for "Leadville,' Hay thought his imagery had usually been 'very simple and related to a very common place activity,' with the 'clarity of a single idea,' his material exiting as a 'function of his activity.'"

(AH) "For the most part, what they've been talking about, what seems to be more available are materials and processes and methods in communication. I really have to start dealing with physical things before I start coming to grips with them. This is going to be a little difficult because just to start dealing with these things, expensive equipment has to be built."

RR: "I had met Billy Klüver, the Bell Labs physicist, both here and in Sweden. He gave me the suggestion that the possibilities in technology were endless. Of course he was right. It was a difficult transition to make because I normally work very much by hand. I rely on the immediate sight and actuality of a piece. Moving on to theory and its possibilities was like being handed a ghost bouquet of promises."

Tool for collaboration (creative art making)
PAXTON: "I do think there are definitely two attitudes toward technology, and the one using technology as a servant I find very dull and outdated. It seems to me closed-minded…However, in an open esthetic investigation, where it almost doesn't matter whether one makes art out of it or not, in which an art object may not even be produced,"(the purpose is not to move in a single direction.)…if from the beginning, if you have some curiosity about what would happen if you could do *this*, and then you share that curiosity with someone else and make him curious, then that's the beginning of the piece…and it grows and grows…the whole world then is the medium, if you can relate in your esthetic to something other than the finished product."

RR: "When you're working with something that's as physical as radio equipment, what's absurd to do is very quickly determined. The machine has no tolerance for getting outside a particular radio wave or whatever it is you're working with. The kind of equipment we're inviting has its own integrity built into it. Whereas an artist has to somehow assume integrity or not. I think just that experience of dealing with these kinds of material that have this particular character is probably going to end up being an enormous influence on the work esthetically."

RR: "Harold Rosenberg once said…that the most beautiful instrument an artist has to work with is a pencil. Well, he certainly knows more about a pencil than he does anything else. I think that in the beginning collaborative work is going to be necessarily self-conscious about the technology, no matter who the artist is; parallel to the first drawings he made, when he was admiring what he did with the pencil. A mature esthetic is the result of familiarity with, and accomplishment in, your medium."
(DD: As I listen to you, though, I get the impression that you value the art-technology collaboration for reasons beyond esthetics.)
"I'm talking about conscience in industry, and individual responsibility among artists, scientists, engineers, bankers, politicians, and doctors, leading to more realistic structuring of the earth and its activities."
(DD: What about art?)
"Art is a natural result of society."

WHITMAN: "I think I was interested in the idea. That's why I was interested in being in the project. At first I had a fantastic vision of what this so-called technological world was going to mean and so I thought it would be interesting and important to be in the project. Also, it would be a terrific way to excite a new way of thinking. I mean, all those ideas that we were talking about – social – I think it is an interesting way to be socially involved with art. You know, get at that social involvement through the back door. It seems to be a lot more revolutionary – the things that might be happening more revolutionary than wars or that stuff, civil rights. This is more exciting. A little more important. But I do not think we are doing it in this project and I do not think this project is going to do it. I think this project is an interesting beginning for opening the doors for this kind of relationship between what kind of pure…what art thinks of itself as pure esthetic and that the scientists have a kind of pride in their esthetic of their craft and I think that it's possible for both groups of people to appreciate each other and maybe it will make it available for more communal orientation. I am not interested in that form of orientation though. I think it is important for individual people to keep on being themselves and finding new ways of doing it. Instead of letting the machine determine what is going to happen, the thing is to find what is in the nature of the machine – what is the

form of the machine that one can appreciate as an individual. What the form is that we have to deal with in that world – the world of technology.”

WHITMAN: “I like our organic collaboration with technical facilities where technique and esthetics are both being experimented with rather than our having a set esthetic to implement with technology.”

JOHN GIORNO (not 9E artist but part of production)
“The importance of *9 Evenings* has been largely overlooked because so many things took place right after it. It is literally the first time that artists formally used technology and electronics in their work. It was the seed from which I began, along with the many other people (who) now number in the millions, using technology in our art, with other people. But Bob (Rauschenberg) originated the idea – it arose in his heart, and Billy’s and everyone else’s.”

FLYNN: “Yes, the sophistication of some of these [9E] works is one of the motivations for the engineer to get involved. The artist is thinking along lines outside the engineer’s working patterns at, for instance, Bell Labs or Xerox Corporation. The engineers have an opportunity to use the knowledge they’ve gained in school in something that turns into an interesting creative project.”

HODGES: “It was very interesting. I think when you get on the technical side of things, you tend to look at things in just a certain way, because of the technical limitations of it. And here is this whole bunch of people who came along who wanted to do something *else* with the technology. It was a FUN time. The artists seemed to be enjoying themselves when they were working. I’d classify the whole thing as a very fun experience.”

BK: “I came to believe that a hands-on working relationship between artist and engineer was the best means for providing the artist with access to technology. Rauschenberg’s strong commitment to the idea of collaboration shaped my thinking. We evolved the idea of the one-to-one collaboration between individuals, each operating as a professional in his or her own field in contributing to a joint project. This idea of the artist-engineer collaboration was the central force behind *9 Evenings*….
…Then one engineer was assigned to each artist depending on the artist’s project and the engineer’s field of expertise. Other engineers worked on sound and control equipment and systems that would be used by all the performers.”

BK: “Have you ever met a normal, healthy and working engineer who gives a damn about contemporary art? Why should the contemporary artist want to use technology and engineering as material? Only when a working relationship has been established between artists and engineers can we give answers. The *9 Evenings* was a deliberate attempt by ten artists to find out if it was possible to work with engineers. Their investment in terms of putting-yourself-on-a-limb was considerable. For ten months they worked with thirty engineers and were able to make a series of beautiful performances out of the collaboration. I believe it was John Cage who remarked that the 9E ‘was like the early movies’ where the camera, the stage, the literary content, and the acting were all separate and easily identifiable elements. An unmixed media. The horseless carriage – the wireless microphone – theater and engineering.”

LOEWEN/BK: L. writing: “The artists had individually accepted different materials for making art, including found objects and hardware, sounds and shadows in the environment, characteristics of people and their commonplace activities, time and comic strips. If artists’ materials included these, Klüver asked, why not technology or the engineer? Klüver anticipated the artists would use technology as another material in ways consistent with their previous work but with new freedom as to things possible, that they would deal not only with the aesthetics of technology or use its external qualities to create new forms which he thought belonged in the realm of engineering, and that their work would not be dependent on the quality of the material per se but its use in relation to their ideas of content.”

BK: “The function of technology as a material is not to put previous esthetic concepts into new forms but to provide the basis for a new esthetic, one that has an organic relationship with the contemporary world.”

BK: "By the time *Oracle* was shown at Castelli in May 1965, I had taken dozens of artists through Bell Laboratories and many of my colleagues and I had worked on individual projects with artists. But I felt this was pitifully small in the face of the seeming explosion in new technical possibilities in the 1960s. The artist was effectively being shut off from this important area of society. Rauschenberg also had come to feel strongly that artists must have the opportunity to work with the new technology 'to bring more humanity to the development of technology. The fast development of science shortly will unleash an unbelievable revolution. It is the duty of the artist to confront science in a positive way.'"

SCHNEIDER: "Engineers and scientists attempt to deal in facts and figures to understand, to be able to repeat, and to predict. The artist deals more with images and impressions and up to now his tools have been limited. The engineer visualizes before he tests, and he experiments before he builds. The artist too has a conception, he too creates and attempts to put into a form something that others may see or hear, react to and even appreciate.

The engineer's product, we coldly say, must stand the test of the market place; but so does the artist's. The manufactured product can be called, at least by its designer, a success if it is useful and if it does its job. If it doesn't sell, well, then one can always blame the human factors designer who didn't give it the right shape, or the sales department which didn't put it into the right box. At least the engineer knew that his product worked.

The artist too tests his creation in the market place; but his marketplace is much more restricted, and the appeal is not vital to life and health, except his own. The artist attempts to stimulate reactions which are not only much more difficult to define, but he must also do this for the many whose reactions are never identical. It is exactly these common and varied problems that made the interaction between artists and engineers, and between Art and technology, fascinating.

…here was a voluntary association of a wide variety of people, who believed that it was time to prove C.P. Snow wrong [talking about the 9E]….Let's see how."

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