THE SPIRIT OF EXHIBITION AND VISUAL PEDAGOGY IN THE WORK OF CHARLES AND RAY EAMES

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by

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THE SPIRIT OF EXHIBITION AND VISUAL PEDAGOGY IN THE WORK OF CHARLES AND RAY EAMES

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ABSTRACT

This project examines the ways in which Charles and Ray Eames promoted visual pedagogy in their exhibitions and new media experiments. Through cooperative efforts with various artists, designers, educators, scholars, museums, corporations, and institutions, the Eameses refined methods of visual communication to create effective experiential learning spaces. Within these spaces, the Eameses developed strategies that sought to unite art, science, and technology as well as underline the value of visual literacy within the new media landscape. By analyzing the Eameses' collaborations, interdisciplinary educational initiatives, exhibition designs, multimedia presentations, and didactic films, I reveal the ways in which the designers constructed pedagogical environments through the experimental use of new media.

This dissertation seeks to ground Charles and Ray Eames in their historical moment, illustrating the ways in which the Eameses' work anticipated, engaged, and reflected contemporary theoretical developments in vision, media, and interdisciplinary education. The Eameses believed new media had the potential to dissolve the artificial categorization of academic disciplines: film could be used to teach mathematics; toys could provide insight into fine art; and

technology could help to create a visually literate populace. Consequently, the Eameses combined traditional display models and new media in highly choreographed spaces that relied on objects and images to communicate cultural histories, ideas, and values.

INTRODUCTION

"What is Design?"

Among the papers Charles and Ray Eames left to the Library of Congress, in the fading manuscripts, boxes full of neatly organized notes and letters, and thousands of photographic prints and negatives—a nearly 40-year collaboration and partnership condensed into a vast archive of over 265,000 catalogued items—there is a folder containing a series of diagrams Charles sketched for the exhibition, *Qu'est ce que le design?* (*What is Design?),* held at the Musée des Artes Décoratifs in 1969*.* The museum invited five industrial design offices from five different nations to participate in the exhibition, and each was to serve as a representative of the state of design in their home country.[1] The Eameses' gallery, *Three Clients*, included the now-iconic furniture designs distributed by Herman Miller, but they dedicated the majority of the space to the multimedia projects, educational films, multi-screen slideshows, and information exhibitions

[1] The exhibition included Joe Colombo (Italy), the Eames Office (USA), Fritz Eichler (Germany), Werner Panton (Denmark), and Roger Tallon (France), all of whom submitted work and answered a series of questions posed by Madame L. Amic. See John Neuhart and Marilyn Neuhart, *Eames Design* (New York: Harry N. Abrams, 1989), 345.

produced for IBM and the governments of the United States and India, representing their expansive design approach as one interested in ways of working, making, thinking, and communicating between and across conventional disciplinary boundaries and existing, often restrained, notions of what constituted modern "design."

The series of sketches in the Eames archive illustrate the designers' attempts to visualize and explain their practice for exhibition audiences using various diagrammatic models, and in the end, they incorporated only one in the physical exhibition, which was enlarged and reprinted on a glossy panel that occupied the center of the space (Figures 0.1-0.2).[2] In the final exhibition graphic, an irregular Venn diagram contains three intersecting forms along with handwritten labels to indicate the function of each area within the structure. The first—an elongated organic mass distinguished by a hatching pattern—crosses diagonally through the composition and "represents the interest and concern of the design office," while a second, stair-stepped shape filled in with dashes constituted "the area of genuine interest to the client." A third, kidney bean-shaped form, left unshaded, embodies "the concerns of society as a whole," and encompasses a large portion of the diagram surface. Differentiating the space where the contours of the three forms converge through heavy cross-hatching, the Eameses indicated that "it is in this area of overlapping interest and concern

[2] Diagram by Charles Eames displayed in the 1969 exhibition *Qu'est-ce Que Le Design? (What is Design?)* at the Musée des Artes Décoratifs in Paris. See Part II, box 197, folder 2: "What is Design," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

that the designer can work with conviction and enthusiasm." In the diagram and in the inclusion of a variety of interdisciplinary multimedia designs within the exhibition, the Eameses repositioned the designer as a coordinating force, uniting the goals of disparate parties toward the advancement of an entire society.

By the time the Eameses' participated in *Qu'est ce que le design?* in 1969, they had played an essential part in defining how museums and other powerful cultural institutions presented and marketed postwar modernism to the public for more than two decades. For example, the Eameses' designs were included in the "Good Design" program at MoMA—a watershed merger of art and commerce that selected innovatively designed American consumer goods for display and production—reinforcing the museum's efforts to fuse modern art and domesticity, and to play a key role in defining taste and culture in the United States. Twenty years after MoMA's initiative, the Eameses' were still battling with and continually expanding upon their definition of design, but now within the context of the Cold War, a period that their colleague George Nelson described as "a strange and explosive place where accelerating change seems to be the only remaining constant, where intangible relationships are more concrete than tangible things and where cooperation has replaced competition as the one possible technique of survival."[3] These circumstances called for a new kinds of communication design and awareness of media technologies, the Eameses' and other designers

[3] George Nelson, "Design as Communication," in *Problems of Design* (New York: Whitney Publications, 1957), 4.

who exhibited the same liberal optimism increasingly saw the role of design not as the creation of consumer products, but as a way of working and a way of thinking that relied on interdisciplinary relationships and mass media to share knowledge across seemingly disparate fields and to help promote democratic ideologies of citizenship, culture, and lifestyle.

This dissertation investigates the changing role of the designer in the context of Cold War, examining the ways in which the Charles and Ray Eames navigated connections between universities, corporations, governments, and museums, and collaborated with networks of designers to create large-scale interdisciplinary exhibitions and pedagogical environments to exchange knowledge. I argue that in using this model, the Eameses sought to solve problems of communication and facture between the cultures of art, craft, science, and information technology to stimulate larger solutions to perceived global crises. In doing so, I establishing an intellectual history of Eames design and illustrate how their careers uniquely embody the dramatically shifting circumstances that followed the Second World War, modeling a new kind of designer that utilized interdisciplinary methods and relationships as a means to address and organize the expanding media and cultural terrain.

Charles and Ray Eames

Even a cursory survey of the Eameses' early careers reveal individual orientations significantly invested in utilizing modern organizational structures

within visual design and in methods of working within institutional systems to mend fractures between forms of knowledge and promote progressive social frameworks during rapidly shifting political and economic circumstances. After growing up in a Catholic household in St. Louis, Charles enrolled in Washington University in 1925 to study architecture, however, he left after his sophomore year because the traditional Beaux-Arts curriculum did not support his interest in modern design and his investment in Frank Lloyd Wright' philosophy of organic architecture, and because he prioritized his draftsman work for the architectural firm, Trueblood and Graf.[4] Charles had also immersed himself within the lively social and artistic landscape of the city, taking an interest in progressive politics and becoming a member of the Paint and Potter Club, where he discussed design philosophy with local artistic intellectuals and explored a number of artistic media and methods including printmaking, weaving, pottery, stage design, engineering, photography, and consumer product design outside the confines of the classroom.[5] Moreover, he and Catherine Woermann, whom Charles married in 1929, visited the Weissenhof Siedlung in Stuttgard, where they experienced the work of architects including Mies van Der Rohe, Walter Gropius, and Le

[4] For a more comprehensive chronology of the Eameses' early lives, see the first chapter of Pat Kirkham, *Charles and Ray Eames: Designers of the Twentieth Century* (Camrbidge, MA: MIT Press, 1998), 9-59 and John Neuhart and Marilyn Neuhart, *Eames Design* (New York: Harry N. Abrams, 1989), 17-25. *Eames Design* provides an overview of key milestones in the Eameses' early lives, which was compiled with Ray Eames, however, there are several historical inaccuracies and oversights. The Neuharts credit Charles with the designs and relegate Ray to a supporting role in the partnership, and they have published a series of unverified accounts, however, their catalog remains foundational to studies of the Eameses.
[5] Neuhart, *Eames Design*, 20-21.

Corbusier—an electrifying experience that Charles later compared to "having a cold hose turned on you."[6]

Following his departure from Washington University, Charles continued to work for Trueblood and Graf until 1930, when he and colleague Charles M. Gray formed their own office, with Walter Pauley joining the next year.[7] The Great Depression devastated the architecture and construction industries and Charles had to capitalized on personal connections to solicit his firm's only architectural commission.[8] Supplementing his income with restoration projects and through his collaborative stained glass and mosaic designs with artist Emil Frei, Charles quickly became disillusioned as he recalled some years after, "It got to be so much I finally thought to hell with it and paid off all the debts I could, took what was left, and took off for Mexico."[9] Leaving his wife (eventually filing for divorce), young daughter Lucia, and his architecture firm, Charles embarked on an eight-month trip through Mexico beginning in the fall of 1933, spending most of his time painting local scenes and landscapes and exploring villages. Mexico introduced Charles to an immensely rich craft tradition, and he left with a small collection of artifacts that he admired for their aesthetic value.[10] Upon his return to St. Louis,

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[6] Charles Eames quoted in "An Eames Celebration: The Several Worlds of Charles and Ray Eames," WNET television New York, February 3, 1975.
[7] Kristina Gray Perez, "Miller and Preisler Sources for Our Dictionary of Missouri Architects, *Dictionary of Missouri Architects,* 8, no 1 (Columbia, MO: University of Missouri Press, Spring 2002), https://www.stlouisarchitecture.org/pdf/SAHSTL%20Architect%20Dictionary%20Notes.pdf
[8] Kirkham – traces the construction company to his father-in-law, and Charles' interest in engineering. Regardless, he and his colleagues
[9] Charles Eames, interview with Virginia Stith, 1977, reprinted in Kirkham, *Charles and Ray Eames,* 16.
[10] "St. Louian's Mexican Diary in Watercolor," *St. Louis Post-Dispatch* Sunday magazine, July 29, 1934.

Charles partnered with former colleague Robert T. Walsh to form the Eames + Walsh office and between 1935 and 1938, they designed at least six buildings in Missouri and Arkansas.[11] One of their church designs caught the attention of Finnish-American architect and designer, Eero Saarinen, who inquired about the building. This marked an important catalyst in Charles's career, as Saarinen's father, architect Eliel Saarinen served as president of the Cranbrook Academy of Art in Zeeland, Michigan. In 1938, Eliel offered Charles a fellowship to study at Cranbrook where he continued to explore interdisciplinary art forms, eventually becoming head of the Department of Industrial Design in 1940.[12]

Relatively little documentation exists on the early work of Ray Eames, and she preferred it remain that way, revealing few details about her life before she met Charles in 1940, with scholars noting her guarded demeanor and defensiveness when questioned about certain topics in interviews.[13] Born as Bernice Alexandra Kaiser, she was eventually known simply as "Ray" growing up in a Episcapalian and Jewish household in Sacramento, California. After graduating high school in 1931, Ray spent a term at the Sacramento Junior

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[11] Charles Eames's early designs have been sparsely archived, and evidence of more designs have been found in Missouri archives as recently as 2001. See Perez, *Dictionary of Missouri Architects.*

[12] *Eames Design* (page 24) indicates that Charles was head of the Department of Industrial Design, but his title was Instructor of Design according to Kirkham (page 416), and in Robert Judson Clark, "Cranbrook and the search for twentieth century form," in *Design in America: The Cranbrook Vision, 1925-1950,* ed. R.J. Clark et al. (New York: Metropolitan Museum of Art, 1984).

[13] Kirkham interviewed Ray Eames on a series of occasions and recounts Eames's guarded behavior. Ray's responses to questions about her early life in an interview with Ruth Bowman were also vague and often veered quickly toward conversations about Charles and describing working relationships with other designers. See Kirkham, Charles and Ray Eames, 31-41, and Ruth Bowman, "Oral history interview with Ray Eames," (July 28-August 20, 1980), Archives of American Art, Smithsonian Institution.

College before moving with her mother to New York and enrolling in the May Friend Bennet School in Millbrook, an all-women's liberal arts college where art, music, dance, and drama were core elements of the academic structure. Ray received a degree in fashion design and her sketches, reminiscent of handmade paper dolls, show an early investment in quality textiles and vibrant patterns (Figures 0.3-0.4).

In 1933, Ray enrolled in the Arts Student League to study with avant-garde German émigré Hans Hofmann, whom Clement Greenberg regarded as "the most important art teacher of our time."[14] When Hofmann opened his own institution in 1933, Ray followed him along with other prolific students, most notably Lee Krasner and Mercedes Matter. It was during this time that Hoffman developed his "push and pull" theory, whereby he established illusionistic form and dynamism through juxtaposition and visual collisions of various color planes.[15] What little of Ray's work remains from this period evidence a keen sense of composition and color, strong spatial awareness, a facility for deconstructing forms, and an ability to suggest three dimensions on two-dimensional planes. For example, in an untitled painting from the late 1930s, Ray applied thin layers of vibrantly colored oils, allowing the surface texture to emerge from the paint, establishing conflict between the stretched canvas

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[14] Clement Greenberg, "Art," *The Nation,* 160, no. 26 (April 21, 1945), 469.
[15] For more on Hans Hofmann's approach to art education and aesthetics, see Irving Sandler, "Hans Hofmann: The Pedagogical Master," *Art News* (May 30, 1973); Michael Schreyach, "Re-created Flatness: Hans Hofmann's Concept of the Picture Plane as a Medium of Expression," *The Journal of Aesthetic Education* 49, no. 1 (Spring 2015), 44-67; and Lucinda Barnes, et al. *Hans Hofmann: The Nature of Abstraction* (Berkeley: University of California Press, 2019).

through the paint, creating a conflict between the flat surface and the visual depth established through the juxtapositions of organic forms, lines, and textures (Figure 0.5). Placing elements in relationship throughout the composition, Ray rhythmically activated a system of forces and counterforces that promoted dynamic interconnections between color and form. She would later recall, "Somehow I've always been interested in structure, whatever form it was—in dance and music, and even my interest in literature had that base, I think… as structure in architecture."[16]

While living in New York, Ray attended modern dance classes led by Martha Graham and Hanya Holm and became increasingly interested in film as an art form. She continued to study and paint under the mentorship of Hoffman and in 1936, Ray became a founding member of the American Abstract Artists (AAA) group, displaying paintings in their inaugural show at the Riverside Museum the next year.[17] The AAA advocated for the exhibition of non-representational art, picketing galleries that refused to show avant-garde artists and organizing petitions and meetings to discuss their cause. However, at some point in early 1939, Ray Eames left the Hofmann School of Fine Arts to care for her mother, who died in 1940. As she entertained options for future endeavors, her friend and fellow Hofmann student, architect and industrial designer Benjamin Baldwin, suggested she apply to Cranbrook Academy of Art to

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[16] Saarinen quoted in Davira S. Taragin, "The History of the Cranbrook Community," *Design in America,* 35-45.
[17] Susan C. Larsen, "The American Abstract Artists: A Documentary History, 1936-1941," *Archives of American Art Journal* 14, no. 1 (1974), 3.

continue pursuing her interdisciplinary interests and she enrolled in courses for the fall 1940 term.[18]

The Cranbrook Academy of Art

Under founding director Eliel Saarinen, the early years at the Cranbrook Academy of Art comprised of collaborative workshop activities and highly experimental approaches to design education. Saarinen's reputation as a prominent Scandinavian architect drew talented designers and teachers, and the educational program was informal and relied on what Saarinen called "self-education under good leaders."[19] Students learned by spending hours in the studio, interacting and exchanging ideas about the function of design within a close-knit community, and experimenting with multiple media. Although Charles intended to spend his first year ensconced in the study of disparate design philosophies, he quickly became involved in school projects, working alternatively with faculty including Saarinen and Swedish sculptor Carl Milles, while initiating a cooperative partnership with Eero Saarinen, who would become an important influence in the Eameses' approach to architecture and design based on extensive research and considerations of wider implications. Their first project together, an exhibition of faculty work, reflected the avant-garde ideas of Herbert Bayer and László Maholy-Nagy, with artworks suspended from strings and wires

[18] Kirkham, *Charles and Ray Eames*, 45.
[19] Taragin, "The History of the Cranbrook Community,*"* 42.

to define and organize space, predicating many of the display methods the Eameses' utilized within their home and in subsequent exhibitions.[20]

In response to the Museum of Modern Art's Organic Design in Home Furnishings competition in 1940, Charles and Eero collaborated on submissions for the seating and case furniture categories, winning prizes in both. The entries consisted of the furniture pieces, but also drawings, graphics, and photographs of scale model rooms complete with miniature rugs, drapes, and other textiles made by Cranbrook's weaving department (Figures 0.6-0.7). This project overlapped with Ray's four-month residency during which she studied ceramics, metalwork, and weaving, eventually contributing drawings and presentation graphics to the MoMA submission. The Organic Design competition is the first recorded instance of the Eameses working together, and it also served as a vital networking opportunity, establishing connections between other designers and institutions that would play a significant role in the trajectory of their careers. For example, the contest was organized by MoMA's founding director of the Industrial Design Department, Eliot Noyes, who would go on to lead the Corporate Design Program at IBM and hire the Charles and Ray as design consultants in 1962.[21] Over the next two decades, IBM developed into one of the Eameses' primary clients, coinciding with the Eameses' increased interest in the communicative potential of new media, specifically computer technologies.

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[20] Kirkham, *Charles and Ray Eames*, 49.

[21] The mutually beneficial relationship between Eliot Noyes and the Eames Office is discussed at length in Chapter 3, which analyzes the Eameses' work within the Corporate Design Program at IBM.

Charles proposed to Ray in a handwritten letter on Cranbrook stationary and on June 7, 1941, the couple held an intimate wedding ceremony in Chicago before moving to Los Angeles. The newlyweds settled in an apartment designed by Richard Neutra and Charles found work painting and constructing film sets for MGM Studios while Ray continued to experiment in their apartment, advance techniques for creating compound curves in molded plywood.[22] Establishing their studio in the 1940s against the backdrop of the Second World War, the Eameses soon refocused molded plywood experiments to create a leg splint and develop prototypes for arm splints, airplane stabilizer tails, pilot seats, along with other military equipment (Figures 0.8-0.9). In June 1942, Charles wrote, "I have had to take a leave of absence from MGM so Ray and I can devote all our time (and I mean all) to experiments for the Navy."[23] The Eameses capitalized on increased access to industrial materials and they applied knowledge gained from production methods developed through military contracts toward solutions for the evolving problems of the Cold War.[24]

The story of Charles and Ray Eames and their role in establishing standards for aesthetics and quality within mid-century furniture designs is a

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[22] In her analysis of the Eameses' plywood experiments, Kirkham traces influences for plywood designs to Alvar Aalto and other European designers who followed a machine art aesthetic, influencing curriculum and practice of Cranbrook students including Charles Eames and Eero Saarinen. See Kirkham, Charles and Ray Eames, 50-59.

[23] Charles Eames to Richard Raseman, letter on wood veneer, 8 June 1942, Archives of Cranbrook Academy of Art, Bloomfield Hills, Michigan.

[24] For analysis on the relationship between wartime and domestic applications for postwar materials, see Beatriz Colomina, Domesticity at War (Cambridge, MA: MIT Press, 2007); *Cold War Hothouses: Inventing Postwar Culture from Cockpit to Playboy,* ed. Beatriz Colomina, annmarie Brennan, and Jeannie Kim (New York: Princeton Architectural Press, 2004); and *Atomic Dwelling: Anxiety, Domesticity, and Popstwar Architecture,* ed. Robin Schuldenfrei (London: Routledge, 2012).

familiar one, but the study that follows pivots away from that focus. The purpose of narrating the Eameses' early lives is to demonstrate how the force of circumstance and would, throughout their careers, dramatically change the Eameses' ambitions and the means available to realize them. What remained consistent throughout all of their work was an investment in collaborative methods, interdisciplinary dialogue, systems of aesthetic organization, and in addressing the pressing needs of the contemporary moment in coordination with powerful institutions.

Designers of Cold War Aesthetics

Many designers, artists, and scholars at mid-century identified the explosive advances in technology and science that began during the Second World War and gained expediency within the early decades of the Cold War—and the social, political, and cultural transformation these advances created—as the beginning of an entirely new kind of interconnected society. These radically new circumstances required a different type of designer, one not only interested in changing the way people live, but also how they learn and engage positively with new technologies and developments that had been coded toward military industrial purposes.

Throughout the Eameses' multimedia projects, exhibitions, and educational initiatives, they pioneered strategies for establishing continuity between disciplines through strategic visual comparisons. Many of the Eameses'

projects developed in a similar way: they looked at photographs, juxtaposed them, and manipulated them until they told a particular narrative. Often returning to previous ideas and writing notes on the perceived successes and failures of each project, the Eameses viewed each job as a means to solving broader conceptual and ideological problems. The Eameses promoted the circulation of ideas and to establish channels of communication to interconnect various disciplines, utilizing what they later referred to as "the language of vision" to establish unexpected relationships between seemingly unrelated subjects. Charles and Ray believed new media had the potential to dissolve the artificial categorization of academic disciplines: film could be used to teach mathematics; toys could provide insight into fine art; and technology could help create a visually literate populace. Consequently, they combined traditional display models and new media in highly choreographed spaces that relied on objects and images to communicate cultural histories, ideas, and values. This study investigates the impact of the Eameses' revolutionary ideas on interdisciplinary methods and the challenges to their implementation, using Charles and Ray to establish an unexpected and complex intellectual history for visual studies with the ultimate aim of understanding the continued relevance of the Cold War's powerful political, scientific, technological institutions, and their impact on the aesthetics and methods employed within visual arts and design.

Initiatives to align the goals of art, science, and technology in support of utopian ideologies developed in earnest across the United States, with major

institutions and corporations financing experimental programs and projects.[25] In 1967 alone, several major programs emerged including Experiments in Art and Technology (E.A.T.), which sought to make technology accessible to artists by arranging collaborations with engineers; the Los Angeles County Museum of Art's Technology Program (A&T), established by Curator and Director of Modern Art, Maurice Tuchman to pair famous artists like Andy Warhol, Claes Oldenberg, and Richard Serra with innovative corporations including IBM, General Electric, and the Jet Propulsion Laboratory; and, of particular interest to the Eameses, the Center for Advanced Visual Studies at the Massachusetts Institute of Technology, founded by Hungarian-American artist and former student of László Maholy-Nagy, György Kepes.[26] Charles participated in the interdisciplinary symposium that marked the Center's opening, and throughout the late 1960s-1970s, the Eameses served on various arts advisory boards at MIT. Kepes influenced the Eameses' pedagogical approach within their later courses and

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[25] In recent years, several scholars have analyzed the presence of the sciences and corporate funding in modern and contemporary art history. For example, Caroline A. Jones considers the role of science in how artists identified and presented themselves in the postwar period in her *Machine in the Studio: Constructing the Postwar American Artist* (Chicago: University of Chicago Press, 1996). In his *Making Art Work* (Cambridge, MA: MIT Press, 2020) W. Patrick McCray examines the development of a creative technocratic culture through collaborations between engineers, artists, scientists, curators, and the institutions that employed them. Steve Wilson provides a broad historical survey of contemporary artists engaging with science and technology in *Information Arts: Intersections of Art, Science, and Technology* (Cambridge, MA: MIT Press, 2001).

[26] The Eameses' participation in projects that aligned art, science, and technology departed from many other artists of the period in that they sustained their interest throughout their careers rather than engaging in singular experiments and programs, but they were acutely aware of the successes and failures of each of these ventures as they attended conferences with E.A.T. participants and owned copies of reports, such as Maurice Tuchman's, *A Report on the Art and Technology Program of the Los Angeles County Museum of Art, 1967-1971* (New York: Viking, 1971). In his monography of Kepes, John Blakinger discusses how the artist navigated and facilitated connections between art and science in his *Gyorgy Kepes: Undreaming the Bauhaus* (Cambridge, MA: MIT Press, 2019).

curriculum designs, but perhaps most importantly, his theory of visual design defined in his 1944 text, *Language of Vision,* gave the Eameses' the terminology to describe their own. Charles and Ray Eames had close personal and working relationships with many other midcentury creatives, situating themselves within a network of individuals who employed a similar strategy of worked on large-scale commissions and public educational initiatives in line with private, corporate, and government interests—often geared to scientific and technological innovation—to address those of importance to broader society and the advancement of humanistic values. Often the Eameses would combine webs of corporate and government sponsorship, interpersonal working relationships, and collaborative efforts with educators and institutions into related projects, a method laid out in the *What is Design?* diagram (Figure 0.1). This allowed the Eames Office to serve the specific needs and interests of each party involved while also solving larger, systematic problems that built on information gleaned and lessons learned from previous explorations. The civic function of their work continued to be its driving force as they responded to aesthetic concerns, technological change, and social reform during the Cold War. However, societal problems always overlapped with the private interests of the Eameses' and their clients, therefore, the myriad functions and repercussions of their work must be understood in close association with one another.

The Eameses' relationship to this period can be understood through the ways in which they associated with large corporations, governments, museums,

universities, and other powerful institutions, appropriating their tools and resources to transform social discourses. They operated within established power structures, and another diagram created for the 1969 *What is Design?* exhibition positions the Eameses within a network of Cold War institutional forces (Figure 0.10). Although the first diagram went through a number of drafts and iterations until Charles accurately represented the overlapping interests of the Eames Office, their clients, and society, the second one exists only as a poor quality photocopy of a pencil sketch, located in an obscure folder separated from the other exhibition material; only a handwritten notation in the lower righthand corner indicates its original function.[27]

Within a complicated, unbalanced web diagram comprised of harshly rendered circles connected by irregular vectors, Charles identifies the Eameses' predominate collaborators at that point in time. Charles situated individuals including Eliel "El" Saarinen, Eero Saarinen, Alexander "Sandro" Girard, and George Nelson within one degree of separation along with two major corporate partners, IBM and Herman Miller, forming a tight hexagon to emphasize the importance of these influences and partnerships within their creative output. Radiating out from the diagram's core a number of corporations, organizations, government agencies, and universities show the breadth and diversity of the Eameses' projects that united various institutional interests. By 1969, the Eames Office had completed multimedia projects for the Department of the Interior and

[27] See Part II, box 229, folder 2: "Notes and Diagrams," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

the State Department, aligning the Eameses with the goals of the federal government; served on various advisory boards at MIT (represented by Cambridge in the diagram); designed interdisciplinary exhibitions for Herman Miller, IBM, the Museum of Modern Art, and the Smithsonian Institution; developed educational television programing with CBS and the Westinghouse Electric Corporation; utilized funding from the Ford Foundation to create multiple pedagogical projects with Prime Minister Jawaharlal Nehru and the government of India; utilized theories and concepts developed by researchers at the RAND Corporation to guide their systematic, yet humanistic approach to information exchange (most importantly doctrines of nuclear deterrence based on game theory); along with a series of other projects and partners both within and outside of the diagrammatic representation.[28] A complex network of lines articulates the various relationships between the Eames Office and their collaborators, giving visual form to the ways in which they combined the resources and ideas from multiple locations to support their intellectual interests and progressive ideologies.

While the Eameses built their design practice on these connections, they maintained an extraordinary amount of control over their projects. In a 1961 interview with Charles for IBM's *Think* magazine, James B. O'Connell observed the nondescript appearance of the Eames Office location at 901 Washington

[28] *Eames Design* includes most of these projects, however, the Eames Papers in the Library of Congress provide a comprehensive source of the depths of the Eameses' connections to various corporations, universities, governments, and museums.

Boulevard in Venice, California, writing, “There is no sign or nameplate on the front, only the street number. The building’s anonymity is deliberate. Eames likes to protect his privacy from those who might take to dropping in.” Charles added “It is not entirely an accident that all our clients are east of the Mississippi.”[29] In this context, the Eameses formulated a new type of designer that was not fully compromised by or complicit with the corporate, scientific, and political goals of many of their patrons.

In exploring the Eameses’ role within these institutional structures and interdisciplinary collaborations, I argue that they operated within the scientific, institutional, and corporate establishments rather than against them, reinforcing the phenomenon that Marshall McLuhan observed in his book *Understanding Media,* “the artist tends now to move from the ivory tower to the control tower of society.”[30] As with the Eameses’ first diagram for the *What is Design?* exhibition, McLuhan places the artist within the center of social institutions, where they can observe “technological challenge decades before its transforming impact occurs,” and, in response, construct “models… for facing the change that is at hand.”[31] This approach characterizes the impetus behind the Eameses’ design projects, where they took on the role of helping prepare society for the increasingly deleterious effects of scientific and technological change by drawing on values of

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[29] James B. O’Connell, “A Visit with Charles Eames,” *Think* (April 1961), 7-9.
[30] Marshall McLuhan, *Understanding Media: The Extensions of Man* (Cambridge, MA: MIT Press, 1964), 65. John Blakinger suggests that McLuhan was describing Kepes as an artist “in the control tower,” but this phenomenon marked the careers of many technocratic artists during the Cold War.
[31] Marshall McLuhan, *Understanding Media*, 65

the past to help manage a transition into the future. In this dissertation, I reveal the possibilities and potentials of the Eameses' strategy, but also its challenges. I focus on the subtle and subversive ways in which the Eameses asserted the value of creativity and play against institutional control, but I do not ignore the reactionary politics inherent in their attempts to unite powerful, often polarizing institutional forces for the good of humanity.

Interdisciplinary Relationships

To complete ambitious projects and to clearly communicate complex ideas to a range of people, the Eameses worked with a broad range of talent, proposing coherent and relevant solutions to the many of the defining problems of the period. The Eameses maintained close relationships with designers, artists, scientists, and educators, all of whom had intersecting goals and objectives and were navigating the same technocratic terrain. The method of interdisciplinary collaboration for the development of complex projects implied the enhancement of quality, and the Eameses' believed that synchronizing individual efforts could raise the integrated work to higher potentials than what could be created by an individual in isolation—essentially applying Gestalt theories to their way of working. Charles and Ray had both encountered this approach at Cranbrook, where Eliel Saarinen and other instructors encouraged intellectual inquiry and exchange, prioritizing interdisciplinary workshop production for the mutual stimulation of teachers and students. This organizational structure

characterized many design schools that sought to instill a sense of community responsibility in their students.[32] The Eameses were inspired by the ideas and working strategies at the Bauhaus and other European design institutions that emphasized democratic involvement and responsibility, along with the many progressive pedagogical techniques and approaches developed during the mid-twentieth century. Many different individuals filtered in and out of the Eameses' catalog and each brought with them experience and expertise that influenced the ultimate design.

Upon arriving in California in 1941, Charles and Ray immediately began forging relationships with key figures in the area. The Eameses became close with John Entenza and consistently contributed to his magazine, *Arts & Architecture,* building both their home and Entenza's in the context of the magazine's Case Study House Program. Collaborating with George Nelson and Alexander Girard on furniture and showroom designs for Herman Miller, the Eameses also joined forces with these men to create course curriculum for art departments at several universities. For many of their films, the Eameses discussed ideas with their close friend, filmmaker Billy Wilder and commissioned composer Elmer Bernstein to create various soundtracks. In their work for IBM, the Eameses collaborated with scientists, mathematicians, and engineers to understand the methods and theories within each field, working with individuals

[32] For example, Black Mountain College in North Carolina where the Eameses close friends, Josef and Anni Albers taught, and the New Bauhaus, founded by Lazlo Moholy-Nagy after he immigrated to the United States from Germany. See Eva Díaz, *The Experimenters: Chance and Design at Black Mountain College* (Chicago: University of Chicago Press, 2015).

including Owen Gingerich, a Professor of Astronomy and the History of Science at Harvard University and astronomer for the Smithsonian Astrophysical Observatory; I. Bernard Cohen, a History of Science professor at Harvard University; Philip Morrison, a Professor of Physics at MIT known for his work on the Manhattan Project; Edward A. Ackerman, a geographer and administrator at the Carnegie Institution, who served as an authority for advisor to the federal government on the management of water resources and environmental systems; Jerome Wiesner, professor of electrical engineering and eventual president of MIT; and mathematician Raymond Redheffer, who taught at UCLA and developed electronic games and short films for the Eameses' mathematics exhibition. The Eameses' active participation in exhibition and interdisciplinary conferences expanded the Eameses' web of connections infinitely further, with their correspondence files holding letters from designers, artists, intellectuals, scientists, mathematicians, museum professionals, all too numerous to list.

The larger methodological ambition of this study is to shift away from a singular look at the Eameses' as isolated innovators to one that acknowledges the many different ways they interacted with other designers and worked within a larger institutionalized system. Above all, this dissertation aims to use the Eameses as an intellectual and creative model for interpreting the aesthetics of visual design during the Cold War—and I use the term "aesthetics" not to discuss the mid-century modern furniture style for which the Eameses are known, but a broad worldview crucial to understanding the era. Scholars often discuss the

Cold War as a series of containment strategies and nuclear stand-offs fueled by the indifferent, cold, and technocratic visions of scientific progress, however, several recent studies have countered this narrative, emphasizing period's openness to explosive creativity and scientific imagination, and this study participates in this dialogue.[33] New technological frontiers fascinated experts and corporate investors, but held the attention of the American public as the Machine Age gave way, in rapid succession, to the Atomic Age, the Space Age, and the Computer Age. The Eameses worked to counter organizational structures that cast science and technology as completely rational, underestimating the intrigue and unifying potential of advanced methods such as game theory, information theory, systems theory, and cybernetics. To the Eameses and their myriad colleagues, these fields offered new ways of seeing and thinking in line with the cutting-edge research carried out by innovative minds at universities, corporations, government agencies, and other institutions. Collaborating with artists, designers, educators, scholars, corporations, and institutions, I suggest that the Eameses developed strategies that employed objects and images to

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[33] See studies by scholars such as Fred Turner, whose *The Democratic Surround: Multimedia and American Liberalism from World War II to the Psychadelic Sixties* (Chicago: University of Chicago Press, 2013), Jamie Cohen-Cole's *The Open Mind: Cold War Politics and the Sciences of Human Nature* (Chicago: University of Chicago Press, 2014), and Orit Halpern, *Beautiful Data: A History of Vision and Reason since 1945* (Durham, NC: Duke University Press, 2014), that emphasize the broad-mindedness of the period. See also John Jay Curly's discussion of "Cold War visuality" in his study, *A Conspiracy of Images: Andy Warhol, Gerhard Richter, and the Art of the Cold War* (New Haven: Yale University Press, 2013). See Serge Guilbaut's *How New York Stole the Idea of Modern Art: Abstract Expressionism, Freedom, and the Cold War,* trans. Arthur Goldhammer (Chicago: University of Chicago Press, 1983); Greg Barnhisel, *Cold War Modernists: Art, Literature, and American Cultural Diplomacy* (New York: Columbia University Press, 2015); and David Crowley and Jane Pavitt, et al. *Cold War Modern: Design 1945-1970* (London: V&A Publishing, 2008).

unite academic disciplines; underline the importance of visual literacy as new media developed at an accelerated rate; and explore relationships between art, science, and technology.

State of the Field

This dissertation participates in a dialogue with a large body of important biographical and textual accounts of the Eameses' lives and work. These studies, which have firmly situated the Eameses' within the context of midcentury modern design in the United States, have served as invaluable resources as I traced the Eameses' connections with various individuals and institutions. After working closely with Ray Eames, for example, John and Marilyn Neuhart published *Eames Design* in 1989, offering a nearly comprehensive catalog of the Eameses' interdisciplinary design work and Eames Demetrios, the Eameses' grandson, has organized images, important quotations, and scholarly analysis in his books *An Eames Primer, Eames: Beautiful Details, 100 Quotes, Ray Eames: Changing Her Palette,* and *Essential Eames: Words and Pictures.*[34] The first monographic study of the Eameses, by art historian Pat Kirkham, provides a thorough survey of the

[34] While Kirkham credits John and Marilyn Neuhart for verifying some factual information, she and other scholars and Eames Office affiliates have questioned the accuracy of several key points and recollections made by the Neuharts. *Eames Design,* is generally considered credible, but the Neuharts published a subsequent book, which takes historical liberties and is heavily influenced by personal bias. See John Neuhart and Marilyn Neuhart, *Eames Design* (New York: Harry N. Abrams, 1989) and John Neuhart and Marilyn Neuhart, *The Story of Eames Furniture* (Berlin, Germany: Gestalten, 2010); Eames Demetrios is the director of the Eames Office, Chairman of the Board of the Eames Foundation, and has authored several books related to the Eameses' work. See Eames Demetrios, *An Eames Primer* (New York: Universe Publishing, 2002); Eames Demetrios, *Eames: Beautiful Details* (Pasadena: AMMO Books, 2012); and Eames Demetrios, *Essential Eames: Words and Pictures* (Weil am Rhein, Germany: Vitra Design Museum, 2017).

Eameses' creative output and resituated Ray as a crucial element of the couple's success.[35] Kirkham writes extensively about the Eameses' relationship, their work in "humanizing modernism," within their home and furniture designs, and traces stylistic influences to various European avant-garde movements. In 2016, curator Catherine Ince and the Barbicon Gallery organized the largest retrospective of the Eameses' work since their death, producing an accompanying catalogue with essays by leading Eames scholars and Daniel Ostroff, a filmmaker and Eames Office affiliate, edited *An Eames Anthology,* which makes accessible a number of Eames lectures, presentations, and correspondence.[36] More recently, studies by Eric Schuldenfrei and Justus Nieland locate Charles and Ray within the context of avant-garde cinema and film theory during the Cold War, with an especially close reading of the Eameses' many "idea" films, multi-screen presentations, and educational materials. These studies have provided key insights into the Eameses' place within the history of new media and communication in the United States. My study grounds the Eameses work within a broader intellectual history, and in contrast to previous approaches, my work underlines the cross-media exchange that is foundational

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[35] Kirkham's book provides key insight into the Eameses' careers and work, discussing their aesthetic and use of objects as "functional design," and tracing important influences for the Eameses' work within the history of modern design and art. Pat Kirkham, *Charles and Ray Eames: Designers of the Twentieth Century* (Cambridge, MA: MIT Press, 1998).

[36] This exhibition is by far the most comprehensive ever exhibited, and the catalogue compiles essays from leading Eames scholars and Eames Office staffers along with high quality visuals. I visited the exhibition during its time at the Henry Ford Museum in 2018, which displayed many artworks and artifacts together for the first time. See Catherine Ince, et al., *The World of Charles and Ray Eames* (New York: Rizzoli, 2016); Daniel Ostroff, et al. *An Eames Anthology: Articles, Film Scripts, Interviews, Letters, Notes, and Speeches* (New Haven: Yale University Press, 2015).

to the Eameses' working method as well as their efforts to reform education and broader social structures.[37]

The work of Charles and Ray Eames has also been at the center of cross-disciplinary scholarship interested in mid-century American design within a national and global framework. In his book, *The Interface: IBM and the Transformation of Corporate Design, 1945-1976,* architectural historian John Harwood discusses the Eameses' role within Eliot Noyes's expansive design program and Gordon Bruce investigates the Eameses' as one of many important "linkages" Noyes maintained throughout his entire career.[38] Wendy Kaplan, Elizabeth Armstrong, and scholarship completed in coordination with the Pacific Standard Time initiative at the Getty Center position the Eameses' influence within the realm of California design and have explored the cultural impact Los Angeles artists had during the postwar years.[39] In October 2011, Jeannine Falino compiled a series of essays in the exhibition catalogue, *Crafting Modernism: Midcentury American Art and Design,* where various scholars situate the Eameses' within a new generation of craftspeople whose work dismantled

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[37] Studies by Schuldenfrei and Nieland are important in opening the door to studies outside of the Eameses' furniture production, focusing on film and new media, broadly conceived. See Eric Schuldenfrei, *The Films of Charles and Ray Eames: A Universal Sense of Expectation* (New York: Routledge, 2015); Justus Nieland, *Happiness by Design: Modernism and Media in the Eames Era* (Minneapolis: University of Minnesota Press, 2020).

[38] John Harwood, *The Interface: IBM and the Transformation of Corporate Design, 1945-1976* (Minneapolis: University of Minnesota Press, 2011); Gordon Bruce, *Eliot Noyes* (New York: Phaidon Press, 2007).

[39] Wendy Kaplan, et al. *California Design, 1930-1965: Living in a Modern Way* (Los Angeles County Museum of Art, 2011); Wendy Kaplan, et. al., *Found in Translation: Design in California and Mexico, 1915-1985* (New York: Prestel, 2017); Elizabeth Armstrong, et al. *Birth of the Cool: California Art, Design, and Culture at Midcentury* (Los Angeles: Prestel Publishing, 2007); Esther McCoy, *Modern California Houses: Case Study Houses, 1945-1962* (New York: Reinhold Publishing Corporation, 1962).

distinctions between the fields of art, craft, and design through artistic innovation in various media.[40] In his book, *Cold War on the Home Front: The Soft Power of Midcentury Design,* Greg Castillo discusses the Eameses' multi-screen film, *Glimpses of the U.S.A,* as part of an effort to promote the superiority of American capitalism to Soviet audiences during a series of cultural exchanges.[41] Castillo's work significantly contributed to a perspective of midcentury modernist style as an propaganda agent during the Cold War, revealing the political agenda behind designs produced by the Eameses' and many of their colleagues. Expanding the geographical and temporal focus of these studies to focus on the Eameses' work with multinational corporations, the federal government, and multiple universities and museums, I situate Charles and Ray Eames within a wider movement of media experimentation, theorization of vision, and interdisciplinary education initiatives that defy standard historiographies of design. While their furniture designs and work with Herman Miller have been heavily researched and featured in a number of important scholarly projects that variously trace influences to previous modern design movements, this study examines how the Eameses' universalizing intellectual project engaged with key ideological debates occurring in American institutions during the Cold War. Mid-century designers, architects, and artists including leading figures such as Alexander Girard, György Kepes, George Nelson, and Eero Saarinen worked with the Eameses to produce all-

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[40] Jeannine Falino, et al. *Crafting Modernism: Midcentury American Art and Design* (New York: Harry N. Abrams, 2011).
[41] Greg Castillo, *Cold War on the Home Front: The Soft Power of Midcentury Design* (Minneapolis: University of Minnesota Press, 2010).

encompassing solutions to society's problems by working with American corporations, universities, and museums, and although these figures have been focused on within recent scholarship, the full extent of the Eameses' participation in this milieu has yet to be explored.[42]

Drawing upon recent studies of exhibition design produced by Alan Wallach, Carol Duncan, Mary Anne Staniszewski, Jennifer Marshall, and various art historians that contributed to the Fall 2014 *October* issue, where scholars including Benjamin Buchloh, Kristie La, and Kevin Lotery discuss modern aesthetics in artist-designed exhibitions.[43] I explore how and why the Eameses advocated for the importance of object display, visual literacy, and collaboration. Focusing on the temporal connections and translations between various forms of

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[42] A number of monographs that discuss individual designers and their relationship to the Eames Office and other designers have been published in the last decade. For example, Todd Oldham and Kiera Coffee published an extensive monograph, *Alexander Girard* (Los Angeles, CA: AMMO, 2011) that covered the multifaceted character of Girard's and examined his collection of folk art, textiles, toys, and objects that mirrored many characteristics of the Eameses' collection of objects and in 2016, the exhibition and accompanying catalogue, *Alexander Girard: A Designer's Universe* (Weil am Rhein, Germany: Vitra Design Museum, 2016) provided the most comprehensive study and series of scholarly essays covering the designer's career. Last year, John Blakinger published, *Gyorgy Kepes: Undreaming the Bauhaus* (Cambridge, MA: MIT Press, 2019), the first book-length study of the artist, arguing that Kepes's pioneering interdisciplinary collaboration between the arts, sciences, and military-industrial complex established a new paradigm of creativity and aesthetics: the artist as technocrat. Blakinger's study explores the complicated and politically charged atmosphere in which artists worked during the Cold War, and his interdisciplinary approach influenced this study's perspective on the Eameses' careers. In *George Nelson: The Design of Modern Design* (Cambridge, MA: MIT Press, 2000), Stanley Abercrombie provides an definitive monograph that uses extensive archival research to situate Nelson's design theory within the context of the Cold War.

[43] For important scholarship on exhibition design, see Alan Wallach, *Essays on the Art Museum in the United States* (Amherst, MA: University of Massachusetts Press, 1998); Carol Duncan, *Civilizing Rituals: Inside Public Art Museums* (New York: Routledge, 1995); Mary Anne Staniszewski, *The Power of Display: A History of Exhibition Installation s at the Museum of Modern Art* (Cambridge, MA: MIT Press, 2001); Jennifer Marshall, *Machine Art, 1934* (Chicago: University of Chicago Press, 2012); "Artists Design Exhibitions: A Special Issue," *October* no. 150 (Fall 2014).

media and design including exhibitions, films, and multi-media presentations, I argue that Charles and Ray Eames established visual and theoretical continuities between projects; collaborated with notable individuals and institutions to construct expansive multi-media learning spaces; and continually relied on the juxtaposition of imagery to promote intensive looking as a means of conveying larger ideas, creating a community of viewers, and developing active learners.

Structure

This dissertation does not attempt to provide a comprehensive account of the Eameses' entire artistic output. I dispense with the conventions of the survey monograph not only because this is the approach art historian Pat Kirkham employed in her book, *Charles and Ray Eames: Designers of the Twentieth Century,* which continues to serve as the foundational text for any study of the couple, but also because the Eameses were not conventional designers. They often gravitated toward alternative labels to describe themselves, at times maintaining reference to their original media categorization—Charles calling himself an "architect" and Ray a "painter"—while increasingly showing preference for the term "tradesmen" to articulate their approach and the breadth of their creative endeavors.[44] In a 1977 article titled, "On Reducing Discontinuity," in the *Bulletin of the American Academy of Arts and Sciences,* Charles stated:

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[44] Charles used these terms in several speeches to describe Ray and himself, and they were incorporated into *An Eames Celebration.* For Charles's explanation of his professional affiliations, see Owen Gingerich, "A Conversation with Charles Eames," in *American Scholar* 46, no. 3 (1977), 326-337, 331.

> In practice, we think of ourselves as tradesmen – it's a kind of custom trade; people come to us for things. The products, for the most part, are models, in one sense or another… The model is something you build in order to communicate about a structure that interests you. If there was a particular training that prepared us for this trade, it was the training and the concerns of architecture.[45]

The Eameses cared less about design as expressive form and more about the systems it occupied—from aesthetic structures within a single photograph to the networks of relationships between individuals and institutions in wide-ranging, far-reaching environments. This study focuses on the role and purpose of the designer as the generator of such systems, reconstructing the Eameses' expansive interdisciplinary world and cross-media exchange through the close analysis of archival material including research files, lecture notes, reports, proposals, bibliographies, manuscripts, correspondence, and photographs. It embraces the archive as the driving force behind the course of analysis because, after all, the systems the Charles and Ray Eames created did not take the form of proper works of art or widely published theories. They exist only in the archive, in a series of related projects and creative activities that avoid that avoid easy disciplinary and media characterization.[46] In making sense of these materials, I

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[45] Charles Eames, "On Reducing Discontinuity," *Bulletin of the American Academy of Arts and Sciences*, 30, no. 6 (March 1977): 24, https://doi.org/10.2307/3823119

[46] Ray Eames gifted the Charles and Ray Eames papers to the Library of Congress after her death in 1988, which was divided between the Manuscript Division and the Prints, Photographs Division, with a few items in the Recorded Sound Research Center. Together, these collections hold nearly 750,000 catalogued items with hundreds of undocumented photographs. In my research for this project, I also consulted archival material from the Eames Office and their many collaborators within the collections of the Archives of American Art, the National Archives, the Smithsonian Institution Archives, the Cooper-Hewitt Archives, and the UCLA University Archives. Moreover, I conducted site visits to the Eames House and the former Los Angeles Herman Miller Showroom, attended multiple exhibitions to study Eames objects firsthand, and continued to build

use the Eameses' own methods of locating visual and theoretical connections between networks of images and ideas to provide a focused social and intellectual history of their creative output. Each of their projects is but one element within a broad, interrelated body of pedagogical production and the Eameses are but one aspect within a wider web of institutional power and collaboration.

I therefore focus on selected, roughly chronological episodes from the Eameses' careers after their arrival in Los Angeles in 1941. Chapter 1, "Visual Design in the Eames House," begins this narrative by first reconsidering the Eames House (1949) and the ways in which the Eameses conceived of objects within that space. It presents a study of the Eameses' participation within *Arts & Architecture*'s renowned Case Study House Program, analyzing how the Eameses capitalized on highly public campaigns for postwar housing and consumer products to establish connections between industry and life, and to collaborate with various architects, designers, and theorists to create a new aesthetic concept for post-war living. The Eames House served as an initial model for creating immersive spaces and enticing visuals through strategic object display, and the Eameses utilized this approach within later exhibitions to refine methods of structuring information, to promote quality design, and to establish effect visual communication strategies.

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on existing documentation by interviewing several Eames collaborators and former Eames Office staff members.

Chapter Two, “Visual Pedagogy and the Design of Higher Education” examines how the Eameses established institutional partnerships to advance their educational initiatives, giving viewers the tools to distinguish meaningful patterns through the repetition of images and information in various media. I argue that the Eameses were part of a national attempt to synthesize various branches of art, science, and technology as well as close the gap between innovators and consumers through the use of cross media systems-thinking. Utilizing photomontages, multi-screen slide projects, and “idea” films, and in their role on educational advisory boards for various universities, the Eameses and their colleagues sought to expand notions of art and make information accessible to different audiences. This chapter looks at the Eameses’ joint efforts with designers, artists, scientists, and educators such as George Nelson, Alexander Girard, and György Kepes to integrate visual design and progressive pedagogical approaches within their work for institutions including the University of Georgia, UCLA, Berkeley, and MIT, situating them within a wider movement of media experimentation, theorization of vision, and interdisciplinary educational initiatives.

While previous chapters looked at collaborations with educational institutions and individuals, **Chapter Three** focuses on the Eameses’ work with corporations, particularly IBM. Within its corporate design program, the Eameses created all of the exhibition material, films, graphic displays, and signage for the IBM Corporate Pavilion at the New York World’s Fair, along with a series of

educational exhibitions for that connected IBM to a history of scientific discovery and exploration. This collaboration not only served as positive publicity for IBM, but also allowed Charles and Ray to experiment with the latest advances in technology, work out educational problems within set parameters, and reach large audiences that would have otherwise been unavailable to them. By incorporating multiple media and creating interactive educational activities, the Eameses sought to underscore the importance of visual imagery and play within effective learning spaces.

In the **Epilogue**, I consider *The World of Franklin & Jefferson*, an exhibition designed to celebrate the Bicentennial of the American Revolution. While the exhibition was positively received in Europe, its display in art museums throughout the United States was met with mixed reviews. As the last project completed before Charles' death in 1978, the reception of *The World of Franklin & Jefferson* suggests that the Eameses' modernist credentials and their experimental visual pedagogy were no longer viewed as part and parcel of one another. By focusing on this exhibition, I reveal the challenges of the Eameses' interdisciplinary efforts and their attempts to change institutional systems of knowledge.

I seek to interpret the Eameses in their own terms, through their own writings, speeches, exhibitions, notes, and photographs, as a project different, but deeply connected to other artists of the period. This dissertation explores how the Eameses utilized interdisciplinary ways of thinking as a means of revealing

and mending the fractures caused by the politics of the Cold War. This project focuses on their method and the myriad confrontations between art, industry, science, and technology and investigates the impact of the Eameses' ideas along with the challenges of their implementation in the various institutions and the problems of their universalizing perspectives. It uses the Eameses to center the web of interdisciplinary experimentation during the development of the contemporary visual culture and new media—with the ultimate aim of recovering the continued significance and expansiveness of the Eameses' role in the Cold War ethos of visual design.

CHAPTER ONE

The Eames House and Visual Design

Depicting the Eames House

In 1958, noted architectural photographer, Julius Shulman, captured a now-iconic image of Charles and Ray Eames sitting casually on small stools on the floor of their living room.[47] Around them, a number of objects and artifacts the Eameses collected all compete for attention within the frame: Hopi kachina dolls, seashells, craft objects, silk textiles from Nepal and Thailand, and elaborately patterned rugs from Mexico, various chairs the Eameses designed and sold through Herman Miller (Figure 1.1). In recent years, this photograph has been the center of art historical consideration on the Eameses, as numerous scholars

[47] Shulman's images were first printed in *Architectural Forum* (July 19, 1958), and are preserved in the Julius Shulman Photography Archive at the Getty Research Institute.

describe and analyze the organization of objects within their home, coming to wide-ranging conclusions about significance. Beatriz Colomina attributed the "kaleidoscopic excess of objects" to Ray, who others descried bas a "sublime pack rat," saving and collecting a number of seemingly insignificant objects and items, importantly acknowledging Ray's contribution to the couple's design aesthetic while also relegating her to traditional feminine roles.[48] Most notably, Pat Kirkham, described the Eameses style as "humane modernism," linking the couple's unorthodox collecting practices to the substantial influence of the American Arts and Crafts movement. According to Kirkham, the Eameses viewed the carefully composed arrangements of objects in their living room as "functioning decoration," a concept which deliberately sought to overcome the rejection of decoration within concepts of modern minimalistic designs.[49] Recently, in 2011 Saloni Mathur again analyzed the objects in the living room within the photograph, but this time as a product of postcolonial cultural appropriation, understanding how the Eameses' organization of objects from different temporal and spatial locations undercut their cultural significance.[50]

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[48] See Beatriz Colomina, "Reflections on the Eames House," and Joseph Giovannini, "The Office of Charles Eames and Ray Kaiser: The Material Trail," in *The Work of Charles and Ray Eames: A Legacy of Invention,* ed. Donald Albrecht (New York: Harry Abrams, 1997), 144-145.
[49] Pat Kirkham first discusses the Eames House her article, "Humanizing Modernism: The Crafts, 'Functioning Decoration,' and the Eameses," *Journal of Design History* 11, no. 1 (1998): 25; later Kirkham included an analysis of the Eameses' use of objects within the decoration of their home in Kirkham, "Objects and 'Functioning Decoration,'" in *Charles and Ray Eames,* 143-199. Kirkham builds on concepts of "extra-cultural surprise" and "functioning decoration," both phrases first used to describe the Eameses' aesthetic in Peter Smithson, "Just a Few Chairs and a House: An Essay on the Eames-aesthetic," Architectural Design 36 (September 1966): 443-446.
[50] In her article on the Eameses' use of objects in their home, Mathur critiques their utopian outlook and situates them within a larger postcolonial context that used modern aesthetics to influence the cultural production of design. See Saloni Mathur, "Charles and Ray Eames in India,"*Art Journal,* vol. 70 (May 29, 2011): 34-53.

While these projects all analyzed essential elements of the Eameses' design philosophy, this project seeks to view the Eameses' designs within the postwar period from which they developed, where objects were transformed by the conceptual rigor of cybernetics, semiotics, and structuralism. Design was increasingly understood as communication, and from a semiotic vantage, the object held value beyond its use and functionalist capacity to transmit a message.

This chapter reexamines the Eames House to establish continuity between the Eameses' early modern architecture designs and their later explorations with exhibition design, new media and visual pedagogy. By analyzing the ways in which the Eameses' designed their home with a consideration of scale and spatial awareness; discussed it within archival notes, scripts, and speeches; and visualized it throughout photography and film, I illustrate the ways the Eameses' communicated knowledge and democratic ideology through objects, images, and their juxtaposition. Each project the Eameses' completed during their collaborative careers furthered their commitment to enacting social change by giving people the tools they needed to become producers of knowledge with the ability to disseminate ideas to disparate audiences. To do so, the Charles and Ray Eames remained transparent about their process, illustrating how principles of design could be applied across media, disciplines, institutions, and societies.

The Context of the Case Study House Program

The Eames House was built as part of the Case Study House Program, a postwar experiment to develop high quality homes and new modes of modern living that was publicized in *Arts & Architecture* and organized by the magazine's editor, John Entenza. Entenza and architects participating in the program anticipated a housing shortage following the end of World War II, a projection reinforced by the rapidly growing population recorded in California between 1940 and 1960.[51] In the 1940 Federal Population Census, the state reported approximately 6.9 million inhabitants, which expanded to 10.6 million in 1950 and nearly 16 million by 1960.[52] California experienced unprecedented military, technological, and industrial growth, constituting nearly ten percent of all federal government expenditures during the war, which not only furthered a cooperative interdependence between the federal government and the state, but served as a major draw to migrants in search of access to well-paying jobs and reliable health care. Specifically, Los Angeles' economy was bolstered by defense contracts, propelling it to a leader in aircraft and ship production, among other industries. After the war, government agencies, private corporations, educational institutions, as well as architects and designers all discussed solutions for the incipient housing shortage through the use of materials and production

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[51] John Entenza, "Announcement: The Case Study House Program," *Arts & Architecture* (December 1946), 19. See Smith, et al., *Blueprints for Modern Living: History and Legacy of the Case Study Houses*, exhibition catalog (Los Angeles: Museum of Contemporary Art; Cambridge, Mass.: MIT Press, 1989), 96.

[52] U.S. Census Bureau, *Population of the 100 Largest Cities and Other Urban Places in the United States: 179 to* 1990 (Washington, D.C.: 1998), https://www.census.gov/library/working-papers/1998/demo/POP-twps0027.html

techniques developed during the war.[53] This milieu of production created a situation in which architects, designers, and artists could readily experiment with new technologies and materials for various applications, both industrial and domestic.

After relocating to Los Angeles in 1941, the Eameses built on ideas developed with Eero Saarinen for the *Organic Design in Home Furnishings* exhibition at the Museum of Modern Art, seeking to identify methods for mass-producing molded plywood furniture with compound curves. As industrial activity continued to shift towards the war, the Eameses refocused molded plywood experiments to create a leg splint and develop prototypes for arm splints, airplane stabilizer tails, pilot seats, along with other military equipment.[54] This approach—working on large-scale commissions in line with private interests—was one that characterized the Eameses' design strategy throughout their careers. The civic function of their work continued to be its driving force as they responded to aesthetic concerns, technological change, and social reform during the Cold War.[55] The Eameses' participation within the Case Study House

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[53] Wendy Kaplan, "Introduction," in *California Design 1930-1965: "Living in a Modern Way,"* exhibition catalogue, ed. Wendy Kaplan (Los Angeles: Los Angeles County Museum of Art; Cambridge, Mass.: MIT Press, 2011), 42-44. See also Andrew M. Shanken, *194X: Architecture, Planning, and Consumer Culture on the American Home Front* (Minneapolis: University of Minnesota Press, 2009); Dana Cuff, "Domestic Speculation: Architects and Builders in Postwar Los Angeles," in *Overdrive: L.A. Constructs the Future, 1940-1990,* exhibition catalogue, eds. Wim de Wit and Christopher James Alexander (Los Angeles: Getty Research Institute, 2013), 137-47.

[54] See a list of the Eameses' plywood experiments in Neuhart and Neuhart, *Eames Design*. See also Nieland's recent conversation about furniture production in the first chapter of his book, "Happy Furniture," in *Happiness by Design* (Minneapolis: University of Minnesota Press, 2020).

[55] Charles Eames drew a series of webs and diagrams discussed in the introduction that articulated the relationships. These diagrams included the corporations, governments,

Program was no exception. While Charles and Ray, along with the other architects participating in the program, sought to develop models for what they hoped and believed postwar American could look like, the result was highly personal in form, meeting the specific needs of personal and professional partners. The Eames House hardly serving as a replicable model, rather, as with their molded plywood experiments, it represented the adaption of technical innovations and industrial developments within a domestic context. The Eameses established a structural precedent and aesthetic for the future, providing a concrete example of how new methods could be applied to meet their specific needs.

When the Case Study House Program was announced in the January 1945 issue of *Arts & Architecture*, it included seven architects tasked with designing eight houses (Figure 1.2). The pioneering group of men consisted of the prominent European immigrants such as J.R. Davison and Richard Neutra, along with Whitney Smith, Sumner Spaulding, Eero Saarinen, William Wurster, Ralph Rapson, and Charles Eames, all of whom had recently moved to Los Angeles to take advantage of the opportunities available through government and private contracts and to work within established interpersonal networks.[56] In the program announcement, Entenza defined its parameters:

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universities, and individuals that the Eameses worked with at different times and for different purposes.

[56] The story unfolds along the lines of interpersonal networks—the people, relationships, and ideas that influenced and characterized the region's artistic production—as well as the undulations of an art world in formation. See: Bobbye Tigerman, "Fusing Old and New: Emigré Designers in California," in Kaplan, *California Design,* 91-115.

> [Each] house must be capable of duplication and in no sense be an individual 'performance'… It is important that the best material available be used in the best possible way in order to arrive at a 'good' solution of each problem, which in the overall program will be general enough to be of practical assistance to the average American in search of a home in which he can afford to live.[57]

Entenza's use of instrumentalist vocabulary, where a problem is defined and considered within set parameters, reflects that of the Eameses and utopian philosophies put forth by the Bauhaus and other European avant-gardes. The Eameses' connection to these modernist schools was by proxy, through correspondence and collaboration with European immigrants and their American successors.[58] Despite their professional and intellectual proximity to these schools, the Eameses and other designers in their generation departed from many of their mentors' concerns in significant ways. Relationships with various individuals grew and sometimes diminished, leading to changes in collaborative networks.[59] More importantly, the Eameses, along with other American architects, designers, and artists, applied interdisciplinary approaches within the fraught environment of the Cold War—a period dominated by science, industry, and technology—in ways that differentiated from concerns of the interwar and

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[57]. See John Entenza, "Announcement: The Case Study House Program," *Arts & Architecture* 58 (1945), 38.

[58] In a draft for the *Discovery* Television Program developed for the San Francisco Museum of Art, Charles referenced Mies van der Rohe, Aalto, Breuer, and Thornet as influences for their approach to plywood and industrial materials. See Part II, Box 190, Folder 8, "Drafts of the Discover Television Program with Notes by Charles," Eames Papers.

[59] The list of Eames collaborators, friends, and professional contacts is extensive and shifted throughout their long careers. These relationships will be discussed in connection with specific projects and correspondence rather than exhaustively detailed in one place. This process is also defined in the Eameses' diagram used in the 1969 exhibition, *Qu'est-ce Que Le Design?* (see introduction).

Second World War in Europe. The rhetoric of holistic integration between disciplines and the practical applications of design took on highly charged, political meanings. Moreover, architects and designers in the Case Study House Program had different questions and problems they sought to solve in the context of postwar economic growth.

Case Study House Program in Popular Media

Between 1945 and 1966, *Arts & Architecture* featured thirty-four designs by twenty-seven architects and by the time the program concluded, twenty-four single family homes had been built. Although it was limited in scope and did little to find solutions for the postwar housing crisis, the program has been lauded critical and popular success by scholars, critics, and mid-century modern enthusiasts, influencing architecture and industrial design internationally for decades to come. The impact of the program was due partially to the involvement of reputable architects, however, it can also be traced to *Arts & Architecture*'s concerted publicity campaign as well as media coverage that stretched beyond the pages of the magazine.

A number of strategies became instrumental in promoting the Case Study House Program. *Arts & Architecture* published blueprints, architect statements, construction updates, and cost estimates, as well as photographic essays emphasizing how each house solved a particular design problem. The magazine hosted highly-publicized open houses, where a reported 368,554 people visited

the six case studies completed during the first three years of the program.[60] This approach drew on a long history established in the 19th century, where architects employed periodicals and demonstration dwellings as a means of not only promoting materials used in their designs, but also in modeling social and architectural ideologies.[61]

Within the pages of *Arts & Architecture*, Entenza emphasized the affordability and the new ways of modernized living that these homes furnished. While the Eameses disclosed information on specific brands and cost of standardized off-the-shelf or prefabricated components, many elements were handcrafted to meet site specifications and were excluded from the listed expense approximations. Eames Office staff members rabbeted the edges of cemesto panels to would fit comfortably in the steel sash and customized window frames, door frames and tracks, the spiral staircase, and several built-in furnishings. If construction materials were unavailable in builder's catalogs, the Eameses handcrafted them.[62] These customization practices reinforced the

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[60] Esther McCoy included this number in an early overview of the program. All of the Case Study houses were open for six to eight weeks, however, *Arts & Architecture* only maintained attendance records for the first six houses. See Esther McCoy, *Case Study Houses: 1945-1962* (Los Angeles: Hennessey & Ingalls, 1977).

[61] Helen Searing writes, "an American synthesis of two hallowed means of transforming domestic architecture: the illustrated periodical and the demonstration dwelling. The Eames House Conservation Plan cites several examples where publicity and demonstration dwellings were used in America for "the sale of new building materials, household technologies, furnishings, and appliances," while in Europe, demonstration dwellings were "'more broadly social and architectural.'" Charles visited at least one European example, acquainting him with the strategy of using demonstration dwellings as "well-designed housing prototypes."

[62] Architectural drawings for the staircase, as well as a description of its construction in *Arts and Architecture* Entenza and Eames 1949, 35), support the contention that the Eames Office fabricated it within their workshop. Charles Eames, "Circular Staircase for Case Study House 1949," architectural drawings, July 20, 1949, Eames Office files. See also the recent study of the Eames House as part of a conservation partnership between the Eames Foundation and the

notion that the Case Study Houses were not literal models, where parts could be purchased and readily assembled to fit the needs of the average American family, but were instead examples of the potential that various materials held within domestic architecture. The concept behind the program was somewhat akin to Buckminster Fuller's exploration of dynamic solutions and multi-functional aesthetics in modern architecture and design similar to those put forth by European modernists, providing an example of what the future should look like. However, the Case Study House Project differentiated itself from Fuller's and utopian ideology in crucial ways, one being the emphasis on regional and site-specific design.[63]

In his essay, "Good Neighbors Make Glass Houses," architectural historian Keith Eggener calls attention to the emphasis designers and architectural critics placed on the regional inflections present within the Case Study Houses as they noted the "adaptions to local culture, climate, and geography, and… references to earlier local architects."[64] As Eggener observes, architects in the program loosely defined regionalism as applied to modern architecture, characterizing it as an interdependence of building, place, and people that eroded dehumanizing and universalizing notions of the early

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Getty Conservation Institute. Sheridan Burke, et al. *Eames House Conservation Management Plan* (Los Angeles: The Getty Conservation Institute, 2019).

[63] For discussions of Fuller's modular designs, see Federico Neder, *Fuller Houses: R. Buckminster Fuller's Dymaxion Dwellings and Other Domestic Adventures* (Baden, Germany: 2008); R. Buckminster Fuller, *Buckminster Fuller: Starting with the Universe* (New York: Whitney Museum of American Art, in association with Yale University Press, 2008); and Lloyd Steven Sieden, *Buckminster Fuller's Universe* (New York: Perseus Books, 2000).

[64] See Eggener, "Good Neighbors Make Glass Houses," in *Found in Translation,* ed. Kaplan, 289.

European modernists. To Case Study architects, these buildings were not formulaic, but focused on interdependent relationships between a number of factors including materials, location, and patrons within a locale.[65] Los Angeles' industry, climate, and proximity to a number of cultural influences led to a distinctive synthesis of craft, art, and technology that was featured prominently within media coverage.

Apart from their presence in *Arts & Architecture,* the homes were also featured widely in regional, national and international publications with a range of readership. The Eames House, for example, was featured prominently in popular magazines such as *Life*, *House Beautiful*, *Look,* and *Vogue* as well as design and fine arts publications including *Interior*, *Industrial Design*, *Portfolio Magazine,* and *Domus.* In an April 1954 article featured in *Vogue,* the Eames House served as the backdrop for a fashion shoot of the latest warm-weather apparel while the accompanying text claimed two-building houses could offer a useful solution to emerging, non-traditional lifestyles—room for, but the necessary separation of work and leisure contained within one home. *Vogue* writers argued further that trends emerging in California were now spreading across the country, which not only illustrated the interest in regional characteristics and how they were disseminated widely, but also the complex overlaps at play between local, national, and international cultural traditions framed in disparate ways by publications depending on their readership. Despite differences in how the it was

[65] Ibid, 261-289.

presented, the sheer number of publicity files within the Eameses' archive speaks to the Eames House's omnipresence within contemporary debates about "good" solutions to problems in architecture and design.[66]

Case Study House No. 8

Arts & Architecture published the initial designs for the Case Study House No. 8 in December 1945, identifying the particular personal and professional functions the space needed to accommodate (Figures1.3-1.5). Charles and Ray Eames, in collaboration with Eero Saarinen, proposed a structure that capitalized on the strength of pre-fabricated materials to create a bridge-like structure that floated above the landscape, serving as a "re-orientor" and "shock absorber" in its relationship to the natural surroundings.[67] While they sought to take advantage of materials developed for industrial and military use, wartime shortages led to construction delays and increased expenditure. By the time the Eameses' materials arrived on site in late 1948, they had completely reconfigured components into a new design. Overlooking the Pacific Ocean from the top of a 150-foot cliff, the structure no longer intersected the 1.4 acre property, but instead preserved the existing

[66] Charles Eames and Ray Eames, Part I: Office File, 1933-1988, Publicity, *Eames Papers.*
[67] Charles Eames used these terms to describe the house in an interview with *Portfolio* magazine in 1950. See Frank Zachary and Alexey Brodovich, *Portfolio: A Magazine for the Graphic Arts* 1, no. 1 (Winter 1950).

meadow and eucalyptus trees by shifting the orientation of the house and lowering the elevation.[68]

Constructed from prefabricated steel, glass, and other industrial materials, the house is divided into two separate two-story high rectangular buildings connected by a small brick-paved patio (Figure 1.6).[69] The larger building on the site served as the Eameses' residence while they utilized the other as a working and multi-purpose space. The steel frame, initially painted what Charles labeled as a "dark, neutral, and very satisfying gray," was inlaid with sections of stucco, cemesto, asbestos, and plywood panels, some left natural while others were painted shades of white, black, red, and blue. The Eameses interspersed transparent, translucent, and wired glass between the opaque panels, resulting in a minimalist structure "as light and airy as a suspension bridge—as skeletal as an airplane fuselage"; or "poetry expressed with High-Tech vocabulary."[70]

In the July 1944 issue of *Arts & Architecture,* Charles created a diagram outlining the Eameses' methodology and necessary considerations taken when designing a home, which other architects could then utilize when they began working with prefabricated materials (Figure 1.7). First, he indicated, architects

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[68] For the original "bridge" design of the Eames House, see "Case Study Houses 8 and 9 by Charles Eames and Eero Saarinen," *Arts & Architecture* (December 1945), 43.
[69] The Eameses maintained their design office at 901 Washington Boulevard in an old Cities Garage building beginning in 1943. The original space contained three rooms, including one dedicated specifically to graphics before they added additions in 1958. 901 provided enough space necessary to take on large-scale projects, and the "studio" attached to their house had various uses at different times. The space functioned as a workspace, a laboratory, a guest suite, Ray's eventual bedroom, along with a place to store records and ideas.
[70] Charles Eames quoted in "Life in a Chinese Kite: Standard industrial products assembled in a spacious wonderland," *Architectural Forum* (September 1950). See copy in Part I, Box 229, Folder 1, "Publicity 1950,: Eames Papers.

needed an understanding of family behavior interpreted in terms of "spatial, chemical, psychological, social, and environmental" requirements along with an advanced "vocabulary of materials and techniques… combined and applied in a way of best fill needs without compromise."[71] These were then "correlated through a logical approach to economics and adapted to an industrialized system of mass production supported by an intelligent program of distribution to the family" while also accounting for problems related to financing and maintenance. In an accompanying article Charles and John Entenza argued for the usefulness of the war industry applied to "the peacetime world," a point Charles reiterated in a 1950 slideshow presentation given at the University of Washington.[72] Drawing on his experience from recently completed Case Study Houses 8 and 9, he asserted that architects and designers should "apply the technical advantages developed by man to the evolutionary problems of man."[73] For the Eameses, this meant reusing, re-appropriating, and re-signifying industrial materials within the structure of a domestic space.

While materials remained true to their inherent qualities—the steel and windows maintained their trademark weight, texture, and density—the Eameses transformed them through contact with new techniques that lead to innovations in appearance. Employing Mississippi Polished Chicken Wire Glass, traditionally

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[71] Charles and Ray Eames, John Entenza, and Eero Saarinen, "What is a House?" *Arts & Architecture* (July 1944), 24.
[72] Ibid.
[73] Charles Eames, "Design Today," speech, University of Washington Arboretum, Seattle, October 1950. See Part II, box 216, folder 29, "Design Today," Eames Papers.

used for increased structural integrity and safety in factories, the Eameses juxtaposed geometric patterns of the wire with materials and textures of other inlaid panels to emphasize their aesthetic form. In a letter to Peter Blake in 1950, Charles wrote that the use of these windows in the studio was "esthetically… successful in establishing a plane and still allowing freedom to look through and beyond," and that the translucent glass created interesting effects at night when the interior light filtered out.[74] To Charles and Ray, these materials were plastic, not because of their material composition, but instead because they changed dramatically based on context.

Repurposing materials forced individuals engaging with them to reconsider their vitality through active looking, rather than passively accepting significance reliant on original meaning and context. Reactions between industrial materials and the domestic environment created visual phenomena that were unpredictable, "accidental," and could not be replicated in the industrial domain.[75] In particular, the windows added dynamism as reflections and shadows constantly shifted and disrupted stable views of the interior, overlaying glimpses of surfaces, furniture, and objects with trees and architectural elements. These effects were highlighted in several images within the December 1949 issue of *Arts & Architecture,* where the transitioning visual relationships between

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[74] Charles Eames Letter to Peter Blake, August 15, 1950, Part II: Speeches and Writings series, Eames Papers. At the time of this letter, Peter Blake served as the associate editor of *Architectural Forum,* which included the Eames House in the September 1950 issue.
[75] Charles Eames quoted in Charles Davenport, "Designer Charles Eames: chairs, fairs and films," Los Angeles Magazine (January 1962), 24-27.

windows, panels, and the site remained at the center of interest in closely cropped compositions. One full-page photograph shows an upper corner of the south façade, where the lines of the roof and steel frame provide a rigid structure within the image (Figure 1.8). As the midday sun gleamed off of the glass, reflections of hillside trees offset the linear construction, creating double images that deconstruct the separation of the interior and exterior while establishing a level of privacy during the day. However, another photograph portrayed how the expansive employment of glass also created powerful visual effects inside the house (Figure 1.9). In this image, the architectural frame and glass inserts react to the sun's placement, forging strong diagonal shadows on interior planes and surfaces. Eucalyptus trees lining the front of the house effectively functioned as a natural, textural wallpaper that simultaneously provided shade from the California sun. As with the exterior, linear and natural elements intermingled, and their relationships to each other changed based on lighting conditions and surface qualities. industrial integrity of the materials, their contemporary form, and their interaction with the site were more important elements than any military use or propaganda previously attached to them.[76]

The vast number of windows within the structure of the Eames House created an intimate relationship with the eucalyptus trees and natural meadow

[76] The Eameses' utilized industrial materials because they allowed for less maintenance and sustainability. For example, they used a special coating to protect the steel from degrading next to the ocean and in changing weather conditions. See "Case Study Houses 8 and 9 by Charles Eames and Eero Saarinen," *Arts & Architecture* (December 1945), 43. The Eameses' insistence on quality closely aligned with discussions Josef Albers included in his 1937 essay, *Truthfulness in Art*. In arguing for the importance of "Mexican plastics," Albers identifies quality as the defining characteristic of art rather than any specific political connotations attached to its creation.

that expanded before the house, separating it from the cliff at the other end of the property. While the meadow appears natural and wild, it too, was a carefully curated element of the design constantly in flux. The Eameses selected rye grass for its color and leaf shape, and for how it reacted to the local climate. Gardeners planted wildflowers and spring bulbs on the hill among the grass, resulting in a dramatically different experience of the house depending on the season. In the spring, the grass was left untouched, saturating the visual plane with vibrant shades of green interspersed with blooming flowers. In the hotter months, the landscape slowly browned, and seasonal plants were meticulously kept in pots immediately surrounding the house. This allowed the Eameses to rotate plants based on what was in season, providing yet another transient element to the site. Apart from the ways in which the landscape and glazing created complex visual phenomena, the eucalyptus trees and potted plants also broke up the sharp, colorful planes on the exterior of the house.

Defining Form and Color

Charles and Ray Eames spoke about the process of selecting exterior colors for their home several occasions, one early instance included in the December 1949 issue of *Arts and Architecture.* That month, Entenza featured Case Study House No. 8 in eleven heavily illustrated pages, where each black and white image was accompanied by a description of methods and materials used in construction. After Entenza's brief introduction of the design, Charles

provided an overview of how the Eameses' rigid, systematic approach resulted in "the free use of space" as well as "pattern and texture." Charles indicated that:

> Color was planned and used as a structural element, and while much concern was given to its use in the various structural planes, the most gratifying of all the painted surfaces is the dark, warm gray that covers the structural steel and metal sash. The varying thickness and constant strength of this line does more than anything else to express what goes on in the structural web that surrounds the building. It is also this gray web that holds in a unit the stucco panels of white, blue, red, black, and earth.[77]

Referring to color as a tool to define planes and create tension, the Eameses sought "to place [pigments] in relation to each other in such a way that the whole thing held together and didn't, you know, didn't lie apart in way of the color structure any more than it did physically."[78] The airy, skeleton of steel organized transparent and translucent windows in coordination with flat, brightly colored visual planes to give form to the building.

Charles and Ray completed a series of studies that evaluated dynamic relationships between color, texture, and structure. At the 1950 University of Washington presentation, Charles explained:

> I could say the color was accidental, but too many of you people have seen a stack of sketches this high that went into studying the color arrangements on the panels. And if it was accidental, it was studied for a long time, and Ray, my wife, and I both made many,

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[77] Charles Eames, "Case Study House for 1949," *Arts & Architecture* 66.12 (December 1949): 26-39.

[78] Art historian, Pat Kirkham attributes the Eameses' color selection to the De Stijl, while others such as Keith Eggener have traced bright color use in Los Angeles architecture to contemporaneous movements in Mexico. See Charles Eames, "Case Study House for 1949," *Arts & Architecture* 66.12 (December 1949), 39; Kirkham, *Charles and Ray Eames,* 116-117; and Keith Eggener, "Good Neighbors Make Glass Houses: Design Dialogues in Mexico City and Southern California, c. 1940-1960," in *Found in Translation: Design in California and Mexico, 1915-1985,* exh. cat., ed. Wendy Kaplan (Los Angeles: Los Angeles County Museum of Art; New York: DelMonico Books, 2017), 260-289.

> many sketches. But certain things that they do in the light of course are accidental. The object however, was not accidental: to use the color in a structural way, to have colors, and areas of colors that relate to each other.[79]

Color studies completed in 1948 and 1949 illustrate this approach, showing how the Eameses first sketched the exterior elevations in graphite before inlaying the grid-like panels with colored pencil, watercolor, and colored paper clippings (Figures 1.10). One early iteration tested earthy tans, browns, and mauves in combination with white, black, and deep blue; another preliminary study incorporated bursts of red on small rectangular panels. Placement of panels coincided with the need for light and the requirements of interior organization while also balancing the visual weight of the various hues. For example, multiple studies show free play with windows and colors on the front elevation while large expanses of neutral greys, blacks, and browns on the north of the structure backed the wood paneling in the living room and provided the upstairs bedrooms and bathrooms with privacy.[80]

Studies became increasingly complex as the Eameses incorporated small portions of wood veneer and colored paper, observing how materials and textures reacted to one another before including them within the final design (Figure 1.11). Through their laboratory-like method for juxtaposing and combining disparate materials and colors, they learned to recognize the influence of one element upon another within set parameters and rather than presuming stable

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[79] Charles Eames, "Design Today."
[80] The exterior of the house has a walking path, located above the retaining wall. Opaque panels prevent views of private areas upstairs.

forms, the Eameses understood that basic elements of line, shape, and color combined with “unexpected surprise” from the environment often created structural patterns that resisted a fixed viewing experience.[81] Certainly, this kind of Gestalt seeing interrogated how the influence of one element on another could yield variable and intensive relationships.[82]

A Space for Living and Working

The selected variation of materials, line, color, scale, and form continued on the interior of the Eames House, present in the way Charles and Ray organized the layout of space and how they arranged their evolving, disparate collection of objects. Media of the Eames House produced in 1950 and 1954 illustrate the ways in which these elements functioned, capturing the resulting visual dynamism and how the Eameses conceived of and utilized the space.

The main entryway to the Eames House, a glass door lined in steel, blended seamlessly with the rest of the exterior, only identifiable through the

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[81] Charles wrote the ways the materials engaged with the environment resulted in unplanned visual phenomena and “unexpected surprise” in his description for “Case Study House for 1949,” *Arts & Architecture* 66.12 (December 1949): 31.

[82]Scholars and historians have noted the obvious visual affinities the Eames House shared with the De Stijl and artwork by Piet Mondrian, however, the strategies employed as well as the ways they spoke about color recall several theories developed simultaneously in Germany during the preceding decades, specifically those of Gestalt psychologists and those employed, further developed, and taught in the United States by Hans Hofmann and Josef Albers. Ray Eames had studied painting under Hofmann before attending Cranbrook and the Eameses maintained a close personal and professional relationship with Josef and Anni Albers throughout their careers. These connections are further complicated considering profound influence of modern art theory by Wassily Kandinsky, Piet Mondrian, and Robert Delaunay as well as disparate strains of 19th century German aesthetics (primarily empathy theory and formalism). For a nuanced discussion of these theories, see: Karen Koehler, “More than Parallel Lines: Thoughts on Gestalt, Albers, and the Bauhaus,” and

addition of a gold leaf panel just above the entry and a “folk art” brass bell visitors could ring upon arrival.[83] A black-and white image taken of the door in 1950 obscures these metallic details in the darkness of night, but provides a glimpse of what visitors could expect when approaching the entrance (Figure 1.12). In the photograph, translucent glass and rayon curtains filter light and obstruct clear views around the doorway, while potted plants arranged in front of the windows provide visual dynamism as silhouettes of plant life interact with the luminous surface before receding into space. The glass door opens, framing a spiral staircase, constructed out plywood treads that wind upwards around a central beam. Just within view, Ray’s painting, *For c in limited palette*, hangs delicately by the stairwell, reminding visitors of her early work under Hans Hofmann, where she experimented with abstractions and learned “structure and relationships, and color as structure.”

The long, narrow hallway spans the length of the building before the entrance, connecting the living room to the kitchen and dining areas. To the south of the stairwell, storage cabinets with sliding metal doors led to the main living space that extended upward two stories to the seventeen-foot ceiling. Two photographs taken from the second-floor balcony in 1950, the first by Peter Stackpole for *LIFE* magazine, show the room sparsely furnished, with rice straw mats, foliage, and a few chairs and sculptures scattered across the original

[83] The Eameses’ description of their home in *Arts & Architecture* contained all the brands and colors they used within their home so that readers could theoretically recreate the same effects in their homes. See Charles Eames, “Case Study House for 1949,” *Arts & Architecture* 66.12 (December 1949), 26-39.

concrete floor (Figures 1.13-1.14). Later, the Eameses covered the exposed concrete in the living room and hallway with Voit rubber tile, forming a surface where they arranged furniture prototypes, rugs, plants, and a range of folk and craft objects, however, Stackpole's photograph, featuring the tatami mats, limited furnishings, and screened, modular views makes explicit the influence tradition Japanese architecture had on Eames House aesthetics and structure.[84] Both images accentuate dramatic, free movement of space and the deconstruction of distinctions between the interior and exterior, one focusing on the rear wood-paneled wall that extended outside and the other on the southeast corner, the glazing capitalizing on views of the partially covered courtyard and meadow extending toward the Pacific Ocean. In the second image, a thin, moveable ladder rests against a window in the corner and in a 1950 interview with Peter Blake for *Architectural Forum,* Charles explained that the Eameses' workshop had fabricated the ladder to meet the specifications of their home, the upper edges curved to "hook on to the open webbed joists at any point, giving a vertical circulation to the room."[85] This feature also allowed the Eameses to attach various objects to the ceiling in playful, unexpected configurations. In this instance, a hanging plant and paper kite seemingly hover in the air and at later

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[84] Ibid.

[85] Charles Eames to Peter Black, August 15, 1950 in *Architectural Form* 93, no. 3 (September 1950), reproduced in *An Eames Anthology: Articles, Film Scripts, Interviews, Letters, Notes, Speeches by Charles and Ray Eames,* ed. Daniel Ostroff (New Haven, CT: Yale University Press), 69-71.

points, visitors could find large folk sculptures and the Eameses' Hofmann paintings suspended above their heads.

Over the north side of the living room, the Eameses situated their master bedroom alongside a second, separated only by a sliding room divider (Figure 1.15). The overhanging balcony could be closed off from the space below through the movement of canvas-covered panels sliding across the balustrade. The Eameses had the option of either integrating the sleeping areas with the living room or establishing privacy necessary when resting or changing clothes. Apart from bedrooms and storage, the second floor also held separate bathrooms, which Charles and Ray considered one of the keys to a happy marriage.[86] These areas were extremely private, illustrating that the Eameses understood the need to accommodate living dynamics within floorplan for the space to function successfully. Sliding panel screens allowed the Eameses shield views of the balcony from the living room below. In describing the house format, the Eameses said that they were "determined on the right and the necessity of privacy. To choose privacy from one another and anyone else."[87] This approach manifested the one illustrated in the 1944 *Arts & Architecture* diagram, where the Eameses asserted that prefabricated materials could and should be incorporated with consideration for family behavior, satisfying the requirements of occupants without compromising the integrity and form of the structure (Figure 1.7).

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[86] Charles Eames stated that two bathrooms were a key aspect of maintaining a happy relationship in an interview in *Portfolio: A Magazine for the Graphic Arts* 1, no. 1 (Winter 1950).
[87] Charles Eames in "Case Study Houses 8 and 9 by Charles Eames and Eero Saarinen," *Arts & Architecture* (December 1945), 43.

Below the overhanging balcony, the Eameses lined an intimate alcove with a customized built-in sofa, storage cabinets, and shelving that a dramatic contrast to the extensive scale of the adjacent living space. Noted architectural photographer, Julius Shulman, captured the alcove as it appeared in 1950, aligning his camera with the edge of the sofa to highlight the way it angles outward towards the viewer (1.1). The vertical movement accentuated within the main living room shifts forcefully as alternating tiers of white and wood veneer cabinets and open shelves drive circulation of space horizontally. Exposed concrete gives way to soft, mustard-colored carpeting, which, when combined with low ceilings, and the liberal use of textiles and wood grains, created an intimate, subdued retreat for the Charles, Ray, and their guests. Within a few years, the Eameses removed the first row of cupboards above the sofa to create more open shelving in line with a small pass-through window that led to the kitchen.[88]

The kitchen and dining areas occupy the north end of the ground floor and could be separated by a Modernfold accordion door, however, in a later interview, Ray admitted that this feature was never used—she and Charles preferred open spaces, unimpeded by the modular partitions (Figure 1.16).[89]

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[88] The Eames House was heavily documented through photographs, both by the Eameses and others, that recorded shifts in designs and decorative structures within their home. Their aesthetic was one of addition, and through years of photographs, viewers can observe the collection and rearrangement of objects from across the globe.

[89] *Arts & Architecture* magazine contained the brandds of all structural elements of the home, including the cabinets. See also the description of products used in the *Eames House Conservation Management Plan* (Los Angeles: The Getty Conservation Institute, 2019).

White cabinetry and appliances formed a horse-shoe configuration along wood-paneled wall and above the oven and kitchen sink, translucent corrugated glass obscured views of the utility and laundry area to the rear of the house, allowing for only the modern, sleek forms to filter through. Leading north, a large sliding glass door opens from the dining area to central court, which serves as a foyer and outdoor living space, separating the residence from the studio.

The studio, the smaller of the two buildings, mirrors the residence's layout in a smaller space with fewer rooms and simpler finishes. It served as the public interface for the site and provided increased privacy for the Eameses' living space located just behind it and across the central court. The southern section of the building has two stories, the lower level housing a kitchen, bathroom, darkroom, and utility nook, while the second-floor loft served multiple purposes; at various times the Eameses used it for storage, additional workspace, and a guest bedroom. The loft overlooked a versatile, double-height studio where the Eames Office maintained operations for nearly a decade.[90] Painted a warm white, the walls essentially served as a blank canvas where the Eameses hung a range of objects, photographs, artwork, and signage that shifted in concert with evolving interests and projects. An image from 1950 shows the studio from above, with Charles seated one of two long, white worktables. A painted Chinese kite in the shape of a buttery hangs on a largely empty wall, and perched on a

[90] The Eames Office moved to a former garage on 901 Washington Boulevard in the late 1950s to accommodate their growing spatial needs. By this time, the Eames Office was partaking in many large-scale projects that required room for film sets, extensive storage, design stations, and space for scaled exhibition mock-ups.

stool, Charles reviews a reel of film, holding the negative out to better examine its content under lamp light (Figure 1.17). Around him, film and camera equipment cover his workstation and along the side of the wall, two thin tables hold dozens of slides organized in long, neat lines. The photograph, with a range of media, toys, props, and supplies, provides viewers with a snapshot into early Eames Office activities, but also into the disparate, interdisciplinary interests the Eameses maintained and developed over the course of their careers. Specific objects and ideas held certain interests in the ways the communicated ideologies, and the Eameses used photography and film to underline their aesthetic and practical significance.

"An Affection for Objects"

Early images of the Eames House taken by photographers including Peter Stackpole and Julius Shulman, along with images captured by the Eameses and their guests, all show the interior minimally decorated, the combination of sparse furnishings and empty walls resulting in an almost austere quality. Within a few years, however, after moving into the house on Christmas Eve 1949, Charles and Ray quickly began integrating objects, books, toys, art, and various other objects and ephemera into their surroundings. When *Arts & Architecture* first featured plans in the December 1945 issue of *Arts & Architecture,* Charles described the intention of the living room: "For music, reading, watching the fire, talking, leaving large unbroken area for pure enjoyment of space in which objects

can be placed and taken away... driftwood, sculpture, mobiles, plants, constructions, etc."[91] While the Charles and Ray abandoned the fireplace in the final design of the house, they retained the stated focus of open, multipurpose spaces and the ability to arrange their large and ever-evolving collection of disparate, but carefully selected objects, what they referred to as "functioning decoration." Their early floorplan descriptions and their use of an active word in combination with a nefarious word, the Eameses asserted that objects served as a pivotal element to the way they organized and occupied space.[92] These objects served as not only a source of personal interest, but inspired technique and form in their professional work. This was something common amongst other modernists and collaborators—George Nelson, Eero and Aline Saarinen, and Alexander Girard—who asserted that forms, materials, and decorations of folk paintings, handcrafted objects, and other collectibles had much in common with modern design, and using them in association freed modernism from and opened new avenues of associations and interpretation.[93] Often, the ways in which the Eameses positioned craft and folk art within their home challenged the way

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[91] Charles Eames in "Case Study Houses 8 and 9 by Charles Eames and Eero Saarinen," *Arts & Architecture* (December 1945), 43.

[92] "Functioning decoration," is a primary focus of Kirkham's book, *Charles and Ray Eames.* Although the Eameses' never used the phrase in exhibitions, Kirkham argues it was a key concept in how they perceived objects in their home. Kirkham uses "functioning decoration" to describe their arrangements of objects, and explains that the word "functional" validated "decoration." See. Kirkham, *Charles and Ray Eames*, 164.

[93] Aline Saarinen frequently wrote folk art and collecting while an art critic for *The New York Times,* see Aline Bernstein Saarinen, *The Proud Possessors: The Lives, Times, and Tastes of Some Adventurous American Collectors* (New York: Random House, 1958). A number of scholars have addressed the collecting habits of noted modernists. See Jennifer Reynolds-Kay, *Small-Great Objects: Anni and Josef Albers in the Americas,* exh. cat. (New Haven: Yale University Art Gallery, 2017); Alexander Girard, *The Magic of a People: Folk Art and Toys from the Collection of the Girard Foundation* (New York: Viking Press, 1968)

people thought about objects by presenting them in new ways and establishing unexpected visual relationships, putting crafted objects, pieces of high art, housewares, and other found items in close proximity, they created thought provoking juxtapositions. For example, in a photograph the Eameses took in 1954, several small silver trinket boxes sit on top of a surface covered in colorful, geometric wrapping paper (Figure 1.18). The boxes come from different temporal and spatial locations, some intricately carved, others inlaid with gems, however, the Eameses' photograph mitigates their cultural origins in favor of aesthetic similarities, highlighting the metallic surface quality of the paper as opposed to the silver trinkets.

The Eameses curated object displays with careful consideration of scale. For example, one of Shulmann's images from 1958 shows the Eameses in the alcove of their living room, sitting amongst range of smaller objects—shells, prisms, kachina dolls, candlesticks, and small bowls—that they situated upon shelves and on coffee and side tables with precision (Figure 1.19). The Eameses layered textiles and cushions from various cultures to give the area increased intimacy and texture. In contrast, to account for the tall, seventeen-foot ceilings in the general living space, the Eameses hung larger objects including a George Nelson light, a wooden wale sculpture, and a Hans Hoffman painting that was at times hung face-down from a series of cords. A modular, customized bookshelf was separated from the back wall by a thin ladder resting delicately on a ceiling joist. The Eameses' extensive collection of books was housed on the shelf along

with a series of objects including pottery, plants, bird figurines, and chalices. Across the living room, an Eames lounge chair, fiberglass chairs, sofa, and a portable platform holding driftwood and large, tropical plants were placed strategically around layered rugs and floor pillows upholstered in fabric designed by Alexander Girard. The Eameses formed small compositions throughout the home that were part of larger design schemes, highlighting particular details within the context of a larger narrative.

Throughout the home, they placed objects with little monetary value such as buttons, pebbles, stones, matches, pencils, scissors, marbles, tumbleweeds, and glass bottles next to collectibles bought from specialized vendors: English pill-boxes, Chinese kites and masks, Mexican textiles and crafts, Japanese and Belgian wooden combs, Indian and African fabrics and stools (Figure 1.1). Some object juxtapositions were personal, others depended on the careful contrast of color, shape, size decoration or material. The basic pedagogic premise was constant: by taking textures out of their normal contexts and placing them in relationship to one another, viewers were empowered to see the world of materials around them more acutely. Objects removed from their larger schemes of meaning take on other meaning as they were redefined within new structures. Their display suggested that rarely does something have a single meaning, but rather new meaning would emerge when objects were placed in unexpected groupings. For the Eameses, their eclectic assortment of items shared the formal simplicity of their pared-down modern structure, which highlighted important

relationships between the seemingly disparate forms. Displaying contrasting objects within a simplistic, architectural frame worked to complicate definitions of modernism and of art by combining a variety of motifs taken from all over the world, combining them in unifying ways through the contrast of pattern, color, and tone, rather than through the coordinated features of a single style. This practice left the objects largely devoid of their original cultural significance—significations that communicated universalized values over political, economic, temporal, racial, or intellectual particularities.

The Eameses' relativistic approach to object display and aesthetics—the reliance on strategic formal comparisons and utopian global outlooks—mirrors the midcentury philosopher and pedagogue John Dewey's conception of the visual arts as defined in his recent book, *Art as Experience* (1934). While outside the purview of mainstream public debate, Dewey's book played an important role in shifting the discourse around art toward an understanding of objects as the source of knowledge rather than simply a product of it. Charles and Ray Eames owned a copy of Dewey's text, and while it is impossible to know the depth of the Eameses' engagement with the ideas Dewey presented, it is clear that they were aware of him and that his approach to arts education shared many continuities with their collaborative work with universities including UCLA, MIT, the University of Georgia, and Berkeley. As such, Dewey's ontological and aesthetic theories provide a useful lens from which to analyze the Eameses' thinking about object display outside the traditional realm art.

Art as Experience served as Dewey's first dedicated study of aesthetics, which coincided with the increased attention to the arts immediately preceding and following American involvement in World War II.[94] Dewey turned his focus away from movements such as Abstract Expressionism, which played a central role in postwar debates on the status and function of art, and mentioned a few conventional modernists including Poussin, Cézanne, and Matisse, before arguing that art was not simply an object, but instead the viewer's experience of objects—a definition that on relationality and the direct engagement with objects over passive contemplation. Dewey asserted that experience was was not just a means by which people gained knowledge, but instead functioned as a starting point, where active looking, comparing, and touching objects created the grounds for subsequent investigation and understanding. This theory positioned objects as carriers of meaning—a physical incarnation of thought, form, texture, and cultural significance—which for Dewey, and for the Eameses, meant that the significance of things could only be gleaned through immediate experience of them—by active looking, comparing, touching, and rearranging on a continual basis. As opposed to displaying objects as containers of stable meaning that could be understood through thinking, meditating, and philosophizing about form within the context of a museum gallery, Dewey's definition of experience involved active use of objects within everyday life—seeing them in space and in shifting contexts. Dewey believed that active engagement with objects would enable

[94] John Dewey, Art as Experience (New York: Perigee Books, 1934).

deeper understanding of how they existed as products of culture and developed from a set of specific rules and constraints, but when placed in relationship with other types of cultural production, objects could reveal universalizing truths and encourage internationalist worldviews.

In a postwar environment where nationalist agendas and political divisions had caused widespread devastation, the Eameses' capitalized on Dewey's philosophy of art as a way to identify quality and to promote commonality and mutual understanding. Their conception of art and design during this period stood in stark contrast to the rhetoric promoted by Axis powers during World War II. For example, the Nazi's Kulturminister Christian Mergernthaler firmly stated that, "Art is not international. Nor is there any such thing as international science. What are for the German people the deepest questions and greatest secrets of Nature, are perhaps for a foreign race unimportant."[95] The Eameses, on the other hand, vehemently positioned themselves on the side of universalism, working against attempts to cordon off human pursuit of knowledge as owned by any particular group or individual to further the conception of cultural value through the exchange of information and knowledge. Although recent scholarship, most notably that of Salomi Mathur, consign the Eameses' utopian agenda to acts of postcolonial aggression, the Eameses conceptualized it as the very opposite, as a way to promote an inclusive definition of art and design that facilitated ideas

[95] This quotation is drawn from a typewritten draft of Barr's unpublished essay, "A Kamfbund Meeting," Alfred H. Barr, Jr. Papers, MoMA Archives, New York.

through collective participation and exchange of knowledge.[96] The Eameses' collection and display of objects within their home developed out of an allegiance and appreciation to universal principles, animating their aesthetic through a support of democratic spirit and ideology.

This idea of objects as the starting point for knowledge production is present within the notes, speeches, written correspondence, and saved articles make up the Eameses' archive and specifically reinforced in materials relating to the Eameses' appreciation of Hopi kachina dolls. For instance, Ray Eames kept transcripts of her 1983 interview with Pat Kirkham, where she described the Eameses' discriminating collecting practices and their process of consideration for each object, using her interest in kachina dolls as a primary example. First, Ray identified the personal and educational function the objects served in Hopi culture, noting that kachina dolls "were made by fathers for their children to tell them about the qualities and particular characters of different gods." She then highlighted the consistency in form and color, and the utilitarian quality of the light-weight wood material, all of which "grew out of a long tradition," and "the strength of design came from tradition." The kachina doll developed from a set of societal needs and environmental constraints, resulting in a stable form that evolved to meet the demands of subsequent generations. Crucially, Ray indicates that, "the objects were not sacred, but the ideas they embodied were," and that the Eameses "found things and kept them as principles or aspects of

[96] Mathur, "Charles and Ray Eames in India," 34-53.

design. We kept it to show it, to use it, to share it, to give insight to others and to ourselves…. That was the discipline of design."[97] Crucially, Ray stated that the objects themselves "were not sacred, but the ideas they embodied were." Within her discussion of kachina dolls, Ray points out their key role in the experience, education, and the exchange of ideas across generations of Hopi, but that the activation of knowledge depended on physical and prolonged interaction with the object in relationship to others, and that this significance was not diminished when removed from traditional cultural contexts.

The Eameses' believed the experience of objects should involve active use to enable an understanding of how they served as cultural products—a product of specific rules and constraints. They positioned objects as central to experience, and thus to knowledge production, but they also acknowledged them as products of experience. Charles and Ray contended that while the goods consisted of disparate components and accommodated complexity, contradiction, and change and their position in the cultural sequence changed and thus their designation. Many originally created for utilitarian ends, the elevation of these objects to the status of art, and the high price paid for originally inexpensive common articles, raised the value of them to that of high art for the purposes of conspicuous display.[98] Objects were the bearers of personal

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[97] Pat Kirkham, Oral history interview with Ray Eames, 1980 (July 28-August 20), Archives of American Art, https://www.aaa.si.edu/collections/interviews/oral-history-interview-ray-eames-12821#transcript.

[98] Charles and Ray Eames positioned monetarily insignificant objects such as prisms, kites, and tumble weeds within an equal visual plane as artwork by Josef Albers and Hans Hoffman, effectively raising the perceived value of every object they collected to that worthy of display in a museum.

memory, nostalgia, identity, as well as cultural and cross-cultural significance that carried complex webs of meaning. The Eameses sought to transform "not only things but the way people think about things," using objects to consider different ways of perceiving, grouping, and conveying information.[99] Charles and Ray found that many objects, particularly those entrenched in tradition, had integrity inherent in the materials and the care and skill with which they were made and the way viewers interpreted these objects also relied on the context in which they were displayed.

"New Covetables" and their Visual Representation

In 1970 Charles Eames began the first of six lectures during his tenure as the Charles Eliot Norton Professor of Poetry at Harvard University by describing the kinds of goods he and Ray valued, presenting them as "New Covetables," which were not simply consumer products for wide use, but rather objects that represented innovative concepts, ideas, models, and skills.[100] Americans, he contended, has become too focused on mindless consumption and had lost sight of the enormous discursive value that quality objects provided. Later during the lecture series, he illustrated this point, describing an incident where Ray's car had been broken into a month previously. The thief had not taken much, but according to Charles, "a beautifully wrapped, broken alarm clock that was being

[99] Quoted in Bill N. Lacy, "Warehouse Full of Ideas," *Horizon* (September 1980), 22.
[100] Charles Eames, "Norton Lecture One," *Harvard Charles Eliot Norton Lecture Series,* The Eames Collection, Recorded Sound Division, Library of Congress, Washington, D.C.

sent to a grandchild for further dismantling was the most important thing lost." However, as Charles gathered items that had been strewn across the parking lot, he came upon a bolt of cloth, which was "really distressing" for "what was shocking about it was that the guy hadn't thought enough of it to take it."[101] To Charles and Ray, the quality of the cloth should have made it desirable in that it had potential to be transformed into something useful. He went on to describe a series of other goods: fishing line, a ball of twine, a keg of nails, a ball of twine, reams of paper, boxes of chalk—all of which took on new significance depending on how they were used and what other "covetables" they came into contact with. Presenting a three-screen slideshow, *Goods,* Charles showed the audience objects the couple had collected over the years and had admired on their international excursions, stating," they're goods as maybe we've forgotten them."[102] His contention was that the Americans had lost the ability to create themselves, and encouraged the audience to be not only be thoughtful consumers, but also producers of knowledge through the careful use and curation of goods. They saw the value of objects, not necessarily in their original context, but in their ability to create continued conversations and challenge interpretation. The way objects related to others was just as important as the principles within the objects themselves.

The Eameses positioned artifacts after painstaking planning that involved the use of photographs, which would become increasingly important throughout the

[101] Ibid.
[102] Ibid.

couple's career and indicates how they saw objects as bearers of meaning. Describing the process years later, Ray stated:

> We used to use photographs. We would cut out pieces of photographs and put them onto a photograph of the house to see how different things would look. For instance – there was a space in the studio we wanted filled. It was between the depth of the floor where it opens for the stairs (this is not so in the house, where there is a balcony rail). We wondered what to do. We had some pier pylons from Venice pier (we wanted to keep something of it to remember it by). Well, we had pictures of it, glued it onto a photo and decided it worked so we went ahead and did it.[103]

This method relied on montage and assemblage theory and drew connections to contemporary surrealist production, where artists deliberately positioned apparently incongruous objects in an attempt to elucidate meaning.[104] Given Charles's accomplishments as a photographer, images of objects served the dual purposes of documentation and art and were the result of his greater fascination with how photography represents texture. Eames was particularly aware that photography was a reductive process that flattened objects through projection. In a photograph, the haptic became primarily visual, and texture was transformed into pattern.[105] Photography of objects was a way to achieve the objectification of the object – to reveal the modern, material world on its own terms.

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[103] Ray Eames, Lecture by Ray Eames for the United States-Japan Conference on Cultural Educational Exchange, Tokyo, Japan, 1978 in Part I, Box 218, Folder 13, "U.S.-Japan Conference on Cultural and Educational Exchange," Eames Papers.
[104] For more surrealist connections to the Eameses' work, see Pat Kirkham, *Charles and Ray Eames,* 144.
[105] Charles' photographs all share a similar aesthetic: they are closely cropped, focusing on the material qualities of objects, people, and places rather than the context in which they are seen.

Charles often photographed objects in their personal collection, using them later in exhibitions and speeches to illustrate discussion of design. On research and purchasing trips conducted for various exhibitions and projects, Charles and Ray documented objects and places that they could not physically take home, adding the essence of these works to their extensive archive.[106] By photographing objects from multiple angles and viewpoints to give a sense of the objects material presence/haptic qualities, enabling viewers to explore the internal properties of materials. The Eameses' photographs focused on the integrity and vitality of these objects through independent exploration, that is, active looking, rather than passively accepting information regarding original meaning and context, which they considered of secondary importance to the object.

The use preliminary photographs and models as the basis for design decisions is highly indicative of the process Ray Eames described in her hand-written notes for the Revell Toy house. While these notes are somewhat scattered, they reveal Ray's conception of design, a viewpoint rarely considered in scholarship as Charles was the public face of the Eames Office, giving speeches and presentations to large audiences while Ray spoke on only a handful of occasions. Charles often spoken in idioms, used vague language, and relied on accompanying slide images for understanding, while Ray's notes give

[106] For one example of the Eameses' travel, see their work for the Astronomy and Science exhibition series for IBM in Chapter 3.

nuanced insight into methodology and process that could be applied broadly and across media.

The Revell Toy House

In 1959, the toy manufacturer, Revell Company, commissioned the Eameses to design a model house kit for widescale production and distribution.[107] As with many Eames toy designs, this project involved updating traditional objects with contemporary materials and forms. The Eames Office completed prototypes for a kit, where prefabricated frame construction used in their home would be expressed in ¾-inch scale. The design was based on a system of modular units where Revell would replicate structural grids and panels from injection-molded plastic. With the materials provided, children could create a variety of constructions ranging from a simple pavilion shape to more complex structures (Figure 1.20).[108] Miniature Eames furniture and small-scale rugs were developed to fill the space, allowing the toy to be used by the Herman Miller Furniture Company for display and marketing purposes.[109] However, the project never developed beyond the prototype stage as the Eameses' relationship with the Revell Company proved inharmonious when the Eameses expressed their displeasure with unresolved production problems.[110] In designing the prototypes,

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[107] See description "Revell Toy House," in Neuhart, Neuhart, Eames, *Eames Design,* 235.
[108] Charles Eames and Ray Eames, Part II, Box 189, Folder 9, "Ray's Notes on Revell Toy House," Eames Papers.
[109] Ibid.
[110] See Kirkham, *Charles and Ray Eames*, 138-139.

Ray handwrote instructions to guide users through a design process similar to those the Eameses had utilized within their own home.

Ray began by asserting that the modular structure and furniture that was included in the kit was "only the beginning," before describing the sustained time and effort required for the interior decoration:

> The trick is to keep your eye peeled as you look through Magazines, Newspapers, Advertisements, and announcements… When you find an object (a jar, a painting, a pillow, a rug, a cat, a dog, a telephone, a bouquet, or flowers, or a person, that is JUST the right scale, CUT IT OUT and put it in an enveloped marked in its proper category… so that when it is time to redo or add to your house (or time to try out another scheme) you can assemble your props (short for properties) and form a palette to play with, certain colours that you love can become the BACKBONE of your plan and it can start anywhere.[111]

As her notes suggest, the objects (or in this case, photographs of objects) were the basis of the home on which other elements—color schemes, textures, materials—relied. She indicated that design was a process and that the first iteration was never to be considered the final product, which even applied to the kit itself. She encouraged active feedback from users to improve the toy design, writing that "what finally matters is that your house works the way you want it to and is a pleasant place to be in… You might let us know what it is you most need for your houses. If enough children want certain things REVELL will try to provide them—and you can help us decide what the next kit should contain." If a child could not find the right object, Ray suggested they create their own through the transformation of "a tiny piece of tissue paper or a spot of paint."

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[111] Charles Eames and Ray Eames, Part II, Box 189, Folder 9, "Ray's Notes on Revell Toy House," Eames Papers.

Most importantly, Ray included a “note to remember: there is not right way. Some people like square rooms [and] some people like some high rooms. And colour can mean the brilliant glow of a flowerbed but it can also mean the subtle quiet of a misty morning!” Many design choices were relative and reliant on location and other decisions, for example, “a closed in house provides privacy but if your garden is closed in, you can have open windows and still have privacy!” She summarized by asserting, “There are no RULES. (One picture, placed where you can see it and enjoy it and give you and your guests pleasure and be enough or pictures or posters or children’s drawings or your sketches at a picnic or photographs that you like very much) completely filling a wall can be just as pleasant, as much fun-giving as a terribly important impressive painting.” The house was meant for children to “experiment with color and with space” and to “try out different ideas” so children “will see that there is pleasure in all directions when you care and do it with love.”[112] Ray’s notes for the Revell Toy House demonstrate the way that their visually discursive practice could be applied across media and shifted based on the requirements of the individual project. Furthermore, her instructions reveal the value and meaning of objects to be relative and defined based on the needs of the user.

The primary meaning and value of simple materials such as tissue paper, magazine clippings, photographs, and painted images could shift when placed in direct physical or connection with other objects and images. This method also

[112] Ibid.

provided a solution to the problem of consumption and production that Charles pointed to in his discussion of "new covetables," and created a pedagogical toy based on their design model to teach children these values from an early age through the application of photographs to three-dimensional spaces. The toy house sought to help users identify patterns and information, to follow one's own intuitions and to identify less tangible or obvious aspects of the world at large.

The Eameses often used toys to introduce children to design concepts and ways of relaying information, an approach heavily based on progressive educational theories put forth by Dewey, whose enthusiasm for the meaning of objects as fully present in their immediate experience served as a key element of mid-century educational reforms. Dewey stated that the subject had to engage with the world, physically and mentally testing the limits and potential effects of its phenomena, before he or she could even begin to use its objects as a basis for knowledge.[113] Not only could the experience of rearranging objects and images within the confines of a modular toy house provide children with the opportunity to learn about the malleability of objects, but it also illustrated how objects were in some sense products of experience. Experience involved the subject both using the object and being affected by it. Those who were able to redefine—and this revalue—these objects attained increased social power within democratic societies.

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[113] John Dewey, "The Need for a Recovery of Philosophy," in *Creative Intelligence* (New York: Henry Holt, 1917), 48.

The Eames House in Context

In the construction of the Eames House, the Eameses' initiated many of the methodologies they continued employ throughout the remainder of their collaborative careers. Within the space, they capitalized on access to newly developed industrial materials to construct the skeletal frame, using expansive planes of glass to dismantle distinctions between the interior and exterior to ground the structure within its surroundings. The staggering of translucent glass and opaque panels created visually enticing visual phenomenon within the interior as lighting conditions shifted throughout the day. The industrial structure established the conditions upon which to have an active and ever-changing relationship with the objects that occupied the space.

Within their home, Charles and Ray conceived of their expansive object collection and its arrangement as a way to highlight universalizing continuities between seemingly disparate cultural production. Using Dewey's definition of immediate experience, the Eameses positioned objects as a starting point of knowledge, believing that the active engagement and comparison of objects would reveal continuities and increase cross-cultural understanding and information exchange. In doing so, they prioritized ideas of international communication, responding to a postwar environment where democratic ideologies had recently overcome nationalist agendas of the 1940s.

Within their home, their display of objects, and their explanation of interior design within speeches and children's toys, the Eameses sought to demonstrate how principles of design could unite people across disciplinary and national divides.

CHAPTER TWO

Visual Pedagogy and the Design of Higher Education

[Visual] "Design Today"

In October 1950, Charles Eames delivered a public presentation on the contemporary state of design at a three-day exhibition and conference sponsored by the Arboretum Foundation of Seattle, the Institute of Modern Living, and the University of Washington. Eames opened the lecture with a short anecdote, detailing how John Entenza had received a letter from an *Arts & Architecture* reader asking him to provide her with precise definition of art, "a pat answer, a clearly stated formula" that she could easily understand, then compartmentalize, store away, and call upon only when needed. He argued that the reader's misguided conception of art as easily determinable and as detached from other fields of knowledge was a reverberation of disciplinary divisions present within educational structures and institutions. To mend fractures in knowledge resulting from "this time of specialization," Charles suggested following the models of "the great original thinkers of our time," which required revolutionary democratic

involvement and communication between individuals with a broad range of knowledge to establish a fundamentally relational way of thinking.[114]

Charles proceeded to demonstrate this process of interconnected reasoning through a series of slides accompanied by verbal analysis, describing the compositional elements and aesthetic qualities of photograph before tying it to the next seemingly unrelated set of photographs. For example, Charles compared and contrasted details of art historical masterpieces such as Picasso's *Guernica* with the costumes of circus performers and the face painting techniques of clowns, underlining how each manipulated the perspective of the viewer through the careful application of black and white formal elements (Figures 2.1-2.4).[115] As he sifted through the slides at an accelerated pace, Charles explained how a fire escape "could be thought of as sort of a homely thing, if it is seen sort of distorting a preconceived idea of what a structure should be," but viewed from another angle could render it a visually "rich experience"; he connected paper dolls and driftwood to the organic sculptural forms of Henry Moore and the planes of color within a Paul Klee painting; and he highlighted "the kind of double imagery thing we see while looking through a piece of glass, a kind of phenomenon you experience every day," emphasizing that "to stop and to look at it and then to relate it to the next thing is part of the process."[116]

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[114] Charles Eames, "Design Today," speech, University of Washington Arboretum, Seattle, October 1950. See Part II, box 216, folder 29, "Design Today," Eames Papers.
[115] In *An Eames Anthology,* Daniel Ostroff includes an edited transcript of "Design Today," along with photographic reproductions of the slides Charles utilized. See Ostroff, *An Eames Anthology,* 78-91.
[116] Charles Eames, "Design Today," speech, University of Washington Arboretum, Seattle, October 1950. See Part II, box 216, folder 29, "Design Today," Eames Papers.

Throughout the thirty-eight slides, Charles asked the audience to see not only visual affinities but also similarities across places, times, cultures, and even object categories and taxonomies: a crowd of people on the street imitates the movements and "lines of tension" visible in seagulls flying over the beach, the texture of Eucalyptus bark in close proximity evokes "an aerial view of some kind of terrain" or "a microscopic view of something else," and the reticulated electric wires crossing over Venice, California echo the regimented veins of a plant leaf magnified through drop of dew.[117]

Charles's presentation established a wide scale of reference, utilizing visual aids and narration to encourage the audience to see their surroundings with new eyes, rendering familiar objects and places extraordinary through the process of aesthetic inquiry. This kind of relational, visual thinking was not only applicable within the arts as they had been traditionally structured, but had wide reaching implications with seemingly disparate disciplines. Charles asserted that art and design should never be studied in isolation: "….if what I have shown you has meant anything, why, it will be clear that the [design] is a sort of chain reaction mechanism that can start anywhere and go everywhere, and is commonly related to every problem, because we must see every problem as one in design..."[118] Indeed, Charles's presentation revealed the potential of design, and specifically visual design, to reveal unexpected perspectives and continuities between fields and to expose the superficial divisions that prevented innovative,

[117] Ibid.
[118] Ibid.

comprehensive solutions to the world's most pressing problems. The Charles considered the notion that:

> If one could, as some of the great can, see and look at everything as though we were children looking for the first time, it would be a wonderful thing, and a wonderful help. And perhaps we would be in a position to recognize the real idiom of design, the real idiom of form of our times when it comes. Because where they are crystallizing now, we don't know, and none of us can predict what they are going to be, but we can certainly participate in forming them, and perhaps the smallest thing we do will be the element which will most influence the form of the idiom of anything that we do.[119]

The function of design, as the Eameses defined it, was "to apply the technical advantages developed by man to the evolutionary problems of man."[120] At the end of his lecture, Charles located a key element within his conceptualization of design: the role of institutions. Charles argued that for students to feel prepared to face the unnumbered challenges of the contemporary moment, educational institutions needed to provide them with a diverse, interdisciplinary skillset that allowed them to identify connections and continuity between seemingly disjointed ideas. It was the responsibility of schools, universities, and museums to help individuals to, "feel secure in change" and foster an understanding of the collaboration and commitment necessary that, "makes this change work."[121]

I open with the "Design Today" presentation for two reasons. First, it suggests a continuity of interest between the Eameses forays in architecture, design, new media, and education that contradicts former accounts of their

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[119] Ibid.
[120] Ibid.
[121] Ibid.

careers that have drawn strict divisions between their industrial design practice with that of their educational initiatives and experiments in new media.[122] While much of the Eameses' attention had gradually shifted toward exhibition design, film, multi-media presentations, and the creation of effective pedagogical environments, they were still designing new furniture for Herman Miller and developing object-based educational models to communicate cultural histories, ideas, and values.[123] The only significant difference between the Eameses' industrial design and later efforts to reform pedagogical approaches through the use of new technologies is the media employed.

I also open with "Design Today" because it serves as a precursor to the Eameses' concerted efforts to reform educational systems in the United States by applying the concepts of relativity that guided their design practice and illustrates their early interest (1950) in reforming institutions—this is not a later phenomenon as earlier accounts have argued. This understanding of relationships and learning continued conceptions they displayed in their house and the understanding of the objects they collected as fundamentally functional and the result of interdisciplinary ingenuity. The Eameses applied this attitude toward developing educational materials and practices, attempting to teach their methods to students while also reforming educational structures within the United

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[122] In his book, *Happiness by Design,* Justus Nieland similarly underlines the importance of intermedia and interdisciplinary approaches within the Eameses' work. See Nieland, *Happiness By Design.*

[123] For a chronological timeline of the Eames Office projects, including most of their completed projects across various media, see Neuhart, *Eames Design,* 5-7; and Schuldenfrei, *The Films of Charles and Ray Eames,* xviii-xix.

States and democratic nations across the world. While the Eameses' 1953 *Sample Lesson* (discussed below) has been seen as a discursive shift in their production, I suggest that their educational work reified theories and beliefs expressed in the design of their home and furniture, and represented a change in emphasis and audience rather than a disjuncture in their creative production.

This chapter reestablishes continuity between the Eameses' modern furniture and architecture production with their explorations in exhibition design, new media, and visual pedagogy, demonstrating how designs across media developed in congress, influencing the aesthetic and educational models employed within each project. This sense of connectedness between disparate projects is reinforced in the course recommendations and lectures the Eameses gave as well as the kinds of conferences they participated in and, therefore, this chapter focuses on two series of educational reforms: one beginning in 1953 with *A Sample Lesson* and the resulting film, *A Communications Primer* (1953); the other involving the Eameses' work with artist and MIT professor, György Kepes, along with other faculty interested in visual language, culminating in the Eameses' *The MIT Report* in 1967. I argue that while the Eameses' pedagogical influences are various and dynamic, Kepes played an important role in how the Eameses' spoke about their design objectives, drawing on Kepes' phrase "the language of vision" to describe their own methodologies.[124] Through an examination of their work in university curriculum reform, I interpret the Eameses'

[124] See Gyorgy Kepes, *Language of Vision* (Chicago: Paul Theobald, 1951).

pedagogical aims and the problems they encountered in making their aspirations a reality. This chapter recovers institutional adjacencies and interdisciplinary partnerships that have remained unexplored, absent from discussions of their work and how these connections played an important role in defining the Eameses' communication practices and their ideas of how institutions should share information and interact with the public, promoting liberal ideologies of universality.

A Rough Sketch for a Sample Lesson for a Hypothetical Course

In the summer of 1952, Lamar Dodd, chairman of the Department of Fine Arts at the University of Georgia in Athens, recruited designer George Nelson "to study and suggest curriculum revision" and develop new educational policies for their program.[125] At the time, Georgia's program resembled that of many other universities. It drew on classical traditions and the separation of media, offering courses in theory, drawing, painting, and design along with workshop spaces for fiber arts, screen printing, and ceramics.[126] After the initial meeting with Dodd and faculty committees, Nelson invited Charles and Ray Eames to collaborate on

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[125] George Nelson's and the Eameses' accounts of *Sample Lesson* vary slightly in the order of the course of events, along with who is credited with certain ideas. Nelson referred to the experiment as "Art X," penning an essay recounting the designers' approach in "Art X = The Georgia Experiment," *Industrial Design* 1, no. 5 (New York: Whitney Publications, October 1954). This essay was later reprinted in Nelson's book, *Problems of Design* (New York: Whitney Publishing, 1957). The Eames Papers contain original correspondence with Nelson, giving an indication of how the project was organized and who proposed certain ideas. See Part II, box 189, folder 1, "Rough Sketch for a Sample Lesson," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

[126] See George Nelson, *Problems of Design* (New York: Whitney Publishing, 1957), 16.

the project and throughout the fall semester, they embarked on a series of class visits and closely assessed the undergraduate curriculum. Instead of suggesting additional courses or requirements for the program, the designers concluded that the department's pedagogic *method* and *structure* needed to be reexamined and reformulated to meet the evolving challenges to the arts in an increasingly technocratic society. Nelson explained this point to the faculty by structuring a comparison between teaching methods used in the arts and sciences:

> It was perfectly clear that much time was being wasted through methods originally developed for other purposes. For example, one class was finishing a two-week exercise demonstrating that a given color is not a fixed quantity to the eye but appears to change according to the colors around it. In a physics class, such a point would have been made in about five minutes with a simple apparatus, and just as effectively.[127]

The designers sought to establish principles for efficiently communicating course concepts to art students and accelerating the learning process through the application of multisensory and multi-dimensional strategies, emerging technologies, and alternative presentation techniques in classroom settings. These strategies would combat inefficiency and the compartmentalization of fields of knowledge, exposing relationships between seemingly unrelated phenomena. The designers stressed that education's primary concern is to provide students with an awareness of connections and to "foster understanding and creative capacity" so that this awareness "could be employed in any situation."[128] For the Eameses and Nelson, this objective became especially

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[127] Ibid.
[128] Ibid.

pertinent in art programs similar to the University of Georgia's, whose graduates rarely pursued careers as professional artists and would be better served in learning how to identify relationships between vast informatic fields.

Nelson and the Eameses' interest in pedagogical reform—their investment in nonspecialized, liberal education and the holistic understanding of "relationships" through the use of new technologies—echoed a number of contemporaneous conversations in postwar education in the United States.[129] The Cold War fascination with connectedness was an ideal of national and intellectual character, which grew out of wartime concerns with morale and perceived threats to national unity. This crisis overlapped with a broad critique of modernity as an agent of fragmentation of knowledge into increasingly disparate domains of specialization and expertise—a phenomenon later formulated in C.P. Snow

's "two cultures" of art and science.[130] Many believed the fracturing of knowledge erected barriers in communication and learning, testifying to a loss of common national culture and democratic educational agenda. Scholars and practitioners understood this loss as a result of the technoscientific habits of thought that had

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[129] For key studies on collaborations between art and science, see Marga Bijvoet, *Art as Inquiry: Toward New Collaborations Between At, Science, and Technology* (New York: Peter Lange, 1997); Anne Collins Goodyear, "The Relationship of Art to Science and Technology in the United States, 1957-1971: Five Case Studies" (PhD Dissertation, University of Texas at Austin, 2002); Eva Díaz, *The Experimenters: Chance and Design at Black Mountain College* (Chicago: University of Chicago Press, 2015); and John R. Blakinger, *Gyorgy Kepes: Undreaming the Bauhaus* (Cambridge, MA: MIT Press, 2019).

[130] C.P. Snow coins the phrase, "two cultures," to refer to the sciences and the humanities in his often quoted Rede Lecture of 1959. See C. P Snow, *The Two Cultures and the Scientific Revolution* (Cambridge: Cambridge University Press, 1959). The Eameses' interest in art and science is exhibited in their military commissions and house, discussed in the first chapter, which predates Snow's commentary.

developed during the war, which had resulted in the alienation of humanistic cultivation aligned with the domains of religion, philosophy, art, and literature. A series of sweeping curricular reforms emerged to remedy the problem, solutions offered by proponents of multiple education movements.[131]

To develop their own approach to educational reform, the Eameses studied a diverse range of sources written by experts in multiple disciplines and produced extensive sets of research notes—many hundreds of pages in the archives—filled with illustrations, quotations, and yet more citations of additional sources; the notes point to an even wider set of references, as does the collection of books the Eameses' maintained in their house and office. These documents, taken as a whole, reveal the expansive intellectual world the Eameses inhabited during the mid-twentieth century and how the role of design had extended from consumer products to the structuring of ideas.

Some of the Eameses' references are predictable—foundational texts in art and educational philosophies. Charles and Ray studied classic works of art history and aesthetics, like Vasari's *The Lives of Artists* (1550), Erwin Panofsky's *Perspective as Symbolic Form* (1927), John Dewey's *Art as Experience* (1934),

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[131] For studies on education reforms in the United States at midcentury, see Molly Jessup, "Mid-Century Education Reform and the Character of Citizens," *The Councilor* 74, no. 2 (2013); Sara Mondale and Sarah B. Patton, eds. *School: The Story of American Public Education* (Boston: Beacon Press, 2001); and Amy F. Ogata, *Designing the Creative Child: Playthings and Places in Midcentury America* (Minneapolis: University of Minnesota Press, 2013). For recent studies that explore the history of modern design education at midcentury, see Zeynep Celik Alexander, "The Core That Wasn't, *Harvard Design Magazine* 35 (2012), 84-89; and *Kinaesthetic Knowing: Aesthetics, Epistemology, Modern Design* (Chicago: University of Chicago Press, 2017).

and Roger Fry's *Transformations* (1926) (Figure 2.5).[132] Some of the art historical titles Charles and Ray consulted were more obscure. They owned books on Etruscan sculpture, medieval history, Renaissance painting, American photography, and popular taste. Nineteenth-century sculptor Horatio Greenough's writings on art, design, and architecture, largely forgotten until a selection of his essays was reprinted under the title *Form and Function*, had only recently been rediscovered in 1947, but served as an important influence for the Eameses' conception of functional design and modern engineering.[133]

The Eameses also turned to trailblazers of progressive education, among them art critic Herbert Read; the educator Maria Montessori; and Bauhaus figures and descendants like Walter Gropius, Josef Albers (a close personal friend), László Moholy-Nagy, and György Kepes, who the Eameses would ultimately collaborate with at MIT.[134] They modeled approaches after the Swiss education reformer Johan Heinrich Pestalozzi and his student, the German pedagogue Friedrich Fröbel, known for inventing kindergarten education.[135]

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[132] These sources are all visible in photographs of the Eameses' bookshelves, and were still in the Eames House during my visit there in 2018. See Giorgio Vasari, *The Lives of Artists,* trans. A.B. Hinds, and William Gaunt (London: Dent, 1927); Erwin Panofsky, *Perspective as Symbolic Form* (New York: Zone Books, 2009); John Dewey, *Art as Experience* (New York: Minton, Balch & Company, 1934); and Roger Fry, *Transformations: Critical and Speculative Essays on Art* (London: Chatto and Windus, 1926).

[133] See Horatio Greenough, *Form and Function: Remarks on Art, Design, and Architecture,* trans. Harold A. Small (Berkeley: University of California Press, 1947).

[134]See Herbert Read, *The Meaning of Art* (Middlesex, England: Penguin Books, 1967); Maria Montessori, *The Montessori Method* (New Brusnwick: Transaction Publishers, 2014). The Eameses have correspondence with each of these listed designers in their files, and had an Albers painting hanging prominently in their home.

[135] Charles recalled playing with Fröbel Gifts (geometric and pattern building blocks) as a child and noted that they served for inspiration in the Eameses' own educational toy designs. Many modern architects and designers such as Frank Lloyd Wright, Le Corbusier, and Buckminster

Pestalozzi and Fröbel advocated learning through participatory activities; Fröbel's recognition of the importance of "games" and "free work" in education heavily influenced the Eameses' use of interactive exercises in their proposed courses and in later exhibitions.[136] Moreover, they held contemporaneous theories of art by individuals including such as Frank Lloyd Wright, Buckminster Fuller, Mies van der Rohe, and György Kepes.

Importantly, the ideas and publications of these figures were placed alongside the Eameses' extensive collection of contemporary theory in philosophy, linguistics, mathematics, and science. The Eameses' owned a copy of Alfred Korzybski's *Science and Sanity* (1933), a key work in the foundation of general semantics that maintained human understanding as restricted by the makeup of the nervous system and structures of language.[137] *Language in Thought and Action* (1949) by S. I. Hayakawa and Susanne Langer's *Feeling and Form* (1953) also investigate human interaction through symbolic mechanisms, with Langer, in particular, connecting philosophical and scientific knowledge to aesthetic experience.[138] The Eameses' approach to these sources—how they borrow ideas from multiple disciplines and apply them to design—makes it especially clear that they were both were deeply invested establishing strategies to educate perception in an attempt to combat a modern sense of fracture. These

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Fuller also noted early exposure to Fröbel's mathematics in primary education. See Kirkham, *Charles and Ray Eames,* 147.

[136] Friedrich Fröbel, *The Education of Man* (New York: D. Appleton and Company, 1900 [1887]).

[137] Alfed Korzybski, *Science and Sanity: An Introduction to non-Aristotelian systems and general semantics* (Lancaster, PA: Science Press Printing Company, 1933).

[138] S I Hayakawa, *Language in Thought and Action* (London: Allen & Unwin, 1974); S. K. Langer, *Feeling and Form* (London: Routledge & Kegan Paul Ltd., 1979).

texts reveal the basis of the Eameses' method as an open-ended appropriation of discourses.

The Eameses pedagogical program required a dialectical way of seeing, calling for new modes of perception and social action – a kind of networked visuality for postwar citizenship that would be enabled by the very new media technologies that had instantiated the pace and scale of the postwar change. In the aforementioned speech, "Design Today," for example, Charles Eames evaluated the function of design in "this time of specialization," concluding that its purpose "would be to apply the technical advantages developed by man to the evolutionary problems of man."[139] In a postwar society dominated by consumerism and a fear of atomic warfare, the Eameses believed that the designer's role was to teach citizens to see continuity through relationships, combatting habitual "atomistic" ways of seeing and thinking using "all the means that are at our disposal at this time."[140]

In presenting their ideas to the faculty at the University of Georgia, Nelson and the Eameses were met with confusion, hostility, and misunderstanding, and they resolved to demonstrate their methods and pedagogical approaches in a sample lecture. The designers invited their colleague, Alexander Girard, to participate in the organizationally complex presentation and Edgar Kaufmann, Jr., director of the Industrial Design Department at the Museum of Modern Art

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[139] Charles Eames, "Design Today," speech, University of Washington Arboretum, Seattle, October 1950. See Part II, box 216, folder 29, "Design Today," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.
[140] Ibid.

served as a project consultant.[141] The designers had all served key roles in Kaufmann's "Good Design" exhibition series and shared a common objective—to promote quality design and show how expansive its applications were, echoing Charles' assertion that "the function of design would be to apply the technical advantages developed by man to the evolutionary problems of man."[142] In this project, the designers applied their experience with systems and visual language acquired through years of solving problems in design and architecture to reform ineffective organizational structures and pedagogical approaches within higher education. To support curriculum development, Dodd secured funds from the Rockefeller Foundation, completing a complex web of investors and experts that represented university administration, corporate philanthropy, a prestigious art institution, and preeminent industrial design offices.[143] This method of collaboration allowed Nelson, Girard, and the Eameses to expand the scope of their commission to create a universally adaptable art curriculum with implications and audiences that they hoped would extend far beyond the University of Georgia.

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[141] See letter from George Nelson to Charles Eames, Part II, box 189, folder 1, "Rough Sketch for a Sample Lesson" Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

[142] Charles Eames, "Design Today," speech, University of Washington Arboretum, Seattle, October 1950. See Part II, box 216, folder 29, "Design Today," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

[143] Kaufmann directed the Good Design exhibition program and headed the selection committees, the first of which included Alexander Girard and Meyric Rogers of the Art Institute of Chicago. The Eames Office designed the inaugural good design exhibition in Chicago, which opened on January 17, 1950. This exhibition is discussed at greater length in the first chapter.

A Rough Sketch for a Sample Lesson for a Hypothetical Course revolved around the theme of communication and the lecture incorporated a range of communicative devices including synthetic aromas, music, narration, film, multi-screen slide projections, and graphic panels that engaged multiple senses simultaneously and provided the audience with information in a highly coordinated manner (Figure 2.6). Charles described the presentation in an interview years later, recalling:

> …it had not only multiple images, including the relationship between still and motion pictures, but also sensory things—smell and music. We used a lot of sound, sometimes carried to a very high volume so that you would actually feel the vibrations. In a sense that we were introducing sounds, smells, and a different kind of imagery, we were introducing multimedia. We did it because we wanted to heighten awareness.[144]

The Eameses, Nelson, and Girard endeavored to show their proposed method of combining multiple sensory media to construct immersive learning experiences, accelerating and enhancing students' understanding of ideas and core concepts while "supply[ing] a very broad range of material upon which the teacher could then base his arguments."[145] For example, as the designers explained the multiple functions of stained glass within medieval churches, they utilized triple-screen slide projections, narration, and music, accompanied by the aroma of incense pumped into the auditorium through the ventilation system to replicate the experiential effects of standing in a sacred space.[146] Stained glass not only

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[144] See Owen Gingerich, "A Conversation with Charles Eames," *The American Scholar* 46, no. 3 (Summer 1977), 332-333.
[145] Ibid, 332.
[146] Ibid.

produced mystical effects by filtering light through carefully crafted colored glass, but it also served as a communication device, instructing visitors through the visual representation of biblical narratives and religious symbolism. Instead of having to articulate the combined sensory effect enacted by the multiple media within churches that informed the experience of viewing stained glass, the designers utilized smells along with audio-visual material to suggest how they could serve as the primary method for communicating information, enriching and stimulating high-paced, substantive educational experiences.

Correspondence with Nelson from December 1952 illuminates the designers' approach to *A Sample Lesson* and their interest in using new media to convey information about complex concepts. The lecture was modular in structure, a sequence of what the Eameses and Nelson referred to as "packages" or "capsules," each prepared individually by the designers and integrated into the final lectures.[147] Modularity was pragmatic in that the designers each maintained individual design offices in New York, Venice, and Michigan, however, it also reinforced ideological principles in that it allowed them to incorporate multiple films, thematically arranged slide shows, and tape-recorded soundtracks and narrations. Offering details of their initial preparations, Charles wrote that he and Ray had consulted with faculty in the Department of Theater Arts (now the School of Theater, Film & Television) at UCLA, who

[147] These terms are taken directly from letters exchanged between Charles and George Nelson, describing their approach. See correspondence files between Nelson and Charles Eames, Part II, box 189, folder 1, "Rough Sketch for a Sample Lesson" Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

provided the Eameses with short film clips—a documentary on Egypt; *La Lettre* (1930), a French film about the development of writing and the invention of the printing press; selections from the UPA (United Productions of America) cartoon titled *The Animated Calligraphy of Sound*—along with advice on best practices for incorporating audio-visual material in classroom settings.[148] For the Georgia lectures, the Eameses also combined still and moving images with narration to develop two original short films titled *Communications Process* and *Communications Methods*, and working jointly with George Nelson, they fabricated a communicative device that utilized "fast-cut" triple-screen slide projections alongside interpretive commentary.[149] Both of these new media formats—film and multi-screen presentations—became standard elements within the Eames Office's projects and presentations and recalled traditional art-historical comparison methods where multiple images are juxtaposed against one another to reveal subtle differences and unexpected similarities. Throughout the lecture, the designers demonstrated the ways in which familiar viewing patterns could be enhanced through the introduction of new multimedia strategies in classrooms to give students an understanding of formal relationships and key ideas at an accelerated pace.

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[148] Filmmakers and producers in the department advised that they found "it much more profitable in getting information across, not to rely on the impact of the four or five minute film, but to, in some way, lay preparation beforehand so [students] have some clue to help them recognize the point when it comes." See correspondence files between Nelson and Charles Eames, Part II, box 189, folder 1, "Rough Sketch for a Sample Lesson" Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.
[149] Ibid.

Fine arts faculty at the University of Georgia responded poorly to the presentation, conveying apprehension that their roles as teachers would be threatened or even replaced by advanced technologies and that the proposed method would encourage quantitative assessments of classroom performance. Nelson recalled, "That night Eames and I discussed the turmoil created by what we had believed were innocuous proposals," and afterwards they determined to rework the project and develop another course on communication which they would demonstrate at UCLA in May 1953.[150] The Rockefeller Foundation continued to sponsor the project, and this iteration was also co-sponsored by several departments and schools on campus—the Engineering School, the Department of Art, the School of Education, and the Department of Theater Arts. The expanded list of sponsors reflected a broader interest in visual communication within the university along with a different pedagogical atmosphere than that of the University of Georgia—one located within the technocratic nexus of Los Angeles.

The printed invitation seeped with optimism and anticipation for the potential implications of communication technologies and interdisciplinary collaborations within higher education:

> *something new is happening … a*
> *normal progression, perhaps,*
> *toward*
> *breaking down the barriers*
> *between fields*
> *of learning … toward making*

[150] See George Nelson, *Problems of Design,* 17.

people a little more intuitive …
toward
increasing communication between
people and things.[151]

In their study of university structures, Nelson, Girard, and the Eameses had found that these artificially constructed "barriers" prevented communication "between art and engineering"; "engineering and business"; and "business and art in technique and appreciation."[152] Seeking "to break down compartmentalization by helping students make links and cross-references between subject areas," *A Sample Lesson* offered a possible solution to the contemporary crisis of fracture by illustrating continuities between fields through the use of new communication technologies and expanding the scope of what can be considered art, arguing, "Art is a chair, a test tube, a loaf of bread"; "Art is a mathematician's formula, a philosopher's way of life."[153] The designers suggested that new communication methods such as film and multimedia modes of presentation could establish a unified language that would allow artists, scientists, and mathematicians to discuss their disciplines as a communication process equal in social and cultural value to all others.

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[151] Charles and Ray Eames, George Nelson, and Alexander Girard, "A Sample Lesson Brochure," Part II, box 189, folder 10, "Rough Sketch for a Sample Lesson," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.
[152] Charles Eames quoted in Owen Gingerich, "A Conversation with Charles Eames," *The American Scholar* 46, no. 3 (Summer 1977), 332. In unidentified notes in the archive, Ray Eames refers to "barriers" between the arts and other disciplines in existing educational models within her desk materials from 1955. See Part II, box 216, folder 8, "Unidentified notes from the desk of Ray Eames, June 1955," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.
[153] Charles and Ray Eames, George Nelson, and Alexander Girard, "A Sample Lesson Brochure," Charles and Ray Eames Papers.

Although they had faced resistance in Georgia, the designers' vision received enthusiastic reactions at UCLA, where *A Sample Lesson* enjoyed a six-day run; by the third show, the auditorium reached capacity with faculty, students, and community members spilling into the aisles and lining the walls for the last several demonstrations (2.7).[154] The multimodal educational approaches proposed in *A Sample Lesson* were less radical to postwar audiences in Los Angeles who were accustomed to the ways in which architects, designers, and artists transformed new technologies and materials into tools for cultivating creativity. Moreover, the Eameses developed many of their methods in conversation with film studies faculty at UCLA, who had already established common practices and effective strategies for introducing film and multimedia elements in classroom settings.[155] The audience was receptive to the use of communication technologies for educational purposes.

However, the scale and degree to which the designers utilized proved impractical for widespread implementation at universities. *A Sample Lesson* required eight technicians to run the film, music, and slide projections and the suggested interdisciplinary approach—where new media would allow for the exchange and enhanced flow of information within and between departments—opposed academic trends of the mid-twentieth century.[156] As fields of knowledge

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[154] George Nelson, *Problems of Design,* 17.

[155] See Letter from George Nelson to Charles in Part II, box 189, folder 1, "Rough Sketch for a Sample Lesson," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

[156] In *Eames Design,* the Neuharts indicate that the project took eight technicians. See Neuhart, *Eames Design*, 183.

were growing more and more specialized and introverted, Nelson, Girard, and the Eameses suggested a comprehensive new way of structuring educational institutions, where university-wide communication systems would allow faculty in any discipline to share resources and information for the benefit of their students and the broader community. This model necessitated concerted dedication and participation from the entire academic body—a utopian vision for the future of higher education that initiated discourse about the potential of new media as a cross-disciplinary pedagogical tool within several universities and schools, however, failed to launch any substantive structural change at the University of Georgia or at UCLA.

While neither university broadly adopted the strategies exhibited in *A Sample Lesson* and little documentation from the lectures survives aside from the scattered proposals littered throughout the Eameses' correspondence and a few photographs and invitations from the UCLA lectures, Charles and Ray Eames repurposed the content and didactic approaches demonstrated in *A Sample Lesson* to develop two subsequent projects that reached far broader audiences: their first strictly pedagogical film, *A Communications Primer* (1953) and a series of lectures for the introductory design course in the School of Architecture at the University of California in Berkeley. Both of these projects benefitted from the experience, feedback, and financial support the Eameses' had received in creating *A Rough Sketch of a Sample Lesson for a Hypothetical Course.* The opportunity served as a critical juncture in the Eameses' careers,

enabling them to collaborate with designers and institutions to begin formalizing theories of communication and to advance methods of using multimedia as an educational tool to exchange ideas across multiple disciplines, universities, and nations.

A Communications Primer **(1953)**

Charles and Ray Eames created two short films for *A Sample Lesson* entitled *Communications Process* and *Communications Method*, which incorporated photographic stills, short film clips, graphic diagrams, and voice-over narration in a discursive montage that reinforced the lecture's interdisciplinary objectives.[157] Later that year, they combined the films to produce *A Communications Primer,* which served a specific function: to introduce architects to communications theory and illustrate "how information of all sorts can be handled efficiently and effectively" to face challenges generated from contemporary "social changes." However, their conception of design as communication made the theories within the film applicable in disciplines and ways of thinking that extended far beyond the original audience of architects. The Eameses' interest in theories of communication was a result of thinking about wider questions of architecture, design, and city planning in a new "post-industrial" society and their involvement in the postwar transformation of new technologies and developments that had been coded toward military purposes.

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[157] In *Eames Design,* the Neuharts state that the presentation included two films that the Eameses later combined. See Neuhart, *Eames Design*, 187.

With *A Communications Primer,* the Eameses sought to expand the application of communication sciences to other disciplines and ways of thinking, and they believed that finding solutions to humanity's most pressing problems relied on clarifying communicative processes and illustrating their diverse, interdisciplinary applications.

When developing the two initial films, the Eameses discussed the project with their close personal friend, filmmaker Billy Wilder, who expressed concern in the expansiveness of the subject and suggested a "simple, direct, and clear" approach to demonstrate to large audiences "how broad and varied and ever-present and stimulating in the most uncomplicated ways, communication is, and that more than ever expected, and if it was, then perhaps many more things are more than they ever could suspect they could be."[158] In correspondence, Charles described the encounter, detailing how Wilder selected an Oxford unabridged dictionary from the Eameses' bookshelf and under "communication" found a variety of definitions from disparate geographical and temporal locations. Wilder suggested that the dictionary entries—multiple and contradictory—would provide a simple, yet effective opening to illustrate how the term shifted meaning depending on its cultural and historical context. A photograph of the dictionary entry serves as the opening image in *A Communications Primer,* indicating the ways in which "communication" has been defined in the past, before Charles, serving as the film's narrator, announces the arrival of an "Era of

[158] Letter from Charles Eames to George dated December 16, 1952, Part II, box 189, folder 1, "Rough Sketch for a Sample Lesson," Charles and Ray Eames Papers.

Communication," and prepares audiences to identify ways in which the subject manifests in daily life (Figure 2.8).[159]

The film then introduces a graphic diagram of Claude Shannon's mathematical communication model, which determined the most efficient way of encoding messages and calculating redundancy in human interactions. Shannon, an MIT professor and Bell Telephone Laboratories research mathematician, first published his information theory in the *Bell System Technical Journal* in 1948 in an article titled, "A Mathematical Theory of Communication." Identifying a crucial distinction between information and the semantics of a message, Shannon stated, "The semantic aspects of communication are irrelevant to the engineering problem. The Significant aspect is that the actual message is one selected from a set of possible messages."[160] Shannon essentially separated the content of the message from its communication method, defining the constituent elements and terminology—information source, transmitter, message, signal, receiver, destination, noise, and redundancy—through a series of examples (Figure 2.9). The inherent challenge to this method was to eliminate "noise contamination" of a communication channel that arose during transmission, a problem that could be overcoming by adding calculated redundant information to the signal and cancelling out any minor errors that would prevent effective transmission.

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[159] *A Communications Primer,* directed by Charles and Ray Eames and Ray Eames (New York: Museum of Modern Art, 1953).
[160] See Claude E. Shannon, "A Mathematical Theory of Communication," *Bell System Technical Journal*, Vol. 27 (1948), 379-423, 623-656. Later reprinted in Claude E. Shannon and Warren Weaver, *A Mathematical Theory of Communication* (Urbana: University of Illinois Press, 1972).

Shannon addressed the need to reduce the quantity of transmitted data by compressing the information without the loss of legibility. The Eameses summarize this point in their 1973 book, *A Computer Perspective*, where they write:

> In Shannon's information theory, the more difficult it is to guess what the next letter or symbol in a message will be, the more "information" the message contains. Conversely, the more easily the receiver of the message can guess the next symbol, the less "information." This idea gives the engineer a way to exploit the statistical character of communication. The part of the message that he can predict, he need not transmit.[161]

The Eameses acknowledge that "the English language is about one-half redundant," and in a sentence such as "only infrmatn ncesary to comprhnd shuld b tranmitd," the absence of letters condenses the information and reduces redundancy, yet the message remains legible.[162]

The Eameses' sought to "inspire greater appreciation of the broader meaning of 'communication,'" and the abstract nature of Shannon's formula allowed them to integrate theoretical-mathematical research on communication within various pedagogical projects, informing their working method and approach to multimedia.[163] Redundancy became a communication strategy for the Eameses, evident in *A Sample Lesson, A Communications Primer,* and later films and educational projects where the repetition of images and scenes

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[161] Charles and Ray Eames, *A Computer Perspective* (Cambridge, MA: Harvard University Press, 1973).
[162] Schuldenfrei uses a similar sentence construction to explain repetition and redundancy in language in Schuldenfrei, *The Films of Charles and Ray Eames,* 24.
[163] Quoted in Neuhart, *Eames Design,* 183.

enabled viewers to distinguish meaningful patterns, reinforcing essential themes to control the audience's free association of images and to prevent "noise contamination."[164] *A Communications Primer* exhibited the operational system that guided the Eameses' approach, and it introduced this concept in a highly self-referential manner, demonstrating the ways in which multimedia could be used to communicate the value of communication. To Charles and Ray Eames, film was a useful informational tool with the potential to translate complicated concepts, create visual continuity between seemingly disparate material, and convey ideas to various audiences.

After explaining Shannon's information theory, the Eameses demonstrated its value as an interdisciplinary interpretive model for understanding a wide range of communicative methods. Beginning with the dictionary entry, the film quickly moves through other scenarios including telegraphy, graphic forms, Morse code, traffic lights, printed press, flight navigation, mosaics, calligraphy, and hand signals. Using painting as "another example of a signal transmitting a coded message," the film flashes a selection of Josef Albers' work before focusing on Georges Seurat's pointillist painting, *Sunday on the Island La Grande Jatte* (1884-1886).[165] As the camera snakes across the surface of the artwork, the narrator explains that the placement of each small dot of paint influenced the entire composition and that "the communication of the total message contains the

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[164] Terminology take from Claude E. Shannon, "A Mathematical Theory of Communication," Bell System Technical Journal, Vol. 27 (1948), 379-423, 623-656.
[165] *A Communications Primer,* directed by Charles Eames and Ray Eames (New York: Museum of Modern Art, 1953).

responsibility of numerous decisions made again and again, always checking with the total concept through a constant feedback system." The Eameses outlined how the "mind and experience" of the painter served as the "information source," and the "concept" of the painting as the "message."[166] The artist's "technique and talent," functions as the transmitter, sharing the intended "message" with the receiver"—the ultimate destination being the minds and experiences of the painting's viewers.[167] The artist also served as a potent example of the Eameses' proposed method as he explored painting as both an artistic and scientific endeavor; his studied, precise technique developed from his interdisciplinary intellectual engagement and research.

Near the end of the film, after discussing a myriad of communicative forms, the Eameses conclude with a focus on computers and automation, humanizing their use through a concept of responsibility. As the music composed by Elmer Bernstein heightens and builds anticipation, the camera follows the path of a landing airplane, flashing between shots of an airport communications tower and the descending craft. Scanning over the gages, knobs, and levers that make up the complicated navigation, the pilot flips one last switch as the narrator states "these elements of a communication system act together as one great tool, and though the tool can complete complex tasks, it can never relieve the man of his responsibility. No matter where it occurs, no matter what the technique, communication means the responsibility of decision all the way down

[166] Ibid.
[167] Ibid.

the line."[168] By highlighting the pilot's interaction with the machine, the film establishes new media and technologies as continuities of past communicative devices, solving problems at an accelerated rate, but maintaining a reliance on human decisions to initiate and interpret information exchanges. The film impresses this point in the final scene, where the camera centers on a piece of paper and a brush wet with black ink crosses its surface. The Eameses visually relate the pilot's action to that of a calligrapher's, the only difference being the form of the communication medium. In *A Communications Primer,* the Eameses create systematic visual relationships between seemingly incongruous processes, unifying ideas of human cognition, aesthetic composition, and the use of new media and developing technological advantages while reinforcing the role of individual choice and social responsibility.

Although the Eameses utilized Shannon's formula as the interpretive formula for *A Communications Primer*, its application within the arts and social sciences can be traced to figures including Warren Weaver, Norbert Wiener, John von Neumann, John Campbell, Jr., Oskar Borgenstern, L.M.K. Boelter, Hamilton Write, and Edgar Kaufmann, Jr., all of whom the Eameses referenced alongside Claude Shannon in early outlines for *A Sample Lesson,* listed in ending credits of the film as inspiration for "ideas, direction, and material," and later consulted on several corporate-funded projects.[169] The Eameses' explained

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[168] Ibid.
[169] Part II, box 114, folder 12, "A Communications Primer Synopses and Pamphlets," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

their method of systems-based principles through ideas set forth in information theory, but the ways in which they applied these concepts within architecture and design came from other emerging interdisciplinary discourses such as cybernetics and game theory. In these fields, communication was no longer confined to human interactions, but instead expanded to include biological, social, and computer processes. Summoning far-flung examples for *A Communications Primer,* the Eameses integrated human and nonhuman communication processes and argued that symbols and tools evolve across time and space, yet the function of connecting and exchanging information remains largely the consistent and tied to human action.

A large portion of Charles Eames's voice-over in the film directly quotes Warren Weaver in the introduction to Shannon's 1949 book, *The Mathematical Theory of Communication,* which revised and elaborated upon ideas from his landmark essay. Weaver expanded the implications of the formula to uses in linguistics and social sciences, contemplating the cultural impact of Shannon's theories. This film also invoked Norbert Weiner and the proponents of cybernetics, who saw a correlation between biological and machine communication processes and promoted interdisciplinary exchange between the physical and social sciences. Wiener's assertion that "the most fruitful areas for growth of the sciences were those which had been neglected as no-man's land between various established fields," firmly established the discipline within the

interstitial disciplinary spaces.[170] *A Communications Primer* capitalized on cybernetics' synthesizing character, calling upon it's universalizing language in the promotional materials to discourage "thinking of communication in a limited way" and "aspired to the breaking down of barriers between areas of learning."[171] The Eameses actively sought to popularize cybernetics within *A Rough Sketch for a Sample Lesson for a Hypothetical Course, A Communications Primer*, and later exhibitions and films developed with IBM's corporate design program. Understanding cybernetic concepts and models as effective ways to understand and organize modern society, the Eameses again sought to utilize technological and theoretical advances made through wartime collaborations between the military-industrial complex and academic institutions.

The Eameses were well aware of cybernetics theories of communication and control, and believed, these cybernetic models were particularly potent in their utopian vision of communication. Cybernetics formulated a system of efficient information exchange between humans and machines, and its investment in disseminating messages as a form of guidance and control were applied across fields of biology, mathematics, linguistics, anthropology, physics, and toward a globalized system of communication. The Eameses sought to include architecture and design within this model, utilizing new media to highlight how information patterns could be relevant to structuring not only the physical

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[170] Norbert Wiener, *Cybernetics or Control and Communication in the Animal and the Machine* (Cambridge, MA: The MIT Press, 1948).
[171] Charles and Ray Eames, flyer for *A Communications Primer,* 1953, in Part II, box 114, folder 12, "A Communications Primer Synopses and Pamphlets," Charles and Ray Eames Papers.

and social sciences, but also the arts and society at large. The Eameses' referred to this web of relationality modeled in many of their hand-drawn diagrams as "connections," which stood at the conceptual core of their design practice within the context of the postwar convergence of cybernetic communications theory, Cold War political agendas, and the accelerated development and theorization of new media.[172]

In formulating their own approach to incorporating information theory and cybernetics within their work, the Eameses referenced a range of contemporaneous figures who shared the same positivist outlook on transmuting war-coded technologies for the benefit of humanistic political agendas. Returning, for a moment, to the Eameses' extensive collection of books for insight into their interests and methodology, sources such as John von Neumann and Oskar Morgenstern's 1944 text, *Theory of Games and Economic Behavior* and Oystein Ore's books of games and chance are especially striking in their conceptualization of mathematical formulas for economic and social organization based on strategic interactions.[173] The Eameses owned work by Alan Ross Anderson, a logician who pioneered relevance logic and texts including David Riesman's *The Lonely Crowd* (1950) and Harold D. Lasswell and Abraham Kaplan's *Power and Society* illustrate how to interpret relationships in terms of

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[172] Charles Eames quoted in *An Eames Celebration: The Several Worlds of Charles and Ray Eames,* directed by Perry Adato (New York: Eductional Broadcasting Corporation, 1975).
[173] John Von Neumann and Oskar Morgenstern, *Theory of Games and Economic Behavior* (Princeton: Princeton University Press, 1944); Oystein Ore, *Number Theory and Its History* (Mineola, NY: Dover Publications, 2012); and Oystein Ore and Lorande Loss Woodruff, et al. *The Development of the Sciences* (New Haven: Yale University Press, 1945).

political power and suggest how systems theories could reorient themselves toward democratic ideals and social justice.[174] This sense of relativism underlies the Eameses' working method, identifying it as subtly political, however, the fact that these agendas are so latent that they are rendered almost unrecognizable is consistent with the ethos of the era.

The Eameses' influences for their pedagogical approach are, to be sure, hardly cohesive or even coherent; Charles and Ray studied disciplines not typically considered commensurate with one another and often cited authors from a single field who were explicitly at odds. Many of the things they studied were beyond their expertise; they often puzzled over equations and diagrams, then copied them in their notes and changing their meaning in the process. This was, in effect, what they had done with Claude Shannon's information theory in *A Communications Primer*, adding an element of human responsibility to a mathematical principle to render it universally applicable. The Eameses essentially reinterpreted and reimaged a wide body of scientific and technological research as aesthetic, comparing and contrasting ideas and images from various disciplines subjectively, illustrating how the underlying concepts could be widely applied in architecture and design.

Years later, the Eames Office released a synopsis detailing the intended distribution for the film in 1953, acknowledging that *A Communications Primer*

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[174] David Riesman, *The Lonely Crowd* (New Haven: Yale University Press, 1950); Harold Dwight Lasswell and Abraham Kaplan, *Power and Society* (New Haven, NJ: Yale University Press, 1957).

had less potency in the field of architecture than they had hoped: "Our first organized picture at [sic] which we attempted to put together all of our ideas on communication theory and present them to the world of architecture. Architects turned a deaf ear, but many agencies in our government, and in England gave it a lot of attention."[175] In 1954, the MoMA Film Library began distributing the 16mm film as part of its agenda to disseminate American art as propaganda during the Cold War, transforming the Eameses' message of liberal communication strategies into a powerful democratizing force. This point is driven home in the film, as Charles' asserts that "communication is that which links any organism together. It is communication that keeps a society together," and that Information could influence the entire way in which society functioned.[176]

Embedded in an expanded terrain of creative media production that connected the Eameses' work in architecture, design, filmmaking, curriculum revision, communications theory, and cybernetics, *A Communication Primer* represents the Eameses continued method of using multiple media to help audiences to see across time, place, and object category at a time when the scale and fear of postwar technologies were at their height. The domain of technology, including film, airplanes, and computers, the Eameses argued, necessitated human interaction, and their sought to determine and disseminate

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[175] Charles and Ray Eames, flyer for *A Communications Primer,* 1953, in Part II, box 114, folder 12, "A Communications Primer Synopses and Pamphlets," Charles and Ray Eames Papers.
[176] *A Communications Primer,* directed by Charles and Ray Eames and Ray Eames (New York: Museum of Modern Art, 1953).

methods for organizing and utilizing media in their experiments and pedagogical initiatives.

Design Education at Berkeley and Beyond

In the fall of 1953, the Eameses continued their efforts to train architects in modes of perceptual-affected awareness of relationships after accepting the invitation of Dean William Wurster to restructure the first-year design course for the School of Architecture at the University of California, Berkeley. In a series of monthly lectures, Charles implored the 125-student class to "think in new terms about design," and to "connect experiences and events," history and practice."[177] As with their previous pedagogical demonstrations, the Eameses incorporated multi-screen slideshows of photographs Charles had taken, films created by the Eames Office and others, lengthy reading assignments from divergent sources on information theory, design, economics, and game theory, accompanied with supplementary audio tracks. The Eameses created material to situate each assignment within the course, modeling design solutions to Cold War problems through the use of four audio-visual, multiscreen slideshows or what they referred to as "scapes": *Railroad, Roadrace, Seascapes, and Townscapes.* In

[177] For Charles Eames, various speeches at the University of California, Berkeley, 1953 see Part II, box 215, folder 5, "Lectures, University of California, Berkeley," Charles and Ray Eames Papers. The citations from lectures that follow in the next series of presentations all come from typed, unpaginated transcripts of lectures. Over the course of the academic year, the Eameses screened films and slideshows that their office produced, but also played films such as the French movie, *La lettre;* UPA films including *Flat Hatting* (1944), *Rooty Toot Toot* (1951), and *The Unicorn in the Garden* (1953); and Jean Mitry's film on the French National Railways. The transcript also indicated that they played a "Kepes film giving his introductory remarks before a speech."

one of his lectures, Charles stated that the use of “slides and sounds and film” helped pull experiences of everyday life “into the act of architecture” and heightened students’ “awareness of future looking, seeing, hearing, smelling feeling, tasting, and relating.” Seeing with “new eyes,” he suggested, would help students to realize the “possibility of gaining new emotional experiences through intensive looking.”[178] The photographic representation of object and spaces, in particular, allowed students to look at “familiar objects from a different perspective,” and effectively stimulated “greater awareness.” Throughout the semester, Charles used a range of imagery the Eameses had begun to amass for their large photographic archive, an approach that prefigures others developed during the 1960s and 1970s in their projects for IBM, in which they used the same images within radically different contexts and for disparate purposes. The Eameses emphasized was not the message within a specific image, but how the image contributed to forming an argument when juxtaposed with other images, objects, and texts.

Rather than continuing educational models practiced at institutions like the Cranbrook Academy of Art and Black Mountain college, where small groups of students interacted closely with instructors in an intimate studio environments, the Eameses demonstrated their method using audio-visual presentations within an auditorium, delivering a lesson to all 125 students at once before sending them to complete lab assignments under the close supervision of a teaching

[178] Ibid.

assistant. A typical slideshow, *Townscapes* (1953) for instance, combined images and textures of American towns with recorded sounds from traffic, shows, and overheard conversations. The presentation also incorporated a recording of Gertrude Stein reading, "The Living and the Dead," from her novel *The Making of Americans,* which generalized her own family lineage and claimed to represent a history for all Americans. Combining references to American literature that emphasized "bottom nature" with the sights and sounds of built environments, the Eameses began to create linkages across academic disciplines, a practice they would focus on in their pedagogical reform efforts at MIT.

The Eameses reuse of images and media across projects demonstrated a conceptual continuity throughout their work as they constantly recycled, refined, and synthesized content. Throughout the 1950s and 1960s, in multi-screen films including *Glimpses of the U.S.A.* (1959) and *Think* (1964), along with numerous other projects, the Eameses demonstrated a high degree of consistency in develop an interdisciplinary grammar and vocabulary for their images—even if viewers could never be expected to fully comprehend the Eameses' visual code. For example, the Eameses' utilized images of seashells from the Berkeley slideshow, *Seascapes*, as a recurring motif in films and IBM exhibitions including *Mathematica* (1961), *Fibonacci* (1973), and *Philosophical Gardens* (1974), where they illustrated the complex mathematical geometry found in the natural world. This suggests that the Eameses seemed to trust viewers' capabilities to make abstract connections between disparate content, and as they continued

developing pedagogical strategies in their work for IBM, in the 1958 *India Report,* and in their information campaigns for the federal government, *Think* (1964), their temporal, spatial, and cross-disciplinary connections became more and more complicated.

Throughout these projects, the Eameses understood the crisis of communication as one that extended outside of art departments to encompass the entire Cold War university, creating a profound fragmentation of experience and dispersion of knowledge into many self-contained disciplines, each with its ever growing, increasingly private language. As the public became increasingly disillusioned with corporations and institutions during the 1960s (the subject of the next chapter), the Eameses became resolute in their belief that education should stimulate the circulation of ideas across fields. In their work with MIT beginning in 1967, the Eameses sought to establish channels of communication that would interconnect various disciplines and technologies to offer a sense of structure within a rapidly changing world. Within their later projects, they maintained that ideas and images could be read through and against each other to produce new ideas and new images—such intellectual exchange could create new knowledge, therefore to think between ideas, to see between images, could, in the Eameses' minds, advance human culture. MIT, the archetype of a cold war institution became the perfect place for which to advance their ideas. Their connection with MIT, in turn, helped them develop a formal language to describe their conception of visual design.

Visual Pedagogy at MIT

Whereas the University of Georgia and UCLA maintained traditional disciplinary divisions, confining the visual arts within single departments and schools, MIT's mission "to advance knowledge and educate students in science, technology, and other areas of scholarship that will best serve the nation and the world," resulted a unique institutional arrangement that prioritized laboratory instruction and programs whose focus extended beyond traditional departmental boundaries. During the 1930s, MIT cultivated partnerships with the federal government and as World War II loomed, increasing funding for military research that prompted the formation of centers dedicated to solving particular cross-disciplinary problems.[179] A diagram from a 1958 report shows the administration's vision for a "university polarized around the sciences," with a constellation of advanced research centers revolving around core departments, connected to while remaining distinct from disciplinary designations.[180] Seven centers in areas of concern including international studies, communication sciences, and energy research and utilization represented the integration of life and social sciences with the physical sciences, and in 1965, artist and theorist

[179] Most notably, the National Defense Research Committee established the Radiation Laboratory, or "Rad Lab" at MIT in 1940 to develop radar and improve navigation. Shortly thereafter, the Manhattan Project absorbed many of the Rad Lab scientists and reoriented efforts towards developing nuclear weapons.
[180] Diagram printed in *Technology Review* (December 1960).

György Kepes publicly advocated for the incorporation of the visual arts within this system.

In 1945, MIT recruited Kepes, who had previously directed the Color and Light Department at the New Bauhaus in Chicago, to initiate a program in visual design as a central aspect of the school's new "postwar orientation." Incorporating general education philosophies, MIT reoriented their curriculum to train broad-based, socially useful mental processes that could be applied to a number of situations rather than continuing to educate students in specific vocational skills. In joining the School of Architecture, Kepes became the first artist on the faculty and his "language of vision"—the theory he published in a book of the same title in 1944—promoted "visual design" as a project that would allow one "to understand how to tie things together visually." As Anna Vallye has noted, Kepes was hired because of his conception of the image as a "visual technology of knowledge, oriented toward 'training the creative imagination for positive social action."[181] Amidst the institution's postwar absorption and reconfiguration of the liberal arts in ta curriculum uniting science, technology, and art, visual pedagogy in architectural training provided "a sense of organic interrelatedness," integrating "structural, biological, technical, psychological, and intellectual frames of reference."[182]

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[181] Anna Vallye, "The Strategic Universality of *trans/formation,* 1950-1952," *Grey Room* 35 (Spring 2009), 41. See also, Vallye, "Design and the Politics of Knowledge in America, 1937-1967: Walter Gropius, Gyorgy Kepes" (PhD dissertation, Columbia University, 2011).
[182] See Gyorgy Kepes, "The Visual Arts and Sciences: A Proposal for Collaboration," *Daedalus* 94, no. 1 (Sinter 1965), 122.

Kepes's visual design program at MIT was a direct descendant of Bauhaus pedagogy; it built on Lazlo Moholy-Nagy's visual design agenda, Josef Albers's classes on the interaction of color, and Kepes's own theories outlined in his book, *Language of Vision*, but he also adapted his approach to the scientific and technological ethos of the institute (Figure 2.10). Kepes synthesized fields as disparate as Gestalt psychology, engineering, and biology—any discourse on images and seeing could be absorbed into visual design—and purposefully merged mid-century fields and concepts like Norbert Wiener's work in cybernetics, Ludwig von Betalafy's systems theory, and Claude Shannon's information theory. In many ways, Kepes's visual design departed from more familiar models of arts education, and in his notes he refers to his theory using a number of interchangeable terms, stating that "Form thinking—structural thinking, configuration thinking, is different from [the] simple making [of a] little painting in an art department of the university. Form thinking must penetrate all disciplines of education." Kepes argues for a reconceptualization of the arts and its teaching methods to emphasize formal structures and relationships over any particular media. He argued that "form thinking" could be taught as a subject in itself within a department "that specializes in this new approach," or by a group of collaborative faculty who "pool concrete materials from other departments—biology, physiology, psychology, art, painting, architecture, music, etc." Kepes's methodological approach, like that the Eameses developed simultaneously, was

based on combining and connecting anything and everything through omnivorous interdisciplinary languages.

"The Visual Arts Today" was one of Kepes's early ventures in interdisciplinary communication at MIT and consisted of a series of themed seminars that assembled various specialists in domains of art, science, and technology. The lectures, discussions, and findings were featured in symposia and exhibitions, and compiled in a six-volume Vision + Value book series Kepes published through George Braziller between 1965-66. These publications overlapped with Kepes's efforts to establish an expanded visual art and design program at MIT that would teach and model capacities for what he termed "interseeing" and "interthinking," thus stimulating "creative achievement" through "the confluence of many types of creative personalities." In an essay titled, "The Visual Art and the Sciences: A Proposal for Collaboration," and published in the interdisciplinary journal, *Daedalus*, Kepes detailed the ways in which avant-garde artwork challenged historical notions of perception before proposing a center that would utilize technologies and techniques developed at MIT to explore their artistic and civic potential while stimulating discursive relationships "between artists and the major scientific and technical contributors of our time."[183] Kepes's plan involved "the formation of a closely-knit work community," comprised of individuals "committed to some specific goals," and "located in an academic

[183] John E. Burchard, dean of MIT's School of Architecture, launched Daedalus in 1955 to help the academy promote, "various topics of cross-disciplinary interest." See Gyorgy Kepes, "The Visual Arts and Sciences: A Proposal for Collaboration," 122.

institution with a strong scientific tradition." Creatives including, "painters, sculptors, film-makers, photographers, stage designers, illumination engineers and graphic designers" would use "techniques of model-making, films, or slides" and develop "new technical tools and materials; new approaches to teamwork among creative individuals in the arts and in the sciences with different backgrounds and training; [and a] new awareness of the interplay of visual factors in the dynamic urban scene." Kepes argued that "by recognizing common problems of adjoining or related fields" such a center could balance the polarizing forces of the sciences and the arts—of rationality and irrationality, logic and illogic—through dialectical relationships, leading to new ideas and knowledge. He linked his model of collaboration to Gestalt psychology, specifically to the figure-ground perceptual relationships; Kepes understood the visual clash of interlocking associations between positive and negative fields as a basis for a much larger set of interlocking connections, ones with civic and utopian resonances.[184]

In his attempt gain support for a new center, Kepes consulted with MIT faculty in physics, biology, engineering, mathematics, psychology, and astronomy departments to "explore ways in which the project can correspond to M.I.T.'s needs" and comply with the Institution's focus on science and

[184]Also taken from Moholy-Nagy – where the artist would use science and technology as tools for aesthetic exploration and the parliament of social design where workers would embody all specialized knowledge into an integrated system through cooperative action. John Blakinger ties Kepes's name for the center was derived from the Institute for Advanced Study at Princeton – the Center for Adnvaced visual Studies would then evoke the famed art and science institute, which had hosted luminaries including Albert Einstein and Erwin Panofsky. See Blakinger's excellent discussion in "The Military-Industrial-Aesthetic Complex," *Gyorgy Kepes,* 290-354.

technology. Kepes emerged from these conversations with renewed positivity, suggesting a series of seminars and symposia "on art-science-relationships" which would "adumbrate further work patterns and collaboration-catalyzing idioms." Kepes believed that these events would provide opportunities to discuss collaborations and serve as "a first step toward discovering common boundary phenomena and establishing complementary activities." The proposal and Kepes's work to open communication lines between disciplines indicate the theoretical ambitions of the Center; its purpose was directed not to the creation of works of art but to "the creation of whole new techniques of collaboration." As art historian John Blakinger asserts, "Kepes was not concerned with technology as a material apparatus, but rather a mental apparatus, a set of approaches for way of understanding the world."[185] Above all the artist hoped to innovate methodologies for cooperation between the arts and other disciplines using technological advances—a goal much in line with the objectives George Nelson, Charles and Ray Eames, and Alexander Girard demonstrated years earlier in *A Rough Sketch for a Sample Lesson for a Hypothetical Course*.

In 1967, Kepes founded the Center for Advanced Visual Studies (CAVS) to bring about the "absorption of the new technology as an artistic medium; the interaction of artists, scientists, engineers, and industry; the raising scale of the urban setting; media geared to all sensory modalities; incorporation of natural processes …; [and] acceptance of the participation of 'spectators' in such a way

[185] These quotes and analyses are indebted to Blakinger's research on Kepes and his role at MIT. See Blakinger, *Gyorgy Kepes*, 314.

that art becomes a confluence."[186] To enact this cooperative model within the intellectual community at MIT, Kepes initiated the first Symposium on the Science of Art during the joint dedication of CAVS and the Center for Theoretical Physics, underlining the "growing effort of artists to harness the tools and spirit of the sciences."[187]

As with his Vision + Value seminars, Kepes invited an impressive roster of Cold War warriors and modernists to speak and lead discussions, and each session panel included dominant and emerging figures from a range of fields united through a shared interest in the creative application of technologies and communication sciences. For example, individuals famous for their work on the Manhattan Project including Cyril Stanley Smith and Robert Wilson presented in a panel along with Harold Tovish and Otto Piene, artists and inaugural fellows at CAVS.[188] Charles Eames participated in a session along with Philip Morrison, nuclear physicist and another Manhattan Project alumnus; James Ackerman, a noted architectural historian known for his work in grounding Renaissance architecture within broader contexts of cultural and intellectual history; George Wald, who won the Nobel Prize in Physiology or Medicine that year for his research in retinal function and vision; and Robert Rauchenberg, a multimedia

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[186] Gyorgy Kepes, *Mission of CAVS*, 1967.
[187] Gyorgy Kepes, "The Center for Advanced Visual Studies," brochure, no pagination, emphasis in original. Quoted in Blakinger, *Gyorgy Kepes*, 315.
[188] Additionally, MIT cognitive scientist Jerome Lettvin spoke in the same session as computer scientist Ivan Sutherland, and two individuals who worked closely with Bell Telephone Laboratories: Stan Vanderbeek, an experimental filmmaker who collaboratively developed holographic projections, and Billy Klüver, an electrical engineer and co-founder of Experiments in Art and Technology (E.A.T.).

artist who had recently co-founded Experiments in Art and Technology (E.A.T.) with electrical engineer, Billy Klüver to promote collaborations between artists and engineers. Together, these men theorized approaches to the advancement of "ideas that occur of at the boundaries of these disciplines"; the exploration of new media devices "that are taking art off the wall and into the environment"; and "the investigation of the expanding and constantly evolving role of the arts in contemporary society.[189]

In its list of participants and their range of interdisciplinary investments, the Symposium on the Science of Art overlapped with the goals of the many midcentury design meetings such as the International Design Conference in Aspen (IDCA) that the Eameses and their colleagues regularly attended in that it provided a platform for interaction between individuals and ideas to develop innovative approaches with cross-disciplinary applications. Such conferences constituted techniques of critical dialogue at a moment when the interdisciplinary conference—as a form of communication within a broader landscape of communications media—became the object of theoretical investigation by a number of scholars. Most notably, Margaret Mead, a cultural anthropologist and mass media theorist, published the book, *The Small Conference: An Innovation in Communication* in 1968 along with collaborator and visual anthropologist, Paul Byers.[190] "Distilled from a stream of historical forms," Mead identified the

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[189] Blakinger, *Gyorgy Kepes,* 315.
[190] Margaret Mead and Paul Byers, *The Small Conference: An Innovation in Communication* (The Hague; Paris: Mouton, 1968). Mead wrote the essays in the first section of the book, tracing the history of the conference form and arguing for its usefulness in creating solutions for the future.

"substantive" conference as a phenomenon uniquely suited to the modern period—a site of "mutual multisensory interchange"—that corresponded with a postwar rise in educational, scientific, and technical organization memberships and advancements in transportation that enabled regular group meetings. In gathering expert knowledge from various fields of research, Mead argued, the conference process was a "unique form of communication characterized by continuous, simultaneous multi-model communication from many-to-many in the pursuit of an intellectual goal."[191] The experiential, intellectual exchange of conferences served as a potent tool in dismantling barriers between disciplines with Mead stating:

> Under the mutual stimulation of exploring a new topic or new ways of looking at an old topic, conference participants mobilize their memories, recognize new connections and are able to place before the other participants items of information which exactly fit the others' needs. This kind of thinking is different – because the participant is using all of his senses simultaneously, the floodgates of memory may be opened to the material that is carried by only one sensory marker.[192]

Mead's theory of the conference as a holistic, interdisciplinary technique of multimodal communication appealed to a range of midcentury thinkers, including the Eameses, who owned copies of her later work on education in American culture. To Kepes, the Symposium on the Science of Art would initiate critical cross-referencing between experts at MIT, unifying what would become known,

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Paul Byers provided a visual analysis of conference proceedings through a series of photographic essays in the final part of the text.

[191] Margaret Mead and Paul Byers, *The Small Conference: An Innovation in Communication*, 14.

[192] Ibid, 13.

following C.P. Snow's formulation, as the "two cultures" of art and science within the Center of Advanced Visual Studies.

The wide-reaching panels of experts assembled at this symposium framed interdisciplinary techniques as a way of managing the pace and global scale of change—and thus a reckoning with the postwar landscape and its unprecedented sense of fracture. Charles Eames reinforced this objective, opening his lecture with a description of *Photography and the City: The Evolution of an Art and a Science*, an exhibition the Eames Office organized for display in Smithsonian Institution's Arts and Industries Building the following year (Figure 2.11). Charles employed images from the exhibition to demonstrate how photography and new technologies had impacted viewers' perceptions of their surroundings and the ways in which they interacted with their environments.[193] For the exhibition, the Eames Office compiled and organized images from prominent collections including the Smithsonian Institution and the Library of Congress, representing the work of historical figures including Lewis Hine, Alfred Stieglitz, Bernice Abbot, and Walker Evans, who transformed the city's physical structures into parallel lines and the converging angles of skyscrapers into formalized abstract patterns; more recent interpreters of the city such as Laszlo Maholy-Nagy, Henri Cartier-Bresson, and G. E. Kidder Smith, whose work relied on tilted angles and unmediated encounters to capture the vitality of urban

[193] Transcribed by the author from session recordings. Series 6: Teaching Files Sound Recordings, circa 1953-1972, box 9, folder 9, "Symposium on Science and Art," Gyorgy Kepes Papers, Archives of American Art, Washington, D.C.

spaces; and photojournalists, namely W. Eugene Smith, Ernst Haas, and Clemens Kalischer, whose technical experiments set new aesthetic precedents in documentary photography (Figure 2.12). To the Eameses, these photographers were exemplars in utilizing technological developments—telescopic lenses, fast emulsions, shutter speeds, and new dimensions—to innovate new aesthetics and form that engaged with contemporary societal concerns and transformed visual perspectives. What was more, photographic images could not maintain distinct disciplinary concerns within its visual form because it was created during a period when that type of disjuncture did not exist, reinforcing the Eameses' belief that visual media could effectively integrate the disparate aims of the arts, sciences, and technology in the middle of the twentieth century.[194]

After introducing visual design as a uniting force and ultimate equalizer, Charles asked the audience to consider a question: "who exactly are the artists of our time?" Offering an answer, Charles proposed an expansive understanding of the title "artist," asserting that it could "be earned in almost any field of endeavor," and that he viewed "science and technology and the world of handling information [as] one of the few areas in which there is actually hope in coming to terms with itself for a new point of view [where] some of the new milestones of a culture come together," but that a misunderstanding and increasing specialization

[194] Photographs within the physical exhibition were arranged on rectangular white pillars, the tops of which had aerial views of the city which could be seen from the balcony within the Smithsonian Arts and Industries Building. The exhibition also included a hot air balloon in the rotunda, modeling the technology used to attain the first aerial photograph.

of knowledge had prevented mutually beneficial collaborations between the arts and information sciences. Charles observed, “that scientists and the mathematicians… [and] certainly people in technology, have a tremendously romantic idea about what art is,” and, “most painters and sculptors are ignorant of the developments that have taken place in a total world, a total view of the world around us. Very often they tend to view science as a way of giving them new ideas…. They are apt to make irrelevant emphasis.”[195]

As with many of the other symposium participants, Charles noted that the fragmentation in knowledge structures was a relatively recent phenomenon as higher education had progressively broken down into a mass of separate specialties. However, to the Eameses, many current discussions of this disintegration amongst academics up to this point had been conducted in a piecemeal fashion, with a historically dissociated view that only took into account certain problems as they affected certain groups. The recent “two cultures” discussion was representative of that approach, often leaving out the social sciences and the arts broadly conceived. In his lecture, Charles reintroduced a historical perspective, asserting that that the most innovative men of the past modeled a process of thinking and intercommunication that did not distinguish between academic fields, examining the universe around them for interesting relationships and continuities and making them clear to others. Moreover,

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[195] Transcribed by the author from session recordings. Series 6: Teaching Files Sound Recordings, circa 1953-1972, box 9, folder 9, “Symposium on Science and Art,” Gyorgy Kepes Papers, Archives of American Art, Washington, D.C.

Charles argued that the finest examples of creativity, a term associated with the self-expressive arts, actually came from the world of science, referring to several articles published in *The New Yorker* in the previous 15 years that recounted historic narratives of discovery and resourcefulness as "recommended reading in the world of creativity."[196] For instance, Charles endorsed a series of articles written by James Dugan in 1953 detailing the remarkable tale of *The Great Eastern,* a colossal ship built in the mid-nineteenth century (Figure 2.13).[197] Designed by Isambard Kingdom Brunel to carry cargo and passengers between England and India, the ship was an engineering feat, its dimensions nearly six times larger than any vessel in the world at the time of its launching in 1858. However, the Eameses were not particularly interested in the record-breaking scale of the ship, but in how Brunel's unwavering dedication to the project and the innovative solutions he formulated to address the many the unprecedented issues that arose during construction and afterward.

In building *The Great Eastern,* Brunel not only collaborated with other engineers to develop several innovations that became commonplace in subsequent ships—he incorporated watertight bulkheads to minimize any damage to single sections (which would eventually save the ship from sinking

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[196] For instance, Jeremy Bernstein, an American theoretical physicist and staff writer for *The New Yorker,* wrote a number of stories that reinvigorated seemingly mundane and complicated subjects such as microbiology, astrophysics, and computer science; he reported on conference proceedings and pertinent panel discussions, detailing their cultural and historical significance; and he profiled midcentury physicists like Robert Oppenheimer and John Stewart Bell, introducing their work to a vast readership.
[197] James Dugan, "The Great Iron Ship," *The New Yorker* (September 11-October 2, 1953) https://www.newyorker.com/contributors/james-dugan.

after an engine explosion), multiple propulsion systems to increase fuel efficiency, and enough storage capacity to accommodate the coal needed for a nonstop voyage around the African continent, but he also carefully oversaw every element of the project, relying on his proficiency in watercolor and several other artistic media to conceptualize color schemes and aesthetics for the ship's interior spaces, and on his business acumen to accumulate multiple support systems to finance construction. Brunel gathered the backing of a number of predominant forces in the British economic and political system including iron manufacturers, British Parliament, import and export companies, independent investors, and popular press, solidifying comprehensive interest in his endeavor across all facets of society.[198] This kind of relational thinking—combining the concerns of industry, science, art, politics, and culture to confront a defining problem of his period—embodied the kind of creativity needed to establish the profound cultural and intellectual unity necessary to solve the contemporary crisis of communication debated at the symposium.

The Eameses' approach drew on historical idioms of collaborations to suggest ways of working that refuted MIT's narrow focus on the practical and pragmatic, on scientific and technical skills and their instrument of implementation in specific careers without regard for potentially wider applications. In his speech, Charles reasserted the importance of Kepes's mission to integrate the arts within MIT's core structure, however, in order to

[198] Ibid.

successfully do so, he argued that institution needed to fundamentally change how it organized the arts in relation to other disciplines on campus:

> Now I do think in bringing together the values that have governed the world of the artist—the aesthetic judgments—into the world of science can be done by teaching and showing and demonstrating particularly in the world of technology, that aesthetics and values in that area are largely an extension of their own discipline. And that they will not find it by the abandonment of the discipline, but merely extending it.[199]

In proposing a systematic reconceptualization of the function of the arts on MIT's campus, Charles's language aligned with that of other conference participants and their employment in myriad iterations "systems discourse," the universalizing interdisciplinary intellectual languages that erupted throughout the universities at midcentury. Systems discourse also encompassed the information theory of Claude Shannon, cybernetics of Norbert Wiener, and Susanne Langer's comprehensive theory of art, which drew on technical language and observations on human experience to understand universal symbols that unite all understanding. The Eameses, along with other creatives including Kepes, Buckminster Fuller, and Otto Piene, borrowed particular methodological precepts from these discourses, using terms like "feedback" and "signal" across otherwise isolated and disparate fields. However, for the Eameses and their closest associates, such terms were not only linguistic, but also visual, the common ways of seeing that might be reflected across disciplines. Like all systems

[199] Transcribed by the author from session recordings. Series 6: Teaching Files Sound Recordings, circa 1953-1972, box 9, folder 9, "Symposium on Science and Art," Gyorgy Kepes Papers, Archives of American Art, Washington, D.C.

thinkers, the Eameses applied this approach to topics that were not previously understood through systems discourse, which was ultimately the purpose of interdisciplinary intellectual languages, enabling specialists in different fields to understand one another through shared ideas and images. The Eameses subsumed a distinct intellectual project into all of their work, some of these were philosophically alighted to systems, like Gestalt psychology, which shares a universalist orientation and which both cybernetics and systems theory often evoked. The Eameses' program, as a whole, which intended to transcend the limits of language, specifically disciplinary language, and thus the limits of cultural, social, and political boundaries—it aimed to facilitate transparent exchange that would unite worlds.

At the end of the speech, Charles reemphasized the serious political imperative underlying the interdisciplinary dialogue at the symposium, recalling what scientist Robert Wilson had implored the audience to consider the previous day, and what Charles characterized as perhaps "one of the most important ideas we've said here," that "'there is no more I, and They, there is only We.' Building the city of Los Angeles with all of its horrors is something that we have done, not what they have done. What happens in Vietnam is a result of what we have done and what they have done. There is no difference between the I and the They, there is only the We."[200] In this way, systems discourse defined in the symposium in terms of the explicit systems-related specializations of some of the

[200] Ibid.

participants, and the general methodology the Eameses championed to establish new relationships between them. But to speak of systems was also, for the Eameses, a profound aesthetic gesture. More than that: it was an ethical ideal, a moral imperative, an altruistic statement of belief that cooperation, collaboration, and as seamless exchange of knowledge could solve global issues. Systems were reparative, restorative, a way of holding together a world that felt as if it was falling apart, spinning too fast, expanding ever outward.

The Politics of Interdisciplinary and the MIT Report

Although the rhetoric of interdisciplinary that characterized the Symposium on the Science of Art was elegant, the theorizations appealing, the utopian outlook inspiring, the Center of Advanced Visual Studies and its model of communicative politics—a system of approaches Kepes variously describes as new idioms of collaboration, as interdependence and intercommunication—faced a number of challenges and frictions at MIT in its early years. Memoranda written by Kepes illustrate his urgency in addressing managerial problems and a persistent lack of money, imploring fellows to take on increased responsibilities and to produce proposals that would secure funding from a range of sources.[201] With every issue that arose at the Center, Kepes became more resolute in his belief that increased communication would lead to mutual understanding of common goals between fellows and amongst disciplines, generating workable

[201]. See Blakinger, *Gyorgy Kepes,* 320.

solutions. However, the premise of the Center, to integrate art and within a curriculum "polarized around the sciences" soon became a fundamental problem for Kepes, as the "intellectual technologies" and scientific collaborations the fellows relied on had already been coded for military research and development, and as Peter Galison has argued, such militaristic associations "do not so simply melt away."[202]

The MIT faculty that Kepes sought out to participate in the initial symposium and consulted to plan the Center had impressive records in developing wartime technologies. To take just one example: Philip Morrison was a group leader at the Manhattan Projects' Los Alamos Laboratory in New Mexico, was among the few physicists aided in the assembly the "Fat Man" plutonium bomb, and after the war's end, was part of the research team that traveled to Japan to assess the devastation caused by atomic warfare, which in turn led to his fierce nuclear nonproliferation advocacy throughout the remainder of his life. Morrison accepted a faculty position at MIT in 1964 to pursue research in astrophysics, but he also produced numerous books, television programs, and articles to popularize science and make it accessible to disparate audiences. Morrison contributed the essay, "The Modularity of Knowing" to Kepes's Vision + Value series, tying the simple, repetitive choices of a craftsman to that of a computer; he participated in the Center's Sky Art conferences that discussed light and space as artistic media; and he designed courses and lectures that

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[202] See Peter Galison, "Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," Critical Inquiry 21, no. 1 (Autumn 1994), 260.

encouraged MIT students to explore interactions and commonalities between disciplines. Morrison's objectives at MIT aligned with those of the Center, seeking to utilize the technological and scientific advances toward humanistic purposes to reveal "richness beyond human grasp contained in the interacting multiplicity."[203]

The presence of military power at MIT, however, became an institutional problem in March 1969, when scores of students joined with concerned faculty to call for a campus-wide research stoppage in protest of the institution's involvement in defense research and its role in the arms race, the Vietnam War, and many other scientific, social, and cultural issues. The March 4th Movement, as it would come to be named (a verbal pun – "march forth"), initiated panel discussions about the extent of MIT's connections with the federal government, calling for scientists to think critically about their research and what new threats and harmful polices their work was enabling. Reactions from scientific faculty at the institute were various, many issuing statements in support or against the research stoppage, illuminating the increasingly divisive academic landscape Kepes navigated.[204] In order for the Center to function, Kepes needed the backing of the entire scientific establishment, however, that establishment was already deeply fractured over the ethical questions of its research.

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[203] Blakinger, *Gyorgy Kepes*, 166.

[204] For information on the March 4th Movement, see Blakinger, *Gyorgy Kepes*, 324; Jonathan Allen, et al. *March 4: Scientists, Students, and Society* (Cambridge, MA: MIT Press, 1970); Dorothy Nelkin, *The University and Military Research: Moral Politics at M.I.T.* (Ithaca, Cornell University Press, 1972); and Stuart Leslie, "Time of Troubles' for the Special Laboratories," in David Kaiser, ed., *Becoming MIT: Moments of Decision* (Cambridge, MA: MIT Press, 2010).

The administration responded swiftly to the March 4th Movement in an attempt to contain debates before they consumed the Institute and further interrupted campus functions and routines. MIT President Howard Johnson formed the Review Panel on Special Laboratories to examine the problem of military research on campus and to formulate solutions and strategies to navigate the institute's government and military connections moving forward.[205] Additionally, Johnson established the Visiting Commission of the Arts, charging its members to assess the current conditions of what was referred to as the "several arts" and to propose ways in which the university could better incorporate the humanities into the existing curriculum. The premise was that the arts had not been "sufficiently represented in the institutional experience of the MIT student, and that this constitute[d] an important deficiency in his education." The institute hoped to address this shortcoming by providing "lessons in art appreciation, painting, sculpture, photography, film, music, and poetry."[206]

Along with Charles Eames, Johnson invited important figures in the arts including art historian and pedagogue, Bartlett Hayes, who chaired the commission; director of the Worcester Museum of Art, Daniel Catton Rich; executive director of the New York State Council on the Arts and soon-to-be director of the Museum of Modern art, John B. Hightower; and new media

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[205] Johnson instituted programs directed at transportation, housing, and community development, and in May 1970, MIT divested itself of the Instrumentation Laboratory, which was developing guidance systems for NASA, but retained the Lincoln Laboratory, a federally funded research and development laboratory that developed advanced electronics for air defense systems. Ibid.
[206] Part I, box 68, folder 1, "MIT Report by Eames, Notes and Background," Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington D.C.

scholar and McLuhan acolyte, John Culkin among a few other men associated with MIT and federal arts projects.[207] In July 1969, the commission convened for the first time on MIT's campus to examine facilities; to meet faculty representatives from the programs including theatre and dance, music and poetry, film and photography, painting, sculpture, graphics, electronics, and education; and to discuss the commission's plan of action over the coming months.[208] In subsequent meetings, Charles and his colleagues received material explaining the institute's organizational structure and research objectives; they invited delegates from organizations such as the National Endowments of the Arts to present at subsequent meetings along with design theorists including architect and founder of the Center for Environmental Structure at Berkeley, Christopher Alexander; and they conducted extensive background research on progressive arts education models, with the Eameses' files containing heavily notated essays and articles by a number of progressive pedagogical thinkers. By the spring of the following year, Johnson asked that each member of the commission produce independent recommendations that considered potential changes to MIT's "formal curricular pedagogy," "physical environmental changes," contributions to the local "cultural scene" through

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[207] Other members included Gus Solomons, Jr. a choreographer and MIT alumn; theater producer founding Chairman of the National Endowment for the Arts, Roger Lacy Stevens; Gunther Schuller, President of the New England Conservatory never submitted a final report; and mathematician James R. Meginniss, known for adapting calculus to create probability theories adapted to human behavior and a graduate student in economics, Brendan Horton, who would eventually serve as an economic advisor for the federal government and for the World Bank joined the Commission after the initial meeting, which recorded invited members in the minutes. Ibid.

[208] Ibid.

exhibitions and performances, “levels of cooperation with other local institutions,” and “appointments of personnel.”[209]

The Eameses’ report went through a series of drafts, beginning with Charles’s handwritten recommendations, extensively marked with edits and additions, certain points underlined or penned over to emphasize their importance (Figure 2.14). In this first iteration, Charles opens with his earliest reference to Kepes’s written work, sourcing its phrase “the language of vision” to explain the Eameses’ own conception of how visual design should be integrated at MIT. Throughout the month of February, Charles talked through his understanding of the commission’s charge and MIT’s needs within the current political climate as Eames Office staffer, Jehane Burns, took careful dictation. Charles would subsequently review the transcripts and make further comments until submitting a final draft to final draft Johnson in March. Throughout every carefully formatted draft, the Eameses maintained bolded and underlined text, establishing a continuity of process and assuring that their verbal description of visual language was properly emphasized, assertive, and clear (Figure 2.15).

While other members of the commission advised the university to make courses in art appreciation an integral of the core curriculum to counter the dominant focus on the sciences, the Eameses found the “Suggested Functions” of the commission to be “mistaken in emphasis,” narrow in scope, and lacking a

[209] Ibid.

greater sense of purpose and social responsibility.[210] The Eameses objected to the positioning of the arts outside of the core department structure and university focus, situating them as a "dietary supplement, an esthetic vitamin concentrate… tokens of cultural and esthetic concern, which few exceptions are cut off from the effective culture of the community." This approach, the Eameses argued, would not go far enough to solve the institutes problems as art and humanistic values could not simply function as an aesthetic veneer for military involvement, but instead had to incorporate the perspectives of creative processes within technological disciplines (and vis versa) to solve problems free from associations with the war in Vietnam; addressing such issues would subsequently attract new, more neutral forms of investment and community support that would work to solve MIT's problems of association.

To the Eameses, MIT's level commitment to intellectual integration and humanistic agenda was reflected in the sterile environment at the institute, as Charles wrote, "we can assess the degree of realism of the institution's intent by our impression of the character of the physical surroundings."[211] Comparing MIT's buildings and proximity to businesses such as bookshops, coffeeshops, and gift stores to the same services offered around Harvard, Charles indicated that the institute had lost understanding of its mission, that it had limited itself to technical concerns and had left everything else to devolve. Charles identified the

[210] Charles Eames and Ray Eames, *MIT Report,* Part I, box 68, folder 2, "MIT Report," Charles and Ray Eames Papers.
[211] Ibid.

problem as a lack of decision by the administration, observing in an early draft that, “On too much of campus, the impression now is of things going by default – of not caring, or of caring not being brought to bear. In light of our present concerns, this lack of decision is much worse than is any lack of art. If the student learns from the institution the habit of treating the seemingly peripheral elements with a lack of decision,” he will perpetuate a very narrow understanding of his discipline and his role in society outward.[212] To the Eameses, the successful and convincing integration of humanistic values within MIT’s militaristic research agenda depended on the institution’s ability to create a positive, welcoming community on its campus, which would require a reorientation of the administration’s priorities and a fundamental change to the ways in which campus facilities were viewed. These buildings needed to serve not only as serious research laboratories, but also as spaces for communication and interpersonal connection to underscore MIT’s commitment to thoughtfully addressing the lack of humanistic values within institute activities.

Following their interpretation of the commission’s function and analysis of physical spaces on campus, the Eameses provided two recommendations within their *Report for the Arts Commission* that built on ideas developed in previous projects such as *A Rough Sketch for a Sample Lesson* and the film, *A Communications Primer* and educational exhibitions developed in the 1960s for IBM. In the first recommendation, the Eameses proposed that a “Media Service

[212] Ibid.

Center" be formed to assist faculty and students in learning to use the new media to effectively while stimulating communication and collaboration within and between disciplines.[213] This would not only centralize the technical components of this new media initiative, but would also break down the strict divide between the arts and sciences and involve students directly in the process of creation. According to the Eameses, education needed to include students in the task of developing expository films and multi-media presentations so as to improve their visual literacy and give them the ability to communicate with a wide array of tools. This was a process predicated on the structure of the Eames Office itself, where staff members with a background in a range of disciplines worked to assemble film sequences, models, exhibitions and other forms of visual media.

The Eameses suggested that MIT integrate the arts into the existing curriculum, giving every department the resources to utilize new media to communicate and disseminate knowledge amongst local and international communities for the benefit of humanity. To stimulate the social responsibility of the research being performed and shared within the university, the Eameses proposed a system for disseminating information to the community for the greatest impact. The first recommendation suggested that each department select a few teaching assistants to work in small groups, creating information packets that incorporated film, slides, audiotapes, graphic displays, holograms, and other forms of new media to convey insight about key developments that

[213] Ibid.

occurred within the department. To effectively create a network of information sharing at MIT, the best packets would the circulate between departments and disciplines, and a select number of those would then be distributed to other institutions and to the larger community through mass media. In their report, the Eameses emphasized the relationships of individual parts to a larger community.

The Eameses intended the packets of information to function "more as a research tool than a teaching too – testing/refining/unsettling one's view of open's own area."[214] This approach would give faculty and students the tools to convey their research to the wider university, increasing communication within and across disciplines and departments to create a community of knowledge and expand transparency about research activities with the public. The Eameses argued that the transformation of the way these departments worked to consider aesthetic and humanistic concerns would be beneficial and new media became a means to visualize and examine ideas, breaking down artificial barriers between creative endeavors. However, Charles and Ray Eames shared Kepes's contention that the visual communication had wider implications and could benefit society on a larger scale, and as Kepes stated, "visual language must… mobilize the creative imagination for positive social action, and to direct it toward positive social goals."

Increased community engagement was also at the core of the Eameses' second recommendation, where their proposed curriculum sought to "build a

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[214] Ibid.

relationship between the student, his discipline, the institution, the larger community, and his own developing powers of discrimination."[215] In the *MIT Report*, they suggested that in their final semester, students work in small groups to teach a few mornings a week at local elementary schools. Students would draw content from their fields of study and use "films, demonstrations, words, experiences, pictures, plays, models – anything that would help the central idea have meaning to the children."[216] Their method had developed from that of *A Sample Lesson* in that the Eameses were no longer just utilizing new media to teach students about connections, but also continuing that process, giving students the tools to use visual media to make a wider impact universally.

In doing so, the Eameses not only suggested that giving students the tools to experiment with and employ visualization of knowledge through new media would help them to better grasp their field by stressing how it related to and diverged from others, but would also serve as their central educational experience in the arts. They maintained in their proposal that, "esthetic considerations are not separable from functional ones. At this point, visual (or linguistic) discrimination presents itself as needed, for effective communication, and not just as an amenity."[217] Moreover, the second recommendation called on institutions to redefine their relationship with the public, allowing the disparate voices to critically interact with educational material and thereby encourage

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[215] Ibid.
[216] Ibid.
[217] Ibid.

alternative applications for research at MIT and enhance learning opportunities for the community. The emphasis on larger structural issues revealed the Eameses' vision of an overarching framework to bring about social change.

In the Eameses' work with MIT, they sought not to draw an aesthetic veneer over the scientific and technological activities of the institute, but instead completely transform the structure of the university to refocus academic efforts toward the advancement of society rather than military defense capabilities. Within their report, the Eameses argued that traditional education in the arts would not work within the context of MIT and could not fix the growing public distrust and misunderstanding of scientific research activities present within their curriculum and explicit within institutional funding structures. Instead, the Eameses suggested that students should learn about visualization through the very tools and media that were being developed by scientists, therefore recoding their function from the beginning while giving the public alternative access points to information produced within research institutions and labs.

Visiting Committee for the Arts at MIT

While MIT adopted less progressive changes to their arts programs and curriculum than the Eameses suggested, they remained committed to institutional reform and maintained their belief in the humanistic and social potential of advanced technologies and scientific theories. In the spring of 1972, Charles was again invited to serve in an advisory capacity at the institute, this

time as a member of the MIT Corporation's Visiting Committee for the Arts. Howard Johnson became chairman of the MIT Corporation (the institute's governing body or board of trustees) after stepping down as President in 1971, continuing to guide the institute's strategic direction toward more ethical and socially responsible practices as a response to the March 4th Movement and continued anti-war activism on campus and across the country. As part of this effort, the Corporation formed four visiting committees to oversee programs and discuss curriculum changes for the Department of Aeronautics and Astronautics, the School of Architecture and Planning, the Department of Biology, and the "Arts" pertaining to several schools and departments (Figure 2.16). Each committee consisted of an impressive roster of distinguished leaders in science, industry, education, and public service—along with Charles, the Visiting Committee for the Arts included prominent figures such as photographer and environmentalist Ansel Adams; architect and modern art collector Armand P. Bartos; and dancer and dominate figure in the postmodern dance movement, Gus Solomons, Jr.[218]

[218] Other members of the Visiting Committee for the Arts included engineer, industrialist, arts patron, and Governor of Puerto Rico, Luis A. Ferré; Angus N. MacDonald, MIT alum with degrees in Aeronautics and Astronautics and Mechanical Engineering, who became a lifetime member of the MIT Corporation; prolific opera conductor and founder of the Opera Company of Boston, Sarah Caldwell; geophysicist and co-founder of the Geophysical Service and Texas Instruments, Eugene McDermott;; Paul Tishman, a real estate developer and collector of African art; Jack J Valenti, marketing mogul and President of the Motion Picture Association of America; and recent MIT graduate, Pamela T. Whitman, who also became a lifetime member of the MIT Corporation. James Killian, Jr. President of MIT between 1948-1959 and chairman of the MIT Corporation between 1959-1971 headed the Committee and submitted meeting reports to members and the MIT administration. See Part I, box 68, folder 4, "MIT Corporation Visiting Committee for the Arts 1971," Charles and Ray Eames Papers.

The group convened for an initial meeting on April 6th, 1972 in a visit to campus where "a full day was spent in reviewing the teaching, research, museum, and environmental activities at M.I.T. that relate[d] to the arts."[219] However, since those activities were not confined to a single department or school, Committee members heard fourteen presentations from representatives of the administration, the Center for Advanced Visual Studies, the Department of Architecture, and the Department of the Humanities.[220] President Jerome Wiesner, who had come to MIT after serving as chairman of the Science Advisory Committee under President John F. Kennedy, initiated meeting proceedings by noting the significance of the establishment of an arts advisory committee as evidence that the Corporation and the Administration had become invested in the arts as a "major field of intellectual activity at the Institute."[221] Despite the discontinuity and dispersion of creative activities across campus, he expressed hope that the Visiting Committee of the Arts would "achieve an Institute-wide perspective" stating, "We are, again, at the moment of the evolution of the arts at M.I.T. when we must make some plans and commitments for the future, when we must at least partially define the future goals and possibly the limits for a number of exciting and dynamic programs and provide additional support if they are to continue to prosper."[222] Following President Wiesner's

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[219] The following quotes come from the Eameses' notes and minutes of MIT minutes kept in their files, "MIT Corporation Visiting Committee for the Arts 1971," Charles and Ray Eames Papers.
[220] Ibid.
[221] Ibid.
[222] Ibid.

optimistic opening statement, the Committee heard presentations from individual faculty including György Kepes, who spoke about the theories of vision infused throughout his program; art historian Judith Wechsler, who discussed a course she was planning that included a series of lectures by more than a dozen scholars from other fields, including a group of MIT scientists, to explore the relationship between art and science; and several other faculty who explained their research and pedagogical objectives.

After touring facilities and communicating with faculty, the Committee provided a series of structural recommendations to better integrate the visual arts within institution. Approaches among members varied as some suggested the expansion of art instruction into existing departments and curriculum while others called for the centralization of the arts within a single center, however, they agreed that MIT needed to find ways to "give more visibility to the variety and quality of the arts" because gifted instructors were "using the arts to aid [the institute's] educational objective of giving students those insights, perceptions, and sensitivities which will help them better to understand the requisites for a social and physical environment—and a life—that is truly humane."[223] The charge of the Visiting Committee for the Arts remained consistent with that of the 1970 Visiting Commission of the Arts, but, to the Eameses, this new iteration illustrated a more sustained effort by President Wiesner and other MIT

[223] Ibid.

administration to reevaluate the institute's reliance on military contracts to finance research at the expense of social and ethical considerations.

Charles served on the Committee for the next four years, meeting periodically to discuss MIT's progress in integrating the arts and humanities into core institutional structures. During this period, a number of faculty retired or transitioned to other universities—Kepes retired in 1973, handing over the directorship of the Center for Advanced Visual Studies to one of its inaugural fellows, Otto Piene, as did Minor White, a photography professor and critic who drew on Gestalt psychology and mysticism within his formal technique and pedagogical approaches—and for every personnel decision, the Committee offered input on personnel decisions.[224] Although this seemed to offer members agency in determining the future of the arts on campus, ultimately the administration's reluctance to adhere to their verbalized commitment to interdisciplinary education led to Charles's resignation in 1976 (Figure 2.17).

In a polite, yet pointed letter to President Wiesner, Charles stated with indignation that his leave was based on his understanding of the Committee's function to extend "non-discontinuity" between disciplines and occasioned by the faculty board's decision to deny tenure to Judith Wechsler, or rather the remarks made to compel determination.[225] Standing in solidarity with the art historian,

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[224] President Wiesner contacted the Eameses, asking for their opinion on Kepes' successor to serve as the Director of the Center for Advanced Visual Studies. Charles responded, writing a letter of support for Otto Piene. Kepes and the Eameses expressed interest in continuity, reaching out to contacts and students to played continued roles in their projects. Ibid.
[225] Ibid.

Charles explained that he had supported Wechsler's candidacy due to "the range of her knowledge and her background, her wealth of cross-disciplinary reference," and the progressive and open way in which she approached courses including "Topics in Art, Science and Technology."[226] Although Wechsler specialized in 19th century French art with much of her scholarship examining Cézanne and Daumier, at MIT, she had become increasingly invested in interdisciplinary studies and intersections of art, theater, film, and science, developing courses that aligned with the scientific ethos at the institute. Charles expressed shock in the fact that other tenured professors had brought forward these efforts as "lessening her value as a faculty member – as a misguided dispersion of effort, at the expense of her scholarly contributions in her official field."[227] Pursuing his critique further, Charles noted that the *reasoning* behind the institute's decision had changed his view of their potential to provide a broad-based education, and that:

> "If the concept of continuity of values is actually opposed where it counts most – in the assessment of teaching – then I'm forced to conclude that M.I.T. as a teaching community is not ready to take seriously the problem which you posed the Committee; that the Institute's concern for cultural broadening will in practice get no further than art in the corridors and concerts on campus.[228]

To Charles, the faculty board's decision illustrated a lack of investment in innovative teaching methods and in generating socially responsible research practices among MIT faculty and students. Disillusioned by the administration

[226] Ibid.
[227] Ibid.
[228] Ibid.

and faculty's unwillingness to advance interdisciplinary and creative practices through financial and intellectual support, Charles expressed the extent of his disappointment by withdrawing from MIT official advisory roles, focusing Eames Office resources on a number of other pedagogical projects and institutional partnerships.

The Eameses maintained connections with the Center of Advanced Visual Studies after Kepes' retirement in 1974 and until Charles's death in 1978 through their collaborations collaborating with Judith Wechsler, who accepted a CAVS fellowship following her denied tenure application. Over the next two years, the Eameses and Wechsler co-directed and produced two art historical films: *Daumier: Paris and the Spectator* (1977) and *Cézanne: The Late Work, With Quotations from His Letters and Reminiscences* (1978). The first film gave visual form to Wechsler's research on the role physiognomy, caricature, and spectacle in Daumier's critiques of 19th century French culture, while *Cézanne* comprised of photographs the Eameses and their office staff had taken of an exhibition at MoMA, alternating between gallery views, painting details and textures, and images of the artist's studio.[229] Put into general circulation, *Daumier* exposed broad audiences to Wechsler's scholarship, and both films served as important explorations of new media as a pedagogical tool within the classroom. Although the Eameses officially abandoned efforts to reform institutional structures at MIT,

[229] The exhibition was co-organized by the Museum of Modern art and the Reunion des Musées Nationaux in Paris, with funding from IBM and the National Endowment for the Humanities. IBM also sponsored the film, providing further entanglements between the Eameses' pedagogical endeavors and corporate design and art philanthropic practices.

they did not consider their participation in institutional activities a loss; they remained committed to revolutionizing educational approaches through interdisciplinary communication and the employment of new media. Moreover, their connections with György Kepes and the Center for Advanced Visual Studies had transformed the Eameses' language in defining their methods during the last decade of their adjoined careers.

"The Language of Vision"

In November 1969, the UCLA Arts Council and the Department of Art History invited György Kepes to give a presentation as part of their Distinguished Scholar Lectureship series and due to the Eameses' connections with various departments at UCLA and their recent work with the artist at MIT, Charles was invited to introduce Kepes's talk, "Arts for a Changing Scale." Kepes discussed his conception of visual design as the use of new media and advanced technologies to disseminate knowledge and train "the imagination for positive social action," and in preparation for his introduction, Charles wrote a series of notes acknowledging Kepes's skill in "aligning of fields of art and science," by the way he "picks topics that are edges between two fields," to "aid the effort for understanding" both and "he has viewed the exchange as a two way—that visual interests are important to any competence." Continuing his description of Kepes's methods, written sporadically across the page, Charles noted that, "It does <u>not</u> depend on imposing an individual personality on an all too fragile discipline.

Kepes offers a principal that supports the most demanding scientific discipline and positioning esthetics as a most natural extension of that discipline."[230] The language Charles used in describing Kepes's theories mirrored the terminology the Eameses' began incorporating into the description of their pedagogical involvement at MIT—that interdisciplinary *exchange* should be conversational and that visual design was an *extension* of scientific disciplines. The Eameses' connections with Kepes in the 1960s and 1970s had given them the terminology needed to describe their own working processes and pedagogical approaches.

In April 1974, Charles Eames delivered his lecture, "Language of Vision: The Nuts and Bolts,"—a title that referred to Kepes's 1944 book of the same name—to a crowded auditorium on UCLA's campus (Figure 2.18). Co-sponsored by the Department of Art and Theater Arts and the School of Architecture and Urban Planning, the lecture was the second in a four-part series organized by the Western Center, one of multiple independent research institutes established under the auspices of the American Academy of Arts and Sciences during the 1970s.[231] While the advertisements for the lecture focused on the many

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[230] Charles notes for introduction of Kepes at the UCLA Arts Council, Part I, box 61, folder 6, "Kepes," Charles and Ray Eames Papers.

[231] The Academy, along with the American Council of Learned Societies served as a catalyst in establishing the National Humanities Center in 1978. The Ford Foundation financially supported many early regionally specific research projects at the Western Center, including Neil Smelser and Gabriel Almond's *Public Higher Education in California* and *Progress and Its Discontents* edited by Gabriel Almond, Marvin Chodorow, and Roy Harvey Pearce. Most evaluated educational structures and arms control emerged as a signature concern of the Academy as scientists, social scientists, and humanists grappled with the social and political dimensions of scientific change. Charles Eames, "Language of Vision: The Nuts and Bolts," speech given at the American Academy of Arts and Sciences, Stanford (1974). Part I, box 217, folder 12, "The Language of Vision," Charles and Ray Eames Papers.

accolades the Eames Office had won for furniture and film designs and mentioned the numerous exhibitions they had recently completed for IBM, Charles opened his address to members of the Academy with a description of *A Rough Sketch for a Sample Lesson for a Hypothetical Course*, recalling the multi-screen projections, live narration, printed visuals, and complementary smells that the designers had used "to make the most efficient possible use of classroom time," and to "demonstrate the importance of using the language of vision in the university."[232] With this introduction, Charles indicated that the Eameses' attempts at institutional change had all been in service of the same goal: to expand the influence of visual design, which he believed had the ability to unite disciplines and produce individuals with a sense of quality and value in every field.

Yet, by this point, Charles expressed disillusionment in administrative structures at universities that had viewed the Eameses' efforts as intriguing, but ultimately too complex, too expensive, and too substantial for actual implementation. "Unfortunately," Charles conceded, "universities today are becoming discontinuity headquarters, with each department avoiding communication with others and with the rest of the world. Used as it could be, the language of vision is a real threat to this discontinuity, and so it is avoided at all costs." Critiquing institutional resistance to positive social change, Charles never wavered in his belief that visual design and new media had the potential to unite

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disparate ways of thinking, but that in order to be used to its pedagogical potential, educational institutions and universities needed to reconceptualize how visual studies programs worked could benefit and communicate research activities within rapidly developing fields and disciplines.

Typically located within an isolated art department, Charles suggested that current approaches to film studies had catered to "people's creative idiosyncrasies rather than the development of basic, current, working ideas of science and the humanities."[233] Positioning film in the peripherals of university activities threatened to make the medium an apparatus of self-expression rather than a ubiquitous tool utilized to visualize and democratize information for the benefit of all intellectual pursuits, and if every educator could utilize multimedia technologies as a pedagogical mechanism, "it would make his point more accessible to his colleagues, his students, and maybe to an even wider audience." Recapitulating the Eameses' earlier contentions that new media should play an instrumental and foundational role in higher education, Charles asserted that, "The film department can support the university's charter for promoting intellectual inquiry only if it is able to serve all departments from a central position within the school."[234] The Eameses believed that the film department's unique ability to produce interactive media could establish relational ways of thinking across disciplines and present a consistent message to faculty, students, and the public to communicate institutional objectives and

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accomplishments. The Eameses believed film was one of the most effective media for interdisciplinary communication, demonstrating its potential in *A Communications Primer*, *Powers of Ten,* and the many idea films such as *Blacktop, Bread,* and Tops, which they used as multimedia aids to accompany presentations and exhibition displays. They continued to believe in the communicative potential of the media, seeking to expand its use in universities to exchange research and ideas for the benefit of society.

Although every educational institution the Eameses' invested in—The University of Georgia, UCLA, Berkeley, MIT, and multiple others—had resisted the structural change Charles and Ray recommended, their faith in the unifying potential of new media never wavered, as Charles proclaimed, "I believe that universities should establish a visual service unit open to every department to assist the faculty in learning to use the language of vision effectively." Recalling the MIT Report, Charles provided a workable model, "whereby a person knowledgeable about the nuts and bolts of the language of vision (the making and thus of film, records, tapes, etc.) would be assigned to each class, whether the class is history, biochemistry, small particle physics or chemistry."[235] While Charles acknowledged the primacy of visual connections, he defined the language of vision as a method of communication not restricted to optics, but incorporating multiple communicative new media that could efficiently transmit ideas to broad audiences. By doing so, Charles indicated that the Eameses' had

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broadened applications of Kepes's phrase to include any communicative media that could exchange ideas efficiently and bring together individuals with disparate disciplinary interests. Charles also expressed the imperative of increasing communication between disciplines, foretelling that, "In the future, intellectual, political, and technical people are going to need ways of communicating complex ideas."[236]

After suggesting its expansive applications, Charles demonstrated how the Eames Office had used the language of vision to share ideas, by explaining the distinct function of several of the Eameses' films, multi-screen presentations, and exhibitions. Playing short clips: *Copernicus* provided a visual record of their 1972 exhibition for IBM and "the imagery and the audio language [were] chosen to decrease the distance between a modern audience and the world of the past; *House of Science* served as an introduction to the U.S. science exhibit at the Seattle World's Fair and utilized a multi-screen technique to give international audiences a "feeling for how science got the way it is"; and *Glimpses of the U.S.A.*, which also incorporated multiple screens, introduced Russian audiences to American landscapes and democratic ideologies.[237] Charles then presented the audience with elements of the Eameses' multi-screen slideshow, *Circus*, spending an extended period of time discussing the form of the circus as a model for innovation with incredible discipline. Going through visuals in quick succession, Charles sought to give members of the Academy "a sharpening and

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a new awareness of aesthetic values," and to reveal the effectiveness of audio-visual communication in getting across a large amount of information in a short period of time."[238] This skill—combing out the communicable message from a tangle of expert knowledge, assembling a sequence of images to state significance, pruning out inessentials, and pacing images to keep the audience's attention—was an arduous process, one the Eameses' developed and refined over the course of their collaborative careers, however, they fundamentally believed that anyone with commitment to their field and to their community had the obligation to effectively communicate their research and ideas to the public, increasing understanding and exchange between institutions and society.

Concluding his speech, Charles lamented over the state of education, expressing his frustration over continued disciplinary divisions within institutional structures and misunderstanding of their pedagogical initiatives. To the Eameses, the solution to the contemporary sense of fracture and institutional disillusionment was simple, and clearly stated in the title for the lecture:

> The choice of the title for this evening—"The Language of Vision: The Nuts and Bolts"—was intended primarily as a warning. We have sometimes found ourselves presented under a title such as "bridging two cultures." To me this is a non-issue and a counterproductive one. If the media people truly had the confidence of their craft they would be ready to assume the task of convey those ideas that individuals have a need to convey with a minimum of added art. And the scientists and engineers had not somehow browbeaten themselves, they would recognize that they have now need for extra aesthetics. What is required to bring these two

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> groups together is nothing exalted—just the nuts and bolts of the subject.[239]

In Eameses' attempts at institutional reform, they embodied a new model for aesthetic practice, for visual design, in a scientific, technocratic environment. The Eameses sought to infiltrate university structures from a unique position to change the ways in which they organized departments, allocated funds, and communicated with the public. In the context of increased social and political unrest, these roles provided unusual opportunities for the Eameses, but also great peril: military technology and the sciences were totalizing forces at MIT and other Cold War universities, omnipresent and all powerful, impossible to recode and redirect toward humanistic purposes. Although the Eameses faced resistance within universities, they ultimately reused, research, images, artifacts, and ideas to change the ways in which the public interfaced with new technologies as they emerged in the 1960s and 1970s, working with IBM they cornered the computer market.

[239] Charles Eames, "Language of Vision: The Nuts and Bolts," Charles and Ray Eames Papers.

CHAPTER THREE

Corporate Collaboration and Communication Strategies

Charles and Ray Eames at IBM

In November 1972, Charles Eames sat down for an interview with writers from *Typographic*, a journal on design, to discuss how the Eames Office approached contracts with their clients including International Business Machines Corporation (IBM).[240] Throughout the course of the conversation, Charles described a series of curious encounters that stemmed from disagreements over the Eameses' initial contract with the company. Originally hired as independent consultants within IBM's new Corporate Design Program in 1957, the Eameses' first formal agreement with the company came in 1960 as they began preparing for their first large-scale educational exhibition, *Mathematica.* When IBM executives sent the Eameses' their standard employment contract for

[240] In the Eames archive, they had copies of this article, which I have been unable to locate elsewhere. See "Charles Eames Would Ask: Are Your Contracts 'Unfriendly?'" *Typographic* (November 1972), in Part I, box 234, folder 2, "Publicity 1972-1974," Eames Papers.

consultants, Charles refused to sign it even as the Eames Office continued work in researching and developing exhibition materials. After months avoiding the issue, IBM representatives confronted Charles directly about the document, asking for his signature and for an explanation of his reluctance. Charles responded, indicating that what they had sent him was an "unfriendly contract," in that the extensive length and general tone of the agreement only provided legal protection for one party, and Charles refused to sign a contract that left the Eames Office in a vulnerable position within the relationship.[241]

This, apparently, was standard practice for the Eames Office in their negotiations with corporate clients—they never signed an official contract with Herman Miller, and CEOs D.J. and Hugh De Pree expressed offense when asked about the subject, describing their connection with the Eameses' as a "covenant," rather than a contract, underlining the moral obligations of both parties within a mutually beneficial collaboration.[242] The Eameses insisted on agency within their institutional partnerships, and upon receiving Charles's explanation, IBM CEO Thomas J. Watson, Jr. became personally involved. After reviewing the contract language, Watson instructed the legal department to write a simple, single-page letter, which the Eameses quickly signed. In the magazine interview, Charles indicated that, "The ideal contract should be so worded that no one can tell which party wrote it," an idea that reinforced similar approaches of

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[241] Ibid.

[242] Ralph Caplan describes the relationship between Herman Miller and the Eames Office in his book, *The Design of Herman Miller* (New York: Whitney Library of Design, 1976): 43.

industrial designers of the period. For example, Buckminster Fuller referred to institutional partnerships as a "game," arguing that if designers and corporations hoped to have lasting arrangements, they "must be constructed as a game in which everyone can win something."[243]

I use this anecdote to highlight the autonomy the Eameses' maintained in their relationship with IBM, and to show that while the collaboration served as positive publicity for the company, helping calm anxieties about automation and counter IBM's role in problematic military and government tracking activities, the Eameses were not completely complicit with the capitalistic agenda of the company. The Eameses had to frame their ambitions for and understandings of computers in wholly positive terms—they were employed by IBM, after all—even if the relationship between the company and the public was not so positive. Indeed, the Eameses' rhetoric struck a delicate balance, intentionally suppressing the hostility between the collaborative spheres they occupied.

To underscore the complex dynamics of joint projects and corporate sponsorship within the Eameses' work, this chapter focuses on their designs sponsored by IBM in the 1960s and 1970s. As independent consultants for IBM's newly formed Corporate Design Program, the Eameses had access to large budgets, leading designers, advanced technologies, and expansive audiences, allowing them to work on projects that could, in Charles's words, "only be

[243] Charles Eames quoted in "Charles Eames Would Ask: Are Your Contracts 'Unfriendly?'"

realized within the context of a special occasion."[244] The Eameses ultimately embraced the computer as an interdisciplinary communication tool that could cultivate peace and understanding, and within their exhibitions for IBM, they used a range of pedagogical strategies to establish a sense of interconnectedness that would link the motivations of corporations and the public, thus transforming them both in the process. However, IBM became mired with the politics of Vietnam, antitrust litigation, and automation anxieties, the Eameses could not escape the complicity of such collaborations. This chapter explores the ways in which the Eameses navigated their relationship with IBM with the hope of altering public perception of computer technologies and information theory through traditional display models and how they purposefully suspended themselves between contradictions—between art and science, the past and the future.

Structural Change at IBM

When Thomas Watson Jr. assumed the role of CEO and chairman of the board for IBM in 1956 after the retirement of his father, Thomas Watson Sr., he made a series of fundamental changes throughout the company, transforming managerial structures, refocusing resources, and creating a cohesive corporate aesthetic through consultation with a number of designers.[245] These shifts were necessary to modernize the company and change its focus from large-scale data

[244] This is how Charles described the benefits of commissions from corporations, government agencies, and educational institutions. Charles Eames, "Language of Vision: The Nuts and Bolts," *Bulletin of the American Academy of Arts and Sciences*, 28, no. 1 (October 1974), 23.
[245] Watson and Petre, *Father, Son & Co,* 286.

collection and processing to corporate business and personal computing. Watson Jr. restructured the company and reimagined its relationship with the federal government and universities to divert the bulk of IBM's resources into the research, development, production, and marketing of computers.

Watson Sr. had taken over the company in 1914, transforming IBM from a small business specializing in tabulating equipment to a powerful multinational corporation with lucrative contracts from government agencies, the United States military, and a range of other customers and institutions.[246] By establishing close personal relationships with political leaders, domestic and international, Watson Sr. ensured IBM's presence and prestige through alignment with federal governments. For instance, when the Roosevelt administration passed the Social Security Act in 1935, IBM supplied the punched card equipment along with experience in accounting and payroll data management that allowed the government to implement the law and track the income taxes of twenty-seven million American employees and during WWII, the military used the same technology to trace vital statistics.[247] However, as IBM dominated the market for tabulating machines and punch cards, their practice of patenting technology and maintaining strict user and leasing agreements led to several antitrust lawsuits,

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[246] For the history of IBM in the punch card industry, see Emerson W. Pugh, *Building IBM: Shaping and Industry and Its Technology* (Cambridge, MA: MIT Press): 50-51; James Essinger, *Jacquard's Web: How a Hand-loom Led to the Birth of the Information Age* (Oxford: Oxford University Press, 2007): 35-40; and James W. Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry They Created, 1865-1965* (Princeton, NJ: Princeton University Press, 2016).

[247] For the role of the punch card in government data processing, see Arthur L. Norberg, "High-Technology Calculation in the Early 20th Century: Punched Card Machinery in Business and Government," *Technology and Culture* 31, no. 4 (October 1990): 753-779.

where the government simultaneously served as “prosecutor, litigant, and customer.”[248]

Recognizing that the future of the company rested in development and advancement of computer technologies, Watson Jr. knew the company’s organization, relationships with clients, and public perception needed to change as well. Upon assuming control of IBM, the younger Watson quickly reached settlements in the government’s antitrust lawsuits to initiate a new era in the company’s history, renewing lucrative government and military connections developed over the previous two decades, while, at the same time, devoting resources toward entering into the world of corporate business and personal computing.[249]

After making incremental shifts within IBM after his father appointed him president of the corporation in 1952, the process culminated in a now-almost-mythic meeting in 1956. Watson called together the company’s top 110 executives to Williamsburg, Virginia a few months before his slated promotion to CEO, issuing a decree that no one would leave the conference until an entirely new, fully-fledged managerial structure had been created for the corporation. In his memoirs, Watson indicated that he, “picked Williamsburg because it is a historic place and this meeting was meant to be a kind of constitutional convention for the new IBM,” and stated that, “In three days we transformed IBM

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[248] This is how James W. Cortada described IBM’s convoluted relationship with the government in his book, *IBM: The Rise and Fall and Reinvention of a Global Icon* (Cambridge: MIT Press, 2019).
[249] Ibid.

so completely that almost nobody left that meeting with the same job he had when he arrived."[250]

Watson moved away from a pyramidal managerial hierarchy to a "horizontal" structure that reflected similar shifts in other large American corporations including General Electric and the Container Corporation. He replaced the cult of personality that had grown around his father, as well as the paternalism and internal competitiveness that characterized his company, with a modern management system. In a decisive blow to the former's leadership style, Watson later wrote, "What we created was not so much a reorganization as the first top to bottom organization IBM ever had."[251] IBM's new management system, articulated by Watson's "organizational architect," relied on a metaphor to describe its various elements and functions—the company functioned as a body, with different divisions acting as the "arms and legs," while a six-member corporate management committee would effectively serve as the "head."[252] Each person within the executive team was in charge of a particular division, but would coordinate with other section-heads to make sure the corporation was working efficiently, removing redundancy in production and project-bidding between

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[250] See *IBM Business Machines* 39, no. 19 (December 28, 1956), the "Special Issue on Williamsburg Conference," which provides a number of detailed organizational charts along with rhetoric that focused on the decentralization of power within the company.
[251] Watson, Jr. recalled the process of corporate reorganization in his memoirs. See Thomas J. Watson and Peter Petre, *Father, Son & Co: My Life at IBM and* Beyond (New York: Bantam Books, 1990), 285.
[252] Watson also traced the inspiration for the organizational structure of the military, which be became familiar with during his service as a pilot during World War II.

different areas of the corporation. IBM would be more autonomous and prepared for changing social and technological circumstances in the coming decades.

At the same time, Watson Jr. transformed the company's relationships to the federal government and universities. Prior to WWII, Watson Sr. had largely valued these institutional connections for the prestige they provided. He donated large sums of money for naming opportunities at universities and museums. For example, he was a Trustee of The Met from 1936 until his death, donating more than one million dollars to earn an esteemed place on one of the gilded and engraved "Benefactors" plaques that line the museum's grand staircase in addition to the Thomas J. Watson Library "in recognition for his generous gifts and many years of devoted service to the Museum."[253] Columbia University opened the Watson Scientific Computing Laboratory in 1945 to investigate the postwar use of automatic calculating machines in solving scientific and communication problems.[254] While the university received funding to initiate new research and recruit scientists, Watson gained access to specialists and recent graduates, hiring many of as IBM employees and consultants, most notably Wallace Eckert, who directed the laboratory and eventually oversaw the development of several IBM calculating devises. Institutional relationships served a dual purpose for Watson Sr., aligning him with powerful New York elites and

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[253] Watson, Sr.'s relationship with the Metropolitan Museum of Art is elaborated on in Robyn Fleming, "Yes, *That* Thomas J. Watson," *The Met Library Blog* (March 2020), https://www.metmuseum.org/blogs/in-circulation/2020/thomas-j-watson; and William Rodgers, *Think: A Biography of the Watson and IBM* (London: Panther, 1971).
[254] Watson devoted resources to Columbia after a falling out with Harvard University scientists developing the UNIVAC system. He did not get credit and they cut him from the program.

intellectuals while also providing positive publicity to counter IBM's problematic wartime activities, where one of their subsidiaries continued to manufacture punch cards in Nazi Germany.[255]

Watson Jr. saw these connections through a different lens, financially backing university research with the understanding that in order to win and maintain the numerous newly emerging and lucrative contracts from the U.S. military, with foresight into a prospective market for computers in corporate business operations, and in competitive response to recent successes of Remington Rand UNIVAC computer, IBM should, by the end of the 1960s, dominate a large corner of the computer market.[256] The production of computers was, for Watson Jr., a means to facilitate working relationships with both universities and the US government to gain access to leading scientific minds, while also creating increased sales revenue through the production of advanced technologies.

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[255] Thomas J. Watson Sr. met with Adolf Hilter in his capacity as President of the International Chamber of Commerce. In 1922, IBM purchased a German tabulating company and during WWII, continued to maintain operations in a country whose government violently suppressed political dissent and initiated a genocide that systematically tracked and killed some six million Jews. Early on, Watson expressed support for Hitler's efforts to maintain world peace, but had to apologize and rescind his statements once discrimination tactics intensified. A recent study by the Harvard Business School investigates Watson Sr.'s complicated political legacy and relationship with the German government: Geoffrey Jones and Adrian Brown, "Thomas J. Watson, IBM, and Nazi Germany," *Harvard Business School,* Case 807-133, (June 2007). The relationship between IBM and Nazi Germany is explored at length in Gordan A. Craig and Edwin Black, *IBM and the Holocaust* (New York: A. W. Ellsworth, 2001).

[256] An overview of the competitive relationship between IBM and the production of the UNIVAC system is given in Kevin Maney, Steve Hamm, and Jeffrey M. O'Brien, *Making the World Work Better: The Ideas That Shaped a Century and a Company* (Upper Saddle River, NJ; London: IBM Press, 2011).

The Formation of IBM's Corporate Design Program

The fundamental shifts in management structures and resource allocation at IBM coincided with the third, equally important initiative: the development of a corporate design program. The impetus for IBM's new aesthetic came when Watson encountered a competitor's advertising campaign and showroom in 1954, upon which he called a meeting between IBM engineers, managers, and two designers: Eliot Noyes and Paul Rand.[257] Watson and Noyes had met during the course of the Second World War and had bonded over their mutual interest in gliders. After the war ended, Noyes won several commissions from IBM, first to redesign a typewriter and then a conference room at IBM World Headquarters, both of which reflected characteristics of Noyes's organic design exhibitions at MoMA (Figure 3.1).[258] Noyes invited graphic designer Paul Rand—to whom Noyes had been presumably introduced by Edgar J. Kaufmann Jr.—to accompany him and evaluate IBM's branding.[259] Watson brought with him a series of Olivetti advertisements, brochures, and photographs of their Manhattan showroom design, insisting that IBM needed their own version of a corporate aesthetic. As he recalled in his memoirs, "the Olivetti material was filled with color

[257] On the design of the design of the Olivetti showroom in Manhattan, see "What's Going on Here? Upper Case Showmanship and Lower Case Selling Win a Quick Reputation for Italian Business Machines," *Industrial Design* 1 (October 1954): 52-57, and Harwood, *The Interface,* 38.
[258] For an in-depth account of Noyes' work in establishing the Corporate Design Program, see John Harwood's groundbreaking work, John Harwood, *The Interface: IBM and the Transformation of Corporate Design, 1945-1976* (Minneapolis: University of Minnesota Press, 2016).
[259] Harwood traces relationships between designers in *Interface,* 38-39.

and excitement and fit together like a beautiful picture puzzle. Ours looked like directions on how to make bicarbonate of soda."[260]

Although Watson's comparison to Olivetti was enticing, Noyes brought his own materials to the 1954 meeting in an effort to convince Watson the fundamental, constitutive role that design played within the modern corporation. Using Charles and Ray Eames's film, *A Communication Primer*, which they had produced the previous year, Noyes reaffirmed the Eameses' contention that design was a form of communication, a way of thinking; one that expressed control over form, process, and people, and, if employed properly, had the potential to bring people and machines into harmony with their environment. In showing the film to the IBM executives, Noyes argued that the visual design program needed to extend beyond a reconsideration of advertisements and showrooms to serve an essential role in the restructuring process of the company.[261] A unified aesthetic program had the ability to connect the disparate research and production goals and to communicate a clear message about company values with the public at a moment of accelerated technological advancement during the Cold War. This approach appealed to Watson, who immediately commissioned Rand to study IBM's printed material and to make specific recommendations for improvement in product and advertisement design. In a report submitted to Watson the following year, Rand offered a scathing

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[260] Watson and Petre, *Father, Son & Co.,* 258.
[261] This process is discussed at length in John Harwood, "Eliot Noyes, Paul Rand, and the Beginnings of the IBM Design Program," *The Interface,* 17-58.

review of everything from product design to advertisements, from showroom appearance to company stationary:

> The examination has of necessity been cursory but it is believed that a number of significant features can be noted. Of all these perhaps the most critical is the absence of a family resemblance. There are, to be sure, a number of well-designed advertisements and house organs, but they are isolated pieces… Typographic style is inconsistent even with individual campaigns; the IBM trademark is not sufficiently distinctive to be exploited with maximum effectiveness; and with few exceptions, pictorial execution and layout incline to the commonplace. The fact that IBM's printed pieces bear little family resemblance to one another makes it difficult satisfactorily to establish a "company personality."[262]

To address these inefficiencies, Rand proposed a modern, dramatically simple logo along with a "comprehensive and integrated design program for IBM with respect to its printed material."[263] He suggested that Watson hire a "single consultant director to coordinate all graphic output and to work in collaboration with the overall director of IBM/s design program." Finally, Rand suggested that "IBM might also consider the production of its own advertising in the manner of CBS, Look Magazine, Olivetti, Mutual Broadcasting and NBC," capitalizing on multiple new media formats to gain new audiences.[264]

By February the next year, just before assuming his role as CEO and chairman of the board, Watson contracted Noyes as the Consultant Director of Design, charging him with the refinement of IBM's public image down to every

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[262] Paul Rand quoted in John Harwood, *The Interface*, 39.
[263] Paul Rand quoted in Stephen Heller, *Paul Rand* (London: Phaidon, 1999), 154.
[264] Paul Rand, "IBM Presentation . . . 1955," quoted in Harwood, *The Interface,* 43.

detail, while Rand oversaw all graphic material. As a condition for his employment, Noyes insisted that his position remain distinct from corporate hierarchies and divisions while having direct access to upper management. Noyes and Rand oversaw the design staffs within each IBM division and held weekly meetings to review all promotional material, extending what Harold Van Doren called the designers "sphere of influence" over as many elements of the corporation as possible.[265] Watson gave Noyes a great amount of autonomy to coordinate a redesign that would encompass everything from IBM's products, to its graphics, marketing materials, research labs, and corporate architecture. Noyes described the role in working with engineers and experts, stating:

> [The designer] brings to his client a broader design point of view than a man can have when burned with the responsibilities of everyday operation. He fully acknowledges the superior technical knowledge of the men in the client's organization. He cannot and does not presume, of course, to tell them how to do things which they have learned through years of research and experience.[266]

Following the Eameses' design model identified in *A Communications Primer*, Noyes called on systematic theories of interdisciplinary collaboration between scientists, engineers, and designers to encourage unity of the entire corporate body, identifying visual design as the essential unifying aspect. He later clarified his philosophy:

> [Design] often illuminates the nature of the company to itself and stimulates fresh internal courses of action… the processes of sound industrial design touch the phases of product planning, ergonomics, engineering, economics, manufacturing, aesthetics, and marketing, and so must be an integral part of a company's

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[265] Harold Van Doren, *Industrial Design: A Practical Guide* (New York: McGraw-Hill, 1940), 26-27.
[266] Quoted in Harwood, *The Interface*, 48.

> product development processes…. For such a role [the design consultant] must be some combination of designer, philosopher, historian, educator, lecturer, and businessman.[267]

To initiate the kind of comprehensive corporate design program he described, Noyes began make a number of small changes to advertisements, offices, and showrooms while he and Rand continued to study existing facilities and design strategies throughout IBM. They discovered that each division contained a disorganized, isolated team of designers (many of them amateurs) who improvised solutions for individual products and advertisements without consideration long-term aesthetic continuity.[268] IBM hired Marion Swannie, amateur designer at IBM to serve as head of the new Design and Display Department within the Corporate Division, working as a liaison between consultants and IBMers to create more enthusiasm and understanding for the program.[269] Together with Noyes and Rand, she established and supervised a staff of designers to produce the majority of necessary graphics in conjunction with various independent design offices. During this time, Noyes began assembling a prestigious team of fellow consultants including the Eameses (who received the first of a number of commissions in 1957) along with individual projects by distinguished architects and designers including George Nelson, Eero

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[267] Noyes interviewed by Reyner Banham, transcript of: "New Thinking About Industrial Design: 5. The Consultant Designer in Industry—Eliot Noyes in Conversation with Reyner Banham," Producer: Leonie Cohn, Recorded: Tuesday, October, 11 1966. Transmission: Saturday, October 15, 1966, Box 24, Folder "Lectures," Eliot Noyes Archive.
[268] For the state of the IBM design program when Noyes got involved, see Franc Nunoo-Quarcoo, *Paul Rand: Modernist Design* (Baltimore: Center for Art and Visual Culture, University of Maryland Baltimore County, 2003), 186-97; and Harwood, *The Interface*, 48-50.
[269] Ibid.

Saarinen, Paul Rudolph, Isamu Noguchi, Marcel Breuer, and Mies van der Rohe.[270]

The selection of these specific designers relied on Noyes's history working under Walter Gropius at Harvard University and serving as director of industrial design at the Museum of Modern Art, and although Rand produced the first *IBM Design Guide* in 1960, IBM's aesthetic remained relatively fluid.[271] Noyes sought to establish a distinctive program while still allowing the character of each consultant designer to show through, forming a corporate identity that "express[ed] dignity, authority, efficiency and modernity"—a plastic design aesthetic that would evolve along with the company's technological innovations.[272]

Addressing Automation Anxieties

The formulation of IBM's Corporate Design Program and the shift in company resources toward the development of computer technology coincided with the Eameses' growing interests in large-scale design programs, new media, and information and communication theories. Throughout the 1950s, the Eameses utilized advantageous contracts and grants from U.S. government, universities, and companies to fund projects that employed film and other

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[270]For analysis of IBM's new corporate design program, see John Harwood, *The Interface: IBM and the Transformation of Corporate Design, 1945-1976* (Minneapolis: University of Minnesota Press, 2011) Noyes redefined IBM's purpose as "controlling, organizing, and redistributing information," in order to "help man extend his control over his environment."
[271] *IBM Design Guide*, July 1960, box 60, folder, "IBM Project," Eliot Noyes Archive, quoted in Harwood, *The Interface,* 51.
[272] Ibid.

multimedia techniques to explore methods of sharing information and develop visual communication strategies.[273] For instance, in 1956, the United States Information Agency commissioned the Eames Office to create the multi-screen film, *Glimpses of the U.S.A.,* to serve as an introduction to the 1959 American National Exhibition in Moscow and provide Soviet citizens with a sense of American values and the advantages of democratic governance. As the Eameses refined their approaches to visual pedagogy in like *A Sample Lesson* and a series of educational films following *A Communications Primer,* the Eameses' association with IBM allowed them access to the latest information technologies as they developed and exorbitant corporate budgets to continue developing object- and image-based educational techniques and reach international audiences to introduce them to computers and information theory through traditional organizational models. Charles Eames acknowledged the benefit of these commissions, stating:

> Well every once in a while… a good-sized job comes along – a thing in which a subject is interesting… it follows a line of thought we've been having, it's a situation in which we could really make a contribution to the field in general, it's something where the client would benefit, at the same time you feel that the results of it would be useful in education… [and provide] an opportunity to develop some new techniques.[274]

Yet, public understanding of the computer was not universal, and scholarly and fictional books alike warned of the threat about computer technology,

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[273] Charles uses the "language of vision" in several speeches and notes, referencing György Kepes, *Language of Vision* (Chicago, Paul Theobald, 1944).
[274] See Charles Eames, "Language of Vision: The Nuts and Bolts," *Bulletin of the American Academy of Arts and Sciences*, 28, no. 1 (October 1974), 23.

considering the specter of the machine that could mimic the activity of the human mind, leading to catastrophic devastation and the loss of humanity. Experts and laypersons expressed fear and doubt about a new technocratic order, of the automatization of the workforce and the possible threat the computer posed to humanistic values, exploring these anxieties in range of different media. For example, Isaac Asimov published the science fiction novel, *I, Robot,* in 1950, providing readers with a compilation of stories that anticipated potential horrors of the atomic age; Edmund C. Berkeley's book *Giant Brains; or, Machines That Think* (1949) led to the pervasiveness of giant brain imagery in cartoons depicting the computer as a thinking machine, faster and more efficient than humans; films like *The Day the Earth Stood Still* (1951) explored alien and robot world takeovers; and television episodes, most notably, *The Twilight Zone*'s 1960 episode, "The Thing About Machines," where all of the household electronics chase him to death.[275]

Through Noyes's Corporate Design Program, IBM understood that its problem of creating a mass market for computers was one of visuality, space, and experience. To solve the problem, it turned to experts, architects, industrial designers, and graphic artists. However, both the public image of the computer and even the way it was discussed by experts was anything but certain. Watson and his team of designers were directly involved in what IBM engineer, Homer

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[275] See Isaac Asimov, *I, Robot* (New York: Gnome Press, 1950); Edmund C. Berkeley, *Giant Brains: or, Machines That Think* (New York: Wiley, 1963); *The Day the Earth Stood Still,* directed by Robert Wise (Los Angeles, 20th Century Fox, 1951); and "A Thing About Machines," *The Twilight Zone* (October 28, 1960).

Sarasohn, called “the design battle”: a constant struggle to establish control over the public image of the computer.[276] IBM’s early efforts constituted graphics, machine design, and the beginnings of an architectural program. They balanced between futurism and traditionalism, trying to naturalize the computer and new concepts of data processing, cybernetics, and systems theory. This balancing act continued through the Eameses’ work with IBM as the company continued to rely on its ability to integrate the computer with the most basic aspects of business, government, military planning, and even everyday life.

The lack of clarity about the function of computers became an urgent problem for IBM, and in 1965 they held a seminar with the intention to develop strategies for introducing the computer to its customers and, “the opinion leaders of the US.”[277] Charles Eames attended the daylong program, which became known within the company as the “NYC Seminar,” and outlines and notes preserved in the Eames Collection at the Library of Congress indicate the company sought to start from scratch, totally reconsidering their approach to subduing public anxieties around automation. IBM invited three men—the director of education at IBM, Charles De Carlo; an IBM salesman, John Worthington; and Joseph Wezenbaum, a computer researcher from MIT—to give presentations, which used two films to demonstrate how computers help man

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[276] Homer M. Sarasohn to Eliot Noyes, April 9, 1964, box 64, Folder “IBM Project 1964: ID Design Prgram ’64, Report, correspondence,” Eliot Noyes Archive, quoted in Harwood, *The Interface*, 163.

[277] The Eameses kept their copies of all seminar materials in their archive. See “The Seminar: A Precis,” box 57, folder 4, “Scripts for films and slice shows, 1962, 1972-1980,” 1, Eames Papers.

classify and reason (one of which, created by Charles and Ray Eames). At the end of the seminar, the presenters claimed that any public understanding was unfounded, and that IBM should ignore the psychological effects of technology and push forward with positive marketing campaigns.[278]

In his notes taken during the seminar, Charles angrily refuted the presentation's conclusion, scrawling in the margins: "B.S.: Progress at this scale changes the game."[279] The Eameses did not view the anxiety and uncertainty about the function of computers as something that could be overlooked, but rather as a fundamental problem that needed to be directly addressed through visual communication and comprehensive educational campaigns. I argue that in their work for IBM, the Eameses sought to balance concepts of humanism and technology through a design strategy that overcame widespread misgivings about communication technologies by creating interdisciplinary aesthetic models and experiential learning spaces, where people could test IBM products for themselves and understand their underlying principles within historical contexts.

Mathematica: A World of Numbers… and Beyond

IBM initially commissioned the Eames Office to create two films that would serve as sequels to *A Communications Primer*, relating cybernetics and data

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[278] Ibid.
[279] "Charles Eames notes on "The Seminar: New Afternoon Outline," 1969, box 146, folder 8, "General correspondence, 1964-1970," 6, Eames Papers.

processing to human activities through visual analogies.[280] The Eameses produced their first animated film, *Information Machine: Creative Man and the Data Processor,* for IBM's pavilion at the Brussels World's Fair in 1958. Extending the model of information exchange within *A Communications Primer*, the film provided a grand historical narrative, situating the computer as a culmination of the various tools and systems humans had developed over the centuries to process and communicate larger and more complex amounts of information. In 1960, the Eameses released *Introduction to Feedback,* which continued the project of connecting feedback principles—the cycle by which actions are measured, evaluated against desired results, and improved for future actions—that defined human processes to those of modern electronic computers. The film utilized a combination of live-action, animation, and still photography to underline the concept of feedback in situations ranging from chess games, to the regulation of steam engines, to the effectiveness of international politics, identifying the urgency of their message in the conclusion of the film: "Information channels and feedback loops have formed such a vast communications network that we now find ourselves part of a world community where social and economic changes are taking place at an accelerated rate. The same communications responsible for the change give promise for the future."[281] Both *Information Machine* and *Introduction to Feedback* won prizes at international film festivals

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[280] *Introduction to Feedback,* directed by Charles Eames and Ray Eames. The film was produced by IBM and not released to the general public, but the Eames Office has uploaded it online: https://www.youtube.com/watch?v=3eoE-qrrgLE.
[281] Ibid.

and they became the first in a long series of films, publications, and other pedagogical materials distributed to schools and universities at no cost, expanding IBM's reach within American educational systems.[282]

As IBM emerged from antitrust lawsuits and dedicated resources toward the research and development of computer technologies, the company sought to capitalize on the increased enthusiasm that coincided with the Space Race and the recent launch of Sputnik to enter into the realm of public education in an attempt to overcome widespread misgivings about technology through large-scale information campaigns. When the California Museum of Industry announced plans for a new wing, they asked IBM to sponsor content for the space, covering the cost for the design, construction, installation, and maintenance of a long-term exhibition.[283] The company invited the Eames Office, who had recently completed work on *A Sample Lesson* and were in the midst of creating their first multi-screen film, *Glimpses of the U.S.A.,* to open the 1959 American National Exhibition in Moscow, to submit a proposal for an exhibition that would explain fundamental mathematical concepts using a range of interactive strategies (Figure 3.2).[284] The resulting exhibition, *Mathematica: A*

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[282] In the Eameses' files, they have numerous requests for films. For a portion of these, see Part II, box 188, folder 5 "1970 Requests," Eames Papers.

[283] Exhibits at the new California Museum of Science and Industry explained technology and science in the atomic age as fundamentally necessary and good, while also presenting Los Angeles as the mecca of modern, safe living, ensuring the survival of democracy through advancing military technological superiority over communist countries. This narrative is outlined in Victor J. Danilov, "Mathematica: Exhibition at the Museum of Science and Industry, Chicago" *Museum* xxvi, no. 3 (1974): 86-98.

[284] For letters between IBM and the Eameses, see Part II, box 161, folder 1, "Mathematica General Correspondence, May-July 1960," Eames Papers.

World of Numbers . . . and Beyond, opened in Los Angeles on March 24, 1961—one of the longest running traveling museum exhibitions, lasting with only minor modifications in some form through the present—and translated basic tropes of *A Communications Primer* into hands-on learning experiences, distilling mathematics to its most basic systems and demonstrating them through interactive displays, models, images, and text. True to its namesake—Sir Isaac Newton's *Philosophiae Naturalis Principia Mathematica* (1687)—the exhibition presented ideas and situations that demonstrated the entwined relationship between the natural world and mathematics. In notes on the project, Charles indicated that the Eameses viewed their first museum exhibition as a continuation of their interdisciplinary pedagogical initiatives, stating:

> Wherein we are thrilled (though not too surprised) to find mathematics an abstract model of relationships by which science (and we) link seemingly unrelated situations, and in which we find some mathematicians, through their handling of relationships, functioning artists.[285]

An incredible amount of detailed research went into the production of *Mathematica,* and the Eameses' archive at the Library of Congress contains extensive documentation on the exhibition's development. The Eameses referenced numerous abstracts, articles, and textbooks on elementary mathematics, calculus, cybernetics, and simulation, and read research on computer science distributed by IBM and Rand Corporation scientists and engineers, all of which indicates their intense and early interest in understanding

[285] Charles Eames, "The Design of Mathematics," Part II, box 232, folder 3, "Lectures," April 1963, Eames Papers.

the ways in which mathematical models could be used as a tools for defining complex relationships and phenomena. Together with Raymond Redheffer—a mathematician and skilled teacher from UCLA, who had helped transform the Mathematics Department from a fledgling program into one of the nation's most respected through his research in differential equations and their application in fields including economics, chemistry, and engineering—the Eameses identified important principles, moments, and figures within the history of mathematics. Remarking on the intensive process, Charles wrote, "For the better part of a year we have been working, trying, building, talking, and battling with mathematics – and with a patient mathematical consultant. It has been much the same harrowing experience that accompanies any design problem, but with the added exhaustion that comes from perpetual excitement peaks."[286] Drawing on the interdisciplinary collaborative strategies they promoted in projects such as *A Sample Lesson* and eventually *The MIT Report,* the Eameses sought to demonstrate how visual design and hands-on-learning experiences could, "suggest the richness and variety of mathematics, so that visitors [would] forget any preconceived notion of mathematics as a dry, boring subject, limited to the manipulation of complex numbers, we want[ed] to free people's minds to see mathematics as the art of building relationships, the art of constructing abstract

[286] The Eames archive contains "statements by Charles Eames" about *Mathematica* that were used for promotional purposes. See Part II, box 164, folder 3, "Statements by Charles Eames about the Exhibit, 1961 and 1978," Eames Papers.

models of situations."[287] As the introduction of the catalog of the exhibition adeptly stated:

> Mathematics… forms the base of many practical sciences and for cultural arts such as music, art, and architecture. It is rapidly being adapted as a basic tool by the social sciences and humanities for studies of population, political trends and economic theories. The progress of mathematics and devices for calculating and computing have closely interrelated since the invention of the abacus. Today's modern computers solve in seconds problems that would have taken mathematicians months or years just two decades ago.[288]

Through careful rhetoric and an explication of the natural quality and ubiquity of mathematics, the Eameses simultaneously sought to combat contemporary anxiety about new technologies to project IBM's own ubiquity as an extension of these ideas. This mode of presentation—showing interdisciplinary continuities through visual design—was thus the Eameses' effort to naturalize the place and operations of the computer at the most basic level of human understanding.

Mathematica: A World of Numbers . . . And Beyond encompassed over 3,000 square feet of space in the new wing of California Museum of Science and Industry.[289] Can lights illuminated gold lettering over the entrance, which the Eameses flanked with IBM's newly redesigned logo to subtly remind visitors who sponsored the educational content that followed (Figure 3.3). Centered in the opening between collapsible industrial dividers, a glass case held eleven physical models of theoretical concepts including Euclidean geometrical forms; the

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[287] Charles Eames quoted in James B. O'Connell, "A Visit with Charles Eames," *Think* 27, no. 4 (April 1961): 7-9.
[288] Charles Eames and Ray Eames, *Mathematica: A World of Numbers and Beyond,* exhibition catalog (New York: IBM, 1961), unpaginated.
[289] For dimensions and floorplans of the show, see Part II, box 164, folder 4, "Mathematica Venue Photographs and Floorplans – California Museum of Science," Eames Papers.

rotation of straight-line segments to create circles, spheres, tori, and helices; and a Dupin Cyclide that represented the inverted shape of a cone. Providing a visually dramatic introduction to the exhibition, the Model Showcase powerfully demonstrated the aesthetic relationship of mathematics to the arts (Figure 3.4).[290]

On one side of the space, the Eameses installed a 50-foot timeline that presented a chronological view of mathematics from the twelfth century to 1950, linking creative mathematicians with the major milestones and developments in mathematical concepts (Figure 3.5). In an effort to provide historical context, additional panels included items of "active influence" on the mathematicians, "important accomplishments of the period," and photographically reproduced title pages or frontispieces of key first edition texts.[291] The Eameses included architecture alongside photographs of slide rules, codices, and telescopes. The wall began with gothic cathedrals and positioned the burgeoning field of computer science of as the culmination of a history of mathematical and scientific endeavor. Moreover, at the end of the History Wall, the number of mathematicians listed grew exponentially, illustrating the recent explosion of innovation and opportunity in the field.

The inclusion of the History Wall (and Image Wall opposite) developed from the Eames Office way of working—a result of acquiring massive amounts of

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[290] Information for how the Eameses' organized the exhibition objects, images, and ideas, see Part II, box 164, folder 43 "Mathematica Guides to the 3D Displays," Eames Papers.
[291] These labels are legible in the Eames's photographs and slides of the exhibition. See Part II, box 162, folder 10, "Mathematica photograph lists, content lists," Eames Papers.

documentation about the history of mathematics and establishing an organizational structure from which to understand it (Figure 3.6). In an interview with IBM's corporate magazine, *Think*, Charles described the formation of the History Wall, indicating that first, "With each mathematician's portrait, we put down a professional description of his ideas and biographical notes about the man. Soon, in order to keep relationships clear in our minds, we began to fill in information about the world each man lived in, the great events around him. It ended up being much more than a tool for us. It became one of the biggest and most useful features of the show."[292] Although the interactive games and activities at the core of the exhibition received more attention from visitors, the History Wall provided a clear visualization of relationships, situating current innovations as a natural progression of social, cultural, and scientific developments.

In the same vein, the Eameses incorporated an Image Wall directly opposite of the History Wall, which included pictorial demonstrations of mathematical principles and theories, each with an explanatory caption, providing a "glimpse of the great beauty of basic form," and showing the presence of mathematical concepts within daily life (Figure 3.7-3.8).[293] They argued that natural and manmade objects that have a mathematical basis—seashells, weather maps, snowflakes, butterflies, crystals, spiral nebulae, and more—could

[292] Charles Eames quoted in James B. O'Connell, "A Visit with Charles Eames," *Think* 27, no. 4 (April 1961): 8.
[293] *Mathematica,* upaginated.

be used to demonstrate the principles of set theory, game theory, crystallography, topology, chirality, and symmetry. For instance, the Eameses utilized a photograph of a boy standing next to a mirror to demonstrate infinite recession to a vanishing point, with other examples, from a trombone player juxtaposed with the rotary disk from a music box, to the difference in matter states illustrated by honey and sugar cubes. The Image Wall established a visual landscape, which viewers could view as a whole or connect one image to another to identify the underlying structures of the world and how humans had made use of that structure.

The central area of the exhibition featured large-scale, interactive models of mathematical concepts. The Eameses illustrated multiplication using a cube of lights; as the viewer entered values to be multiplied on a simple push-button panel, the corresponding number of bulbs would illuminate, thus showing the literal power of multiplication grated its user in real space (Figure 3.9). Further, a board game surrounding the cube allowed the children to learn, piece by piece, the commutative law of multiplication, the basics of Euclidean geometry and for more advanced viewers, the uncertainty of the consistency of arithmetic and the potential of set theory as a more basic foundation for mathematics.[294]

The Eameses showed sophisticated concepts in applied mathematics with interactive games. For example, they showed the celestial mechanics of Kepler in Newton in a model that allowed the sophisticated concepts in applied

[294] Eames and Eames, *Mathematica*, unpaginated.

mathematics such as the celestial mechanics of Kepler and Newton were illustrated by allowing the visitor to launch a marble into a funnel; the marble thus rolled around and around the center point in a metaphorical "orbit," maintaining its position vis a vis the central point until its lost its momentum and rolled down into hole in the center (Figure 3.10).[295] The basic concepts of topology were represented by a gigantic Mobius strip suspended from the ceiling, along which a toy train shaped like an arrow ran, demonstrating that the strip had only a single side and a single edge (Figure 3.11). Encouraging hands-on learning, the Eameses invited children to construct their own Möbius strips out of pieces of construction paper and tape, involving them in the learning process, and a series of instructions encouraged them to manipulate them into new forms using scissors.[296]

An enclosed glass case reproduced a classic experiment in the psychology of perception. The case, when viewed from the side, seemed to be filled with randomly placed objects, but when viewers peered through an eyesight at one end, they observed a "neat and ordered" geometric pattern (Figures 3.12-3.15).[297] Such experiments were usually used to demonstrate through several examples the importance of point of view, subjective vision, and the tendency of the human mind to order different sensory impressions into similar and familiar forms. However, in the Eameses' show, only one example was offered, thus

[295] Ibid.
[296] Ibid.
[297] Ibid.

weaving new emphasis into the overarching narrative of the exhibition: that if one viewed the world properly, that is, from the power vantage point, things that at first seemed disorderly had in fact an underlying structure susceptible to description, or even definition, by simple arithmetic. The Probability Machine, which has now become a requisite of children's science museums everywhere, demonstrated how the normal distribution or bell curve could be discovered through experiment (Figure 3.16).[298] At the push of a button, the machine dropped several hundred metal balls through a series of regularly distributed pegs, illustrating that while "a ball can land in any box" below, "and yet any give box fills to nearly the same height every time the experiment is repeated."[299] The Probability Machine made appearances at several other IBM exhibitions, effectively showing the role that computers could play in predicting patterns of behavior to assist in fields of genetics, thermodynamics, games of chance and strategy, insurance, and queuing theory.[300]

Another segment of the exhibition featured six "peep show" devices—individual viewing machines that projected two-minute animated films on continuous loops to explain basic mathematical principles with minimal distractions (Figure 3.17). Peep shows recalled 19th century motion-picture apparatuses, such as Thomas Edison's Kinetoscope, where patrons looked

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[298] Ibid.

[299] Department of Information, International Business Corp., "*International Business Corporation* Pavilion: Probability Machine" press release, Part I, box 158, folders 2-4, "Publicity," Eames Papers.

[300] For example, the Probability Machine made an appearance at the IBM Corporate Pavilion at the 1964-65 New York World's Fair, which is discussed below.

through a lens at the top of the machine to watch a short film, minimizing distractions from the surrounding environment. The Eameses updated this concept, innovating their own projection equipment that utilized 8-mm film, a series of mirrors, adjustable viewfinders, and specially developed speakers that projected from the sides of the box, effectively enveloping the viewer in an intensive multimedia educational experience. Each film explicated a sophisticated mathematical concept as a narrative, detailing the inference of the circumference of the earth by Eratosthenes; Camille Jordan's curve theorem (topology); various kinds of symmetry; the ideas of functions; and exponents.[301] These machines were typical of the Eameses strategy: they seamlessly blended serious, high-stakes concepts with games and play, and just as important, they directly addressed the viewer utilizing a combination of historical forms and new technologies. Charles narrated four of the five films, and the language uses the second person familiar, enacting a personal conversation with the individual peering through the lens. The familiar mode of narration, combined with the isolating viewfinder mechanism, contributed to the naturalizing effect by immersing the viewer in an all-consuming environment where the machine seems to address itself directly to them.[302]

Throughout the exhibition, the Eameses affirmed the notion that machines do indeed think, albeit in tandem with human beings. In this sense, the Eameses

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[301] Scripts for the "peep shows" can be found in Part II, box 163, folders 8-13, "Mathematica Peep Shows," Eames Papers.

[302] The "Peep Show," while a popular, attracted unhappy long lines and the the Eameses' experimental film projector film projector innovations was not reliable to meet the heavy usage.

considered the computer as another sophisticated tool, however, Charles suggested its special importance stating, “The computer significantly altered the man/machine interface, at least in degree. It is a tool man can communicate with. He asks it questions and gets back answers he could not himself have provided, nor does he always understand how the computer got them.”[303] This lack of understanding—that is, the user’s inability to comprehend the functions of computers—could only be resolved at a discursive level, by explaining continuities between the computer and human thinking processes. While *Mathematica* served as a way to introduce millions to the value of mathematics and computers, it also provided the Eameses opportunities to develop display models, interactive games, and immersive pedagogical experiences from which they built on in subsequent exhibitions for IBM and that informed the pedagogical approaches they proposed at MIT in the following years. The Eameses’ work with the company allowed them to pursue their interest in design as a form of communication while gaining access to educators, professionals, and consultants in various fields of expertise to create multivalent exhibitions reaching vast audiences.

Think: **The IBM Pavilion at the 1964-64 New York World’s Fair**

In the fall of 1960, as the Eames Office completed work on several large commissions including *Mathematica* and *The House of Science*—a Department

[303] Charles Eames quoted in Harwood, *The Interface*, 182.

of State-funded multiscreen film presentation that served as the introduction to the United States Science Exhibit at the 1962 Century 21 World's Fair in Seattle, Washington—IBM began considering its contributions to the 1964-65 New York World's Fair to accompany their much-anticipated release of the IBM System/360, the first family of computers with a suite of compatible applications to serve a range of customer needs, from large to small, both commercial and scientific.[304] According to memos distributed within the company and subsequent press releases, the IBM sought to use the pavilion to argue that computers, and the scientific and business functions they performed, were an increasingly integral and necessary part of daily human life.[305] The fair would provide the company with unparalleled access to millions of potential consumers, introducing them to computer technologies through interactive displays and educational films.

Held in Flushing Meadows-Corona Park in Queens, New York between April and October 1964 and again in 1965, the New York World's Fair continued along the trajectory of consumerism that characterized postwar international expositions, however, overshadowed by its financial losses, absence of European participants, heavy commercial orientation, and the looming and rather

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[304] For a detailed history about the technological and cultural impact of the System/360, see Harwood, "The Architecture of the Computer," *The Interface,* 59-99; Maney, Hamm, and O'Brien, *Making the World Work Better: The Ideas That Shaped a Century and a Company*; Emerson W. Pugh, *Building IBM: Shaping and Industry and Its Technology*; and Lawrence R. Samuel, *The End of Innocence: The 1964-1965 New York World's Fair* (Syracuse: Syracuse University Press, 2007)

[305] Department of Information, International Business Corp., "*International Business Corporation* Pavilion: Probability Machine" press release, Part I, box 158, folders 2-4, "Publicity," Eames Papers.

sinister presence of its president, Robert Moses, the Fair was summarily dismissed by critics for its lack of uniformity, what *New York Times* columnist John Canaday described as "tawdry, confused, and vulgar but also tolerable a form of 'folk art."[306] Unsanctioned by the Bureau International des Expositions (BIE), the intergovernmental organizing body of international exhibitions, many European countries refused to participate and the fair began to take shape as the ultimate trade show, with American businesses spending over three hundred million dollars on exhibitions, comprising 60% of total fair costs (Figure 3.18).[307]

When fair organizers announced the theme "Peace through Understanding" in 1960, many activists, namely Dr. Edward Lewis, director of the Urban League of Greater New York (ULGNY), identified a contradiction between the Fair's utopian focus and social realities, noting that the theme would "ring hollow" given the deep divisions along political, social and economic lines, along with a growing sense of cynicism and disillusionment.[308] The optimism of the 1940s and 1950s had disappeared as the utopian world promoted by the government and businesses after World War II had failed to materialize. While fairgoers enjoyed the sites, CORE and the ACLU supported protests outside the gates, holding signs with messages such as "We Don't Want a World's Fair. We

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[306] John Canaday, "The Fair as Art," *New York Times* (May 3, 1964): 1.
[307] Countries including Great Britain, France, and Italy refused to participate in the 1964-65, citing their membership in the BIE. Other countries participated in an unofficial capacity, sending industry groups to take advantage of business opportunities while maintaining good standing with the BIE.
[308] Robert Alden, "CORE Tests Ban on Fair Pickets," *New York Times* (April 29, 1964): 7; Murray Illson, "Picketing at Fair Ruled a Trespass," *New York Times* (June 12, 1964): 2, 5; and Edward Ranzal, "Rights Picket Ban by Fair is Upheld," *New York Times* (July 2, 1964), 3. See also Lawrence R. Samuel's account of fair protests in his book, *The End of Innocence.*

Want a Fair World," and at the same time, thousands marched in Mississippi to register black voters during the Freedom Summer of 1964. As the fair proceeded into its second year, Americans witnessed the assassination of Malcom X in February 1965, the Selma to Montgomery marches the following month, the Watts riots in August, were all happening as "peace through understanding" reigned in Flushing Meadows. President Lyndon B. Johnson signed a string of civil rights laws during this period—the Civil Rights Act in July 1964, the Voting Rights Act in August 1964, and affirmative action the next month—and escalated the United States' involvement in the Vietnam War, sending tens of thousands of troops to the region, which catalyzed antiwar student movements across universities and institutions including the University of California at Berkeley, the University of Chicago, and MIT.[309] Throughout some demonstrations, students burned IBM punch cards containing their registration information to protest the involvement of corporate greed and the military-industrial complex within their educational institutions.

Against the backdrop of social unrest and conflict, fair organizers created a space that was essentially free from the turmoil of the mid-1960s through a series of calculated decisions regarding location, transportation, and entry fees. Moses unapologetically admitted that he viewed the fair as a business enterprise, acquiring private property for the fairgrounds and hiring thousands of Pinkerton

[309] For more on racial politics of the period, Mary L. Dudziak gives an excellent analysis in her book, *Cold War Civil Rights: Race and the Image of American Democracy* (Princeton, NJ: Princeton University Press, 2011).

guards to swiftly shut down any protests that tried to use the event as a stage to voice concerns.[310] Moreover, the organizing committee only agreed to discounted prices for school children after a lengthy battle, but only for families living within 50 miles of the fair, which caused outrage from nearby city governments, who argued that tickets were financially inaccessible for children from low-income households and that the policy disproportionally favored kids from Manhattan. While a *New York Times* article considered the event "a showcase of civil rights, where Negroes and whites work together in virtually every phase of the operation," reflecting the state of equal opportunity employment in the United States in 1964, these claims were anything but true.[311] Within the gates of the New York World's Fair, visitors could experience the benefits of an automated future while isolating themselves from social realities of the period and foundational work necessary to achieve social, political, and cultural utopia modeled within corporate pavilions.

Although the Eameses had concerns about the socio-economic model of the upcoming 1964-65 New York World's Fair, they nevertheless joined other members of IBM's new corporate design team in late 1960 to begin planning the

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[310] For biographical accounts and analysis of Moses' politics, see Robert A. Caro, *The Power Broker: Robert Moses and the Fall of New York* (New York: Knopf, 1974); Robert H. Haddow, *Pavilions of Plenty: Exhibiting American Culture Abroad in the 1950s* (Washington, D.C.: Smithsonian Institution Press, 1997); Erik Larsen, *The Devil in the White City: Murder, Magic, and Madness at the Fair That Changed America* (New York: Vintage Books, 2003); and Ilene Sheppard, "Icons and Images: The Cultural Legacy of the Fair," in *Remembering the Future: The New York World's Fair from 1939 to 1964* (New York: Rizzoli, 1989).
[311] Martin Tolchin, "Fair a Showcase for Civil Rights," *New York Times* (June 9, 1964): 4.

company's pavilion.[312] A committee including Noyes, Rand, the Eameses, and a number of IBM engineers and managers began the process of selecting an architect considering a number of potential options before hiring the Eameses to work alongside their long-time friend and collaborator, Eero Saarinen, to design of the pavilion while also designing the exhibitions and various attractions held within.

Early in the conceptual stages of the project, the Eameses and Saarinen agreed that the pavilion should reflect what they termed "un-architecture"—a structure that established open-sightlines, encouraging visitors to move freely in, out, and through multiple exhibitions, shifting to the next as they observed others partaking in the carefully coordinated attractions.[313] When Saarinen died unexpectedly in 1961 before the planning process was complete, his colleagues Kevin Roche and John Dinkerloo continued working with the Eames Office to complete the project. Preliminary plans include rolled Cor-Ten columns of "trees" which IBM marketed as a new technological development in the long historical development of steel construction and would prove useful in producing inexpensive structures in the future. The plaster-covered, steel-framed ovoid theater atop the canopy of trees had its own representational pretensions. According to Roche, as the embodiment of a "simple geometrical equations" the

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[312] Charles Eames, "Thoughts on Design," speech, IPC Graphex '65 London, October 1965, Part II: Speeches and Writings series, Charles and Ray Eames Papers, Manuscript Division, Library of Congress, Washington, D.C. *Design Journal* 202 (October 1965), 71.; for analysis on the fair broadly, see: Lawrence R. Samuel, *The End of the Innocence: The 1964-65 New York World's Fair* (Syracuse: Syracuse University Press, 2010).
[313] Kevin Roche quoted in Harwood, *The Interface*, 182.

ovoid was meant to suggest, metonymically, "the form of the earth, even the universe," signifying the company's universal presence across the globe (Figure 3.19). On a more basic level, the egg-shaped structure recalled the defining feature of the 1961 Selectric typewriter—a "ball" typing element that replaced standard typebar technology—effectively situating IBM technology as a dominating force within the fair's visual landscape.

The Eameses' initial plans for the interior exhibitions were shaped by their participation in the Seattle World's Fair of 1962, where they learned the processes by which the World's Fair exhibitions "worked."[314] IBM recognized that the company was continually presented to the public through appearances at trade fairs, where products were displayed for potential customers. At World's Fairs, however, the firm's aims, approaches, past successes, and current ventures could be conveyed to an even wider audience. Seeking the most effective means of communication, IBM commissioned a study of pavilions at the Seattle World's Fair (Figure 3.20). Researchers evaluated the ways in which visitors moved through the Fair grounds and pavilions as well as the effectiveness of exhibits in transmitting concepts.[315] Drawing on the report, the Eameses implemented exhibition techniques at the New York World's Fair that would better incite both interest *and* involvement from Fair attendees. They did so by using an organizational model they had long studied: the circus.

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[314] In their files for the New York World's Fair, the Eameses had a hard copy, correspondence, and notes regarding the report, Weiss and Boutourline, *Fairs, Pavilions, Exhibits, and Their Audiences* (Boston: Robert S. Weiss, 1962).
[315] Weiss and Boutourline, *Fairs, Pavilions, Exhibits, and Their Audiences*, unpaginated.

The Eameses were profoundly interested in the circus. They took photographs of performers, animals, clowns, and design elements; collected, filmed, and displayed a wide array of toys and memorabilia; used the circus as a metaphor for design in lectures and presentations; and later produced a face-painting tutorial film for clowns at the Ringling Bros. and Barnum & Bailey Clown College. In a 1974 lecture, Charles articulated the allure of the circus:

> "…Within this apparent freewheeling license [of the circus], we find a discipline, which is almost unbelievable. There is strict hierarchy of events, and an elimination of choice under stress, so that one event can automatically follow another… The circus may look like the epitome of pleasure, but the person flying on a high wire, or executing a balancing act, or being shot from a cannon must take his pleasure very, very seriously."[316]

The Eameses selected the circus model for the IBM pavilion because they believed they shared many of the same "freedoms and restraints."[317] Both were highly regimented liminal spaces, offering individuals what Charles described as a "limited exposure to a kind of reality they will never live with but *ought,* somehow, to get a taste of."[318] The Eameses recognized that the perceived spontaneity of the circus was not only underlined by tradition and ritual, but that it was also endlessly reinventing itself, adding and subtracting elements from other cultural forms to remain enticing and marketable.[319] They used this logic to

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316 Eames, "Language of Vision," 15.
317 Charles Eames frequently referenced the "freedom and restraints" within the design process, see: Charles Eames, "Design: Its Freedoms and Its Restraints," speech, New York Art Directors' Conference, New York, April 1963, Part II: Speeches and Writings series, Eames Papers.
318 Charles Eames, lecture notes, Penrose Memorial Lecture, American Philosophical Society, Philadelphia, April 1974, Part II, Speeches and Writings series, Eames Papers.
319 Janet M. Davis, "The Circus Americanized," in Susan Weber, Kenneth L. Ames, Matthew Wittmann, *The American Circus* (New Haven: Yale University Press, 2012), 22-52.

create a culture within the pavilion that naturalized the computer and made new media and information theory accessible.

The idea of the circus as a ritualistic event that offered a wide array of experiences for the visitor—diverse exhibits that attracted and sustained the audience's attention—was embodied in the Eameses' selection of visual material, interactive models and games, simulations, and other media included within the IBM Pavilion. While each exhibit disseminated a particular message, they were all dedicated to demonstrating how the computer could function as a communication tool for the average person. Furthermore, the computer exhibits were visually united through the use of a familiar, carnival aesthetic with tents and colorful flags that called on the spirit of festivity at the fair and added a playful introduction to the new information machines (Figure 3.21).

In the initial proposals presented to IBM, Saarinen and the Eameses envisioned an open plan that allowed visitors to flow throughout the sprawling space, engaging with the exhibits in a seemingly independent manner that was carefully coordinated (Figures 3.22-3.24).[320] The plans recall the organization of the three-ring circus, with several elements arranged organically around a central attraction (Figure 3.25).[321] In the IBM Pavilion, the central attraction was the "The People Wall," a set of steeply tiered bleachers that would rise up and disappear into a theater located in the ovoid structure above.

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[320] Charles Eames, "Thoughts on Design," *Design Journal* 202 (October 1965), 71.
[321] Fred Dahlinger, Jr., "The American Circus Tent," in Susan Weber, Kenneth L. Ames, Matthew Wittmann, *The American Circus* (New Haven: Yale University Press, 2012), 200-230.

While the pavilion could be entered from any direction, visitors flocked towards the entrance under a brightly lit sign that read: “IBM Information Machine.” Passing through the gates, guests were confronted with a bewildering pair of winding staircases that formed a labyrinth (Figure 3.26). Visitors could enter the maze at any point, and each entrance led to separate rows in the bleachers of the People Wall. In the IBM Employee Training Manual, Charles elaborated on the placement of the People Wall and maze of staircases near the main throughway of the Fair, stating that they “follow these rules which are well known in circus and carnival circles: it takes a crowd to attract crowd; People want to be seen as much as to see; there is enjoyment in being disoriented, and the very special world it creates changes the sense of time; People like to see people being entertained.”[322]

After the disorienting journey through the labyrinthine stairs, the audience filed into the bleachers where they were required to prop themselves up on a seat rest and hold a grab-bar located in front of them (Figures 3.27-3.28).[323] This structure mimicked that of an amusement ride, imposing on the audience a posture that encouraged heightened attention and anticipation. Suddenly, a man wearing a tuxedo descended from the theater on a tiny platform to greet the audience and act as a master of ceremonies, highlighting the celebratory nature of the event and once again calling on the traditions of the circus (Figure 3.29).

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[322] Charles Eames, “Fact Sheet: IBM Pavilion, 1964-65 New York World’s Fair,” World’s Fairs Box 20, Folder 1, “NY 64/65 Training Manual Pt. 2,” IBM Corporate Archives, quoted in John Harwood, *The Interface: IBM and the Transformation of Corporate Design, 1945-1976,* 189.
[323] New York World’s Fair Files, Part II, Box 169-172, Eames Papers.

Following the introduction, the host accompanied the audience as the 60,000-pound People Wall rose into the Information Machine within the Ovoid Theater.

Once inside the Information Machine, the host reappeared periodically during the twelve-screen film, *Think*, reinforcing ideas that the film presented and keeping viewers attentive to the message being delivered to them (Figure 3.30). Charles and Ray had utilized multiple screens in earlier films, including those made for the 1959 American National Exhibition in Moscow and the 1962 Seattle World's Fair, but neither of these films involved physically removing the audience from the exhibition floor, transporting them into a space of visual spectacle and precise coordination.[324] The Information Machine was a purpose-built environment used to control the flow of information by surrounding the audience with a multitude of synchronized images, sounds, and action. Later, Charles explained the use of multiple screens: "The multiple imagery had to perform very specific functions. In the IBM pavilion, for example, it was simultaneity. I think this is a very valuable device: to use multiple images to relate simultaneous happenings to the main theme. You get a feeling of relationships you didn't have previously."[325]

In promotional materials for the Fair, IBM indicated the purpose of *Think* was "to show that the methods used in solving even the most complicated

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[324] Two books that discuss Eames multi-screen films at length: Eric Schuldenfrei, *The Films of Charles and Ray Eames: A Universal Sense of Expectation* (London: Routledge, 2015); and Greg Castillo, *Cold War on the Home Front* (Minneapolis, University of Minnesota Press, 2010).
[325] Charles Eames, "Thoughts on Design," speech, IPC Graphex '65 London, October 1965, Part II: Speeches and Writings series, Eames Papers; *Design Journal* 202 (October 1965), 71.

problems of our times are merely elaborations of the methods we all use in the homely problems of our everyday life."[326] The Eameses sought to make the computer more approachable, demonstrating that the methods used by computers for solving complex problems (such as predicting the weather) rely on the same methods people use to solve simple problems (such as planning a seating arrangement), the only difference being scale. Both the scientist and the host must identify the problem, abstract the important elements, and use models and equations to arrive at an "optimum" solution (Figure 3.31).[327] While a seating arrangement has relatively few variables, the scientist must account for many elements and intricate mathematical relationships including temperature, humidity, wind speed, and air pressure. By entering data points into a high-speed computer, the scientist is able solve each problem in a "practical length of time."[328] As the Visitor's Guide explained, "…when a computer performs the calculations, it is the human model-maker who is really responsible for solving the problem."[329]

To the Eameses, the multi-screen film had the potential to translate complicated concepts, provide multiple perspectives at once, and create visual continuity between seemingly disparate material.[330] Saturating the audience with a continuous flow of information on several screens, the Eameses drew on the

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[326] New York World's Fair Files, Part II, Box 169-172, Eames Papers
[327] Harwood, *The Interface*, 138.
[328] New York World's Fair Files, Part II, Box 169-172, Eames Papers.
[329] Ibid.
[330] For a description of the film, see Amy Gallick, "Think," in in Catherine Ince and Lotte Johnson, eds. *The World of Charles and Ray Eames* (New York: Rizzoli, 2016), 286-289.

heritage of continuity and precise coordination within the structure of the circus. Furthermore, by removing the audience from the time and space of the exhibits below, the Eameses offered an all-encompassing spectacle that produced a liminal alternative reality.[331] As a result, they created a high-paced educational experience, allowing audio-visual information to serve as the primary method for communicating information.

After the film came to a close, the audience was lowered back to the ground floor and ushered into the exhibits arranged throughout a forest of Kor-ten steel "trees" whose branches converged to support a translucent plastic canopy.[332] Amongst these "tree" columns, the exhibition floor was subdivided into five seemingly autonomous exhibits: the Typewriter Bar, the Computer Court, the Scholar's Walk, the Probability Machine, and the Little Theaters. The Eameses sought to effectively communicate concepts through the dramatic, yet simple presentation of products, ensuring that there was a central message and motif in each exhibit that was united through the organizational model of the circus. Moreover, the Eameses purposely designed the pavilion to provide guests with the sense of open circulation, freedom of choice, and spontaneous interaction, while also maintaining control over the visitors' movement and their engagement with the exhibits. [333] To plan the pavilion's layout with these goals in mind, the

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[331] Leon Botstein, "Circus Music in America," in Susan Weber, Kenneth L. Ames, Matthew Wittmann, *The American Circus* (New Haven: Yale University Press, 2012), 176-199.
[332] The trees served as a marker of the Eameses' continued interest in mathematical concepts present in nature. In this case, the trees are reminiscent of branching, which Benoit Mandelbrot described in 1975 as "fractal branching."
[333] Weiss and Boutourline suggested having straightforward displays with a memorable, sentimental attachment present within each.

Eameses created two films that enabled them to work out the parameters of the project and also developed multiple scale models to understand spatial relationships between visitors and exhibitions, as well as to test concepts and share them with clients.[334] Recalling the visitor studies conducted at the Seattle World's Fair, the Eameses used these films and scale models to coordinate every aspect of the pavilion. They enacted particular circulation schemes within the Information Machine and exhibition floors; incorporated a distinct and memorable demonstration within each display; and modeled space to maximize accessibility and flow throughout.[335]

Originally designed by Eliot Noyes for the 1958 Brussels World's Fair, the Typewriter Bar was a calculated marketing strategy that IBM had consistently drawn on for its exhibits (3.32).[336] At the New York World's Fair, visitors had the chance to test the new Selectric typewriter and experience how this IBM product could serve as an effective communication tool. Upon entering the exhibit, visitors received a postcard with a picture of the IBM Corporate Pavilion featured prominently on the front (Figures 3.33-3.35).[337] They were then invited to type a message to send to friends or family that not only integrated a personal connection to their use of the machine, but also transformed each individual into

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[334] For high-quality reproductions of Eames models and images of the IBM pavilion, see Luke Naessens, "Information Machines," in Ince and Johnson, eds. *The World of Charles and Ray Eames* (New York: Rizzoli, 2016), 265-268.
[335] Robert Stuart Weiss and Serge Boutourline, "The Communication Value of Exhibits," *Museum News, Journal of the American Association of Museums* 42.3 (Nov. 1963), 22-27.
[336] Harwood, *The Interface: IBM and the Transformation of Corporate Design, 1945-1976*, 187-188.
[337] New York World's Fair Files, Part II, boxes 169-172, Eames Papers.

an IBM marketing tool, informing potential consumers about new communication technologies. The typewriters were arranged in a circle, breaking from the linear display commonly featured in IBM showrooms, so that fairgoers could watch each other utilizing the latest advancements in communication technology. This new layout normalized the machine amongst thousands of visitors and integrated technology within a carefully controlled and choreographed social experience.

The Computer Court featured exhibits on language translation and character recognition, each showing how a specific function of a computer could be used to overcome barriers of language and the transfer of information. In the Language Translation exhibit, a demonstrator copied sentences from a Russian scientific article into an IBM 1601 computer (Figures 3.36-3.37). The information was transmitted to an off-site computer, which translated the text into English before sending it back to be printed on an automatic typewriter and displayed on a screen moments later. Illustrating how computers "think," the Language Translation exhibit demonstrated the networking capabilities of computers to facilitate communications between disparate locations around the world and make more information readily accessible. As with all the exhibits within the pavilion, an IBM professional was present to answer questions and gently guide the audience through the computer language translation process, connecting it to the steps a human would take to translate the text. The Eameses determined that knowledgeable demonstrators were an essential element of the pavilion, communicating complicated messages and directing the attention of the

audience to prevent them from missing important information. The presence of a demonstrator was also highly effective in increasing the length of time the average visitor spent at an exhibit, personalizing the educational experience and making computers more approachable to apprehensive audiences.[338]

In the Character Recognition exhibit, visitors were asked to "select any date since 1851, and to write that date on a card," which was then fed into an experimental optical scanner and read by an IBM 1410 computer (Figures 3.38-3.39).[339] After analyzing each individual's handwriting, the computer drew on a memory disk containing 40,000 *New York Times* headlines before printing out a headline from that date (Figures 3.40-3.41). By asking visitors to handwrite a date on a card and submit it to the computer, the exhibit reinforced the idea of dialogue between people and computers. Moreover, the exhibit put the computer in conversation with *The New York Times,* which established credibility and was reminiscent of the familiar morning ritual of reading the newspaper.

At the center of the exhibition floor, the Little Theaters held a series of electronically controlled puppet shows in small theatres reminiscent of those traditionally used for Punch and Judy performances (Figure 3.42). Speaking about the Little Theaters in 1965, Charles asserted that puppet shows were a simple, yet effective, way to carry an idea across to an audience. Drawing on another long-established mode of entertainment, the puppet shows consisted of

[338] Weiss and Boutourline, *Fairs, Pavilions, Exhibits, and Their Audiences*, unpaginated.
[339] Ibid.

a sequence of short scenes enacting a dialogue between two characters.[340] One of the most popular shows, written by Eames Office staffer Glen Fleck, was titled "The Singular Case of the Plural Green Moustache." The show tells the story of Sherlock Holmes and Dr. Watson and their efforts to solve the mysterious disappearance of a train. Through a series of "yes-no" questions, the two determine not only who stole the Glasgow Express, but also how to capture the criminal and return the train safely to its station. The script never deliberately addresses the computer, but instead alludes to its relevance in the final scene where the Holmes puppet lifts his jacket to reveal that he is an animatronic figure, controlled by a computer.[341] By revealing the mechanization of a popular form of entertainment, the show again reinforces the idea that computers, like puppets, are controlled by human interaction and could assist in transmitting ideas.

In the initial proposal for the IBM Corporate Pavilion, Saarinen and the Eameses outlined their essential goal – that upon "leaving the exhibit, the visitor should feel that the aims of IBM are not foreign to his own."[342] To accomplish this, Charles and Ray utilized the circus as a model to develop pedagogical methods that made computer processes familiar and transparent to a broad public. The Eameses utilized a disciplined system of planning in the design of a liminal space; relied on spectacle in their creation of an all-encompassing

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[340] Charles Eames, "Thoughts on Design," speech, IPC Graphex '65 London, October 1965, *Design Journal* 202 (October 1965), 71.
[341] Part II, Box 169-172, "New York World's Fair Files," Eames Papers.
[342] Eero Saarinen and Associates, "New York World's Fair for 1964: IBM Building Report," 5 January 1962, World's Fairs Box 20, Folder 8, "Architect's Book," IBM Corporate Archives quoted in Harwood, *The Interface*, 185.

temporal sensory experience; enacted complex and fluid patterns of cultural exchange; and normalized exotic concepts through traditional forms of entertainment and humor. As with many of the other participants at the New York World's Fair, IBM capitalized on the spirit of celebration to communicate the potential of new technologies, often establishing a sense of cultural syncretism that prioritized the possibility of a utopian future over the social realities of the 1960s. Similarly, the Eameses' focus on larger organizational systems and the presumed universality of communication technologies was often at the expense of cultural particularities. Within the exhibition spaces in the IBM Corporate Pavilion, the Eameses' goal was to democratize information, develop ubiquitous educational experiences, and refine visual communication strategies. The Eameses recognized that the perceived spontaneity of the circus was underlined by tradition and constancy and used this logic to create a culture within the pavilion that domesticated the computer and made new media and information theory accessible to skeptical audiences.

The "IBM Museum"

As the Eameses worked on *Mathematica* and on exhibition material for the New York World's Fair, IBM was in the midst of redesigning a number of their corporate offices, distribution facilities, and factories within the context of the Corporate Design Program, where each building was unique, reflecting the individual style of each architect, but also promoted the forward-looking character

of the company as they ventured into computer technologies and expanded their global presence. In selecting architects for these projects, Noyes relied on what he called “linkages” with other designers, architects, sculptors, and visual artists to create a dynamic architectural program, and in 1960, IBM hired the Skidmore, Owings, and Merrill (SOM) office to design its new corporate headquarters in Armonk, New York.[343] The resulting structure moved away from the minimal architectural form of previous buildings designed by Noyes and Saarinen, relying on cantilevered concrete slabs and recessed glass walls to establish a deep spatial surface (Figure 3.43). SOM organized the interior space into four distinct sections, and developed a database to arrange all office machines, furniture, and artwork according to a system: each object was assigned a number, and its location, user, and use were tracked by the IBM 1460 computer installed on the first floor of the building. IBM had a growing collection of modernist art that they made available to managers and executives; each individual worker could “personalize” his or her office by selecting from an approved list of paintings and coordinated upholstered office furniture.[344] Along with its fine art collection, IBM had an impressive array of books and antique calculators that Thomas Watson Sr., had acquired during his time at IBM, and in 1961, as construction on the new headquarters began, IBM vice president approached the Eames Office to design

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[343] See Eliot Noyes, speech, “The IBM Coprorate Design Program,” International Design Congress, the Council of Industrial Design, London (October 1961). See also Gordon Bruce’s excellent discussion of Noyes’ “linkages” and relationships between designers and corporation in, *Eliot Noyes* (London: Phaidon, 2006).

[344] This process is elaborated on in the IBM Corporate Exhibit Program. See IBM, Part II, Box 47, Folder 8, “1974-1975 Corporate Exhibit Program,” Eames Papers.

an IBM Information Center, to house the artifacts and serve as a visitor center, educating invited guests and IBM employees about the history of the computer and its contemporary functionality.[345]

The Eames Office referred to the Information Center as the "IBM Museum and Information Center," or the "IBM Museum" for short, and continued their collaboration with Roche and Dinkeloo to design a space where visitors left "feeling a little more at home with the computer—and sufficiently at ease with the idea that they can position the computer in relation to their own daily decisions."[346] The Roche Dinkeloo Architects completed plans and a scale model for the proposed museum while the Eames Office presented a proposal in the form of a study film, using animated and live-action sequences, drawings, still photographs, and film clips to give an idea of how the IBM museum could establish "a fresh look at those historic objects and events that help lace the computer in terms of our changing culture."[347] The proposal included multiple permanent exhibition areas to display historic machines and memorabilia from IBM's collections alongside the latest version of IBM computers; the Eameses incorporated space for temporary exhibitions, a library and resource center, an auditorium for orientation lectures and multi-screen film screenings, a center where visitors could test computers and IBM products, and a classroom for

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[345] Ibid.
[346] Ibid.
[347] See unpaginated proposals, floorplans that show public exhibition areas and computer exhibitions, and outlines that indicate the function of each section of the proposed museum space. See Part I, Box 147, Folder 1, "IBM Museum and Exhibition Center, Armonk," Eames Papers.

demonstrating the concepts and fundamentals for the computing (Figure 3.44).[348] Although the project was ultimately defunded in 1970, the Eames Office compiled an incredible amount of research on the history of the computer and formulated interactive educational approaches, all of which amounted to boxes upon boxes of materials, notes, slides, and models that they would repurpose for a series of exhibitions in the IBM Building at 590 Madison Avenue in New York. However, these installations would have a newfound sense of urgency as the company sought to utilize educational programming and strategic marketing to manage public perception in light of renewed antitrust litigation and protests highlighting IBM's role as a driving force in the military-industrial complex.

IBM and the Military-Industrial Complex

In the years following the release of the System/360 computer in 1964, IBM experienced explosive growth in global markets, fundamentally changing the ways in which companies and governments managed their business. By the end of 1966, IBM technicians had installed 5,261 systems across the United States, comprising only 13% the market, however, by 1970, IBM's global inventory had grown to $24 billion and accounted for 70% of the computer industry, provoking the analogy of Snow White and the Seven Dwarfs to describe the company's relationship to competitors including the Burroughs Corporation, the Control Data Corporation, General Electric, Honeywell Inc., the National Cash Register

[348] Ibid.

Corporation, the Radio Corporation of America, and Sperry Rand.[349] On the last day of the Johnson Administration, before republican Richard Nixon assumed office, the Department of Justice filed an antitrust lawsuit, charging IBM with monopolistic practices including "tie-ins"—where one could buy a product, but had to purchase other products to make it work properly—strict maintenance contracts, and patent pooling to restrict competition.[350] Over the next thirteen years, IBM provided tens of thousands of pages of evidence in their defense, spent more than a quarter billion dollars in legal expenses, and launched new educational programs to counter negative press and market their machines as tools that could empower citizens through access to information.

As IBM expanded its influence in this period through multinational marketing strategies, it became the face of the technological anxiety that characterized the period, and the company was directly targeted by activists, scholars, and the media. Most notably, Lewis Mumford published *The Myth of the Machine* in 1970, where he constructs a historical narrative of the development of the machine and its relationship to multiple areas of cultural production including art, science, philosophy, customs, and society. The chapter of the book diagnosing the pitfalls of "Mass Production" and "Human Automation," directly identifies IBM as the contemporary by identifying IBM as a contemporary symbol of the lack of transparency and rising levels of corruption within what Mumford

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[349] For critical insight on IBM's growth and monopolization of the computer industry, which led to a series of anti-trust lawsuits, see Cortada, *The Rise and Fall and Reinvention of a Global Icon* (Cambridge: MIT Press, 2019).
[350] Ibid, 105, 495-496.

calls the “new power complex” of the military-industrial technocracy. Moreover, Mumford included an internal memo that applied ideas of organization and data processing to the management of employees, which he forcefully attacked, warning readers of “megamachines” where people were treated as interchangeable components within a soulless company.[351]

Military investments had helped spur IBM to market dominance in the mid-1950s through the 1960s, stimulating research and development that eventually led to the technology in the System/360.[352] IBM engineers managed computing projects that resulted in the first moon landing, helped innovate new national flight control systems, provided programming for ballistic missiles, and fed growing needs for computers in intelligence agencies.[353] Collaborating with laboratories at MIT, Columbia University, and Harvard University, the company developed the technologies like the Semi-Automatic Ground Environment (SAGE), which utilized networking capabilities to coordinate data from radar sites to track Soviet air attacks and became a crucial element of Cold War myth.[354] IBM’s involvement in supplying military technologies for the Vietnam War

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[351] See Mumford’s account of the relationship between “the machine” and society, and his analysis of the “megamachine,” in Lewis Mumford, *The Pentagon of* Power, vol. 2 of *The Myth of the Machine* (New York: Harcourt Brace Jovanovich, 1970): 192-193.
[352] For a history of IBM, see Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry They Created, 1865-1965* (Princeton, NJ: Princeton University Press, 2016); Cortada, *IBM: The Rise and Fall and Reinvention of a Global Icon* (Cambridge: MIT Press, 2019); Emerson W. Pugh, *Building IBM: Shaping Industry and Its Technology* (Cambridge, MA: MIT Press, 1995); and Kevin Maney, Steve Hamm, and Jeffrey M. O’Brien, *Making the World Work Better: The Ideas That Shaped a Century and a Company* (Upper Saddle River, NJ; London: IBM Press, 2011).
[353] Ibid.
[354] Ibid. See also, Jean Ford Brennan, *The IBM Watson Laboratory at Columbia University—A History* (Armonk: International Business Machines Corp., 1971).

compelled student anti-war protesters, including those participating in the March 4th movement at MIT, to publicly burn IBM punch cards containing their registration information to stick it to the "Machine," corporate greed, and the federal government's tracking of personal information.[355] In response, IBM launched public relations campaigns and their executives testified before Congress to dispel the discourse of the computer as the downfall of the American worker. However, ultimately, corporate executives knew that public acceptance of the computer relied on providing people with concrete opportunities to try new technologies for themselves.

In 1970, IBM abandoned plans for an Information Center in the suburbs of New York and instead devoted financial resources toward a long-term exhibition program in their high-profile, centrally located showroom in Manhattan. Although the terms of the contract are unclear, IBM hired the Eames Office to complete a series of informational displays, repurposing the research, exhibition material, and pedagogical devices developed for the IBM Museum within multiple rotating and traveling exhibitions.[356] Years later, in a working notebook for the design of

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[355] I use Mumford's terminology of the "machine" to describe the MIT students' conceptions and objections of the research activities at MIT. See Jonathan Allen, et al. *March 4: Scientists, Students, and Society* (Cambridge, MA: MIT Press, 2011); Rebecca Lowen, *Creating the Cold War University: The Transformation of Stanford* (Berkeley: University of California Press, 1997); and Anne Collins Goodyear, "From Technophilia to Technophobia: The Impact fo the Vietnam War on the Reception of 'Art and Technology," *Leonardo* 41, no. 1 (2008): 169-173.

[356] The Eames archive does not contain a contract for this project, but instead has multiple proposals that repurpose information from the IBM Museum project. See the Eames Office proposal in Part I, Box 142, Folder 4, "IBM Exhibition Center 590 Madison – Proposal, Outlines, Reports," Eames Papers.

the 590 Madison exhibition space, Charles stated the importance of such exhibitions, noting that:

> "IBM cannot count on the Smithsonian, or other museums or any other agency but itself, to state effectively the case for the computer, or for the computer industry. A strong statement of the case would offer—to people off the street—not just an acquaintance with the computer itself, but new access, through computer systems, to real commodities: knowledge they can use, professionally and as citizens; experiences they will want to follow up; resources they can later turn to; ideas that may give them pleasure; that is, it would introduce the computer as an effective means to recognizable and desirable ends."[357]

The Eameses saw the problem as one of communication and used various interactive pedagogical strategies to overcome misunderstanding about computers among the public, casting information machines as the ultimate interdisciplinary communication tool.

A Computer Perspective

A Computer Perspective, the first Eames Office exhibition at 590 Madison, opened on February 17th, 1971 and closed more than four years later in mid-1975 after the Eameses completed a series of coinciding exhibitions on the history of astronomy.[358] Eames Office staff members, Glenn Fleck and Robert Staples, headed the initial stages of the project while I. Bernard Cohen, Professor in the History of Science at Harvard University and renowned scholar of Sir Isaac Newton, served as "a consultant, a critic, and a sort of conscious," along with Owen Gingerich, an astronomy historian at Harvard University and

[357] Ibid.
[358] See overviews of each of these projects in Neuhart and Neuhart, *Eames Design.*

practicing astronomer at the Smithsonian Astrophysical Observatory.[359] The exhibition reiterated many of the themes and techniques discussed in previous projects, incorporating aspects of *A Communications Primer* and *A Computer Glossary*, the research they conducted for the IBM Information Center, and repurposed several of the interactive devices implemented in *Mathematica,* the IBM Corporate Pavilion, and in multiscreen presentations including *Glimpses of the U.S.A.,* and *House of Science.* In *A Computer Perspective,* the Eameses employed multiple historical narratives and multiscreen projections to position the viewer in visual, spatial, and temporal relationship with the development of computer technologies.

In front of the Madison Avenue doors, the Eameses placed an introductory panel to explain the purpose of *A Computer Perspective* and preparing visitors for the various components of the exhibition starting with the History Wall (Figure 3.45). Although the Eames Office had relied on this presentation strategy in previous IBM exhibitions, providing contextualizing narratives to technological and conceptional innovations, the History Wall took on three-dimensional form in *A Computer Perspective*. Building on pedagogical and display techniques that they had developed in conjunction with Alexander Girard and George Nelson in the 1950s in designs for Herman Miller showrooms, the Eames Office fabricated a physical timeline, highlighting the interplay of technological forces, creative

[359] See Owen Gingerich's interview with long-time collaborator, Charles Eames, in Gingerich and Eames, "A Conversation with Charles Eames," *The American Scholar* 46, no. 3 (Summer 1977): 326-337.

problem solving, and economic necessity throughout history as early mechanical adding machines and related developments evolved to a fully automatic electronic computer (Figure 3.46).

The History Wall, now a staple in the Eameses' exhibitions, contained of six major panels, each devoted to a decade in computer history between 1890 and 1950, however, the information included within the timeline was organized by what Charles referred to as "minimum selectivity."[360] On scraps of paper and speaking note cards saved in the Eameses' archive, Charles recorded scattered thoughts on the computer, detailing the Eameses' approach to the History Wall. They sought to illustrate "the presence of the computer. . . as a bundle of heterogeneous contributions and changing needs, not [a single] Entity or a Force."[361] The Eameses juxtaposed photographs with film stills, facsimiles of book and magazine covers, invoices, patents, machine parts, correspondence, and text panels at various depths in six eight-foot wide cases, overlapping various elements that competed for attention within a three-dimensional historical collage that appeared as if it might continue well beyond the limits of the display cases (Figure 3.47). All of these images and objects were connected by formal traits—the repeating details of black and white photographs enhancing visual continuities, from the bars and beads of an abacus to the components of a computer motherboard—by they also created conceptual inversions. Although

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[360] Charles wrote his "thoughts on computers" in undated notes kept in the Eameses' files on the exhibition, *A Computer Perspective.* See Part I, Box 136, Folder 5, "Computer Perspective Misc Notes," Eames Papers.
[361] Ibid.

these were patently false comparisons, they were purposeful, intended to propel the viewer to make cross-connections between images and space, which encouraged them to find reasons for visual affinities within the textual information provided, making precarious conceptual relationships meaningful. In these ways, and in many more—there was no limit to the formal and theoretical continuities one might discover—the Eameses encouraged an open-ended interaction with historical objects and printed images that required viewers to conjure constellations out of the optical profusion.

The History Wall combined the seemingly disparate events and artifacts leading to the development of the modern digital computer into a complicated historical tapestry. As Charles Eames stressed in his notes, the wall's narrative, "did not [represent] a coherent planned development; if one gets any impression from the Wall it's that; not single line."[362] Rather, the wall interwove three chronological threads that converged into the modern electronic computer: *logical automata,* such as self-regulating devices for automatic guidance and control; *statistical machines* for the processing and analysis of masses of data; and *calculating machines* for performing mathematical operations in business and science.[363] In a reversal of the *Mathematica* History Wall, events within *A Computer Perspective* began with a broad range of machines and individuals that slowly converged over time, leading to the development of the first modern

[362] Ibid.
[363] These historical threads are also present in *A Computer Perspective* booklet, which identifies each of these categories. See Eames and Eames, *A Computer Perspective*.

computer in the late 1940s.[364] The narrative began with Herman Hollerith's electric tabulating machine, which enabled the tabulation of the 1890 U.S. census in five years—less than half the time spent counting the 1880 census—and along with descriptions and photographs, the Eameses incorporated a working version of the original Hollerith system as well as an original copy of the contract between Hollerith and the czar to create the first Russian census in 1895. As timeline progressed, the Eameses included Princeton Professor Allan Marquand's original diagram for electrifying a machine that could solve formal logic problems; Elmer Sperry's gyroscopic stabilizer, inspired by watching a child's spinning top; English weather mathematician Lewis Richardson's slide rule; and the IBM 077 Collator, which served a key role in the 1935 Social Security Act, helping the federal government track the personal information of 26 million Americans.[365] All of these individuals, technologies, ideas, and events converged in 1945, with John von Neumann's architecture for the EDVAC (Electronic Discrete Variable Computer), which he developed to meet the Army's need for more powerful machines during World War II. I. Bernard Cohen signaled the importance of this threshold, writing:

> Almost all at once an unanticipated flexibility of operations and power was disclosed, with the result that the computer became transformed from a machine for calculating numerical results to the multipurpose machines that have become so dominant an element in almost every aspect of our society—government,

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[364] Ibid.
[365] Charles Eames and Ray Eames, *A Computer Perspective: Background to the Computer Age* (Cambridge, MA: Harvard University Press, 1990).

> industry, commerce, science, social science, education, any kind of short- and long-term planning, and even writing.[366]

At the moment von Neuman conceived of the binary code underlying the interactive interface of computer technology, the wall abruptly stopped (quite noticeably), just before the members of the Manhattan project succeeded in creating the atomic bomb. An "epilogue panel" stood a few feet away from the History Wall, offering an outline of the "beginning of the first commercial electronic computers" from 1950 onward, situating the IBM computer as the culmination of countless significant interdisciplinary contributions.[367]

The Eameses' archive contains extensive documentation on the collaborative strategies and extensive effort involved in the production of *A Computer Perspective*, detailing how the Eames Office staff worked with consultants, IBMers, and a host of other experts and curators to select and compile the more than 700 artifacts included in the History Wall. They coordinated with IBM archives specialist Edward J. Cullinane to locate manuscripts from von Neumann and Albert Michelson at the Nils Bohr Library; IBM curator in the Museum and Exhibition Department, Bobbi Mapstone, to gain access to IBM's collection of antique calculating devices; archivists at the Armed Forces Institute of Pathology to acquire anthropometric tools used during World War I; librarians at the New York Public Library to borrow rare books and manuscripts; along with a number of other IBMers who served as liaisons,

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[366] Bernard Cohen in Eames and Eames, *A Computer Perspective,* 7.
[367] Eames and Eames, *A Computer Perspective*, 150.

acquiring devices, machines, and information from various IBM departments and divisions at the Eameses' request.[368] At the end of the exhibition booklet, the Eameses credit even more consultants on the project namely Wallace J. Eckert, Claude E Shannon, and Warren Weaver, as well as organizations and institutions that contributed to the exhibition such as Bell Telephone Laboratories, MIT, the Smithsonian Institution, and multiple other universities, museums, and libraries.[369] In an interview with IBM's *Think Magazine,* Cohen recalled the Herculean task: "Assembl[ing] this Wall… required years of research—first to understand how the computer concept developed, then to find the actual objects for the exhibition. There exists today no comparable historical presentation anywhere in the world, in any form."[370] The Eameses overloaded the History Wall with images, documents, devices, and information to provide a comprehensive, overwhelming, and therefore virtually indisputable historical narrative to ground IBM's modern computers and situate the company's activities not within the military-industrial complex, but as the continuation of good-faith efforts to solve the pressing and ever-evolving needs of society.

To underline this point within the physical space of the exhibition, visitors could reenter the present (and by extension, the future) in one of two ways: by walking through an opening in the History Wall to a storefront holding the latest

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[368] The various sources involved in constructing the History Wall are described in Edward F. Pierce, "The Great Wall," and Anne Strate, "The Mosaic of Effort Behind the Wall," in *Think Magazine* (April 1971): 18-22, 22-23.
[369] Eames and Eames, *A Computer Perspective,* 164.
[370] See Cohen's interview in Anne Strate, "The Mosaic of Effort Behind the Wall," 18-22.

IBM System 360 Model 40, or by continuing through the exhibition space into a multimedia “Information Machine” called the AV Rack (Figure 3.48).[371] Building on the experiential learning strategies employed in the IBM Corporate Pavilion, the Eames Office constructed an aluminum frame, hanging Formica and chrome panels to establish a light, translucent structure. Roughly shaped like an I, each end of the rack incorporated and audiovisual experience: the “TV-end” contained three CRTs that played a multiscreen film show close-up photographic stills of computer components and human interacts that the Eameses repurposed from previous computer films. The “shelf-end” of the rack held a scale model of an IBM System/360 computer and several buttons and dials attached to a panel above. Two ends surrounded a set of bays in the center of the rack, the first housing a system of six slide projectors and three additional CRT screens that illustrated feedback principles through a complicated network of visual interactions. Cycling rapidly through 500 slides of computer components, the series of slide projectors projected images through a translucent panel and directly at the viewer. The Eameses covered the CRT screens with colored filters, which displayed overlapping images created by pointing two slide projectors at one another and inserting a piece of clear plastic between them at an angle. The two sets of projected images established tension with one another, with the first projected outward onto the translucent pane, then onto the viewer.

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[371] In his book on IBM’s corporate design program, John Harwood describes the AV Rack at greater length. See Harwood, *The Interface*, 208-213. Photographs and reproductions of each of these components are located in Part I, Box 131, Folder 13, “Floor Panels, n.d.,” Eames Papers.

Simultaneously, three video cameras taped visitors as the images washed over their bodies, playing the footage back to them live on the three CRTs. Through a complex set of projections, reflections, and illusions, the Eameses rendered the experience of computers as one that was profoundly aesthetic, creating complicated visual patterns and juxtapositions, placing the human form in relationship to the architecture of the computer to illustrate how computers and new media mediate perceptions of the world.

The Eames Office referred to the second bay as the "House of Cards Bay" because it employed the same aesthetic devices they had used in their House of Cards toy in 1952 and in subsequent sets of cards produced for various IBM-related occasions.[372] On a white Formica panel, the Eameses mounted close-up photographs of transistors, wiring, chips, and various other computer parts to highlight the abstract, geometric beauty of the computer. Text on a panel insert read:

> These are images from the intimate internal landscape of the computer. The view is one of richness and variety and also one of very little movement. The finest and most precise of these working parts are completely static.
>
> Had a computer professional been able to see these pictures in 1950, he would probably not recognize what is shown I more than half of them. We should perhaps take a good look at such images now, because it is quite likely that in our lifetime many of these elements will become all but invisible to the human eye.[373]

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[372] See *Eames Design* for other versions of the House of Cards and their functions.
[373] See Part I, Box 131, Folder 13, "Floor Panels, n.d.," Eames Papers.

As with the previous bay, the Eameses created a dynamic relationship between the viewer and the photographs as reflects of each appeared on the chrome panels lining each side. Stepping into the bay, a visitor would be completely surrounded by images of circuit boards, switches and knobs, and looking into the chrome panels, see her body receding toward a vanishing point, demonstrating the concept of infinity. However, the space provides visitors with agency in the relationship between humans and computers—as the photographs remain static, frozen in place, viewers are free to filter in and out of the space, illustrating that the functions and uses of the computer rely on human interaction.

At the end of the exhibition, computer terminals enticed visitors to play an educational game of "Twenty Questions," developed by IBM programmer, Clayton Lewis (Figure 3.49-3.50). By typing in questions, the player tried to guess which subject the computer had selected. Computer responses to player questions had been designed not only to carry on the game of "Twenty Questions," but also to show some of the processes involved in computer writing programs—meaning, the game would introduce visitors to the ways in which humans (programmers) communicated with computers and taught them to "think." [374] In one game, the computer challenged the player ask a series of questions to identify what term the computer had selected from a list of twelve terms:

PLUM HELIUM PLATYPUS

[374] Strate includes information on the "Twenty Questions" game in her article "The Mosaic of Effort Behind the Wall," *Think Magazine*, 22-23.

BAT	ORANGE	FLYING FISH
BEET	CLOUD	MERCURY
DUCK	CARROT	KNOWLEDGE

The player could then type in up to twenty questions and use computer responses to narrow down the number of choices until arriving at the correct term: "Is it mineral? NO. Is it animal? YES…. Does it have feathers? NO, IT'S NOT A DUCK… Is it a misanthrope? I DON'T KNOW IF IT IS. IN LISTING LIKELY WORDS FOR THE PROGRAM TO RECOGNIZE, I MISSED MISANTRHOPE….can it fly? YES. Is it found in caves? YES. YOU'RE GETTING WARM. Is it a bat? CONGRATULATIONS!" (Figure 3.50). At the end of the game, the computer restated the steps the player went through to arrive at an answer, providing a clear understanding of how computers "make conversation" and help humans solve problems to convey an understanding that science and technology have a role which is deeply rooted in human values and aspirations.[375]

Although the Eameses designed pedagogical strategies within *A Computer Perspective* to be overwhelming, disorienting, and entertaining, their objective was clear: to manufacture a multivalent number of interfaces with the public, holding in tension the contradictory essentialisms regarding the human being and the computer that defined narratives within Mumford's *The Myth of the Machine* and that propelled anti-IBM sentiments among anti-war activists. The Eameses developed a method for naturalizing the computer that not only

[375] For scripts for the "Twenty Questions" game, see Part II, box 117, folder 2, "Computer Perspective Exhibit and Film – brochures and Exhibition Descriptions," Eames Papers.

addressed fears of a nascent posthumanism, but also identified the computer's crucial role within the future. By April 1st, 1971, less than two months after *A Computer Perspective* opened at 590 Madison, IBM estimated that more than 20,000 people had visited, and following the immediate success of the exhibition, the company commissioned the Eames Office to produce a series of rotating displays to expand the historical scope of *A Computer Perspective* to encompass the work of Wallace Eckert, Newton, Babbage, Copernicus, and Kepler, as well as various topics in biology and astronomy.[376]

The Astronomy and Science Series

The first exhibition in the Astronomy and Science Series, *Wallace J. Eckert: Celestial Mechanic,* opened in the IBM Corporate Exhibition Center in February 1972, occupying a space adjacent to *A Computer Perspective* (Figure 3.57).[377] Eckert joined IBM in 1944 as the initial hire in Watson Sr.'s scheme to capitalize on research and development at Columbia University to develop calculating machines during the course of World War II. As head of the Watson Scientific Computing Laboratory, Eckert developed early computer applications for astronomers, contributing to significant developments in celestial navigation, star mapping, and the study of the complex motions of the moon, and he played an instrumental role in the development of the of the 1954 IBM Naval Ordnance

[376] Strate, "The Mosaic of Effort Behind the Wall," *Think Magazine*, 22-23.
[377] See floorplans present within the Eames Archive in Part II, Box 102, Folder 3, "Astronomy and Science Exhibit Series – Floorplans and Design Elements," Eames Papers.

Research Calculator (NORC), the most powerful computing machine of its time. Retiring from IBM in 1967 and from Columbia University in 1970, the exhibition underscored the ways in which his connections with company had transformed how computers and how corporations worked with scientists.[378] Eameses included a timeline of Eckert's career and divided the photographs, texts, quotations, memorabilia, and research samples into three main areas covering his primary achievements in the development of the Air Almanac, Lunar Theory, and Astronomy. Mounting the material on plexiglass plinths and painted plywood columns, the Eames Office created modular content that could be packed up and shipped to other museums and easily replaced by subsequent exhibitions in the series, which allowed the Eameses to place Eckert in direct conversation with the innovations and developments detailed in *A Computer Perspective*'s History Wall and market the accomplishments of the IBMer at locations including the Museum of Science, Boston; the Burndy Library in Stamford Connecticut; the Krohn Observatory in Cincinatti, Ohio; and the American Astronomical Society at the University of Rochester. In the Eckert exhibition, the Eameses demonstrated the profound impact Eckert had had on the science and computer technologies, providing recognition for his significant contributions and situating him within a long line of innovators both in relation to the computer exhibition in the next

[378] The Eameses' kept copies of exhibition materials and photographs of installations in their files, where these locations and emphases are visible. See Part II, Box 104, Folder 1 "Astronomy and Science Exhibit Series – Wallace," Eames Papers.

room, and the subsequent astronomy-themed exhibitions that connected Eckert's work to those of Copernicus, Kepler, Isaac Newton, and others.

Over the next three years, the Eameses designed and installed a number of exhibitions on the history of astronomy that extended the scope of IBM's historical narrative to show that computers were the latest in a long line of technologies and concepts that scientists invented to meet their needs, many of which were rejected by the public at large for the threat posed to established ways of thinking, but ultimately in how these innovations shaped contemporary understanding of the universe. The first of these exhibitions, *Copernicus,* opened to celebrate the five-hundredth anniversary of the astronomer's birth. Copernicus's heliocentric theory, outline in his book *De Revolutionibus*, challenged the geocentric models of Aristotle and Ptolemy that had been the basis of astronomical calculations for centuries. As with the previous exhibition, the Eameses mounted texts, photographs, diagrams, and memorabilia directly to the glass- and Formica-clad plywood display walls, comparing different astronomical models visually and through a working mechanical model that demonstrated how each system accounted for the same celestial phenomenal (Figure 3.52). However, *Copernicus* put new emphasis on large-scale photographs depicting not just first edition manuscripts and reproduced paintings,

but the temporal, spatial, and cultural contexts in which the astronomer lived and worked.[379]

In preparation for the exhibition, IBM sent the Eameses and exhibition consultant, Owen Gingerich, to Europe, where they took the majority of photographs used in the exhibition at Jagiellonian University, Kraków and Frombork Cathedral in Poland and at the Uppsala University Library in Sweden, which held his books, treatises, and manuscripts following their seizure during the Thirty Years War.[380] A letter from Gingerich to a colleague detailed his lively experience traveling with the Eameses first to Poland, where the historian facilitated access for Charles to photograph the original manuscript of *De Revolutionibus* (written in Copernicus's own hand), and then to Sweden to document Copernicus's library. Arriving in Sweden, Gingerich recalled:

> Charles' enthusiasm for Copernicus caught full fire as he photographed the details of signatures, illuminated initials, and bindings preserved in the Polish astronomer's library. I think Charles is never so happy as when he has a camera in hand and splendid textures to preserve on film. It was almost impossible to make him put down the cameral long enough to eat.[381]

The focus on the aesthetics and historical texture remained at the forefront of the *Copernicus* exhibition, as large-scale photographic reproductions transported

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[379] The Eameses' kept extensive documentation of the Copernicus exhibition both in photographs, notes, and photocopies of materials Part II, Box 103, Folders 17-19, "Astronomy and Science Exhibit Series – Copernicus," Eames Papers.
[380] For Gingerich's account of his work with Charles, see his correspondence with the Eameses concerning his trip to Poland and Sweden in Owen Gingerich, "Letter About Trip to Poland and Sweden," (April 15, 1967) in Part II, Box 67, Folder 5, "Correspondence, Owen Gingerich," Eames Papers.
[381] Ibid.

visitors to another time and place to give them an understanding of the cultural context in which Copernicus's heliocentric model originated. Moreover, to enhance the December 1972 opening, the Eameses collaborated with Alexander Girard to design Christmas-themed window displays, utilizing folk art and objects from Polish Christmas traditions that the Eameses purchased on their trip and that they borrowed from Girard's personal collection (Figure 3.53).[382] The Eameses and Girard filled Madison Avenue with an elaborate six-foot tinfoil cathedral, breads in the shape of animals and fish, puppets, paper cutouts, a polish pie, and a Christmas creche, all drawing people passing on the street into a festive atmosphere, while introducing them to mathematical concepts and the history of the computer within the same space.

The following year, the Eameses installed a third astronomy exhibition within the IBM Corporate Exhibition Center, capitalizing on the same pedagogical methods to explore the work of astronomers including Tycho Brahe, Johanes Kepler, René Descartes, Alileo Galilei, and William Gilbert in the exhibition *On the Shoulders of Giants.* The title referred to Newton's quote, "If I have seen further, it is by standing on the shoulders of giants," and the display served as a prologue to the subsequent exhibition, *Isaac Newton: Physics for a Moving Earth.*[383] Designed as the last exhibition in the three-part series focusing on

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[382] See details and information about the Christmas Window displays designed by the Eames Office and Alexander Girard, including floorplans and object lists in Part I, Box 120, Folders 12-13, "Copernicus Letters and Loan Requests," Eames Papers.
[383] For exhibition materials concerning Isaac Newton in the Eameses' "Astronomy and Science Series," Part I, Box 123, Folders 8-12, "Isaac Newton," Eames Papers.

astronomers, the exhibition presented Newton's groundbreaking work in astronomy and calculus through a series of graphic panels including photographs, text, and drawings as well as pamphlets and the *Newton's Method* film shown in an adjacent room. The *Isaac Newton* exhibition opened on December 20, 1973 to coincide Newton's birth on Christmas Day 1692, and as with the Copernicus exhibition, the Eameses traveled to Europe, this time acquiring a range of artifacts and images drawn from English Christmas celebrations of the seventeenth and eighteenth centuries (Figure 3.54). Working again with Alexander Girard on the window displays, the Eameses situated red pedestals within view of the street, holding festive objects—a wassail bowl, Christmas pie, plum pudding, a wren box, and artifacts associated the "Lord of Misrule"—all of which were explained by labels mounted nearby. The Christmas exhibit also included period musical instruments; stage sets and costumes reproduced after original sketches of Inigo Jones; as well as potted orange trees, evergreens, and garlands. Along with the exhibition material, a puppet show entitled *Two Stones* was shown on film, using the dialogue between three puppets to explain the fundamentals of gravity.

Apart from the exhibitions on astronomy installed during each advent season, the Eames Office also designed and installed three exhibitions that coincided with the Lenten season, highlighting mathematical patterns occurring naturally in growing plants and the role lunar calendars play in cultural and religious celebrations and in the progression of seasons: *Fibonacci: Growth and*

Form (1972), *Movable Feasts and Changing Calendars* (1973), and *Philosophical Gardens*.[384] Within the exhibition space at 590 Madison, the Astronomy and Science Series served as a way to extend the historical context of *A Computer Perspective* while also drawing in visitors in connection with holiday celebrations to capitalize on festive moods. Throughout the series, the Eameses sought to reimbue the cultural connections between science and technology as something that was positive and for the greater good, aligning contemporary scientific achievements with the culturally and politically unpopular discoveries of past scientists including Isaac Newton. Using historical figures and religious references, the Eameses wanted to reveal the immense cultural change possible through interdisciplinary communication technologies. The Eameses' message of positive technological engagement traveled to science centers and museums across the United States, with each exhibition in the series showing at multiple locations including the Field Museum in Chicago, the Exploratorium in San Francisco, the Pacific Science Center in Seattle, and the National Air and Space Museum in Washington, D.C.[385]

In an internal IBM memo from 1973, the company boasted that approximately ten million people visited their exhibitions in IBM exhibition spaces and in traveling IBM installations in various museums. The memo proposed an expansion to the IBM Exhibit Program in 1974 and 1975 stating, "It is in IBM's

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[384] *Eames Design* includes a timeline of projects within the Astronomy and Science Series.
[385] In *Eames Design,* Ray Eames, with John and Marilyn Neuhart, compiled lists of locations each exhibition traveled.

best interests to assemble a selection of portable, interactive computer terminal exhibits… in an effort to bring exhibits to the people rather than relying on the general public to visit a few science centers or museums… Most of IBM exhibits have dealt with the history of technology, mathematics, and historical concepts and their inventors. Few exhibits have been developed that make use of the computer equipment or describe the computer."[386] In the next five years before Charles's death in 1978, the Eames Office proposed multiple interdisciplinary exhibitions for fine arts museums that would utilize computer technology within the exhibition spaces as an interdisciplinary communication tool to help visitors engage in multiple ways with museum collections, however, only one of these exhibitions was realized, and by the time *The World of Franklin and Jefferson* toured art museums across Europe and the United States, the Eameses' relationships with corporations became increasingly problematic, showing the limits to their model of collaboration.

There is no proper or correct way to view the Eameses' corporate exhibitions; their relationship with IBM was not fixed in space, but constantly renegotiated as political and social circumstances shifted during the Cold War. In their role as independent consultants for IBM, the Eameses were not fully compromised by nor fully complicit with the militaristic logic that governed institutional systems, but instead operated within it in a delicate balancing act of conflicting and overlapping interests. To be cynical, the Eameses' methods were

[386] IBM, "1974-1975 Corporate Exhibition Program," (New York: IBM, 1973) located in Part II, Box 47, Folder 8, "IBM Corporate Exhibition Program," Eames Papers.

self-serving; they allowed the Eameses to align themselves with experts and elites from a wide range of fields and enabled them to connect visual design to intellectual context that previously had no connection with the arts, thereby securing validation for their pedagogical program through the power of other discourses. Through their partnership with IBM, the Eameses gained access to massive audiences and new technologies as they developed, forming an early yet sophisticated form of social networking, what Geoffrey C. Bowker refers to as "legitimacy exchange"—the exchange of validation from one field or individual to another through discursive translation, a process in which the discourse of one field is made legible in another.[387] The appeal of IBM, their computers, and the type of systematic data processing and organization they facilitated, was the ability to create the appearance of meaningful historical relationships to naturalize the computer in a long line of innovation, a narrative that did not exist in reality. The Eameses hoped to shape and shift perceptions of technology through exchange—through discourse transformation, a means of creating a revision of perception by turning war research and data tracking into a form of technology to promote peace and understanding. Yet, IBM saw the relationship differently, and by generously funding the Eameses' projects, they could justify its even more generous funding activities with dubious educational value; the majority of research in IBM labs pertained to the large-scale government and

[387] See Geoffrey C. Bowker, "How to Be Universal: Some Cybernetic Strategies, 1943-1970," *Social Studies of Science* 23, no. 1 (February 1993): 116.

military projects criticized by student activists, popular culture, and the news media.

The Eameses fundamentally believed that design and intuitive forms of knowledge within their projects might serve a reparative function, understanding that the aesthetics of collaboration could stimulate collaboration on a higher plane, not just between objects on view but also between the groups and institutions that trace ever outward from their exhibitions. The Eameses had hoped to change IBM from within—by navigating its systems and networks, converting it agendas, transforming its protocols—but in the process, they found themselves ensconced within a new military-industrial-aesthetic complex.

Epilogue

"What is this stuff doing at The Met?"

Between 1971 and 1976, Charles and Ray Eames developed the last exhibition they would display before Charles' death in 1978. Designed to commemorate the Bicentennial of the American Revolution, *The World of Franklin and Jefferson,* traveled throughout art museums in Europe, the United States, and Mexico, displaying objects that were strategically juxtaposed to communicate the cultural histories, ideas, and values of early America. While the exhibition was positively received in Paris, Warsaw, and London, *Franklin & Jefferson* met sharp criticism when it opened at the Metropolitan Museum of Art in March 1976 and mixed reviews when it traveled to Chicago, Los Angeles, and Mexico City.[388]

Most notably *New York Times* art critic, Hilton Kramer, questioned the place of the disparate historical material and glossy photographs within the

[388] The Eameses kept a comprehensive record of exhibition reviews in their files from every location that *Franklin & Jefferson* traveled, along with comment cards from every American museum. Reviewers had a range of comments about the exhibition and while many were positive, several critics pointed out the lack of acknowledgement of slavery and other historical realities in favor of visual appeal. See Part I, box 235, "Publicity 1975-1976," Eames Papers.

context of a fine art museum by asking, “What is This Stuff Doing at the Met?” (Figure 4.1).[389] Throughout the essay, he criticized every element of the exhibition, from the extensive written descriptions to the “slick photographs” designed to “sell” the audience something, before revealing his primary objection:

> Like the stuffed bison from the Field Museum in Chicago that is the real star of the show, what little art there is to be seen here is also, as it were, stuffed into the margin of the exhibition to lend variety to the display. It is a contemptible way to make use of works of art, and it is doubly offensive to see it done in one of our greatest art museums…. We are celebrating the Bicentennial by making, in this instance, a mockery of the museum function.[390]

Franklin & Jefferson (and Kramer’s review) reinvigorated debates about museum functions as it continued the interdisciplinary and interinstitutional methodology the Eameses had developed throughout the previous years and projects: that museums and other public institutions could partner with government and corporations to effectively disseminate information to broad audiences and enact social, cultural, and political change. However, unlike the postwar years where the Eameses began their careers, the agendas of the government, large corporations, and preeminent museums interfered with, rather than enabled, the Eameses’ ability to provide what they perceived as an apolitical, neutral exhibition that could serve a variety of needs while still sending a message that used the collaboration of founding fathers as a way to encourage current community engagement.

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[389] Hilton Kramer, “What Is This Stuff Doing at the Met?” *New York Times* (March 14, 1976), 29.
[390] Ibid.

The Eames Office had begun to reckon with the backlash of institutional and corporate connections in their work for MIT and IBM, both of which wielded extraordinary power during the Cold War. As previous chapters have noted, MIT faculty and student activists challenged the institution's role in military research within their laboratories, a politically toxic situation for the administration, who hired the Eames Office to propose ways in which humanistic values could be imbued within course curriculum and the culture on campus. Likewise, IBM faced a number of antitrust lawsuits during the mid-20th century, accused of monopolistic practices that prevented competition in a number of key industries. Moreover, IBM was responsible for supplying the military-industrial-aesthetic complex with the technology needed to achieve their aims. Yet, although they relied on institutional, corporate, and government connections, the Eameses remained several degrees of separation away, both geographically and contractually, from the agendas of these groups by retaining their status as independent contracts. Despite problematic activities of their clients, the Eameses remained staunch institutionalists, working with government agencies to realize *The World of Franklin and Jefferson* and to promote their universalizing vision of an interconnected society.

After the disillusionment and social unrest that corresponded with the Civil Rights Movement, the Vietnam War, and the recent Watergate scandal, the American Revolution Bicentennial Association (ARBA) officials promoted basic themes that focused on innovations for the future, encouraging Americans to

reconsider the founding principles of the United States and apply them toward solving contemporary issues. In presenting history through a forward-looking lens, the government hoped to facilitate new programs of citizen participation and community development, however, they maintained a measure of oversight, ensuring Bicentennial celebrations focused on commonality and shared identity to create a "unifying community of discourse across the whole nation."[391]

Charles and Ray Eames' involvement in the United States Bicentennial celebrations began in late 1971, when Gerhard J. Drechsler, then Chief of the Exhibitions Division of the U.S Information Agency (USIA), visited their office and initiated preliminary discussions on a display that would highlight Thomas Jefferson and be shown in a number of museums on both sides of the Atlantic. Shortly thereafter, the Eameses expanded the purview of the exhibit to include Benjamin Franklin and other innovators working in this period to avoid what they referred to as "hero worship."[392] As Americans prepared for the Bicentennial, a wave of patriotism and nostalgia swept the nation, and while many celebrations and observances of the Bicentennial commemorated a central event—the American Revolution—the Eames exhibition focused on the exchange of ideas

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[391] The ARBA mission statement is listed in the official register along with all government-supported exhibitions. See American Revolution Bicentennial Administration, *Official Master Register of Bicentennial Activities* (October 1974), 199.

[392] In unlabeled notes from Charles' work folder, he explains the use of Franklin and Jefferson as a way to "avoid 'hero worship' and the compare and contrast approach is effective." See Part II, box 207, folder 7, "CE Work Folder," Eames Papers. See also the negative review using the same terminology in Owen Findsen, "Bicentennial Exhibit Disappoints," *Enquirer* (March 14, 1976), a42.

and the spirit of collaboration that they saw uniquely expressed in the founding of the United States.

A number of parties, primarily the USIA, ARBA, IBM, and the Met, had a vested interest in the outcome of exhibition. In 1971 the USIA contributed an initial $90,000 for the Eames Office to develop a short film, "spelling out the scope of the show for interested government and museum officials," in hopes of garnering support and financial investment.[393] By 1973, the exhibition had gained approval from ARBA and in 1974, IBM financed *The World of Franklin and Jefferson* with a $500,000 grant to the Metropolitan Museum of Art (Figure 4.2).[394]

This approach—working on large-scale commissions and combining patrons with overlapping interests—is one we have explored as a characteristic of the Eameses' design strategy, and in this project, too, they combined networks of corporate and government sponsorship, interpersonal working relationships, and collaborative efforts with educators and institutions into intersecting projects. It allowed the Eames Office to serve the specific needs and interests of each party involved while also attempting to solve larger, systematic problems: namely, divisions in fields of knowledge that inhibited communication and learning.

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[393] In the review of bicentennial exhibitions, Roberta Smith described in detail how *Franklin & Jefferson* came to fruition, beginning with a USIA officer, Burnett Anderson, expressing interested in coordinating with the Eames Office on an exhibition about Thomas Jefferson. See Roberta Smith, "Bicentennial Exhibitions," *Art in America* (January/February 1977), 13.
[394] The Eameses saved the contracts for Franklin & Jefferson in their files, which outline the See Part II, box 198, folder 5, "Franklin & Jefferson Administrative Files," Eames Papers.

The Eameses believed that institutions, museums, libraries, and government agencies contained storehouses of information that reached relatively few people and they focused on creating models to make these materials and collections both more comprehensible and more accessible to the public. As with previous large-scale projects the Eameses participated in, the Bicentennial allowed them to extensive funding and support, and they the event as another opportunity to bring together designers, corporations, government agencies, and educational institutions to create large-scale spectacles and community information exchanges. The expositions allowed the Eameses to refine and develop strategies of sharing information, which they considered a key to building communities based on active citizen interest and involvement.

Franklin & Jefferson served as a continuation of a constantly evolving model—the Eames Office coordinated with museums, corporations, universities, government agencies, historical societies, private collectors, and scholars to cultivate materials and information (Figure 4.3). The scale of the exhibition was unprecedented, containing hundreds of alternating artifacts; over 1000 photographic prints; and 40,000 words of text translated into French, Polish, and English.[395] Between 1975 and 1976, the exhibition traveled to museums in Paris, Warsaw, London, New York, Chicago, Los Angeles, and ended in Mexico City. *Franklin & Jefferson* reached thousands of people and demonstrated the scale

[395] Data on the scale and contents of the show are all present within the Eames archive, and recounted in the Eameses' proposals for the exhibition. See Part II, box 198, folder 5, "Franklin & Jefferson Administrative Files," Eames Papers.

and complexity of information dissemination possible when various groups and institutions combined resources. Apart from organization behind the exhibition, the Eameses also modeled the benefits of communication, collaboration, and cultural exchange in the content of the show, which focused on not only on artifacts, but on ideas and concepts of early America that could be reevaluated and reapplied to solve contemporary systemic problems.

The Eames Office organized the materials in *The World of Franklin & Jefferson* into four sections, each distinguished by individual themes and display strategies. Collaborative models, global communication, and the open exchange of information and ideas integrated the form and content of the exhibition, connecting the Bicentennial theme of interdependence with the ways in which the Eames Office presented material and collaborative method the they used to curate it. Focusing on multiple men in Franklin and Jefferson's circle, the exhibition booklet stated that the Eames Office wanted to provide audiences with useful points of comparison to illustrate that these men were not isolated examples, but instead functioned within a "community of informed, 'philosophical' and versatile citizens."[396] Colonists with a range of skills and professions had come together to construct an experimental model of society, where citizen participation served as the foundation for structural reform and political revolution.

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[396] Quote taken from the Eameses' exhibition booklet with essays on each of the four themes that they had translated and reproduced for each exhibition location. The booklet was expanded and reprinted after the end of the exhibition in 1977. See Charles Eames and Ray Eames, *The World of Franklin and Jefferson* (New York: Metropolitan Museum of Art, 1976): 30.

The exhibition opened with a segment on acquaintances, friends, colleagues, adversaries, and correspondents of the two men, with thirty recognizable figures including John Hancock, Aaron Burr, John Adams, and George Washington making an appearance (Figure 4.4). The Eameses presented each man through glossy, high quality reproductions of eighteenth-century paintings, photographs of artifacts and documents taken by Charles, along with texts blocks mounted on "monoliths."[397] Scattered around the informational pillars, several Plexiglas cases housed period artifacts including Paul Revere silver, Wedgwood ceramics, toys, books, games, as well as scientific and musical instruments. As with the objects in their home, the Eameses selected artifacts in the exhibition for the ideas they embodied – interdisciplinary exploration, quality craftsmanship, and the open exchange and debate of theories and approaches to a range of issues.

The display of historical artifacts, tools, and craft in combination graphic displays and a modular, minimalist space reflected strategies the Eameses had drawn on in the Eames House and in exhibitions commissioned by Herman Miller, IBM, the USIA, and the Smithsonian. Building on knowledge gained from those projects, the Eameses adapted techniques and redirected the use of materials for use in *Franklin & Jefferson.* Displaying disparate artifacts within the context of a minimalist backdrop, the Eameses sought to relieve the objects of their negative historical connotations and enable them to resonate more with the

[397] The Eameses' described pedestals and display panels as "monoliths," in their notes. See Part II, box 198, folder 5, "Franklin & Jefferson Administrative Files," Eames Papers.

current political climate. To them, the quality and range of ideas and materials the artifacts held made them valuable for their "promotion of useful knowledge."[398] The Eameses were not describing historical events as other Bicentennial exhibitions did, but directly responding to contemporary educational concerns and displaying intellectual models that could be readily employed by an active citizenship.

It is important to note that the exhibition's objects changed in relation to the host institution and area collections and its message customized to national and regional interests. For example, the Met's collection of early American art provided the primary source material for *Franklin & Jefferson*, and when the exhibition opened at the Grand Palais in March 1975, it vied for attention with another show, *The U.S.S.R. and France*, running at the same time in another section of the museum.[399] With this in mind, the Eameses selected objects such as the French copy of the Louisiana Purchase Treaty to vividly illustrate France's historic stake in the preservation and promotion of democratic ideology during the Cold War.[400] In the United States, the exhibition functioned as a primer of democratic citizenship; abroad, it functioned as a form of cultural diplomacy,

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[398] See Part II, box 198, folder 5, "Franklin & Jefferson Administrative Files," Eames Papers
[399] In his article on the traveling version of the exhibition, Gerald Satterwhite stated that the Eameses' show ran concurrent with the Russian exhibition, which visitors preferred due to *Franklin & Jefferson* including 'too many words and not enough artifacts." See Gerald Satterwhite, "U.S Bicentennial Goes to France," *The Kansas City Times* (March 14, 1975).
[400] In the Eameses' administrative files, they kept records of objects acquired for each location. For correspondence about the French objects, see Part II, box 199, folders 5-10, "Franklin & Jefferson Administrative Files, Artifacts and Paintings," and "Design and Display Elements," Eames Papers.

showing that when nations communicate openly, the world becomes a more effective, interdependent community.

The second part of the installation, “Contrast and Continuity,” presented biographies of Franklin and Jefferson, comparing the two men, stressing their commitment to the independence movement, and presenting them as figures to emulate (Figure 4.5). Panels contained information on the men’s many endeavors, describing Franklin’s responsibilities as a printer and inventor while emphasizing Jefferson’s work as a farmer and architect. Charles explained the focus on the multifaceted interests of early Americans, claiming that doing so “illustrate[s] the degree to which in America, everything was so immediate and all the problems were right at hand, so that the philosopher had to be the scientist, the scientist had to be the painter, the painter had to be politician, and everyone, in a sense, was functioning at all levels.”[401]

In the exhibition booklet, the Eames office presented as Franklin and Jefferson “members of an international community who believed that the sublime impartiality of sound knowledge would gradually free men everywhere from arbitrary power.”[402] The Eameses argued that instead of the “armchair philosophers” pervasive during the European Enlightenment, American innovators were faced with unique problems in a new terrain, requiring specific, applicable solutions that encouraged collaborations across fields of knowledge. In presenting Franklin’s and Jefferson’s contributions to the public as examples

[401] See Charles Eames and Ray Eames, *The World of Franklin and Jefferson*, 30.
[402] Ibid, 4.

to emulate, the Eameses emphasized their efforts to question and expand their understanding of the world in multiple ways. Not only did these men act as individuals, but each functioned as both an educator and recipient of information within a broader network. The Eames Office presented active citizens that worked together in an effort to reform social and political structures—a model they hoped would inspire visitors to reconsider democratic ideals and ways to translate them into new programs and systems for community information exchange and participation.

Collaboration and communication were themes highlighted in various degrees throughout the rest of the exhibition. Passing through a full-scale replica of an eighteenth-century Georgian-style doorway, visitors transitioned from a focus on men to a display on the founding documents (Figure 4.6). Scaled reproductions of the Declaration of Independence, the Constitution, and the Bill of Rights were on view along with other contextualizing material. Two panoplies of flags, weapons, and musical instruments from the Revolutionary War hung on the walls and text blocks detailed the history of events leading up to the indoctrination of American democratic ideals.

The fourth area of the exhibition, which concentrated on Jefferson's interest in Westward Expansion, was the most difficult to integrate and most controversial (Figures 4.7-4.8). Historians noted the lack of information on the ways Jefferson's views negatively influenced the country's policies toward Native Americans and the extension of slavery into the West, which raised further

questions about ARBA's role in controlling content.[403] That said, the Eameses were more concerned with the intellectual history of Westward Expansion, not its social and cultural history. They viewed expansion as the opportunity to learn about other peoples and environment, having curiosity about the world around you, concerning yourself with the advancement of knowledge for the sake of the whole. The Eameses selected a wide range of artifacts for this section, including the stuffed American bison, objects from various Native American tribes, paintings by George Catlin, and William Clark's original field notebook, all set against a wall sized painted backdrop of an idyllic blue sky.[404] The exhibition narrative ended with Thomas Jefferson's death in 1826, but stressed how his accomplishments served as a basis for further innovations.[405] The presented narrative attempted to inspire visitors to take the forward-looking principles and methods they saw displayed in the show and use them to initiate the next century of American innovation, public awareness, and participation.

While this may have been the aim, visitors, critics, and museum officials frequently referred to the segment "Jefferson and the West" in written reviews of the show, objecting to the traditional account as well as the character display of artifacts, specifically the stuffed Buffalo's prominence in relationship to the

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[403] In her article on the exhibition, Jane Friedman stated serious concerns about the narratives told in the show, and how they overlooked contributions by Native Americans and African Americans in favor of and "idealized rah-rah version of the American Revolution and its perpetrators." See Jane M. Friedman, "Parisians See Bicentennial Exhibit on the Lives of Jefferson and Franklin," *Boston Sunday Globe* (February 16, 1975).
[404] see Part II, box 199, folders 5-10, "Franklin & Jefferson Administrative Files, Artifacts and Paintings," and "Design and Display Elements," Eames Papers.
[405] See Charles Eames and Ray Eames, *The World of Franklin & Jefferson*, 30-59.

paintings.[406] Hilton Kramer suggested that in this context, fine art had transformed into mere illustration, "with their expressive powers neutralized by an environment that has no place for the obtrusive experience of art."[407] Although the objects represented key ideas of the American Enlightenment, several individuals questioned whether they belonged within an art museum. Many agreed with Hilton Kramer's estimation that the exhibition, "contains some works of art, but it is certainly not an art exhibition."[408]

However, this was not the sentiment expressed by stakeholders and scores of other reviews. Seven major art museums used the show as their official Bicentennial celebration and art professionals, educators, and journalists vehemently defended the exhibition's configuration of artifacts, informative text, and accompanying educational materials as serving the museum's function as a pedagogical institute. In a preliminary proposal for another Metropolitan commission, the Eameses provided their conception for ways museums should convey information:

> The thing about the artifacts in Museum is [not so much special aesthetic quality; or rarity or preciousness; or the classification of Art; but] that each of them comes from a situation of severely limited choice and got the way it is because it obeyed rules and answered demands that were practical and specific…. What the mediating experience can do is… clear away what Erwin Panofsky calls 'appreciationism' [of artifacts].[409]

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[406] For critiques focused around this section specifically, see reviews including Thomas B. Hess, "From 'bisontennial' beasts to Cornell boxes, *New York* (March 22, 1976); Franchesca Stanfel, "At the Met: The World of Franklin & Jeffersion," *Women's Wear Daily* (1976); and Kramer, "What Is This Stuff Doing at the Met?" 29.

[407] See Kramer, "What Is This Stuff Doing at the Met?" 29.

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[409] This quote was taken from film scripts created for the *Met Overview* film in 1976. See Part I, box 206, folder 3, "Met Overview Scripts," Eames Papers.

The Eameses saw the value of objects and their display for their ability to create continued conversations and inspire participation, something more akin to the nature of presentation in communications exhibitions rather than in art museums. The Eameses' design method built on their experience in information expositions, where their participation in design and audience studies allowed them to determine the most effective ways to disseminate information through the combination of graphics, film, and dimensional display techniques. Many art museums had also shown interest in effective communication techniques, experimenting with a number of methods to make their collections available to broader audiences. For example, MoMA partnered with public television to create educational programming; the Met proposed a new informational center where computers could be used to access the entire collection; and the Smithsonian initiated new outreach programs, where an extensive program of traveling exhibitions began touring in communities across the country.[410] Indeed, in a letter to the *LA Times,* LACMA president Richard E. Sherwood indicated a shift in museum exhibition and education practices, offering his position that *Franklin & Jefferson* "is an outstanding example of the art of communication," and "as such

[410] In her book, *TV by Design* (Chicago: University of Chicago Press, 2009), Lynn Spigel discusses MoMA's educational programming and the promotion of modernism; see also the groundbreaking exhibition on television and modern art in the catalog, Maurice Berger, et al., *Revolution of the Eye: Modern Art and the Birth of American Television* (New Haven, CT: Yale University, 2015). Beginning in the 1950s with international information exhibitions and gaining wider use in American museums in the 1970s, the Smithsonian Institution launched SITES (Smithsonian Institution Traveling Exhibition Service), to send SI-curated shows to regional museums and reach bigger audiences outside of Washington, D.C. I have not found scholarship about the program, but it is still active and information on SITES can be found on their website: https://www.sites.si.edu/s/

it fulfills the educational mandate of the museum and fits with our view of the museum's changing role in a changing society; to be an innovative communicator of culture."[411]

In this light, *Franklin & Jefferson* serves not as a disappointing end to the careers of two notable designers, but instead an effort to improve the transfer of knowledge using a method they had developed throughout their careers. Moreover, the exhibition fulfilled an important function: it created dialogue about the definitions of early American art and methods museums use make their collections accessible. The Eameses' selection of expanded notions of American art, including paintings and sculpture alongside furniture, silver, glass, pottery, textiles and paintings, situating their value in the ideas and concepts they held rather than categorizing them based on media distinctions. Throughout the exhibition, the Eameses raised concerns about the compartmentalization of information and how it inhibited understanding, arguing instead for widescale collaboration between objects, individuals, disciplines, groups, and institutions. They modeled this process not only in the lives of America's founding generation, but in how they constructed the exhibition through a network of patronage. In *The World of Franklin and Jefferson*, and throughout their careers, the Eameses attempted to challenge institutional systems of knowledge; visually communicate

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[411] In his article questioning the function of the show and its place in the Los Angeles County Art Museum, Henry J. Seldis recounts statements given to the press from LACMA president Richard E. Sherwood before the opening of the show. Seldis proposes that Sherwoos was reacting to Hilton Kramer's criticisms. See Henry J. Seldis, "'Franklin, Jefferson': Enlightenment or Entertainment?" *Los Angeles Times* (November 21, 1976): 1, 93.

ideology through the juxtaposition of objects, images and text; establish networks to construct, share, and develop ideas across corporate, educational, and private spheres, however, unlike their earlier project, the Eameses were entering into an era that was beginning to see those institutional systems as incompatible.

ILLUSTRATIONS

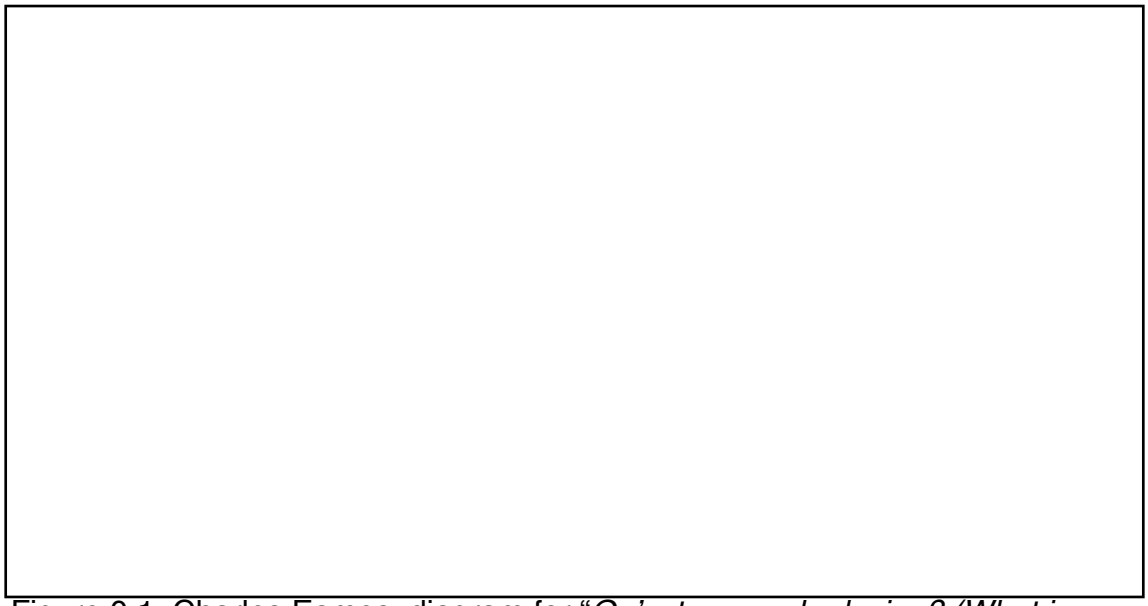

Figure 0.1. Charles Eames, diagram for "*Qu'est ce que le design? (What is Design?),* Musée des Artes Décoratifs, Paris, August 1969. The Work of Charles and Ray Eames, Manuscript Division, Washington, D.C.

Figure 0.2. The Office of Charles and Ray Eames Office, *Qu'est ce que le design? (What is Design?,)* installation view, Musée des Artes Décoratifs, Paris, 1969. © 2017 Eames Office LLC (eamesoffice.com).

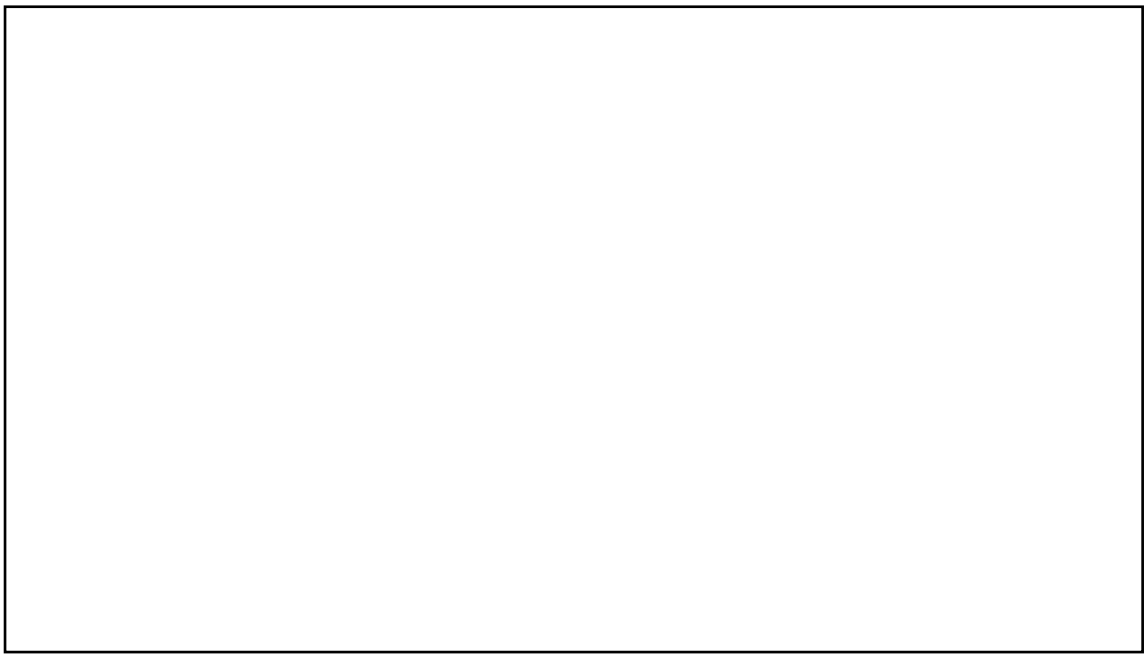

Figure 0.3. Ray Eames, fashion sketches, c. 1933-1939. © 2017 Eames Office LLC (eamesoffice.com).

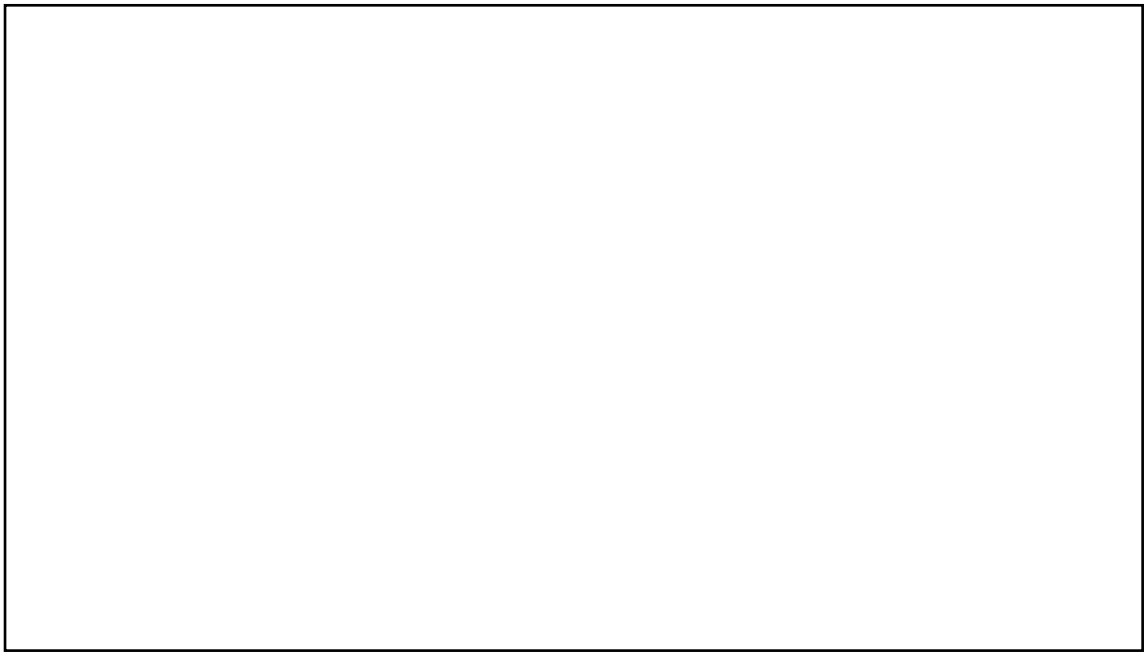

Figure 0.4. Ray Eames, paper doll cut-outs, c. 1933-1939. © 2017 Eames Office LLC (eamesoffice.com).

Figure 0.5. Ray Eames, *Untitled,* c. late 1930s, oil on canvas. © 2017 Eames Office LLC (eamesoffice.com).

Figure 0.6. Charles Eames and Eero Saarinen, *Organic Design in Home Furnishings,* installation view, Museum of Modern Art, September 24-November 9, 1940. © The Museum of Modern Art/Licensed by SCALA/Art Resource, New York.

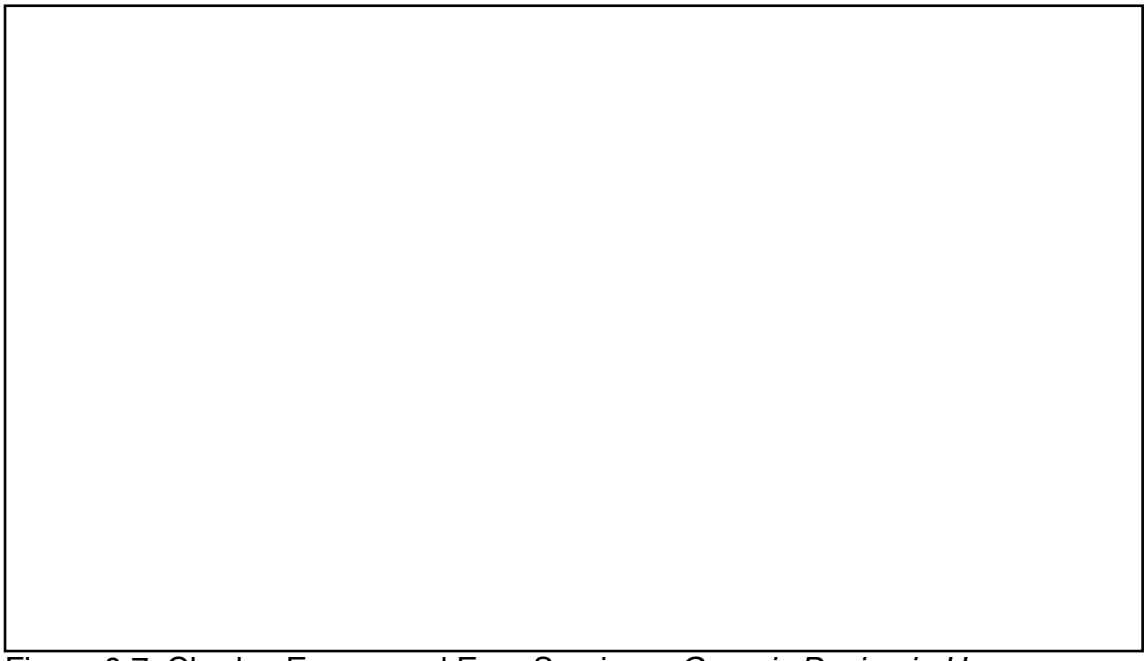

Figure 0.7. Charles Eames and Eero Saarinen, *Organic Design in Home Furnishings,* installation view, Museum of modern Art, September 24-November 9, 1940. © The Museum of Modern Art, New York City.

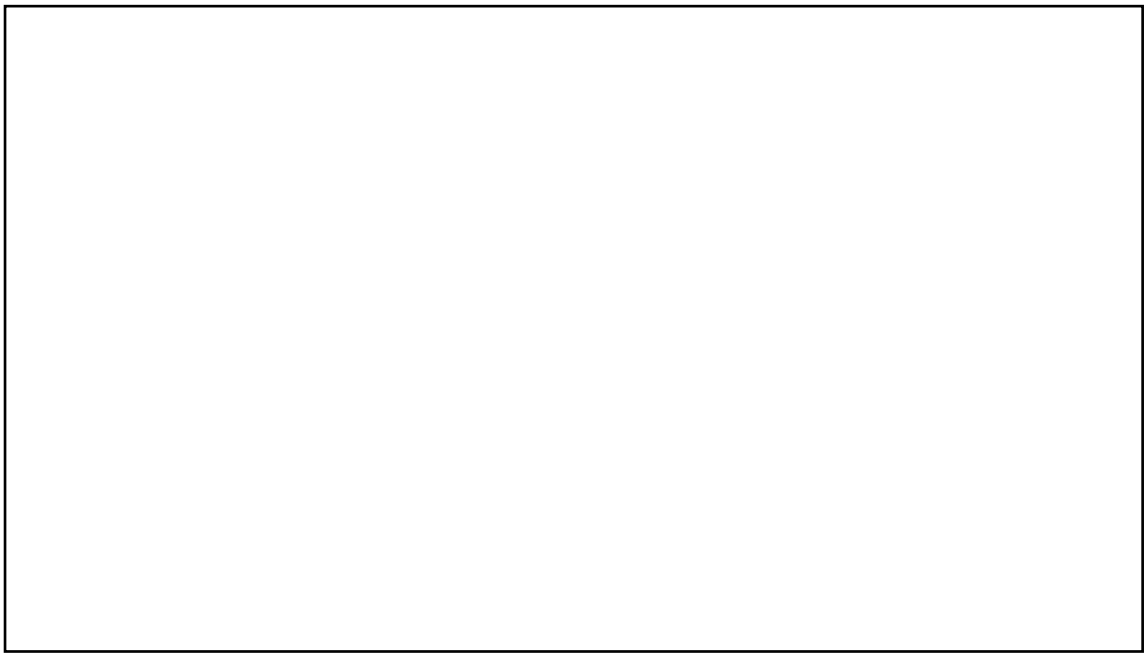

Figure 0.8. Charles and Ray Eames for the Molded Plywood Division, Evans Products Company, “From War to Peace,” brochure for transportation leg splint, c. 1945 (exterior trifold). © 2017 Eames Office, LLC (eamesoffice.com).

Figure 0.8. Charles and Ray Eames for the Molded Plywood Division, Evans Products Company, “From War to Peace,” brochure for transportation leg splint, c. 1945 (interior trifold). © 2017 Eames Office, LLC (eamesoffice.com).

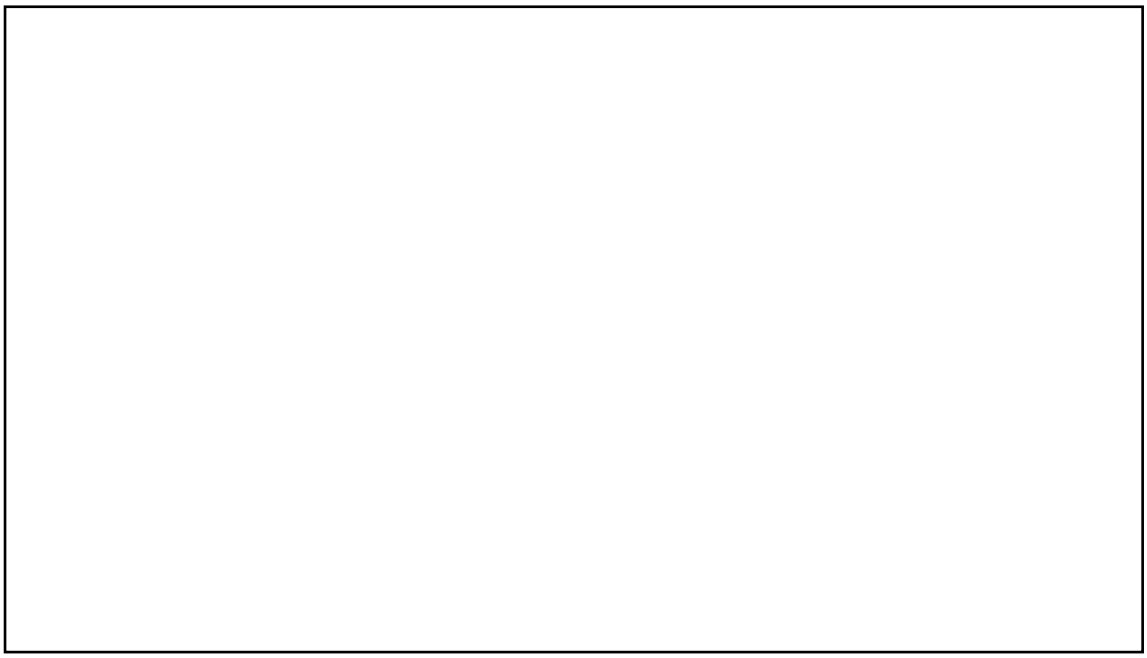

Figure 0.9. Charles Eames, diagram sketch for “*Qu’est ce que le design?* (*What is Design?),* Musée des Artes Décoratifs, Paris, August 29, 1969. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

Figure 1.1. Charles and Ray Eames in their home. Julius Shulman, Job 2717: Eames House (Los Angeles, California), 1958. J. Paul Getty Trust. Getty Research Institute, Los Angeles.

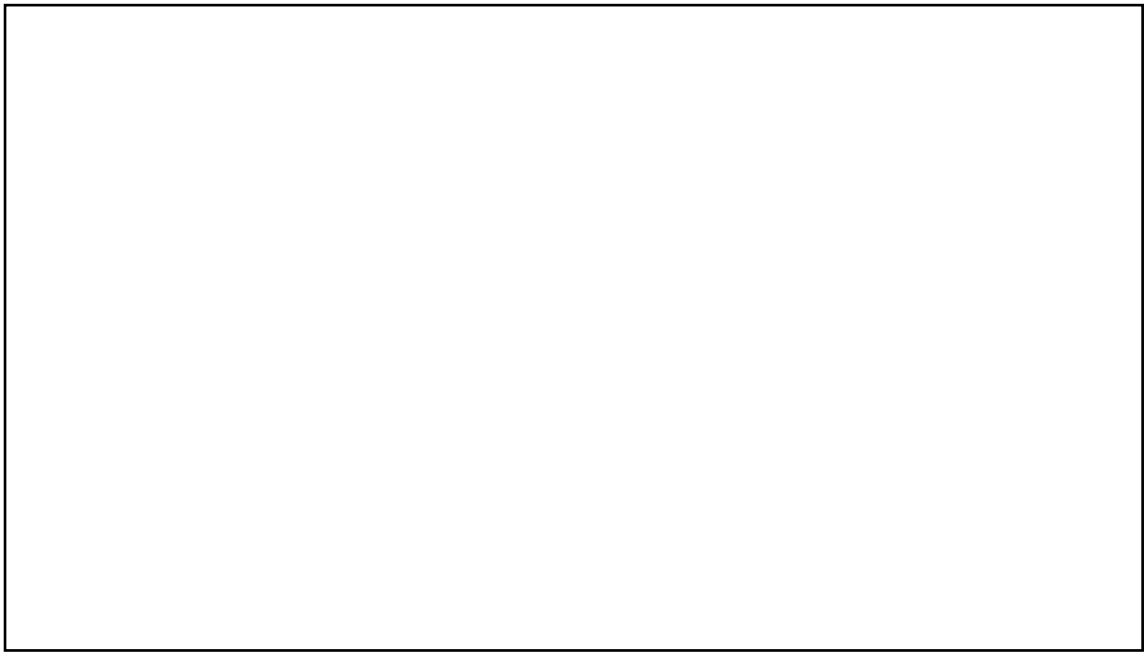

Figure 1.2. John Entenza, “Announcing the ’Case Study House Program,” *Arts &* Architecture (January 1945): 37.

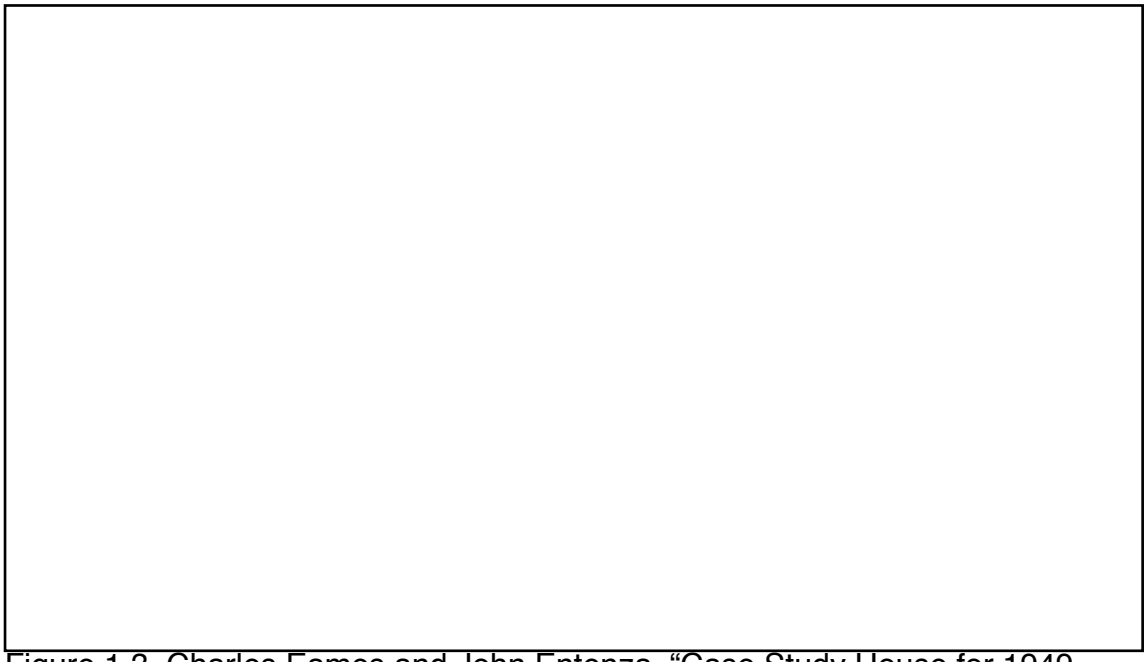

Figure 1.3. Charles Eames and John Entenza, “Case Study House for 1949 Designed by Charles Eames,” *Arts & Architecture* (December 1949): front cover.

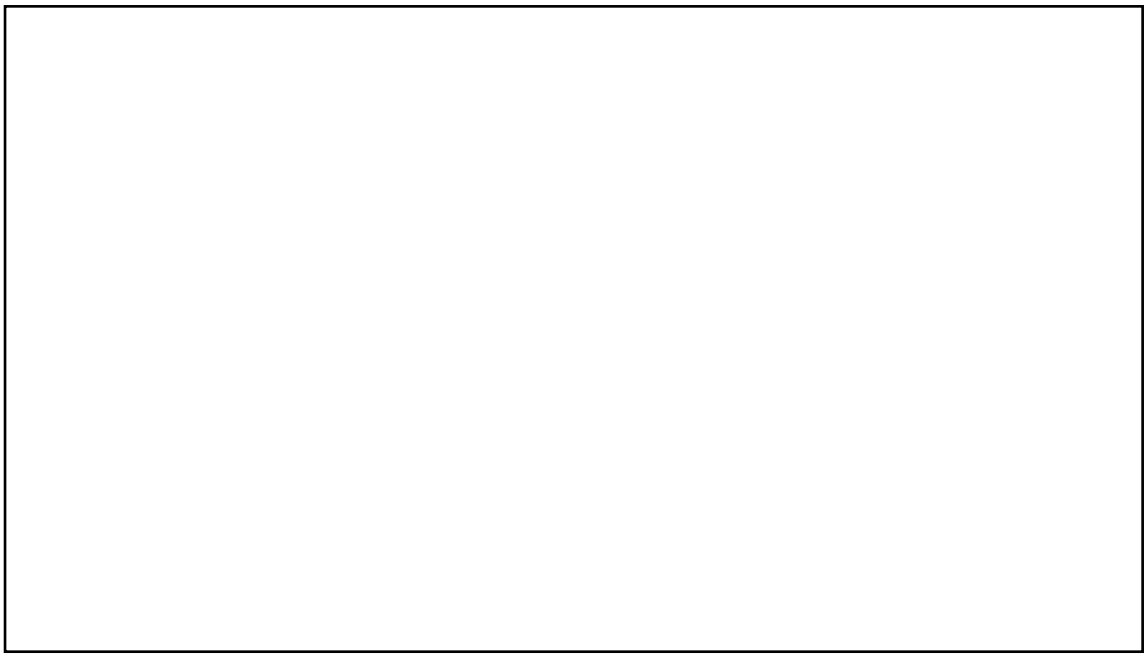

Figure 1.4. Charles Eames and John Entenza, “Case Study House for 1949 Designed by Charles Eames,” *Arts & Architecture* (December 1949): 28.

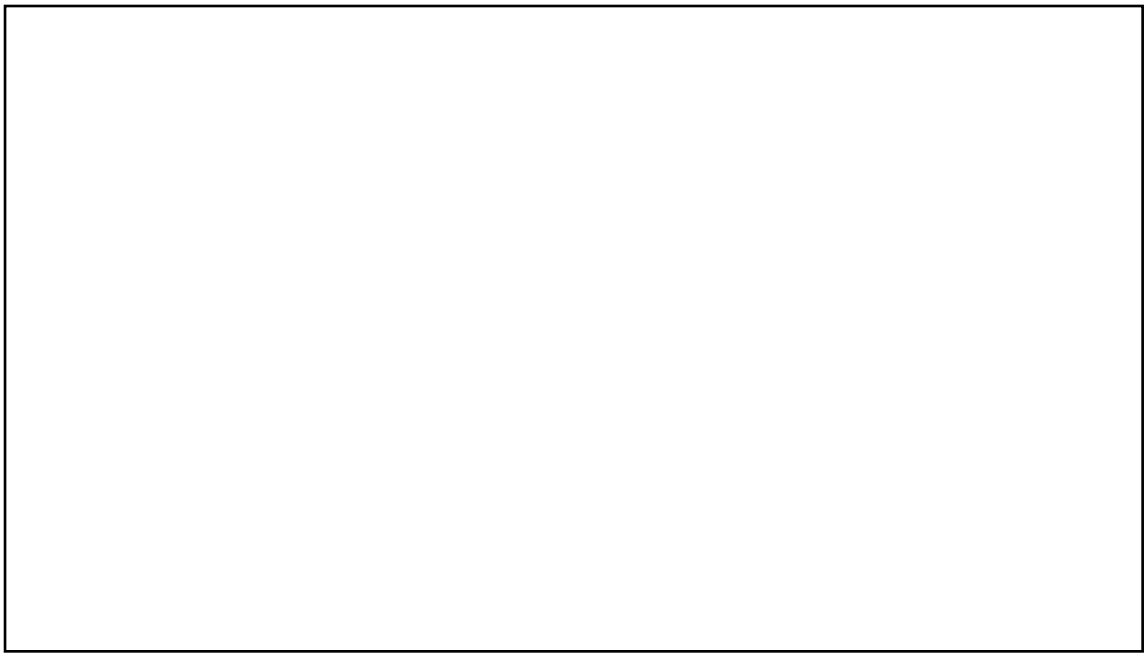

Figure 1.5. Charles Eames and John Entenza, “Case Study House for 1949 Designed by Charles Eames,” *Arts & Architecture*, (December 1949): 37.

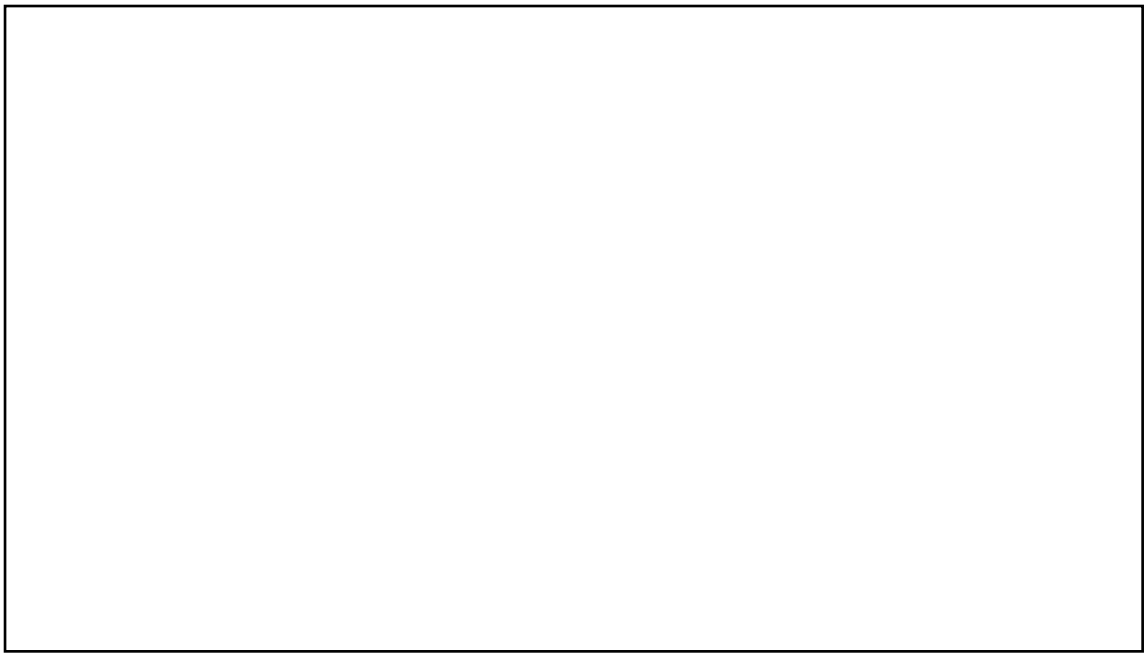

Figure 1.6. Exterior, Case Study House No. 8. Photograph by Julius Shulman. J. Paul Getty Trust. Getty Research Institute, Lost Angeles.

Figure 1.7. Charles Eames, “What is a House,” *Arts & Architecture* (July 1944): 12.

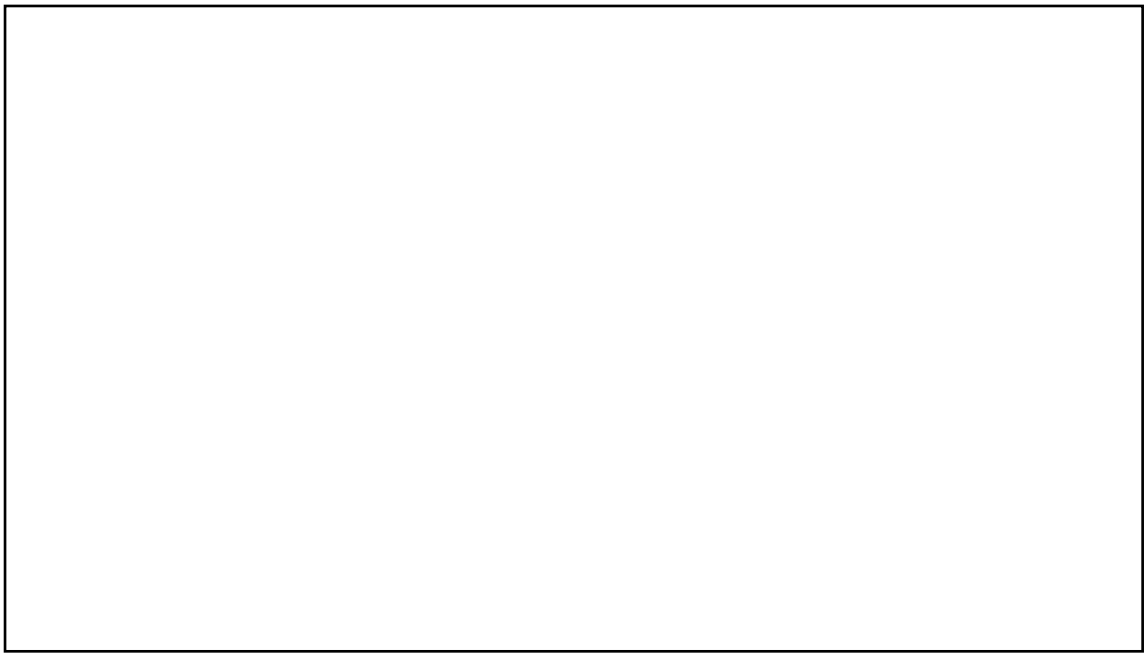

Figure 1.8. Charles Eames and John Entenza, “Case Study House for 1949 Designed by Charles Eames,” *Arts & Architecture*, (December 1949): 36.

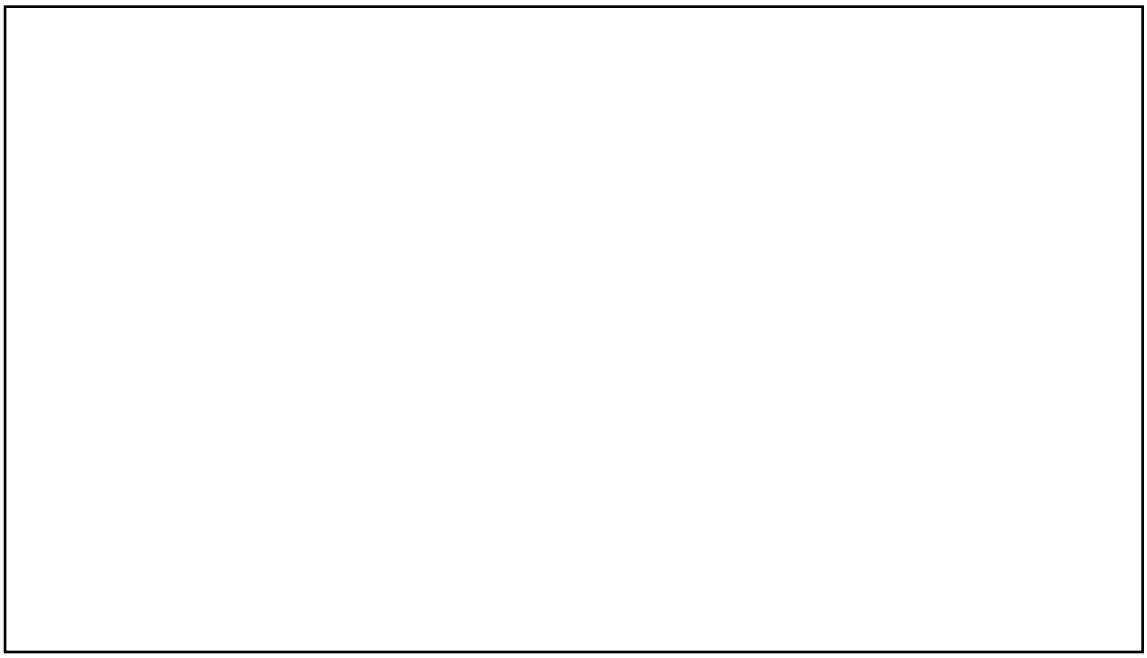

Figure 1.9. Charles Eames and John Entenza, “Case Study House for 1949 Designed by Charles Eames,” *Arts & Architecture*, (December 1949): 31.

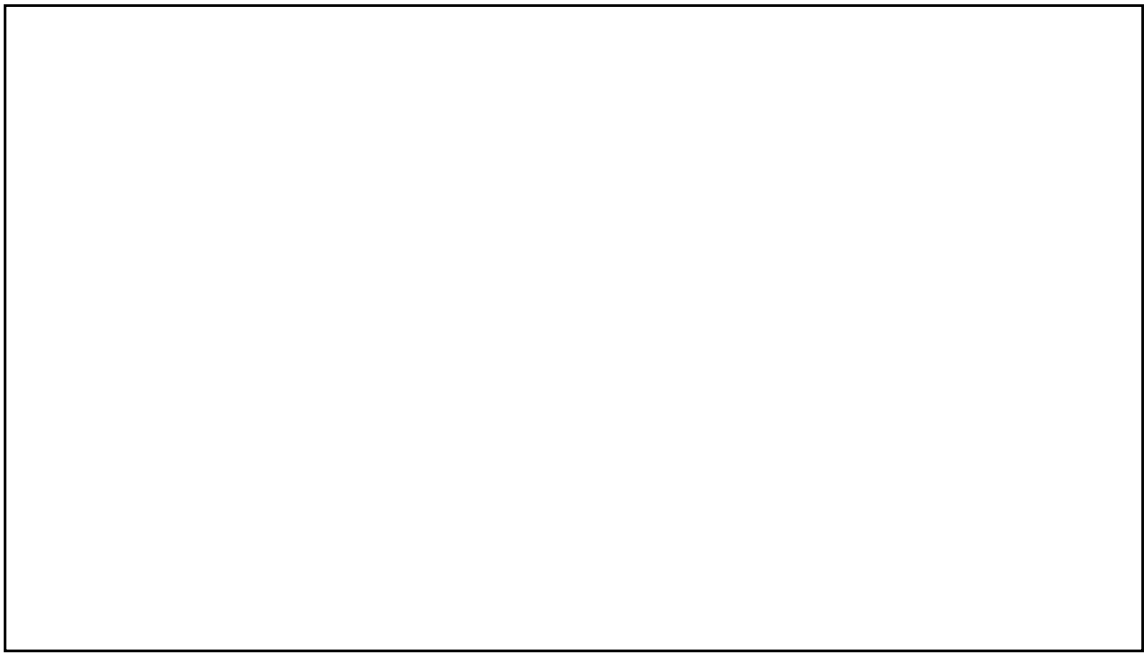

Figure 1.10. Charles and Ray Eames, Façade study for Case Study House No. 8 for Charles and Ray Eames, 14 October 1948, graphite, colored pencil and watercolor on diazo photoprint with colored paper collage. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

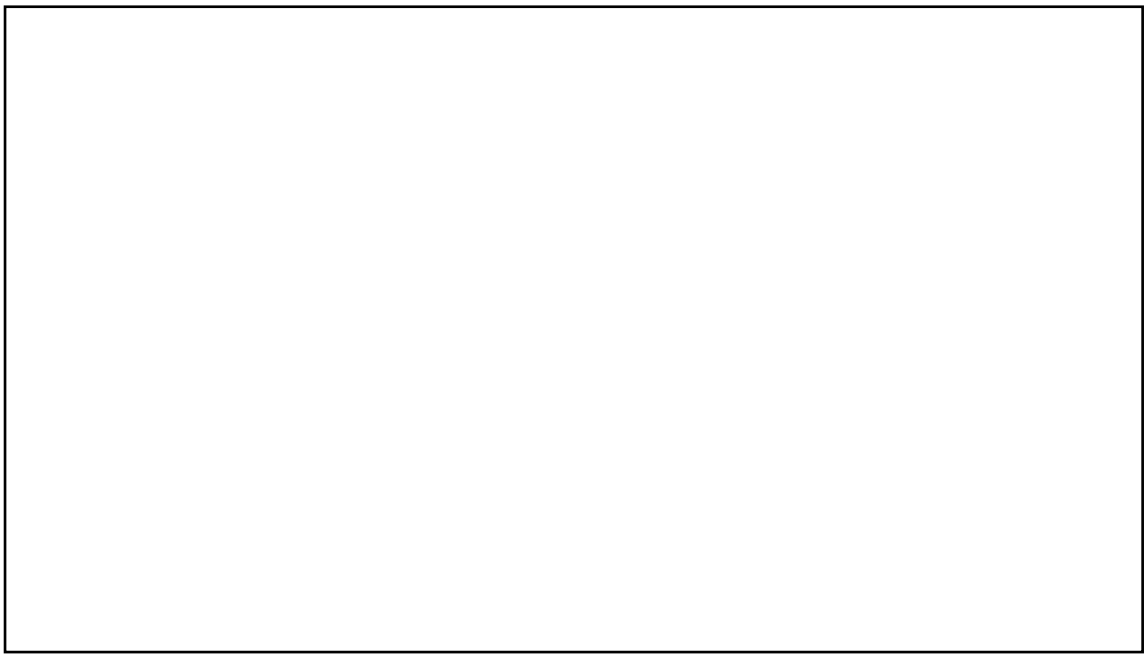

Figure 1.11. Charles and Ray Eames, Façade study for Case Study House No. 8 for Charles and Ray Eames, 14 October 1948. Graphite, colored pencil and watercolor on diazo photoprint with colored paper collage. Eames Collection, Prints &Photographs Division, Library of Congress, Washington D.C.

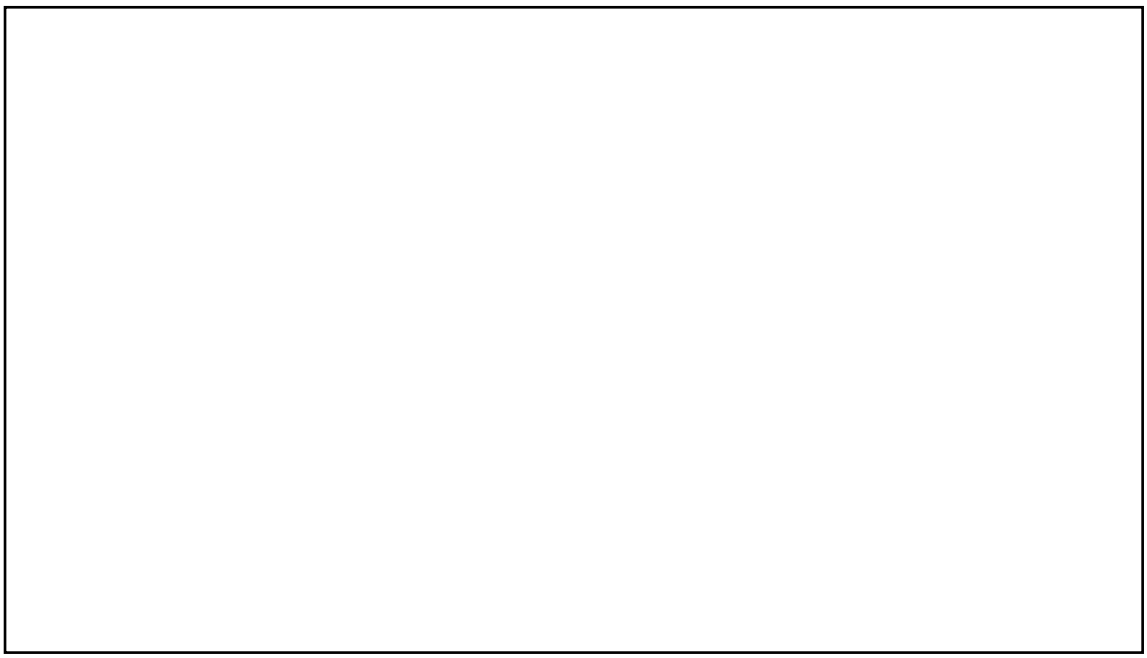

Figure 1.12. Peter Stackpole, exterior view of the Eames House in the evening, 1950, photograph. LIFE Photo Collection, New York City.

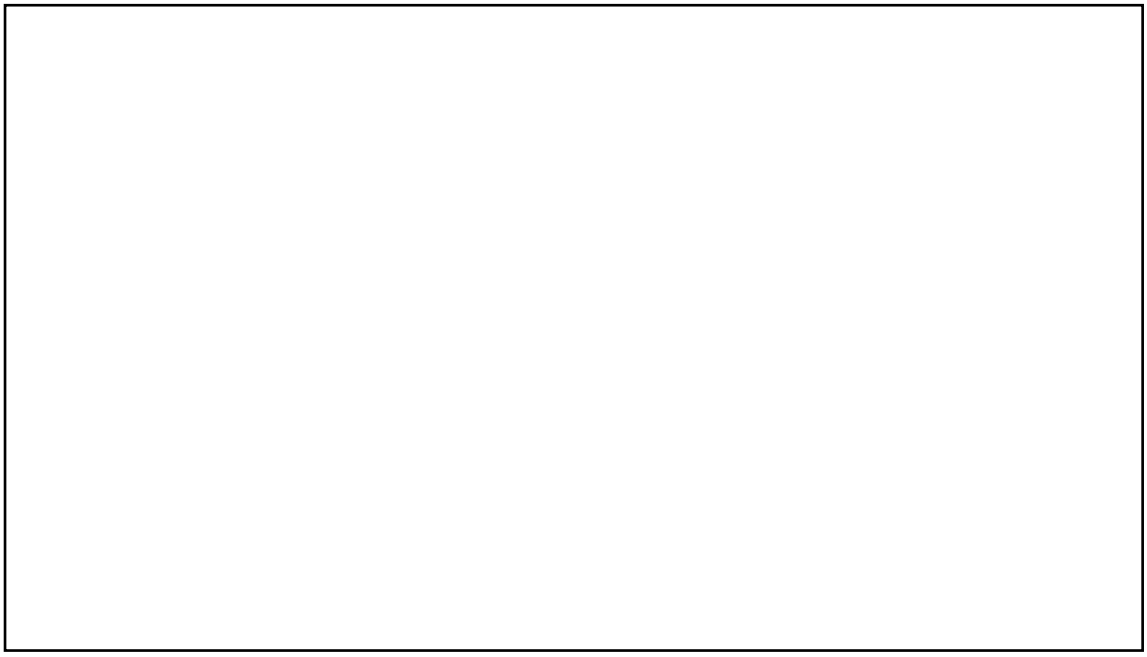

Figure 1.13. Peter Stackpole, interior view of the Eames House living room from balcony, 1950, photograph. LIFE Photo Collection, New York City.

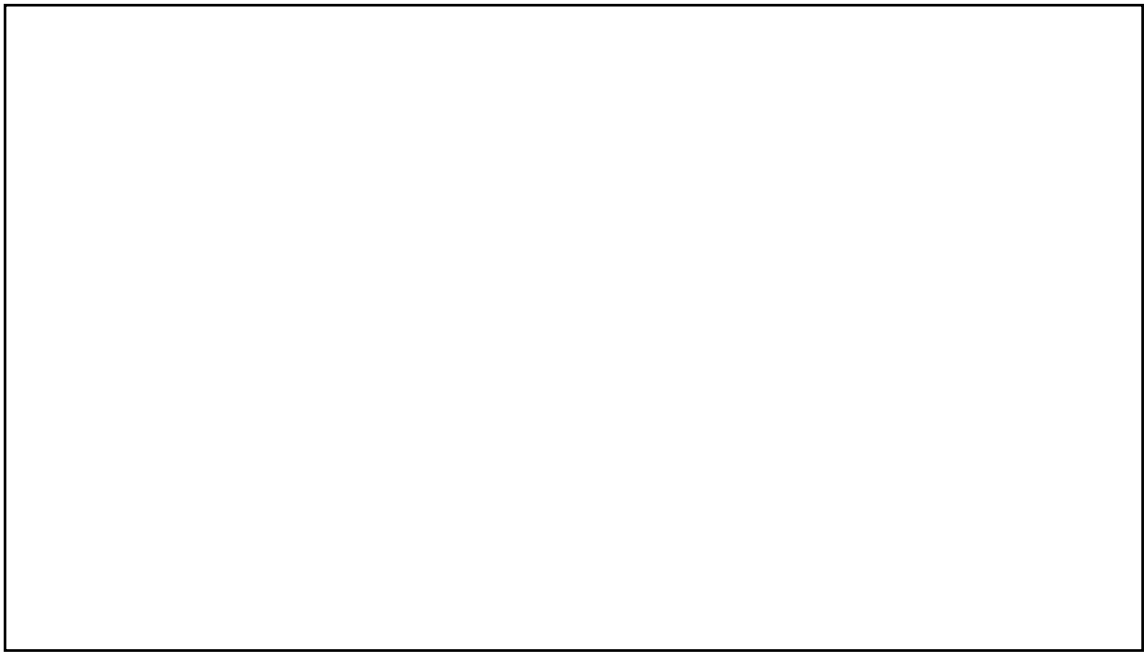

Figure 1.14. The Office of Charles and Ray Eames, view of Eames House, 1950, printed in *Architectural Forum, The Magazine of Building* (September 1950): 96.

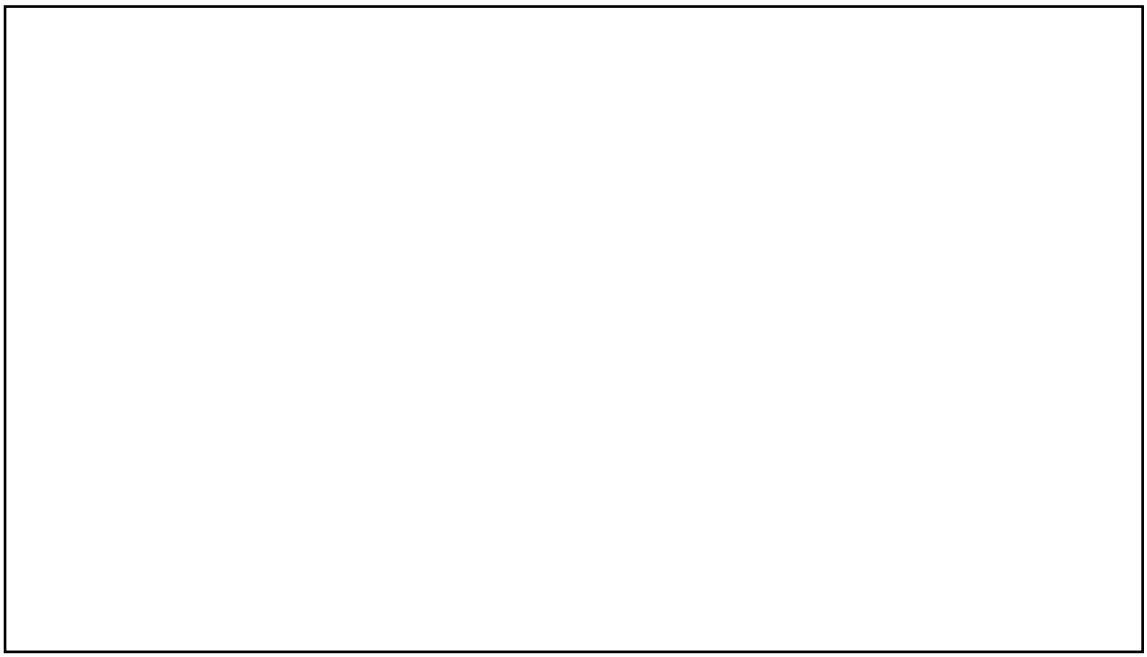

Figure 1.15. Peter Stackpole, view of the bedroom in Eames House, 1950, photograph. LIFE Photo Collection, New York City.

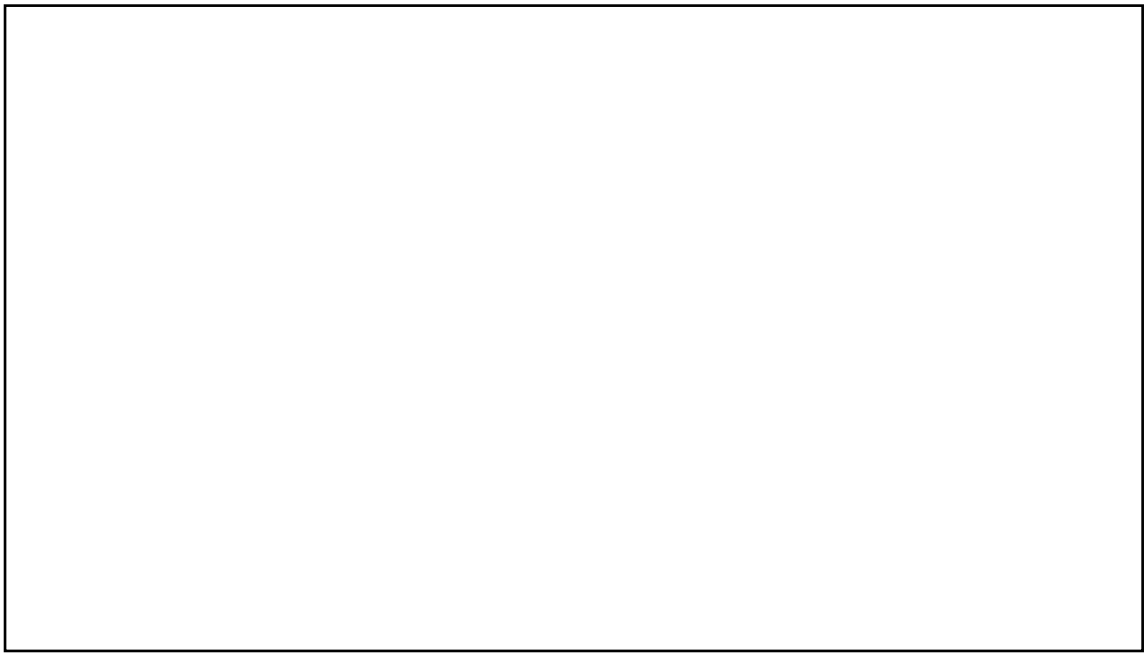

Figure 1.16. Peter Stackpole, interior view of the Eames House living room from balcony, 1950, photograph. LIFE Photo Collection, New York City.

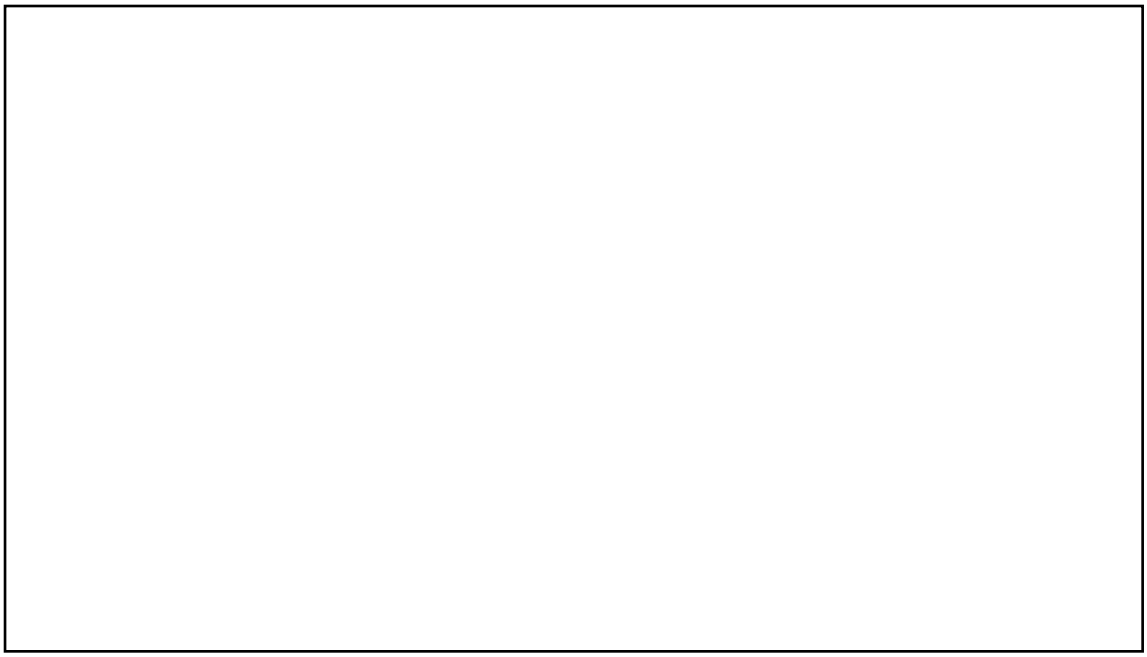

Figure 1.17. The Office of Charles and Ray Eames, Charles in the Eames Office Studio, c. 1950, photograph. © 2017 Eames Office LLC (eamesoffice.com).

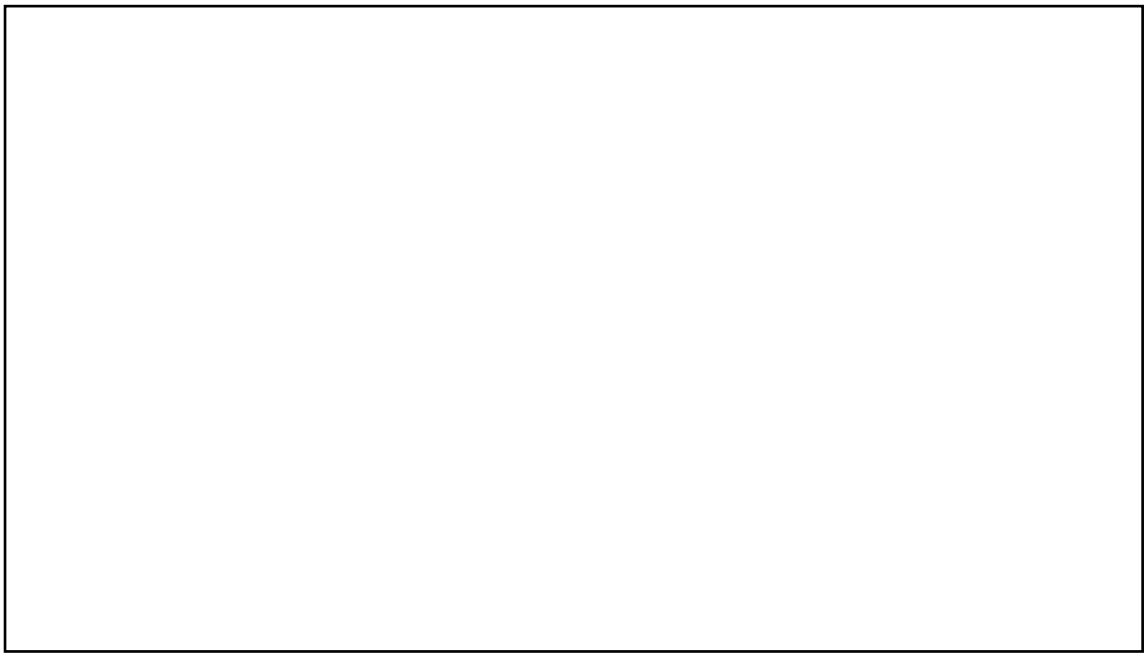

Figure 1.18. The Office of Charles and Ray Eames, objects arranged in Eames House, c. 1954. © 2017 Eames Office LLC (eamesoffice.com).

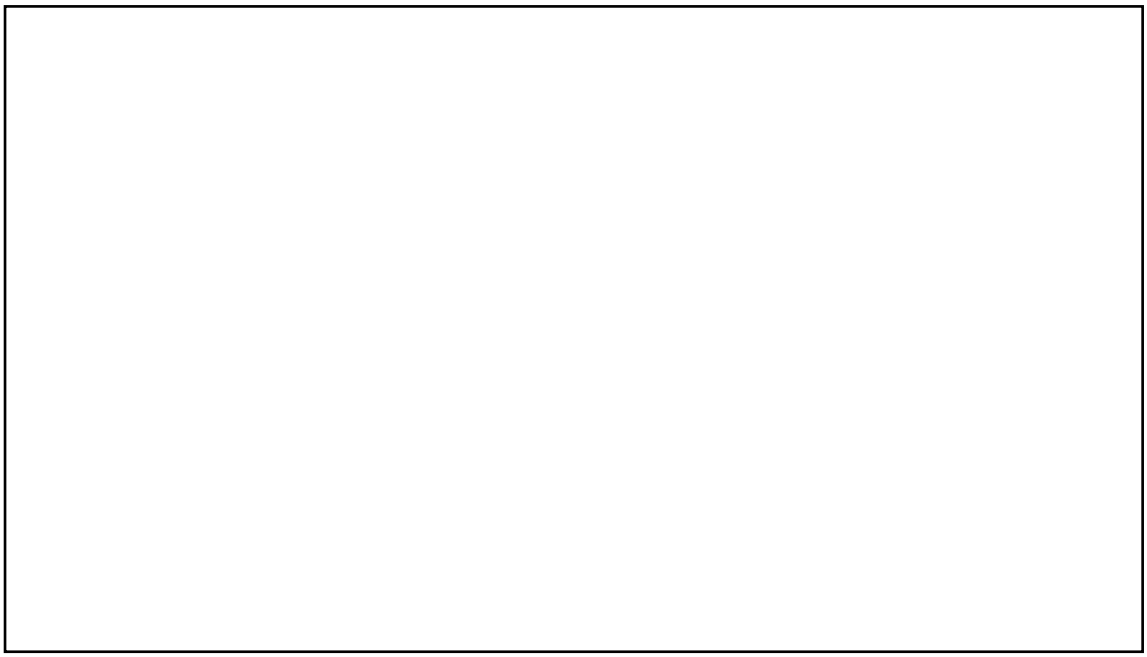

Figure 1.19. The Office of Charles and Ray Eames, objects arranged in Eames House, c. 1954. © 2017 Eames Office LLC (eamesoffice.com).

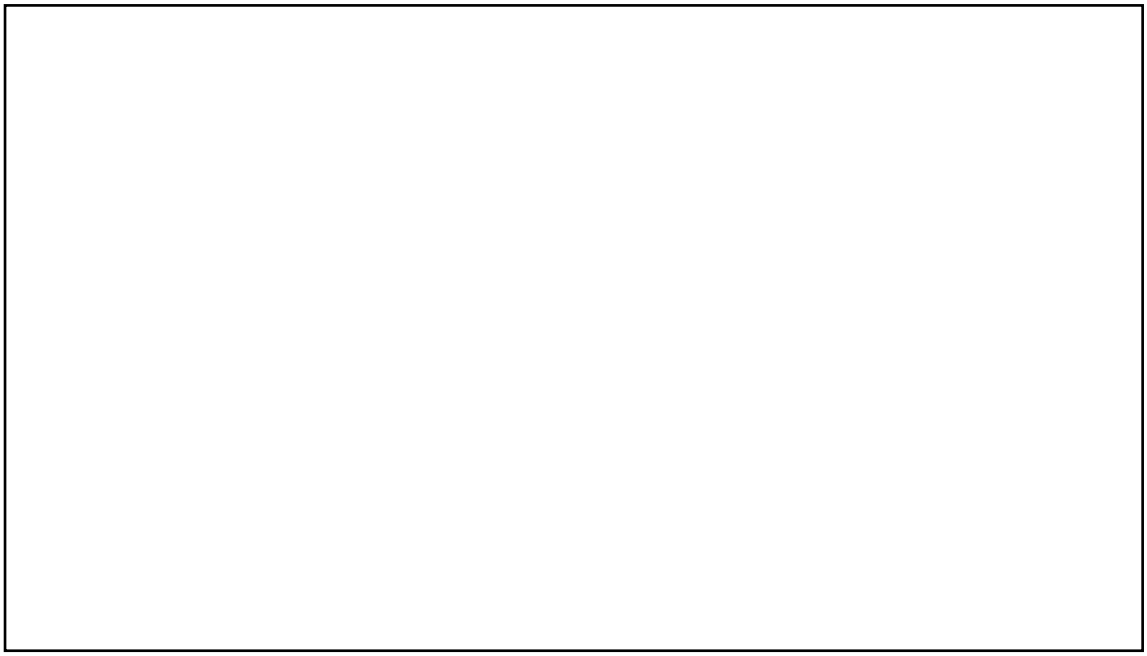

Figure 1.20. The Office of Charles and Ray Eames, Revel Toy House model, c. 1959. © 2017 Eames Office LLC (eamesoffice.com).

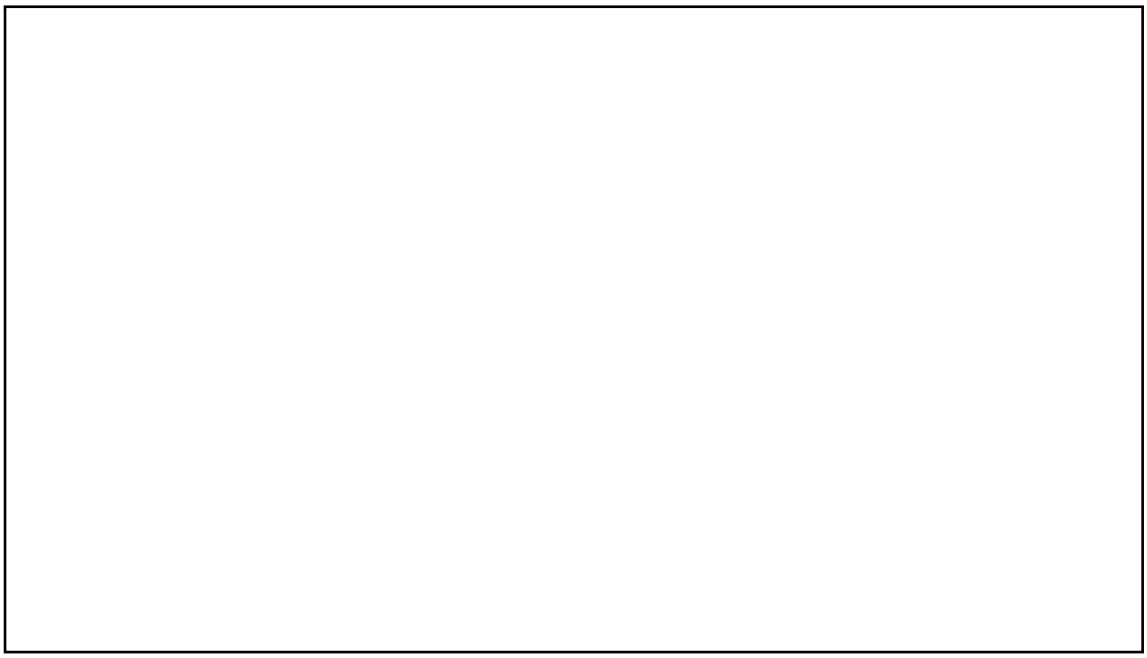

Figure 1.21. The Office of Charles and Ray Eames, *House: After Five Years of Living*, 1955, film. © Eames Office LLC (eamesoffice.com)

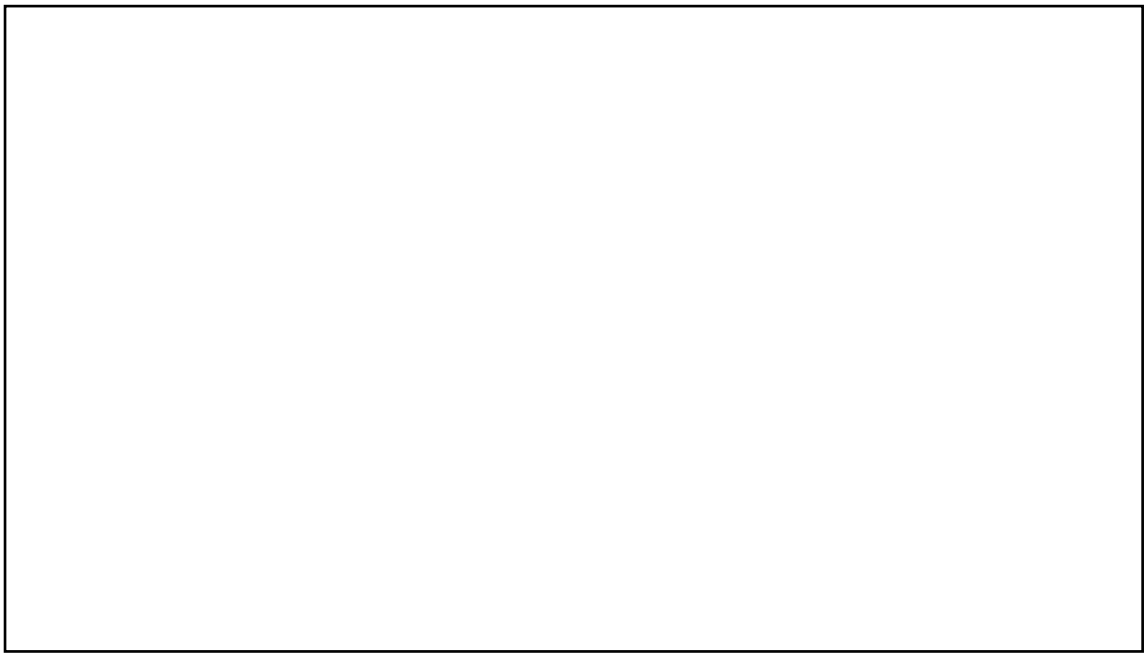

Figure 2.1. Charles Eames, “Design Today,” October1950, speech and slideshow, University of Washington Arboretum, Seattle. Eames Collection, Prints & Photographs Division, Library of Congress, Washington, D.C.

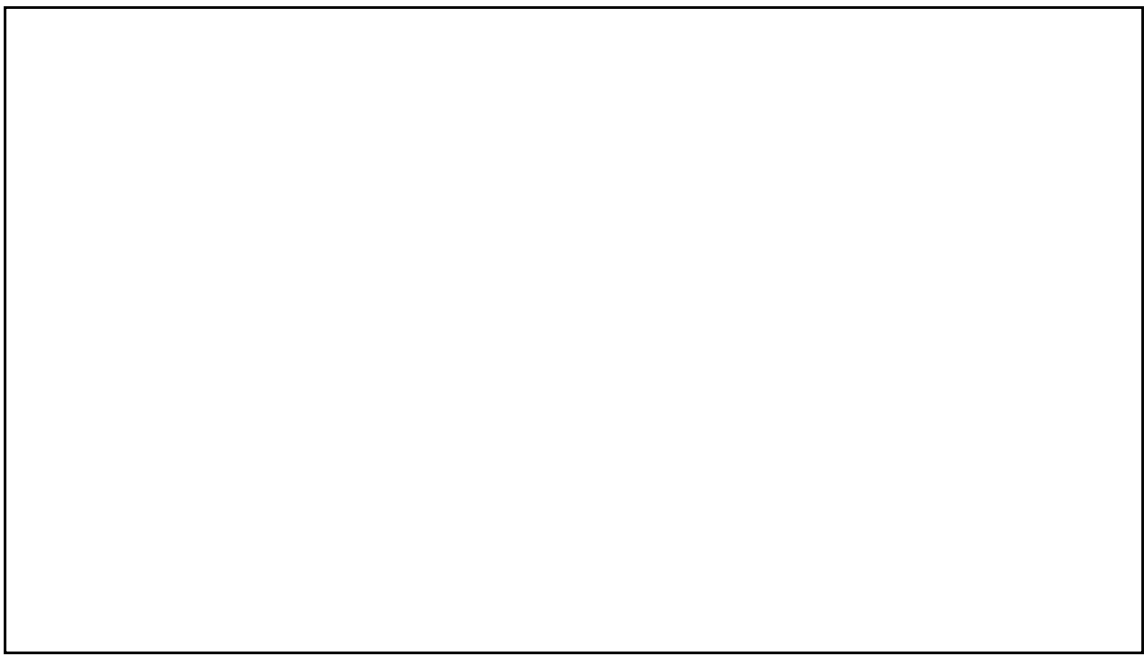

Figure 2.2. Charles Eames, “Design Today,” October1950, speech and slideshow, University of Washington Arboretum, Seattle. Eames Collection, Prints & Photographs Division, Library of Congress, Washington, D.C.

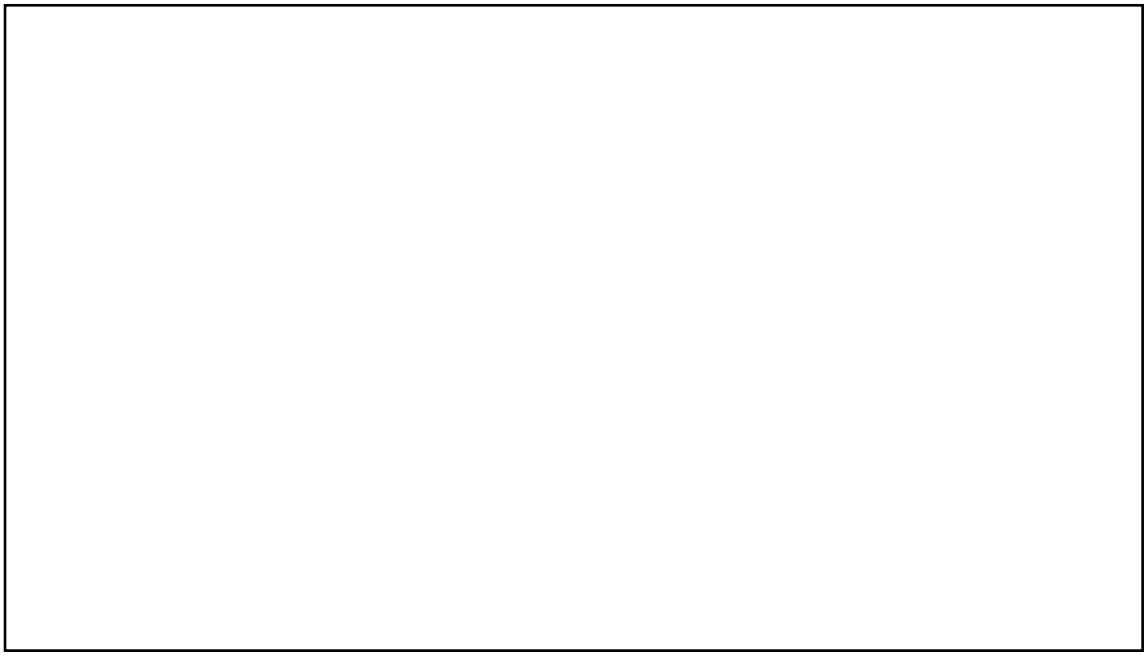

Figure 2.3. Charles Eames, “Design Today,” October1950, speech and slideshow, University of Washington Arboretum, Seattle. Eames Collection, Prints & Photographs Division, Library of Congress, Washington, D.C.

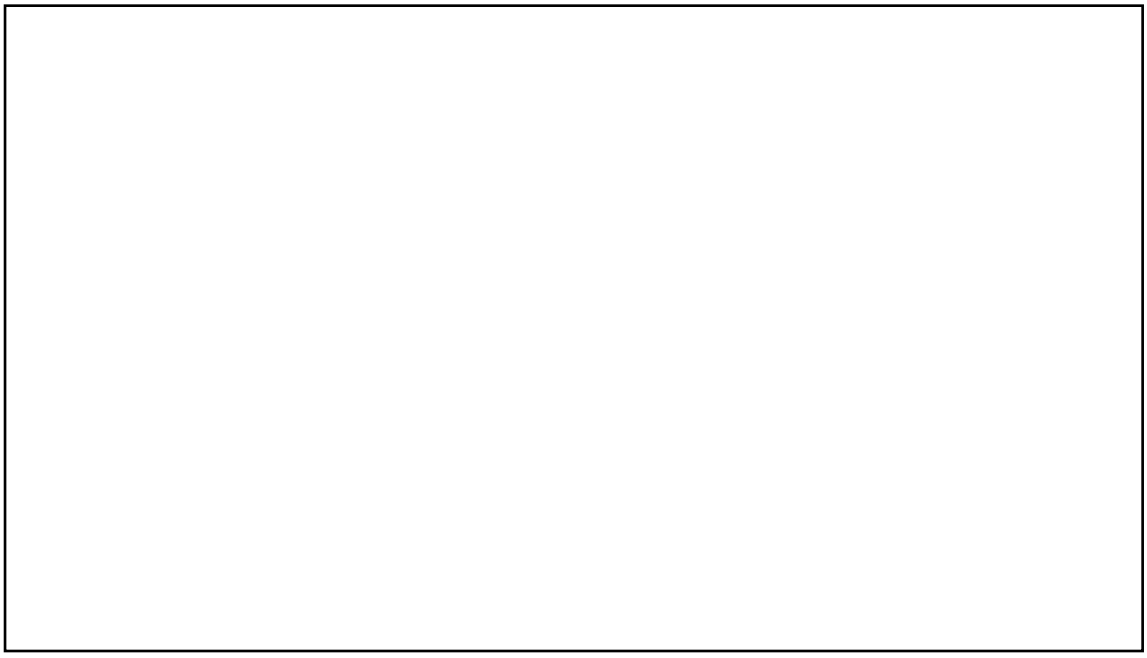

Figure 2.4. The Office of Charles and Ray Eames, view of shelving unit and books in the Eames House, c. 1954. Photograph of books on the shelving unit in the Eames House. © 2017 Eames Office LLC (eamesoffice.com)

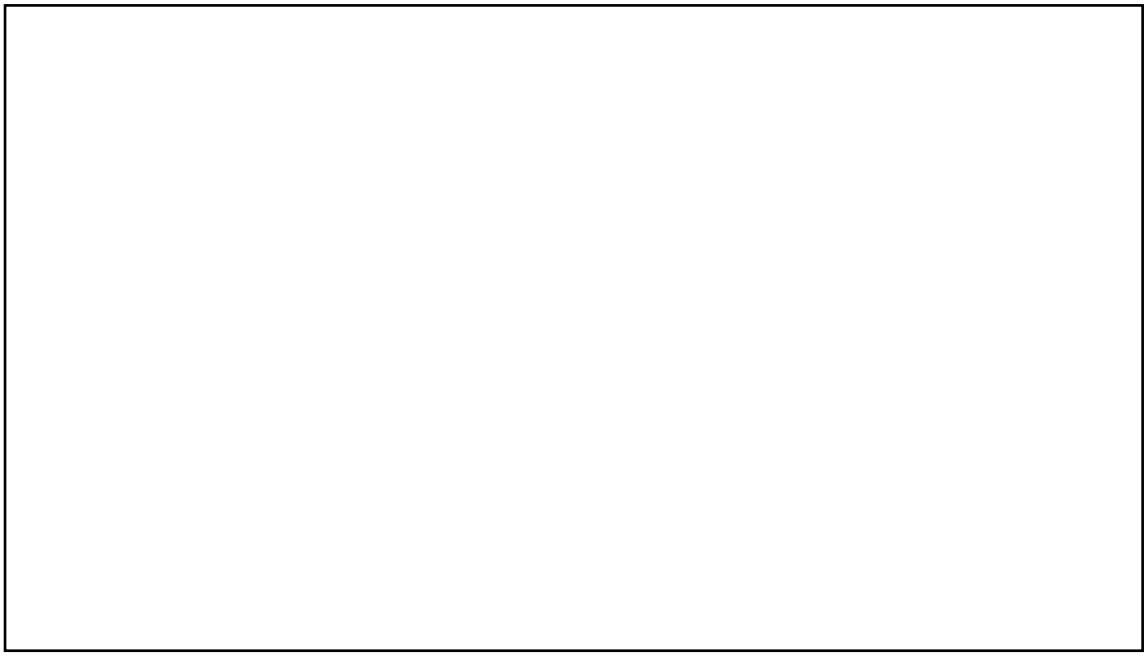

Figure 2.5. The Office of Charles and Ray Eames, brochure for *A Rough Sketch for a Sample Lesson for a Hypothetical Course*, 1953, front cover, design by Jerome Gold. © 2017 Eames Office LLC (eamesoffice.com)

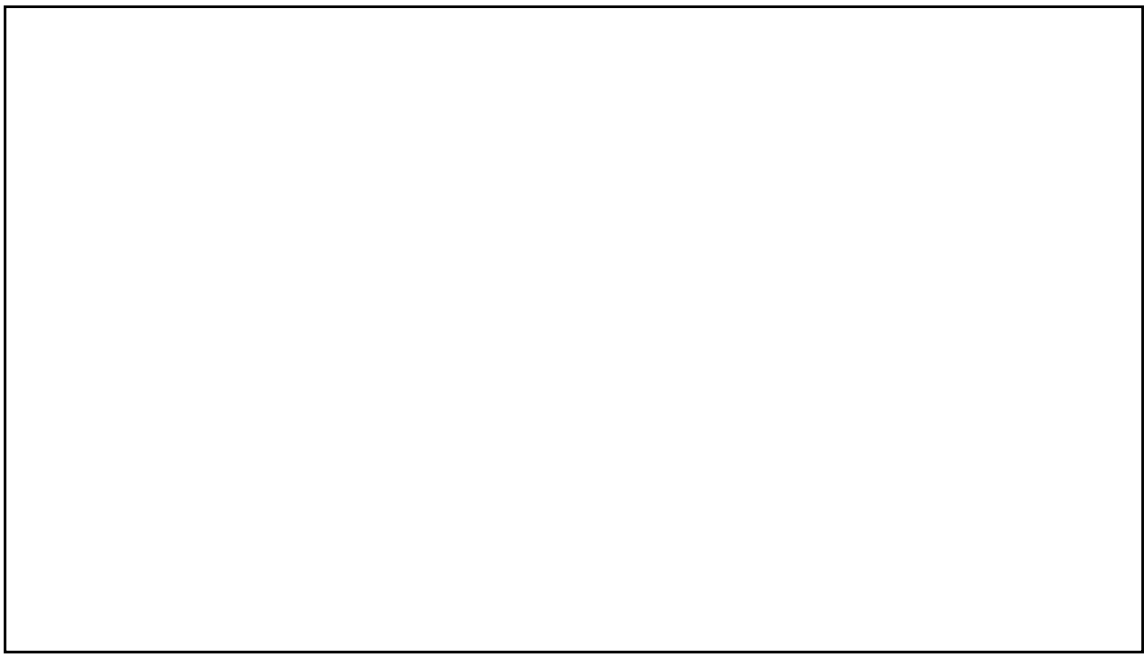

Figure 2.6. The Office of Charles and Ray Eames, UCLA presentation of *A Rough Sketch for a Sample Lesson for a Hypothetical Course*, UCLA, May 1953. © 2017 Eames Office LLC (eamesoffice.com).

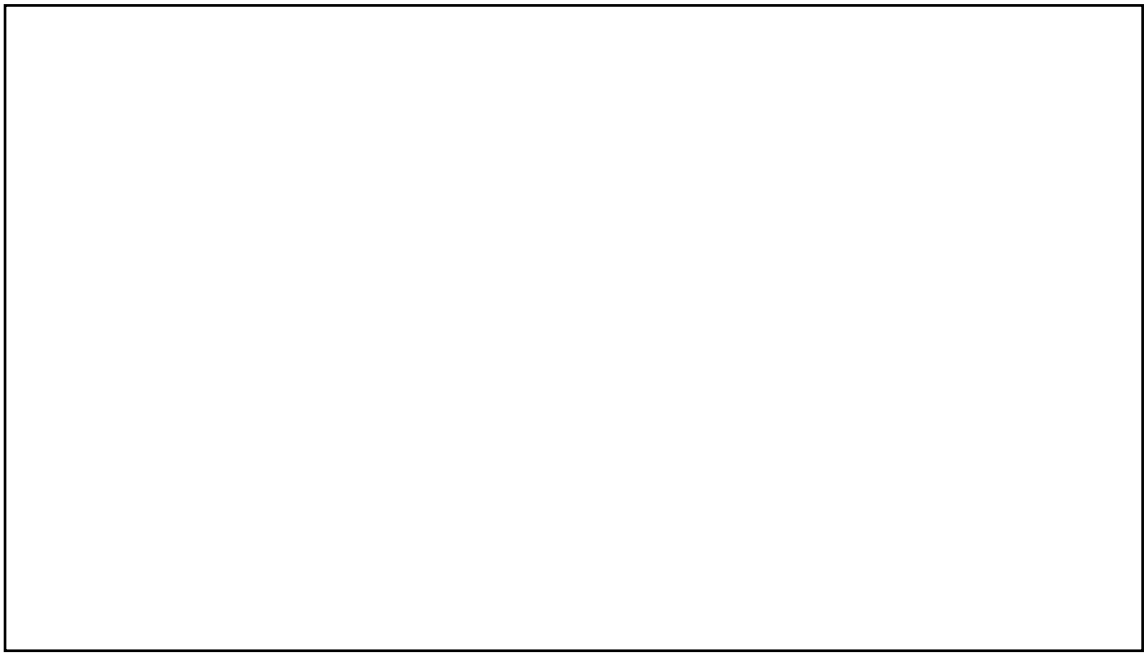

Figure 2.7. Still from *A Communications Primer* (1953), directed by Charles and Ray Eames. © 2017 Eames Office LLC (eamesoffice.com)

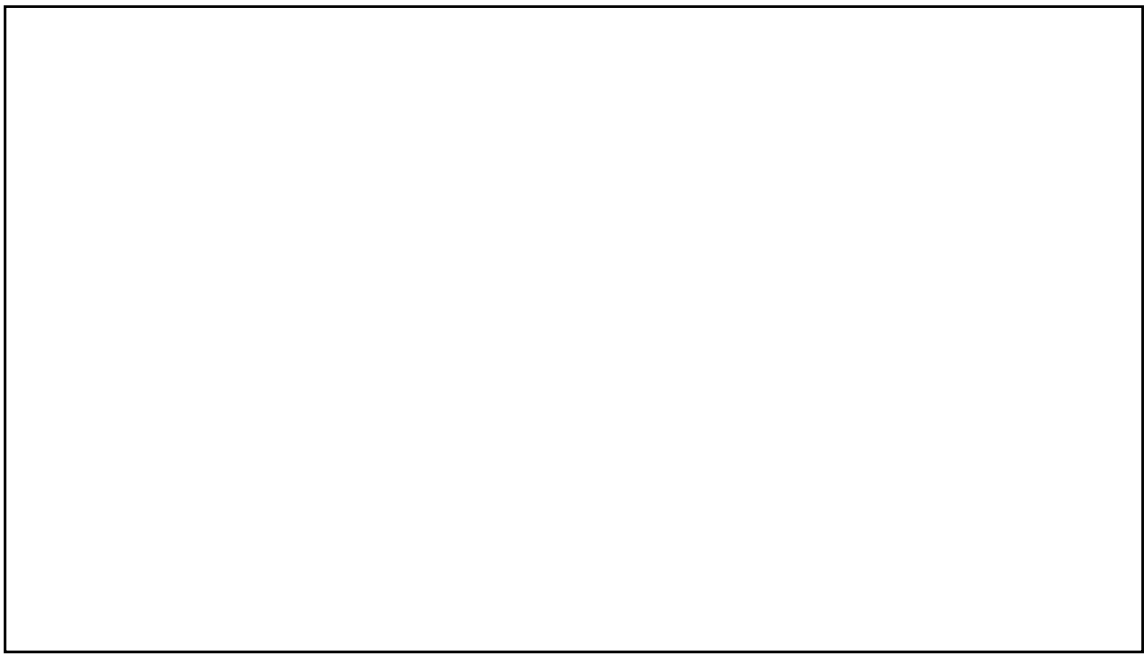

Figure 2.8. Still from *A Communications Primer* (1953), directed by Charles and Ray Eames. © 2017 Eames Office LLC (eamesoffice.com)

Figure 2.9. Gyorgy Kepes, *Language of Vision* (Chicago: Paul Theobald, 1944), front cover.

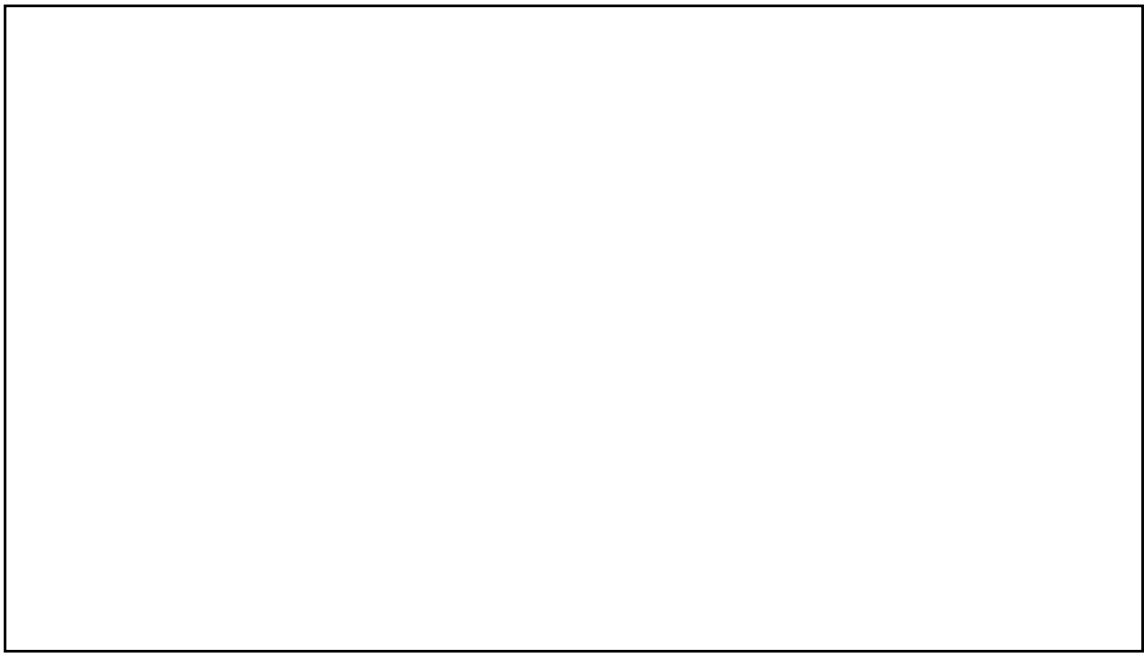

Figure 2.10. Eames Office, *Photography and the City*, 1954, Smithsonian Arts and Industries Building, Washington, D.C. © 2017 Eames Office LLC (eamesoffice.com).

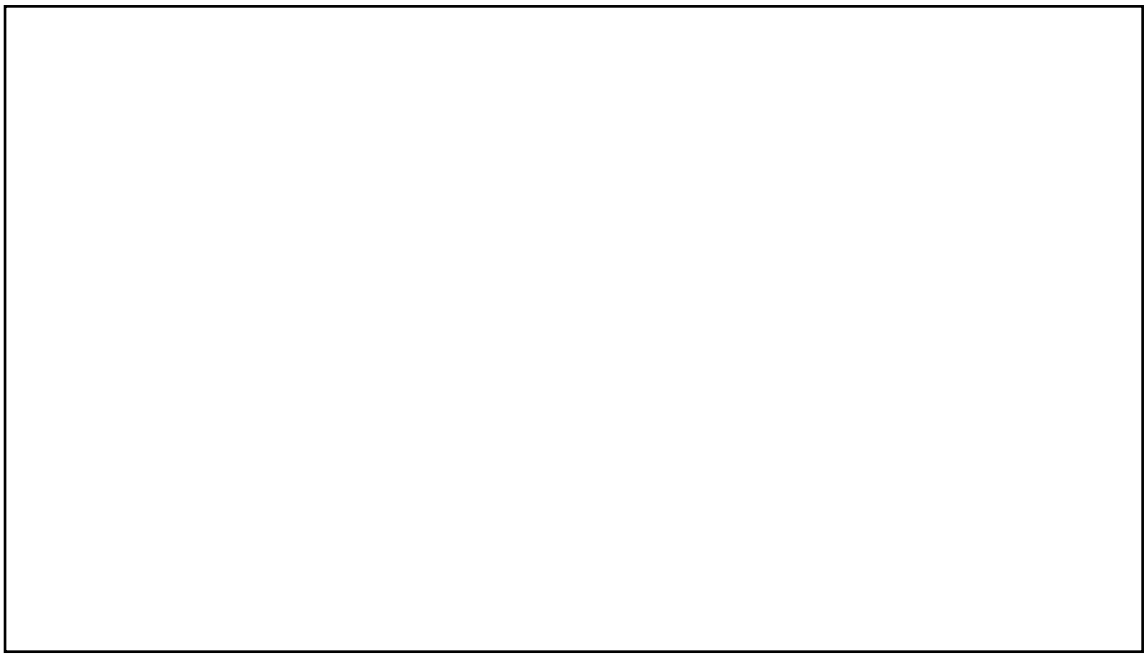

Figure 2.11. Charles and Ray Eames in their office viewing slide selections for *Photography and the City,* 1954, Eames Collection, Prints & Photographs Division, Library of Congress, Washington, D.C.

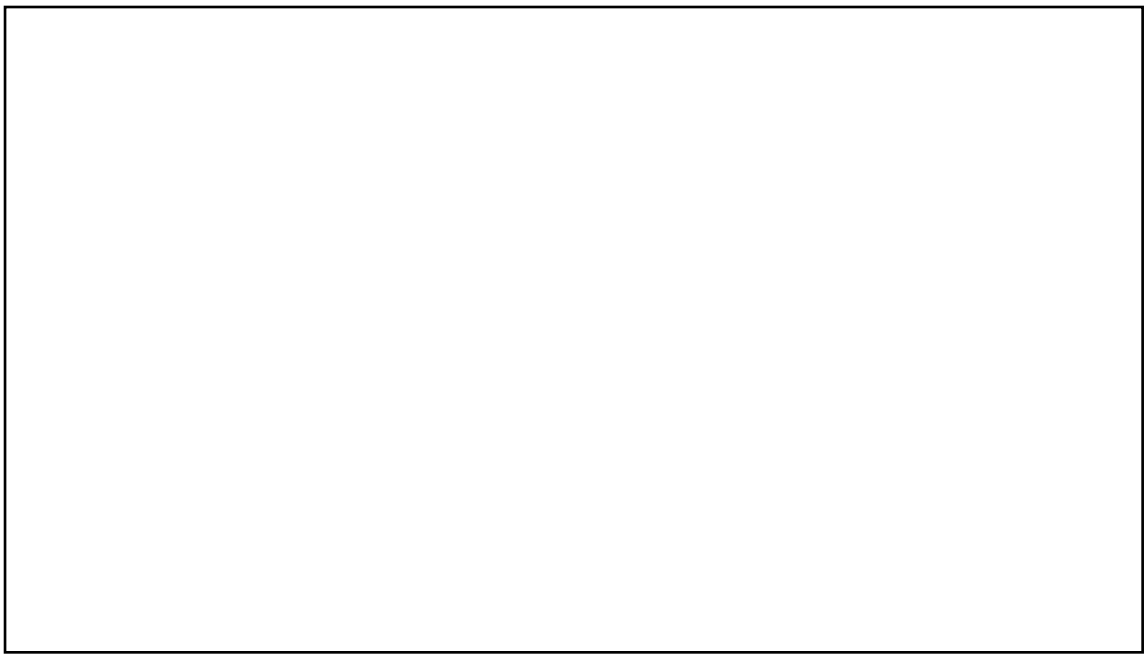

Figure 2.12. James Dugan, “The Great Iron Ship,” *The New Yorker* (January 24, 1954):

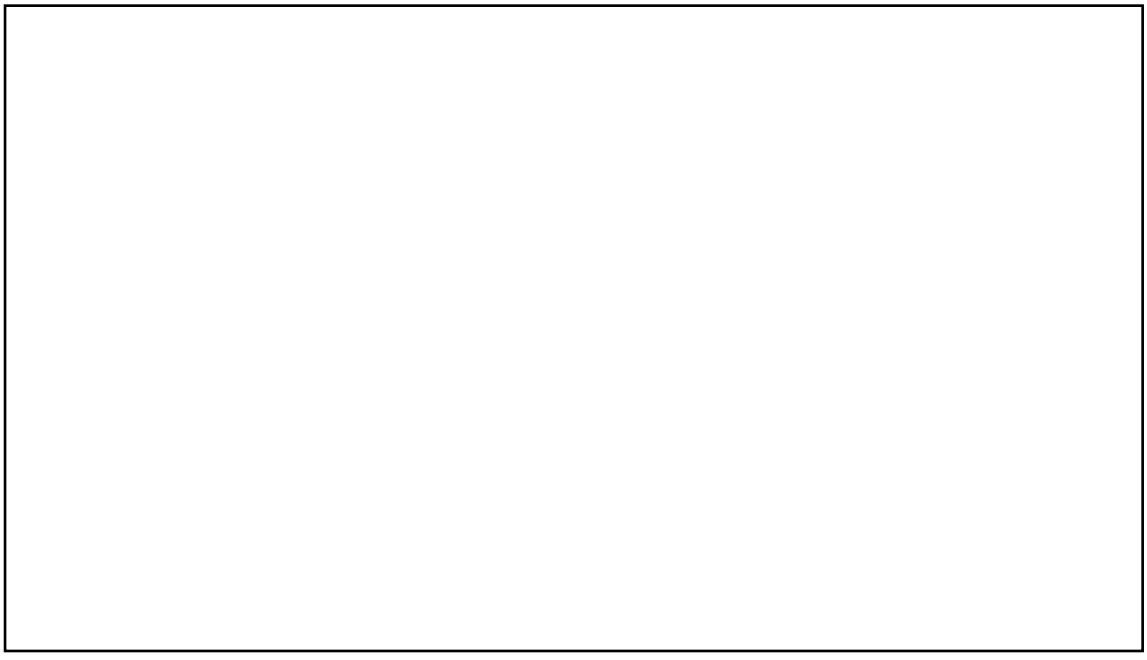

Figure 2.13. The Office of Charles and Ray Eames, *MIT Report,* 1967. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

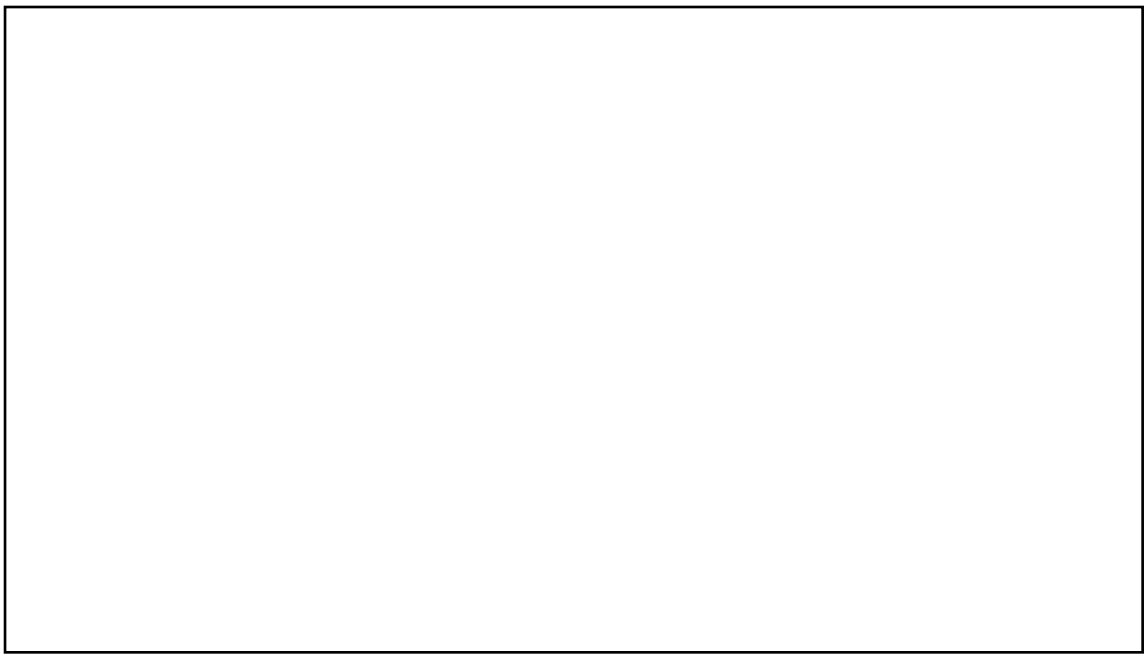

Figure 2.14. Charles Eames, handwritten notes for the *MIT Report,* 1967. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

Figure 2.15. MIT Visiting Committees, pamphlet listing various visiting committees at MIT in 1967. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

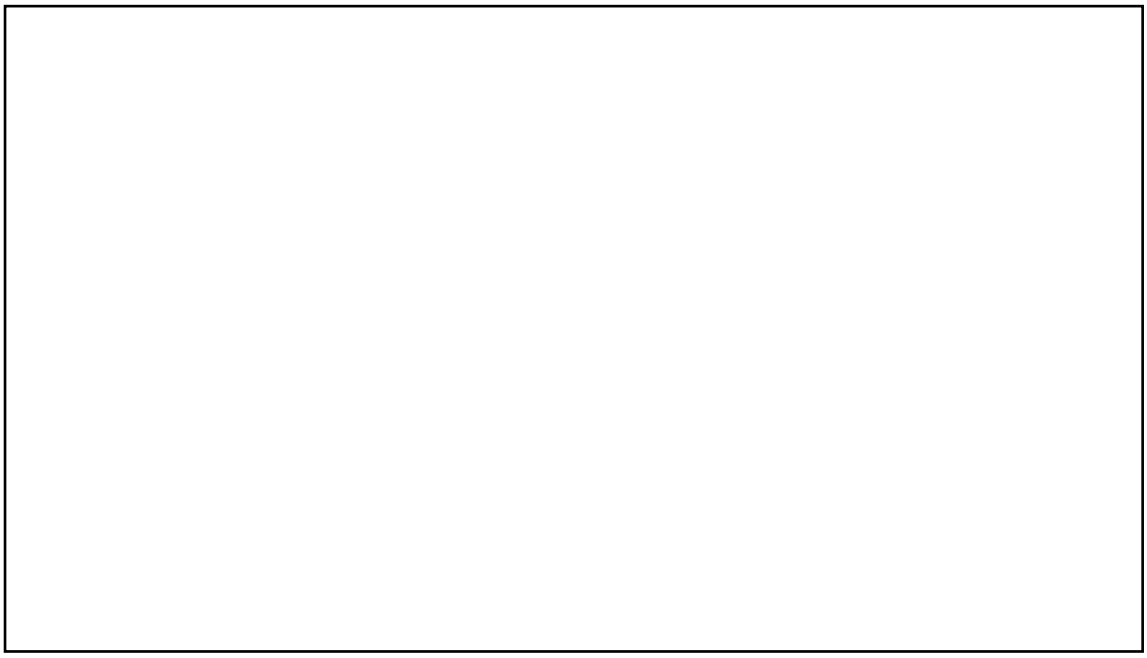

Figure 2.16. Charles Eames, letter of resignation from the Visiting Committee for the Arts, 1976. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

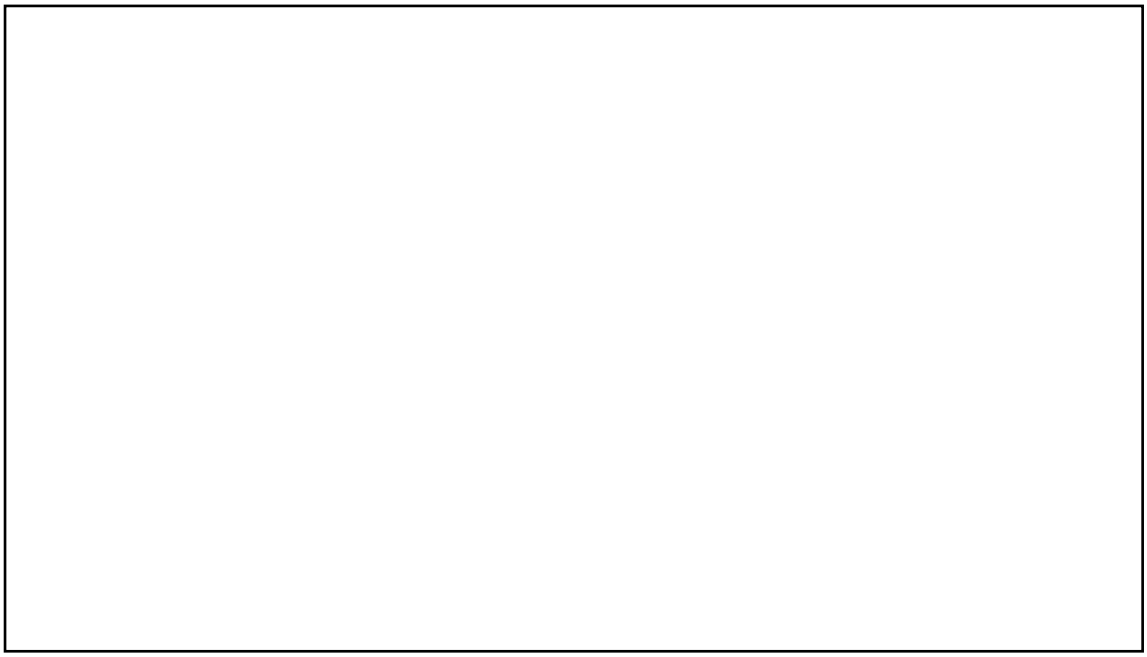

Figure 2.17. Charles Eames, handwritten draft of “Language of Vision: The Nuts and Bolts,” speech delivered to the Academy of Arts and Sciences, 1972. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

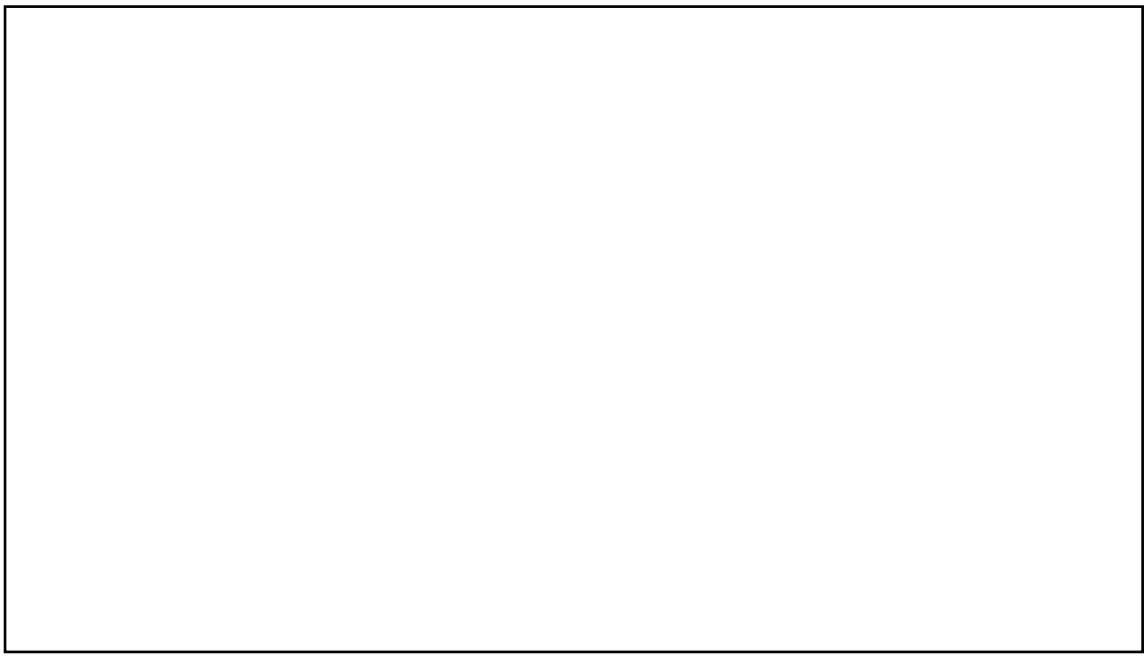

Figure 2.18. The IBM Corporate Design Program consultants: Eliot Noyes, with Paul Rand, George Nelson, Edgar Kaufmann Jr., and Charles Eames, originally printed in Hugh B. Johnson, “From Old IBM to New IBM,” *Industrial Design* 4, no 3 (March 1957).

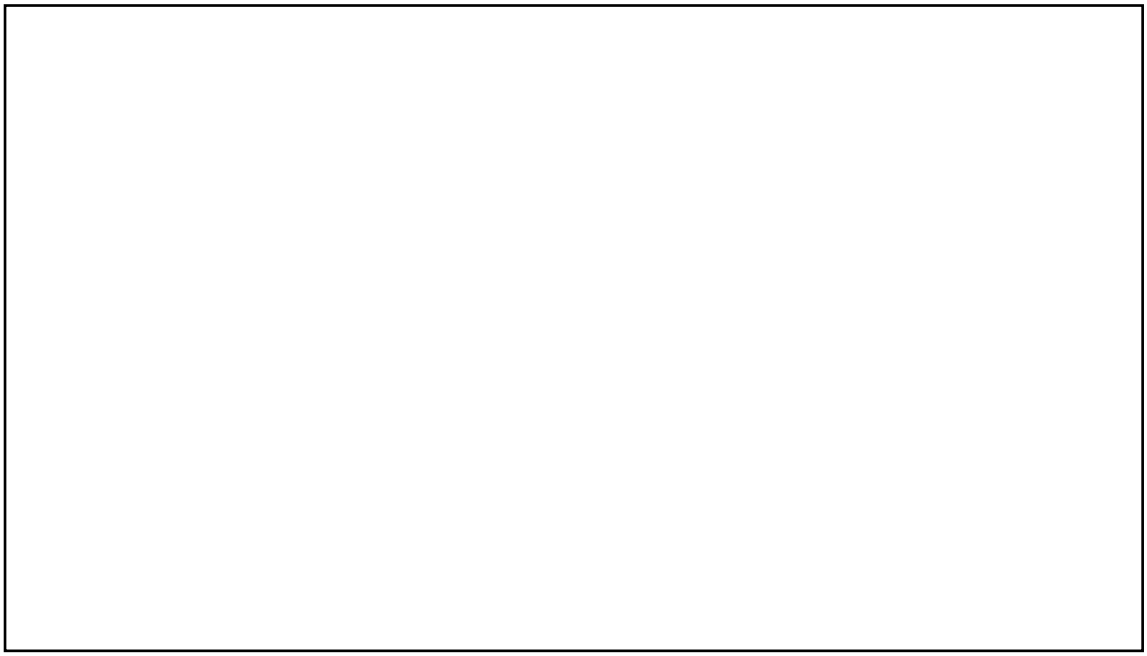

Figure 3.1. The Office of Charles and Ray Eames, Charles and Ray Eames with model of *Mathematica,* c. 1959-1960, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

Figure 3.2. The Office of Charles and Ray Eames, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

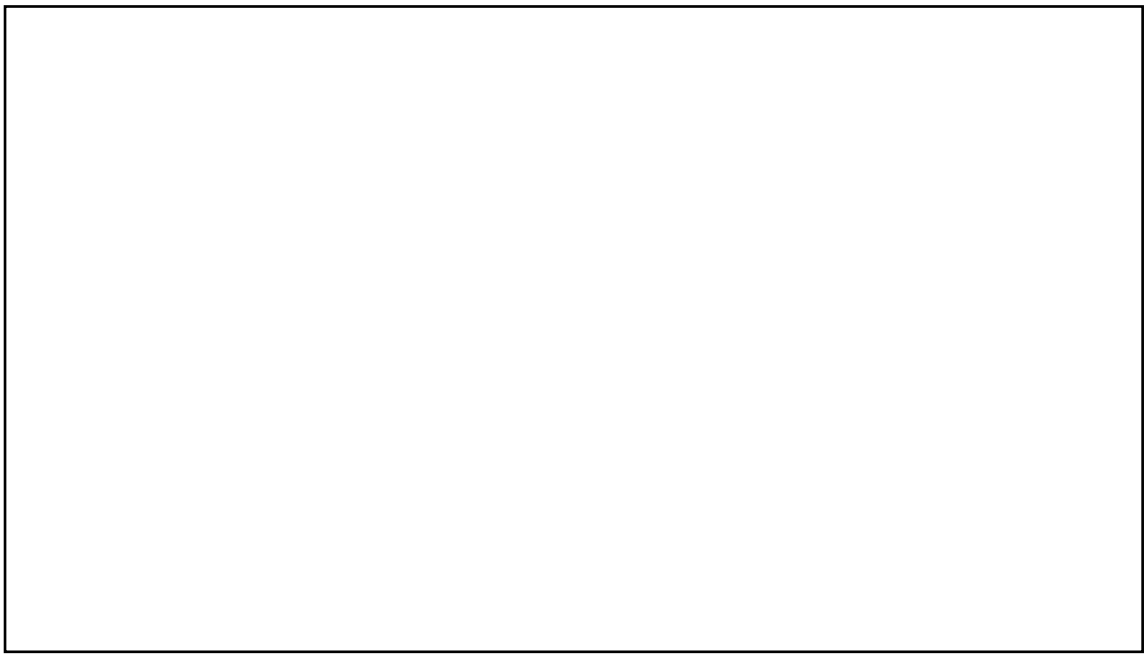

Figure 3.3. The Office of Charles and Ray Eames, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961, exhibition brochure. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

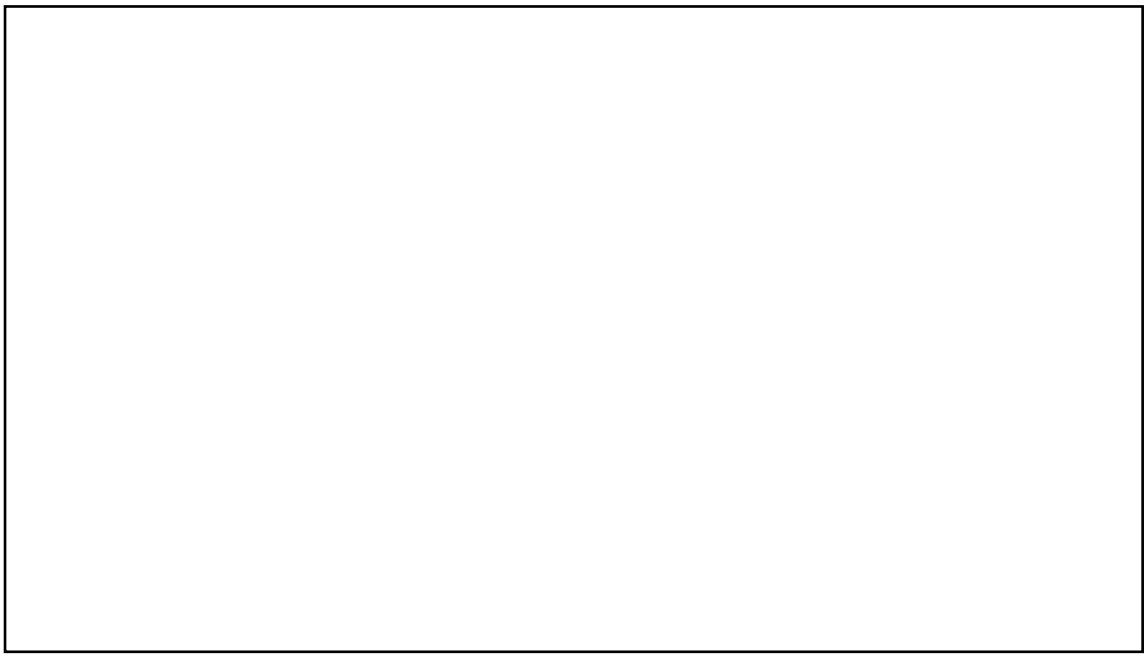

Figure 3.4. The Office of Charles and Ray Eames, History Wall, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

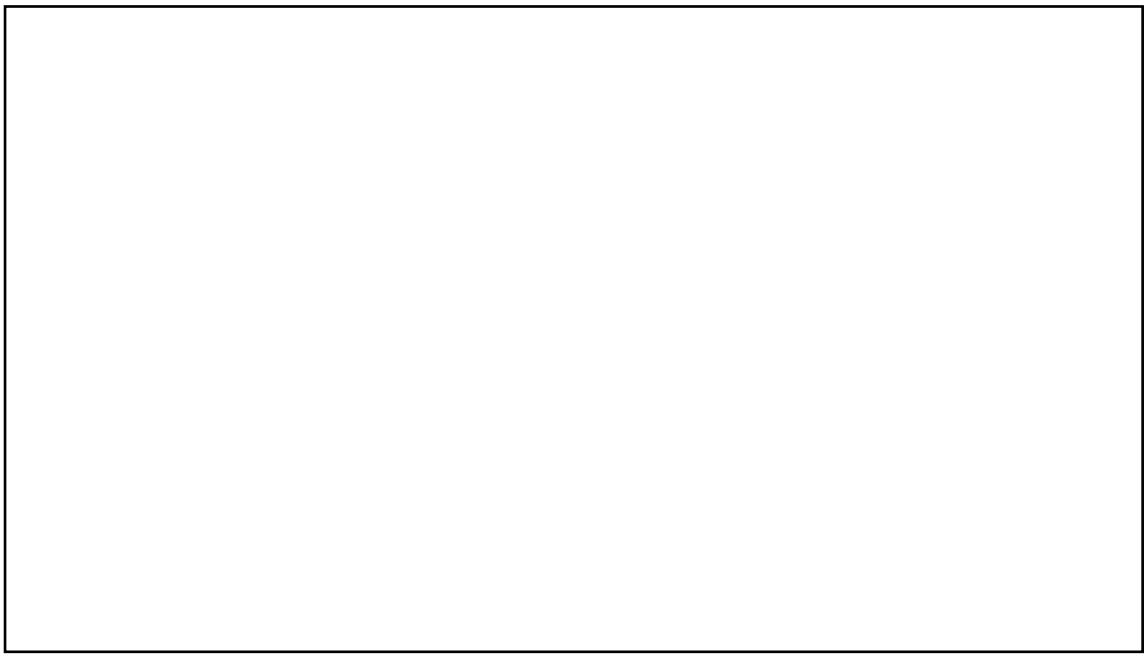

Figure 3.5. The Office of Charles and Ray Eames, Charles Eames and Eames Office Staff developing the History Wall, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

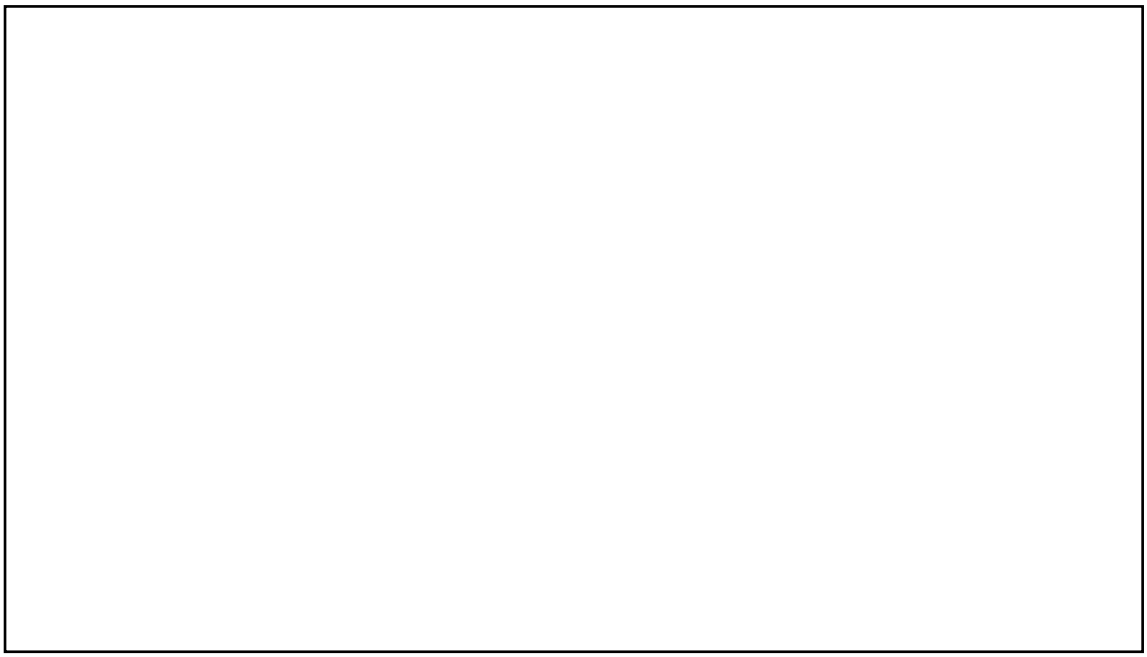

Figure 3.6. The Office of Charles and Ray Eames, “Image Wall,” *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

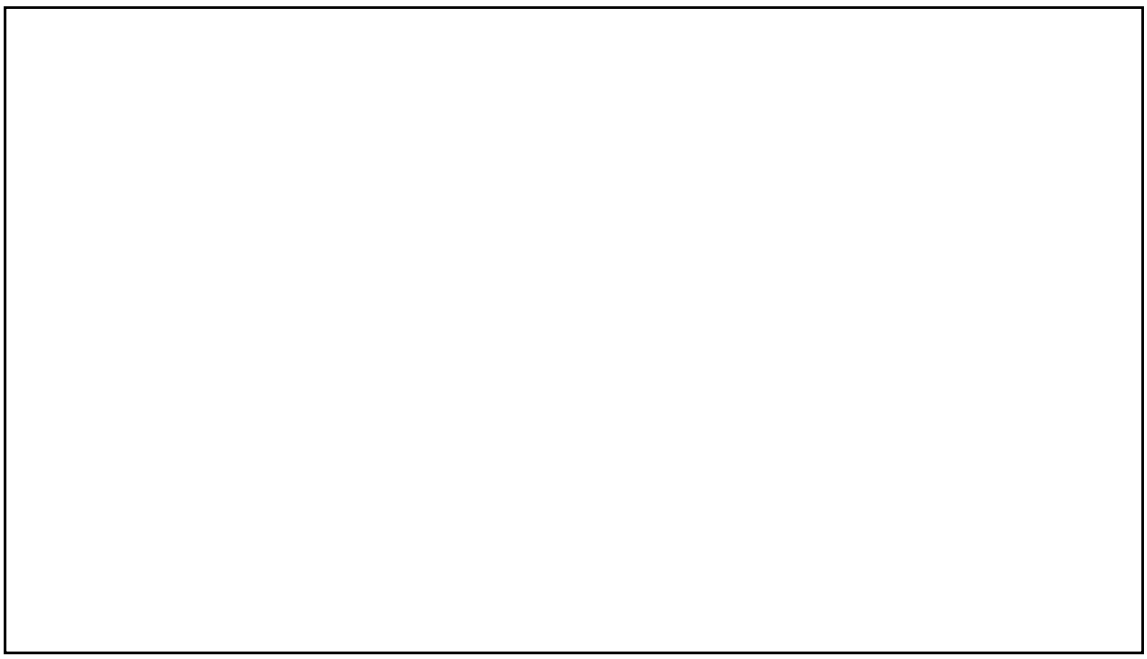

Figure 3.7. The Office of Charles and Ray Eames, Image Wall, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

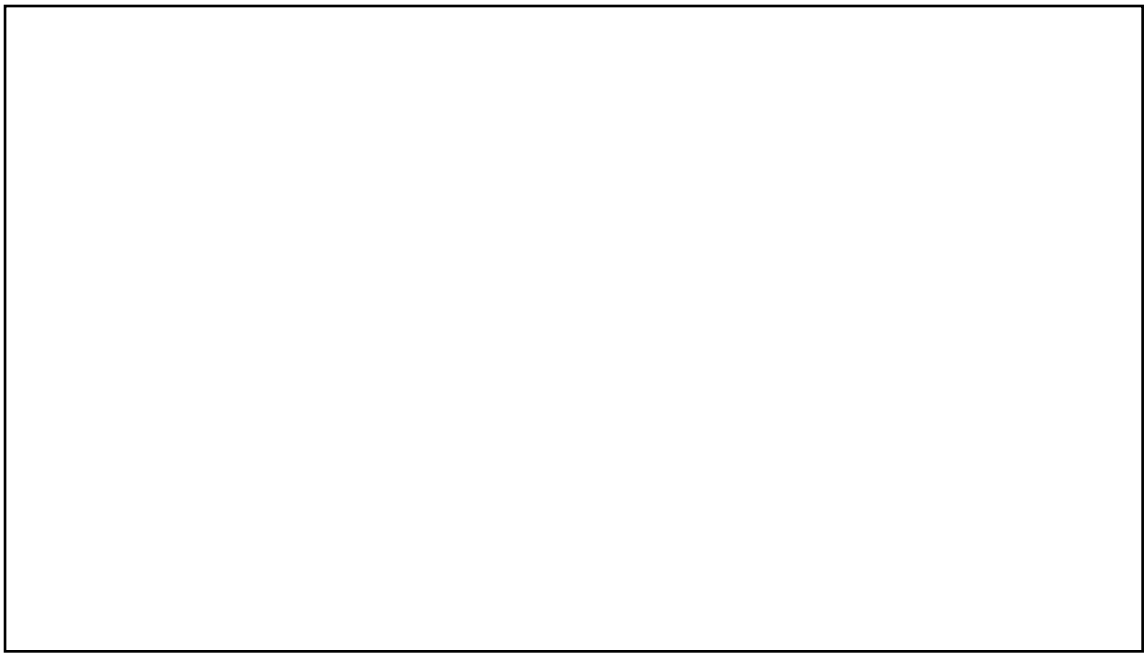

Figure 3.8. The Office of Charles and Ray Eames, Charles Eames demonstrating the Probability Machine to IBM executives at exhibition opening, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. © 2017 Eames Office LLC (eamesoffice.com).

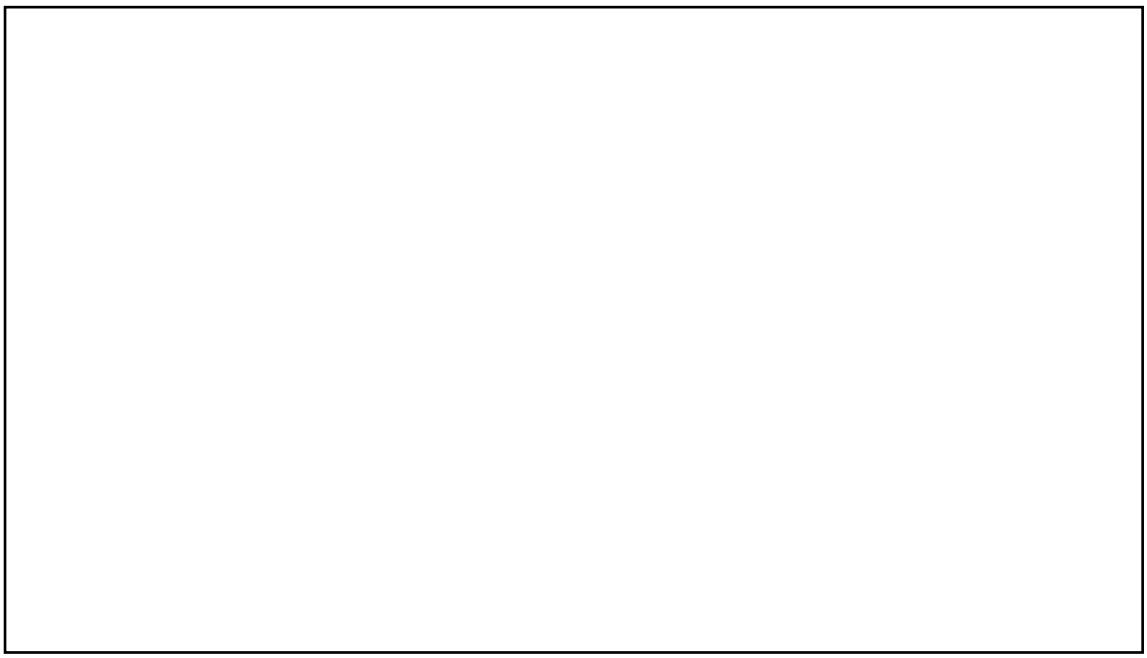

Figure 3.9. The Office of Charles and Ray Eames, game demonstrating movement of celestial bodies, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

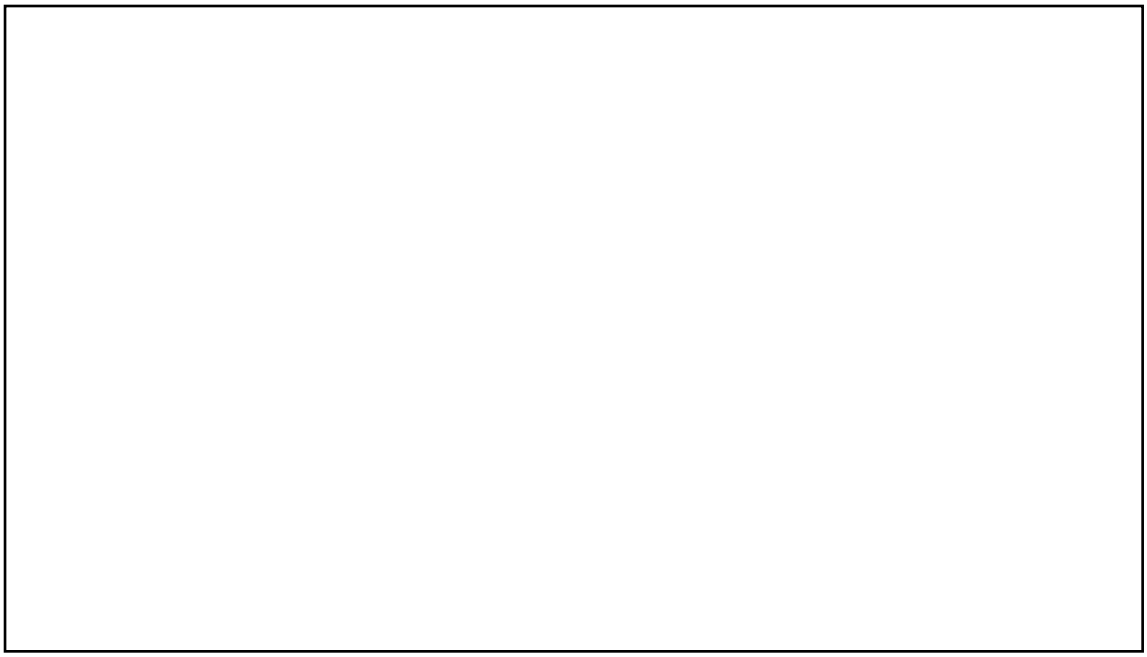

Figure 3.10. The Office of Charles and Ray Eames, Mobius Machine, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

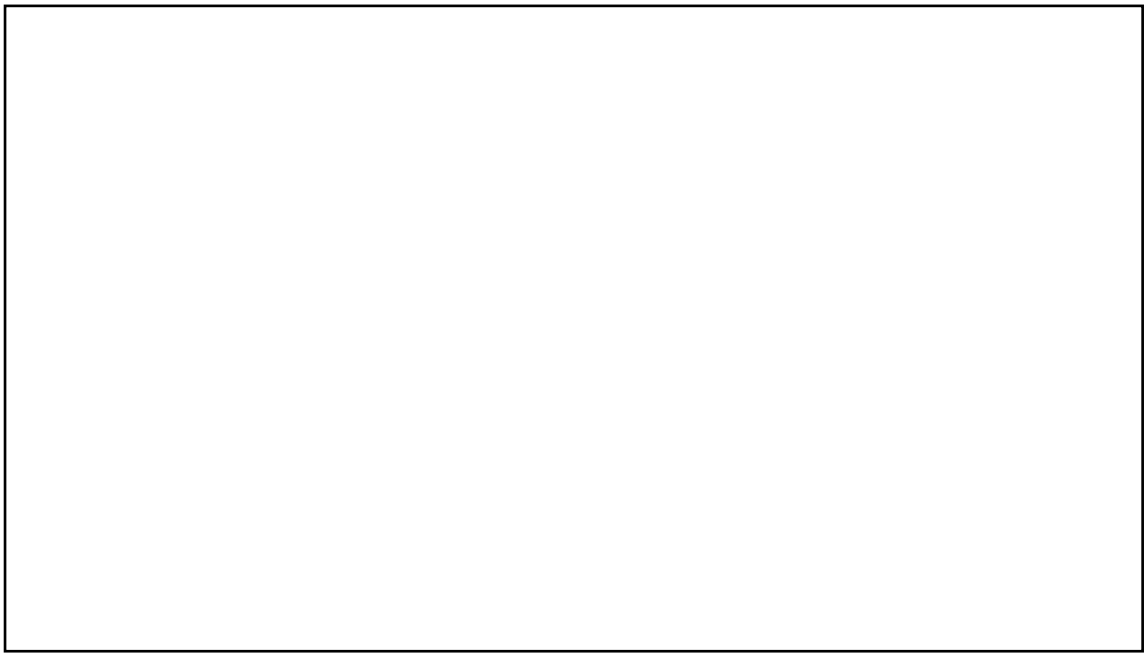

Figure 3.11. The Office of Charles and Ray Eames, Projection Case diagram, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. Originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

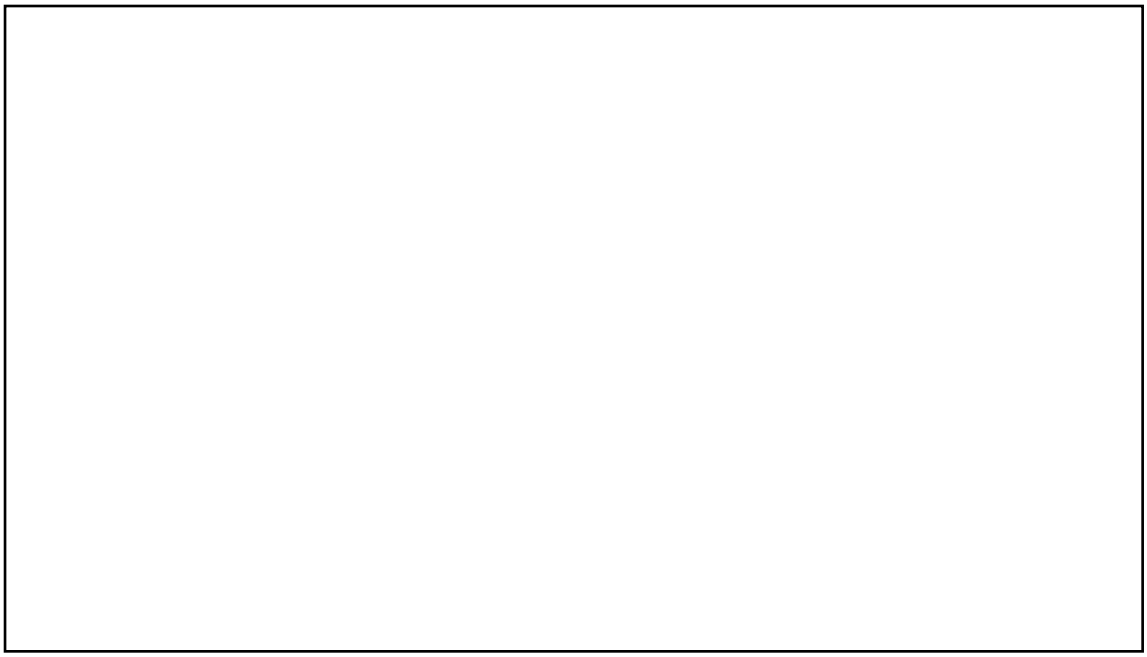

Figure 3.12. The Office of Charles and Ray Eames, Projection Case diagram, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961, originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

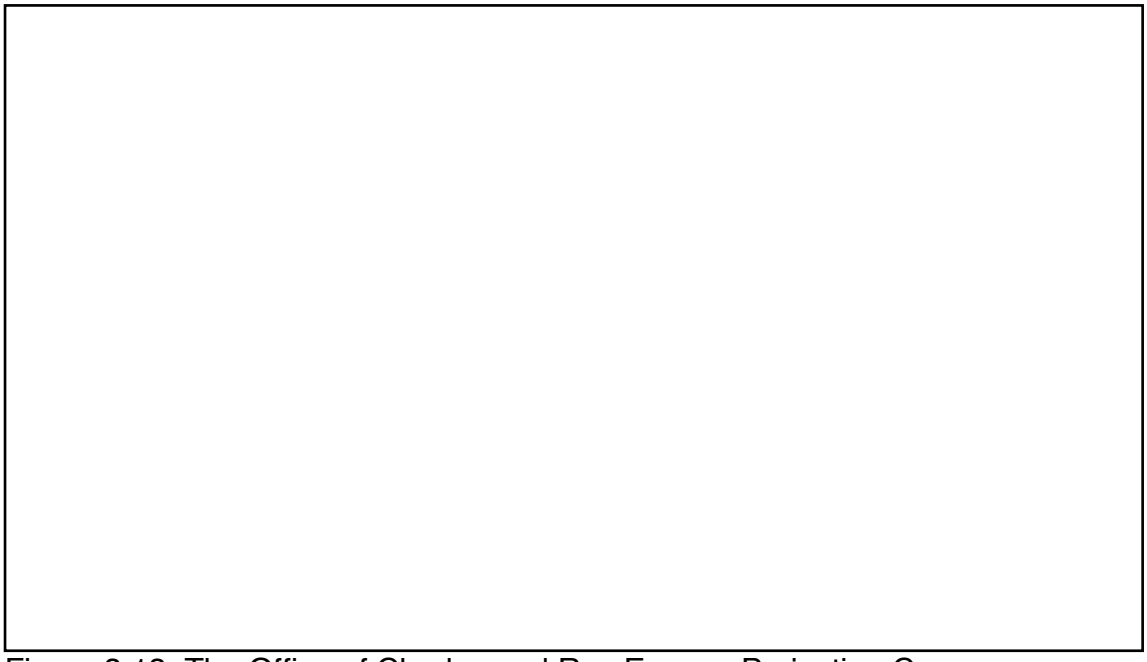

Figure 3.13. The Office of Charles and Ray Eames, Projection Case, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961, originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

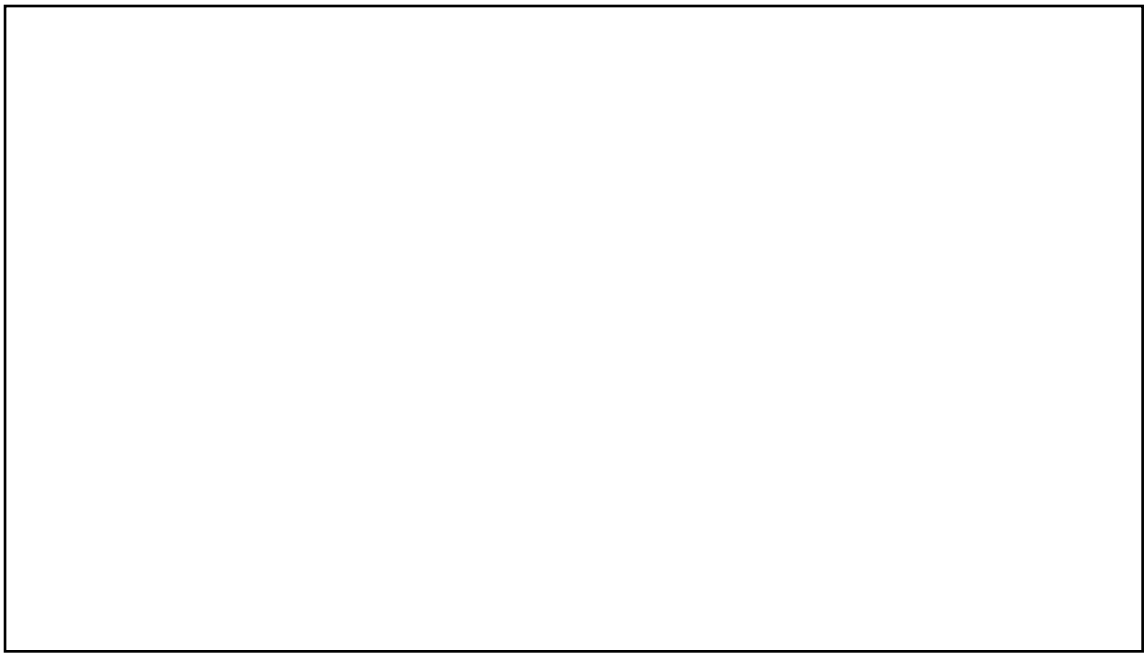

Figure 3.14. The Office of Charles and Ray Eames, Projection Case, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961, originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

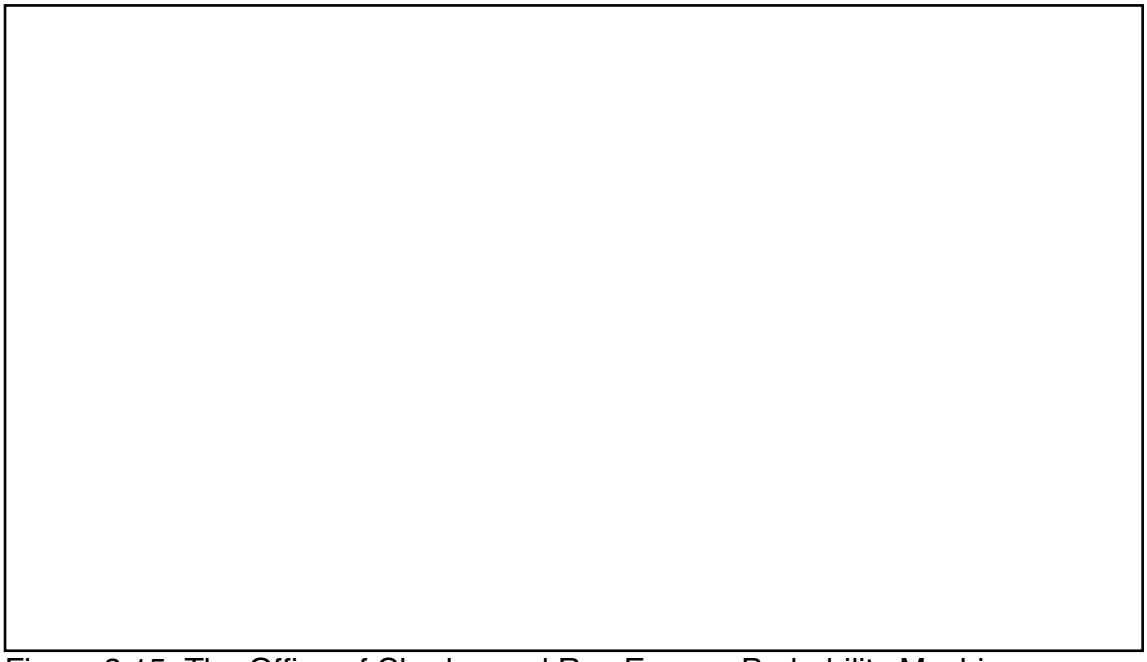

Figure 3.15. The Office of Charles and Ray Eames, Probability Machine Photograph of the Probability Machine, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961, originally printed in exhibition booklet. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

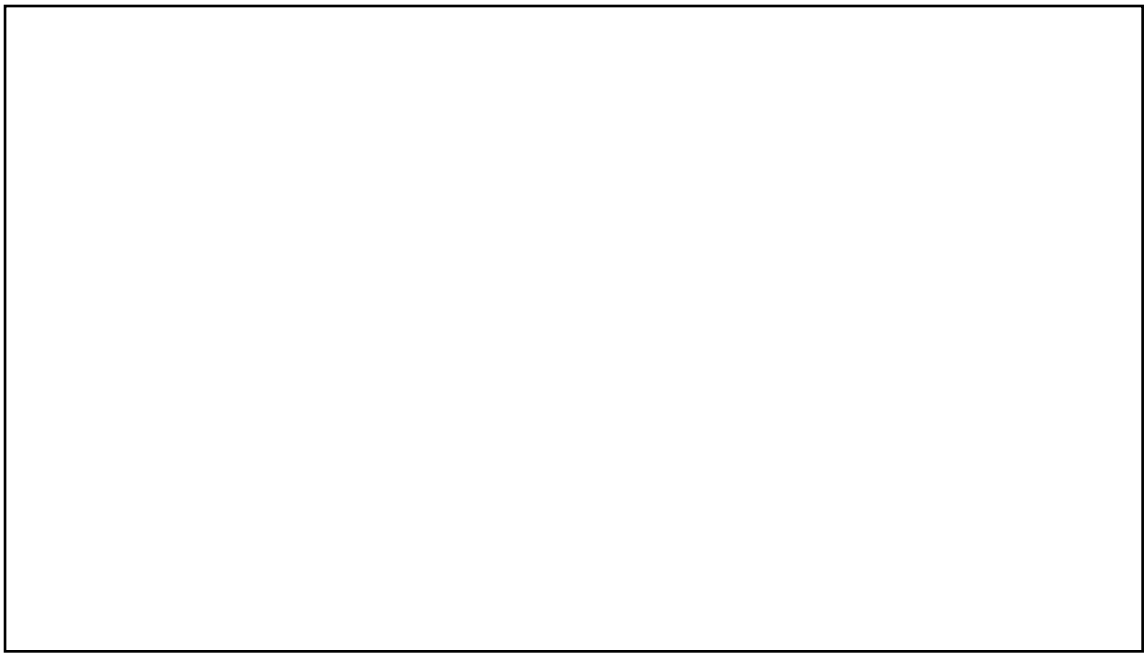

Figure 3.16. The Office of Charles and Ray Eames, “peep show” apparatus with Lucia Eames and children, *Mathematica: A World of Numbers . . . and Beyond,* California Museum of Science and Industry, 1961. © 2017 Eames Office LLC (eamesoffice.com).

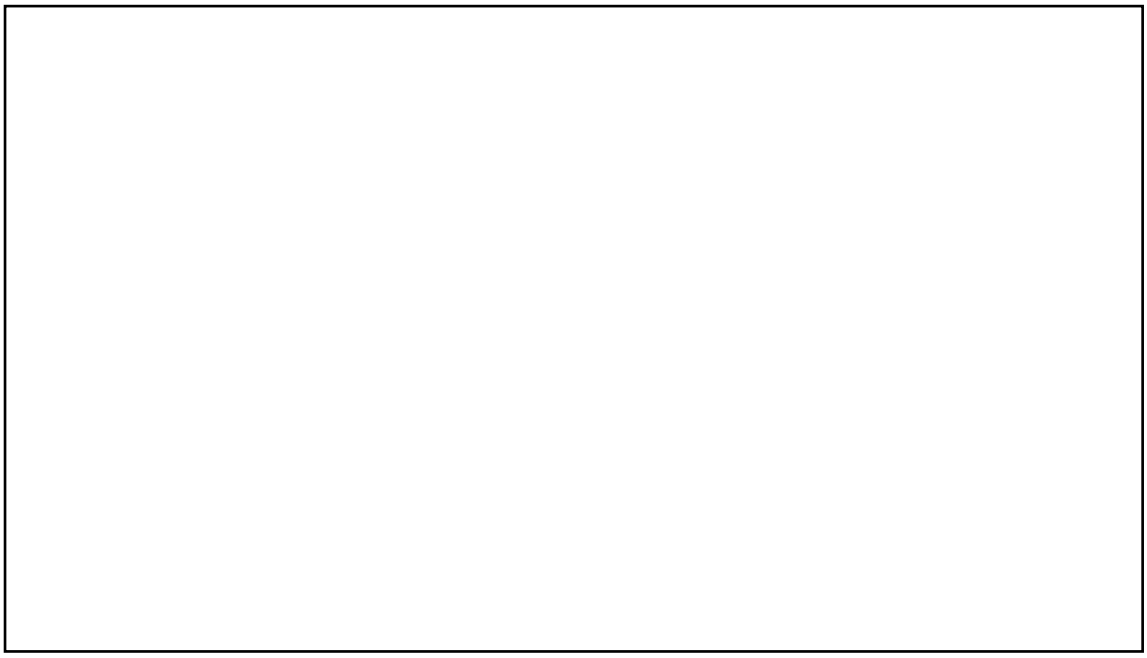

Figure 3.17. Hermann Bollman, souvenir map of the 1964-1965 New York World’s Fairgrounds, 1964. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress.

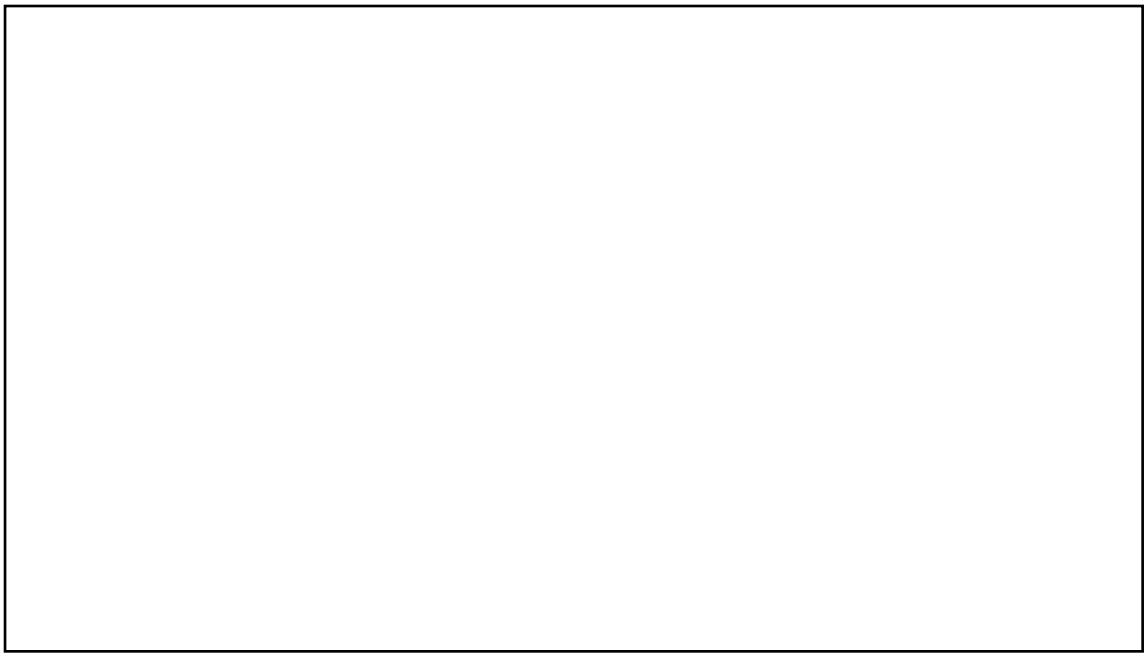

Figure 3.18. The Office of Charles and Ray Eames and Eero Saarinen Associates (Kevin Roche, lead architect), IBM Pavilion, New York World's Fair, 1964, plan. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

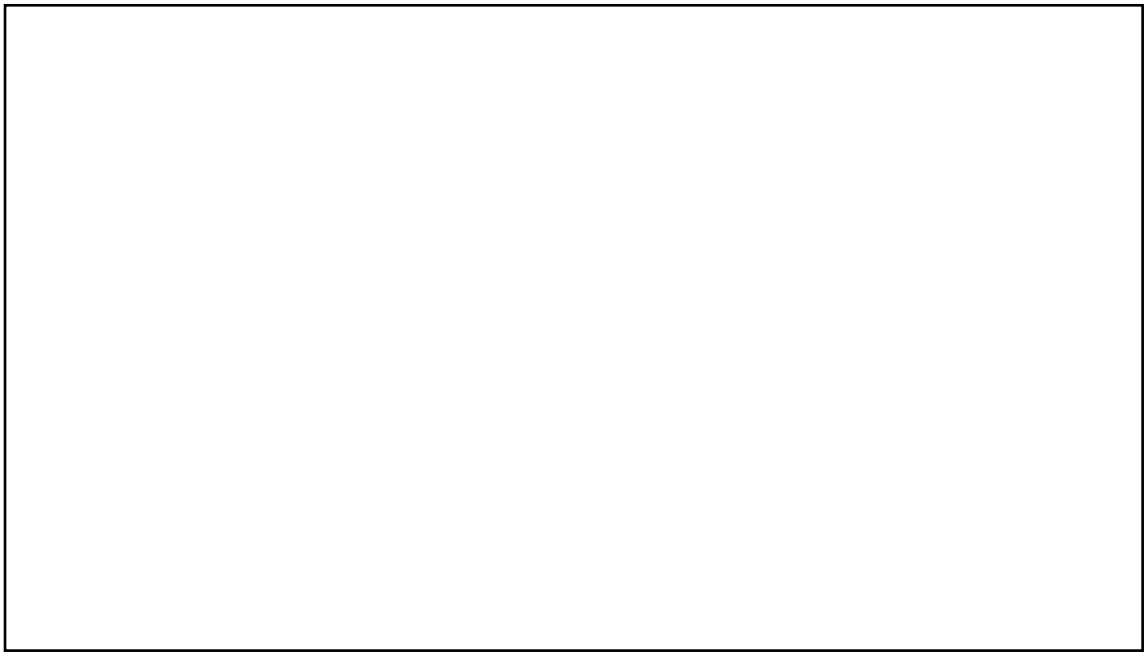

Figure 3.19. The Eameses' copy of Weiss and Boutourline, *Fairs, Pavilions, Exhibits, and Their Audiences* (Boston: Robert S. Weiss, 1962), front cover. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress.

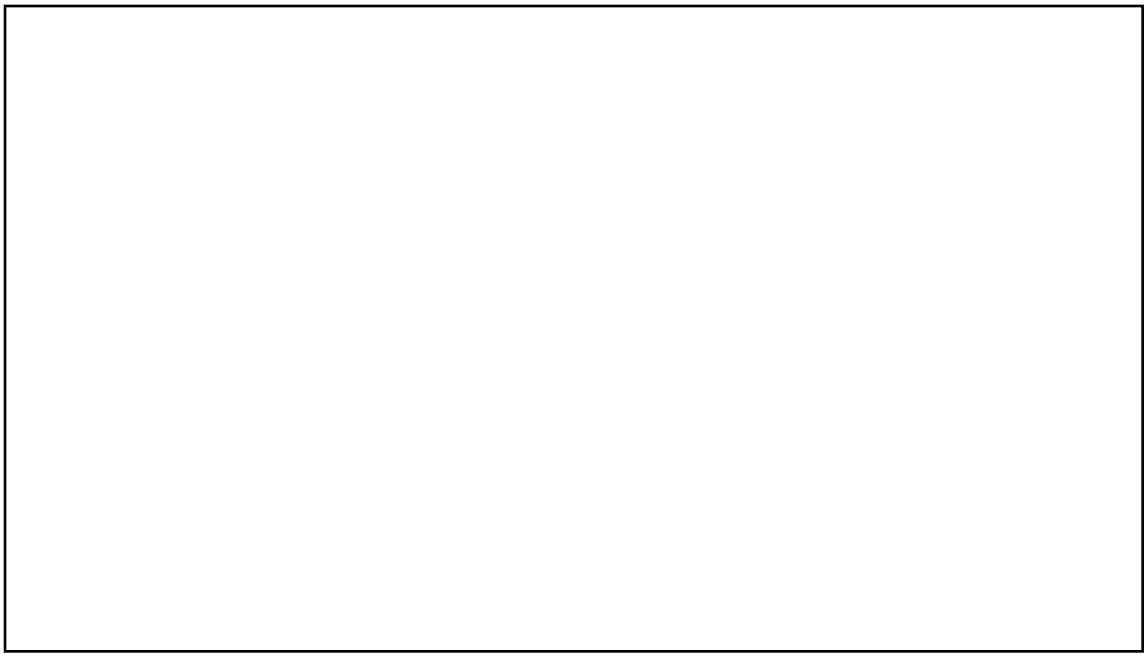

Figure 3.20. The Office of Charles and Ray Eames (Glen Fleck and Parke Meeke, lead designers), Little Theaters, IBM Pavilion, New York World's Fair, 1964. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

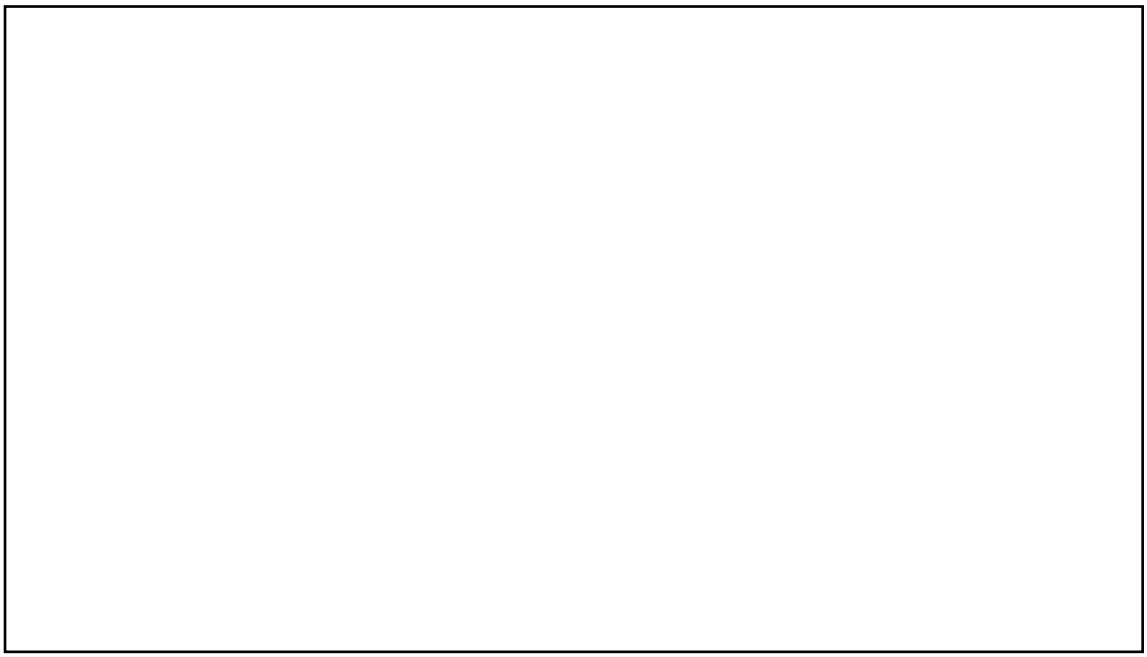

Figure 3.21. Eero Saarinen, Kevin Roche, and John Dinkeloo, plans for the IBM Corporate Pavilion, c. 1961. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

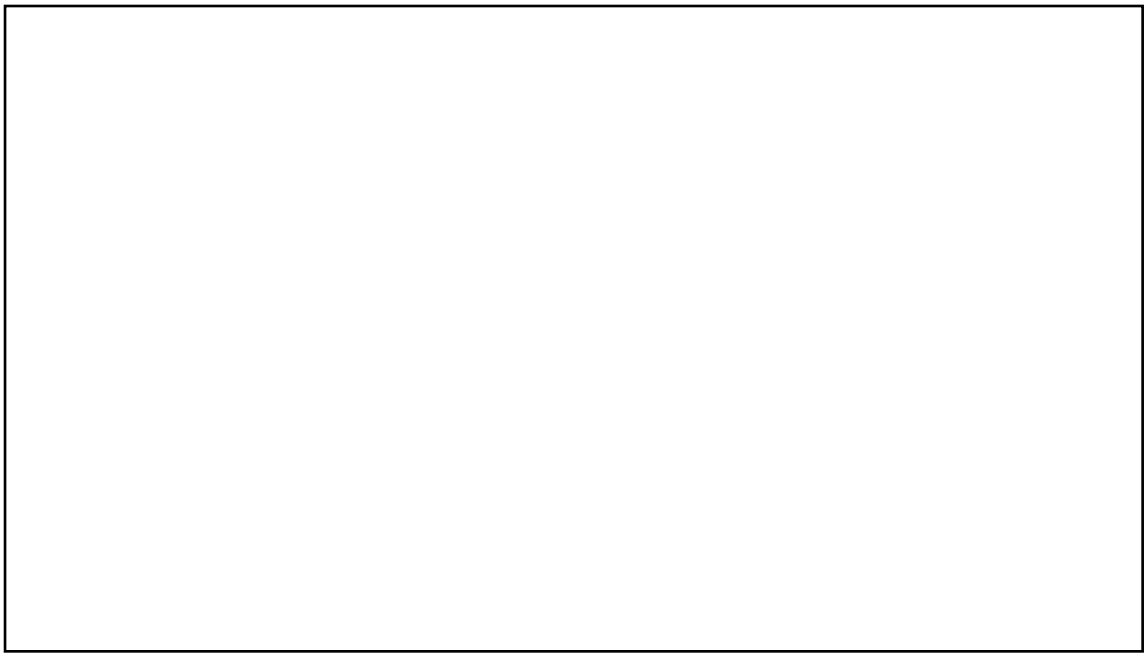

Figure 3.22. Eero Saarinen, Kevin Roche, and John Dinkeloo, plans for the IBM Corporate Pavilion, c. 1961. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

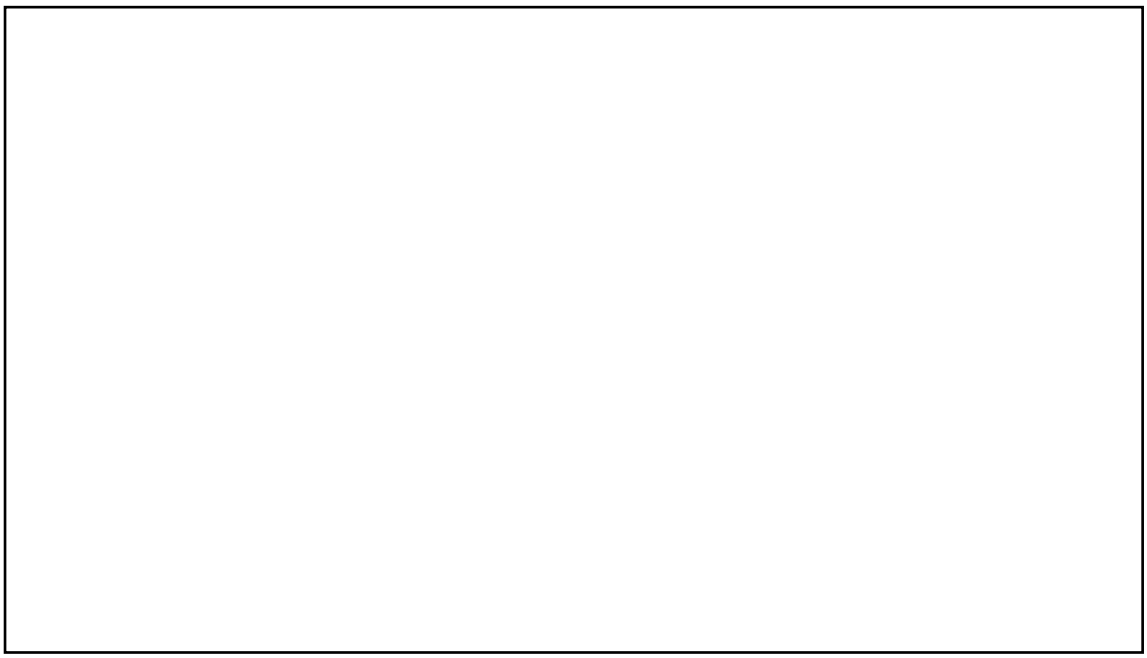

Figure 3.23. Eero Saarinen, Kevin Roche, and John Dinkeloo, plans for the IBM Corporate Pavilion, c. 1961. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

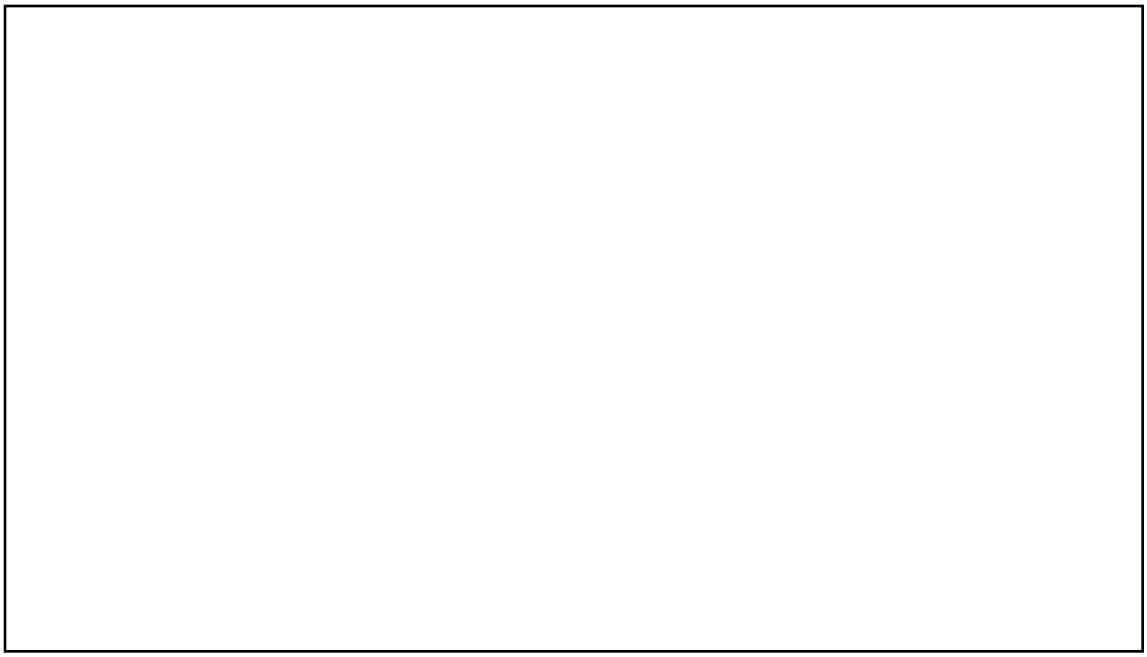

Figure 3.24. Barnum & Bailey Circus tent layout, 1903. Plan from *The Official Programme and Book of Wonders Combined of the Barnum & Bailey Greatest Show on Earth* New York: George Arlington, 1903), 32.

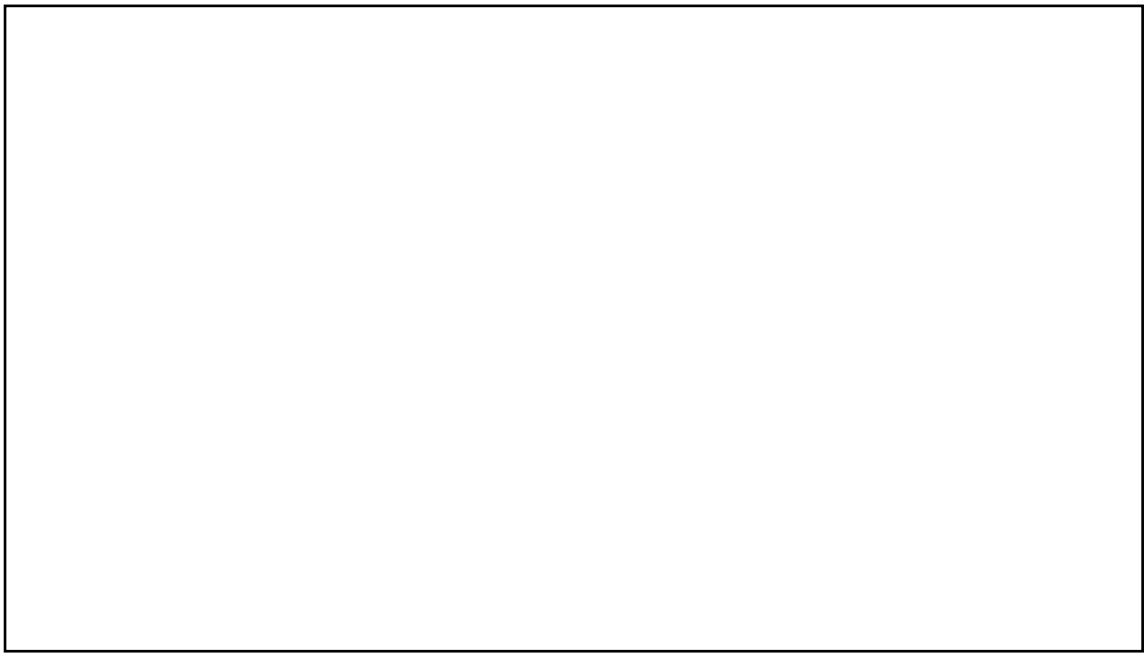

Figure 3.25. The Office of Charles and Ray Eames, stairs leading to the “People Wall,” IBM Corporate Pavilion, New York World’s Fair, 1964, proposal. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

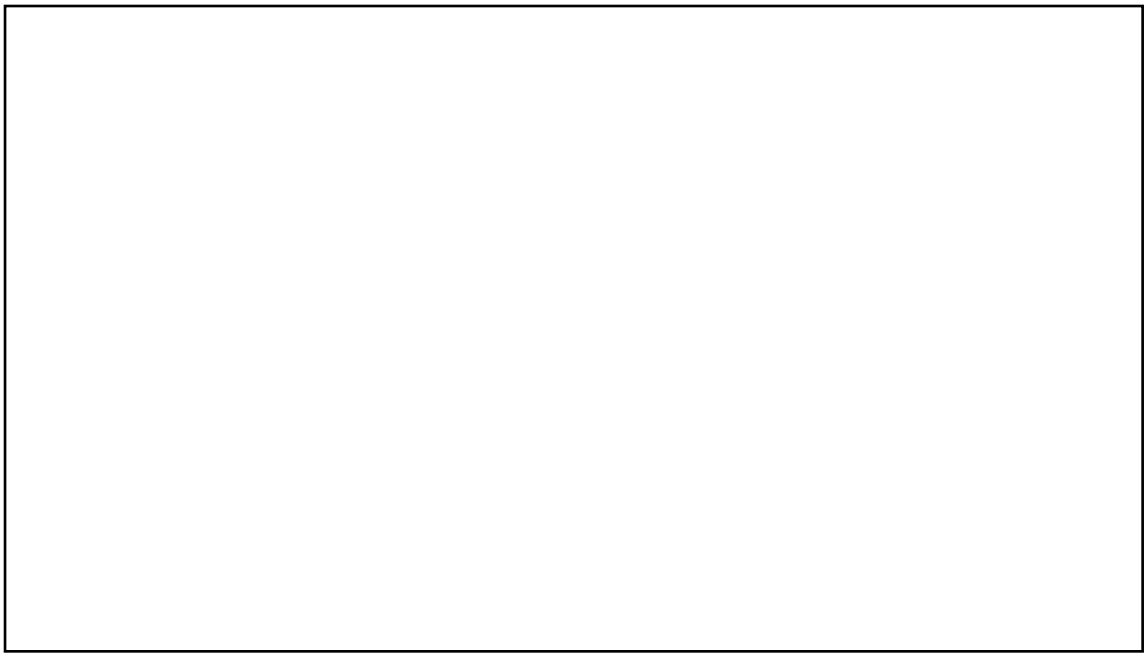

Figure 3.26. The Office of Charles and Ray Eames, view of the “People Wall,” IBM Corporate Pavilion, New York World’s Fair, 1964, plan. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

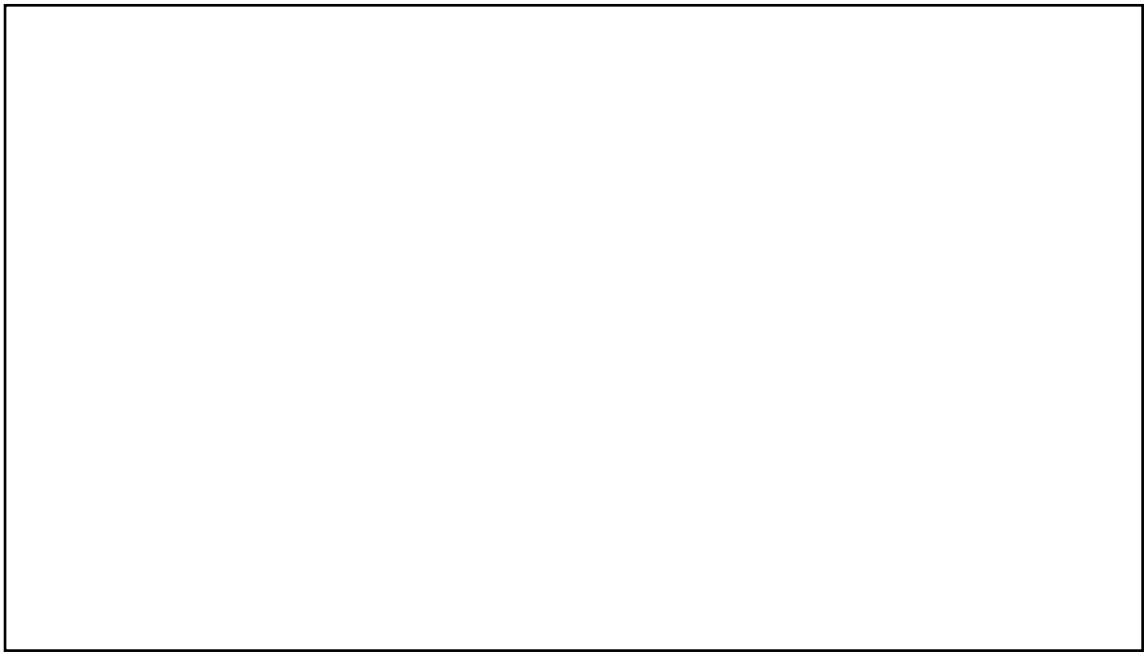

Figure 3.27. The Office of Charles and Ray Eames, view of the “People Wall,” IBM Corporate Pavilion, New York World’s Fair, 1964, plan. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

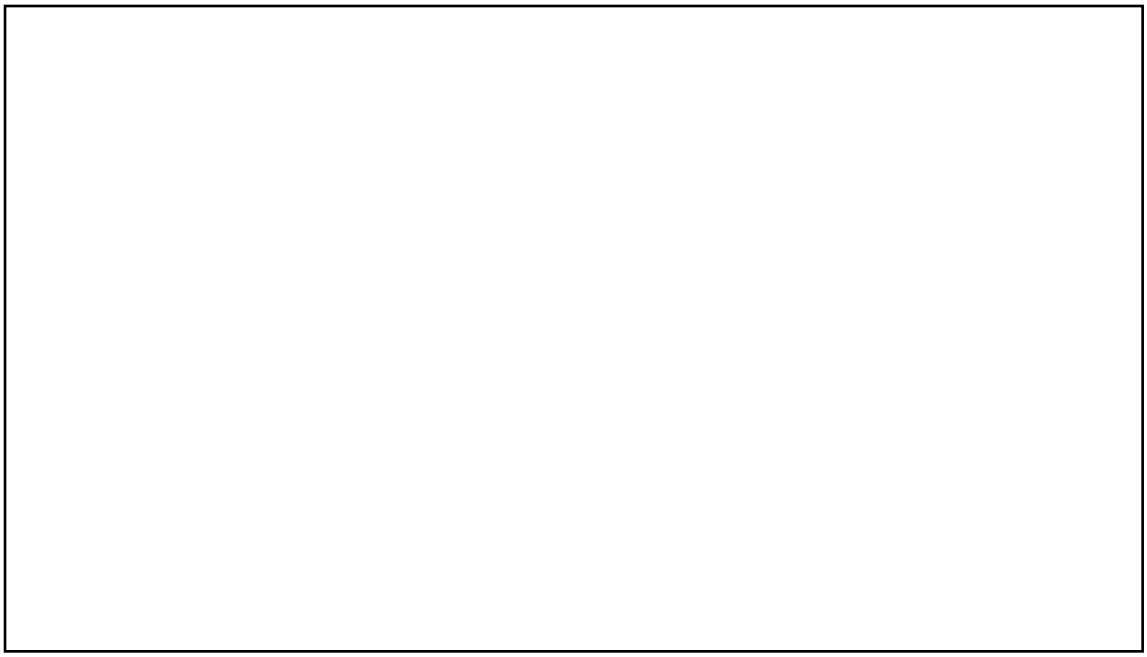

Figure 3.28. The Office of Charles and Ray Eames, view of the “People Wall,” IBM Corporate Pavilion, New York World’s Fair, 1964, plan. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

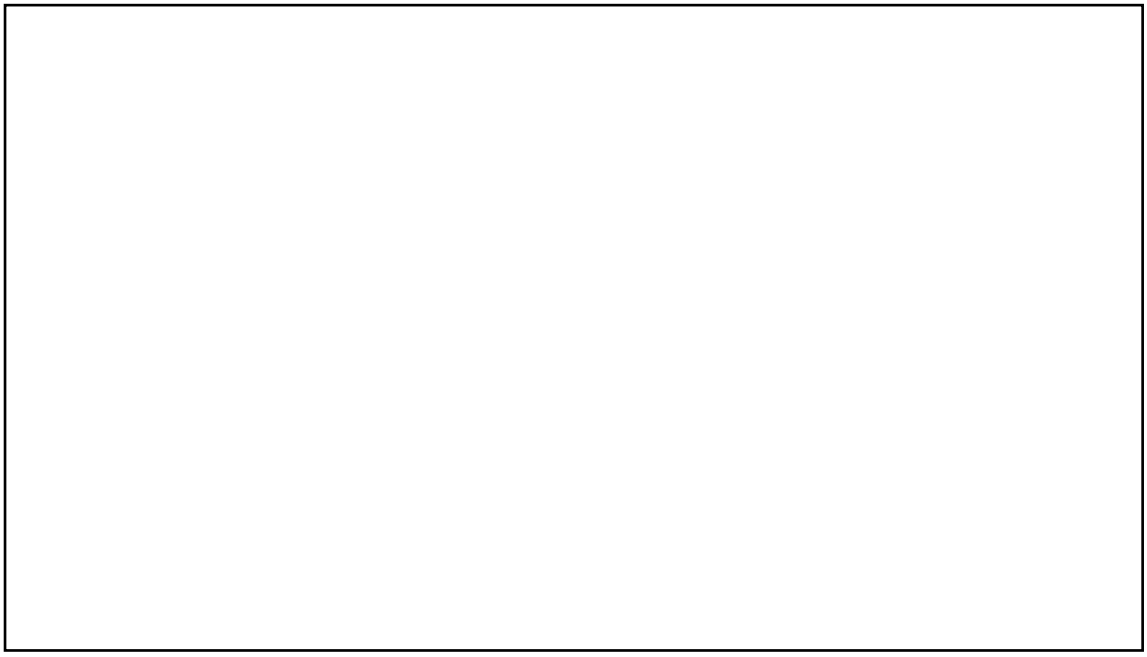

Figure 3.29. The Office of Charles and Ray Eames, *Think*, 1964. © 2017 Eames Office LLC (eamesoffice.com).

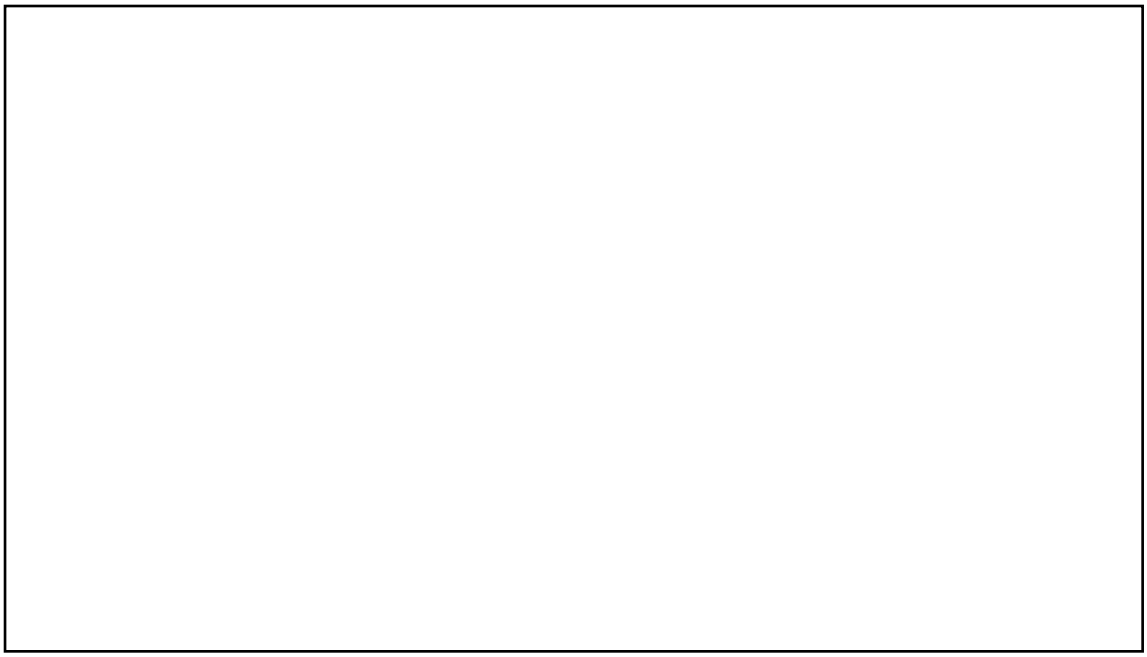

Figure 3.30. The Office of Charles and Ray Eames, installation view of *Think* multiscreen presentation, IBM Corporate Pavilion, New York World's Fair, 1964-65. © 2017 Eames Office LLC (eamesoffice.com).

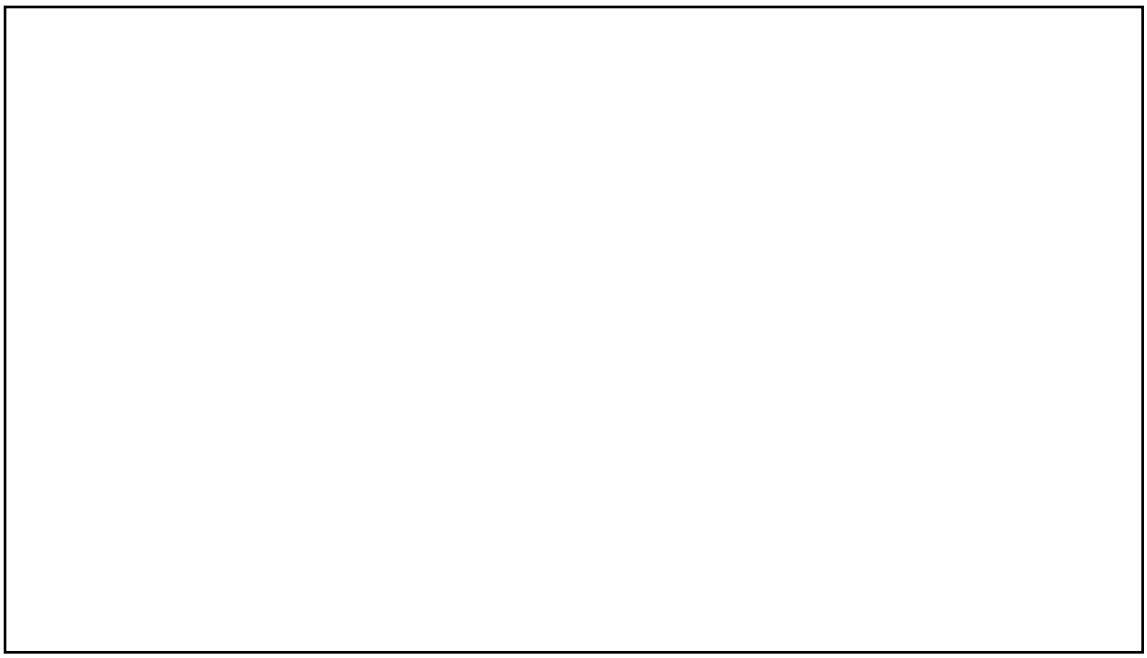

Figure 3.31. The Office of Charles and Ray Eames, Photograph of the Typewriter Bar reproduced in the IBM Pavilion Visitor's Guide, IBM Corporate Pavilion, New York World's Fair, 1964-65. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

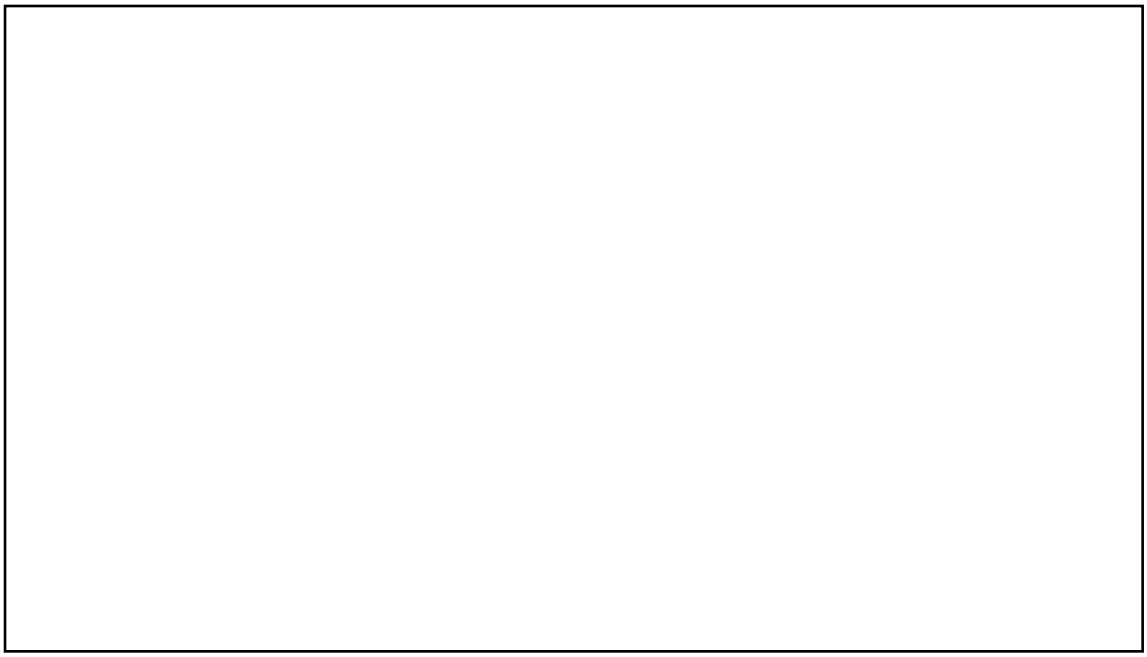

Figure 3.32. The Office of Charles and Ray Eames, postcard souvenir from the IBM Corporate Pavilion, New York World's Fair, 1964-65. Collection of the author.

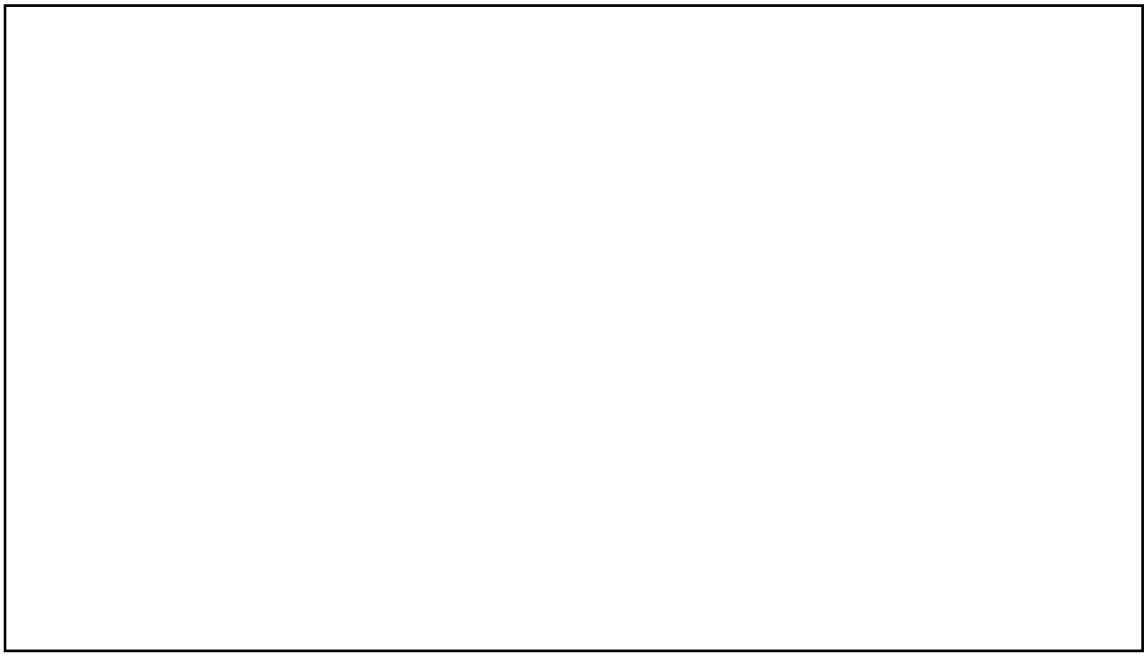

Figure 3.33. The Office of Charles and Ray Eames, postcard souvenir from the IBM Corporate Pavilion, New York World's Fair, 1964-65. Collection of the author.

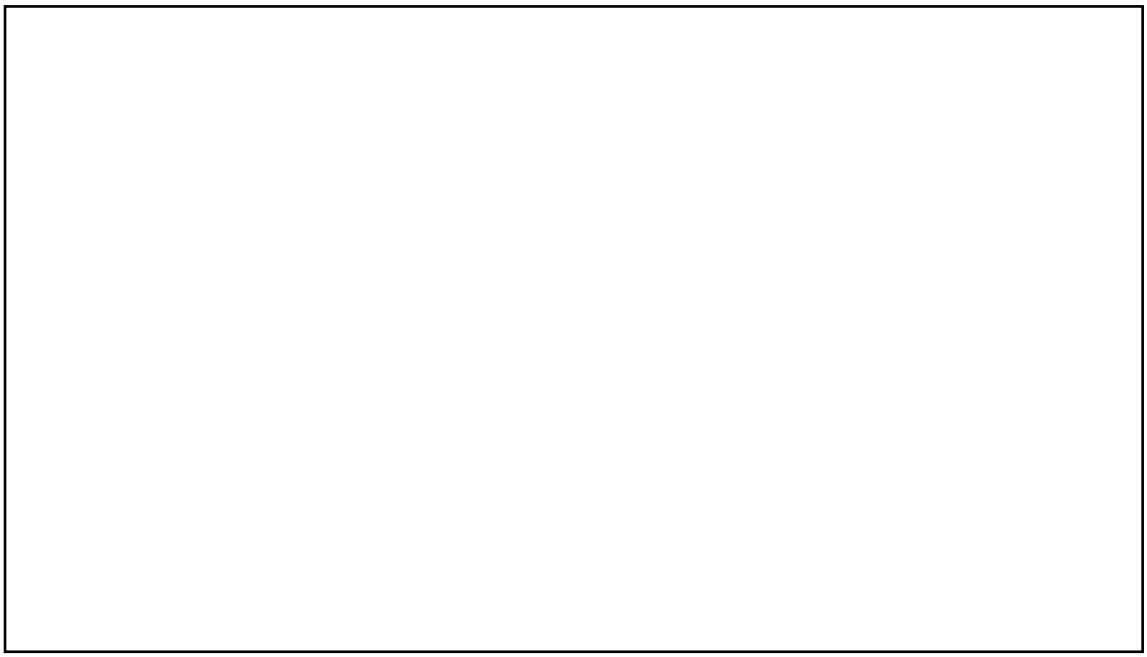

Figure 3.34. The Office of Charles and Ray Eames, postcard souvenir from the IBM Corporate Pavilion, New York World's Fair, 1964-65. Collection of the author.

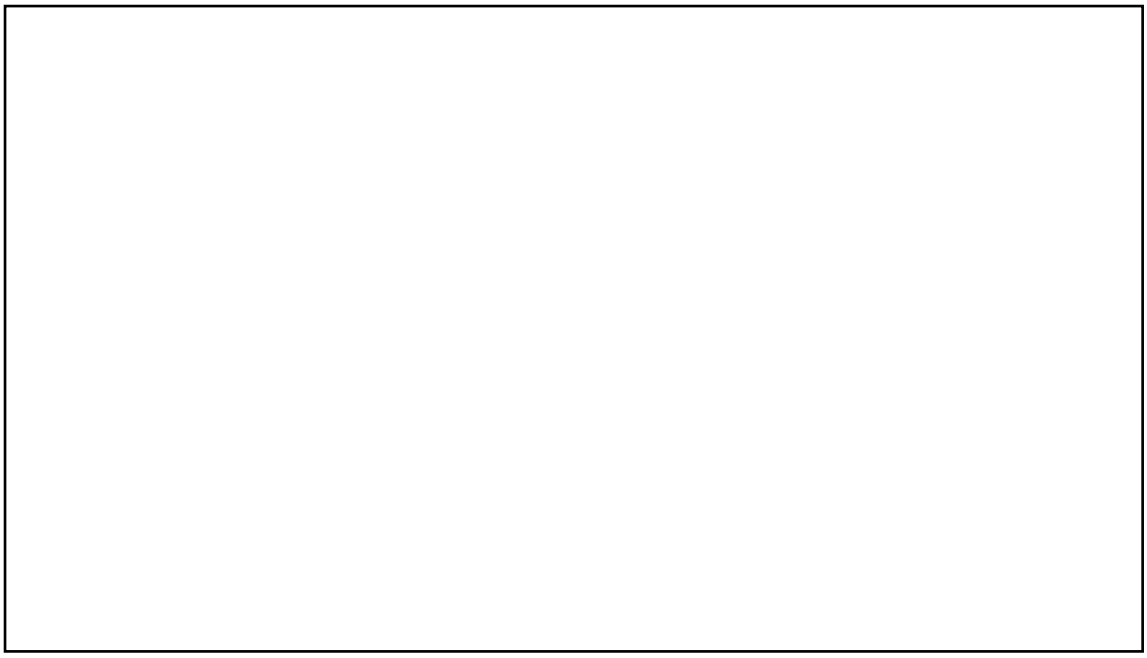

Figure 3.35. The Office of Charles and Ray Eames, Photographs of the "Automatic Language Translation Exhibit" and reproduced from the IBM Automatic Language Translation brochure, IBM Corporate Pavilion, New York World's Fair, 1964. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

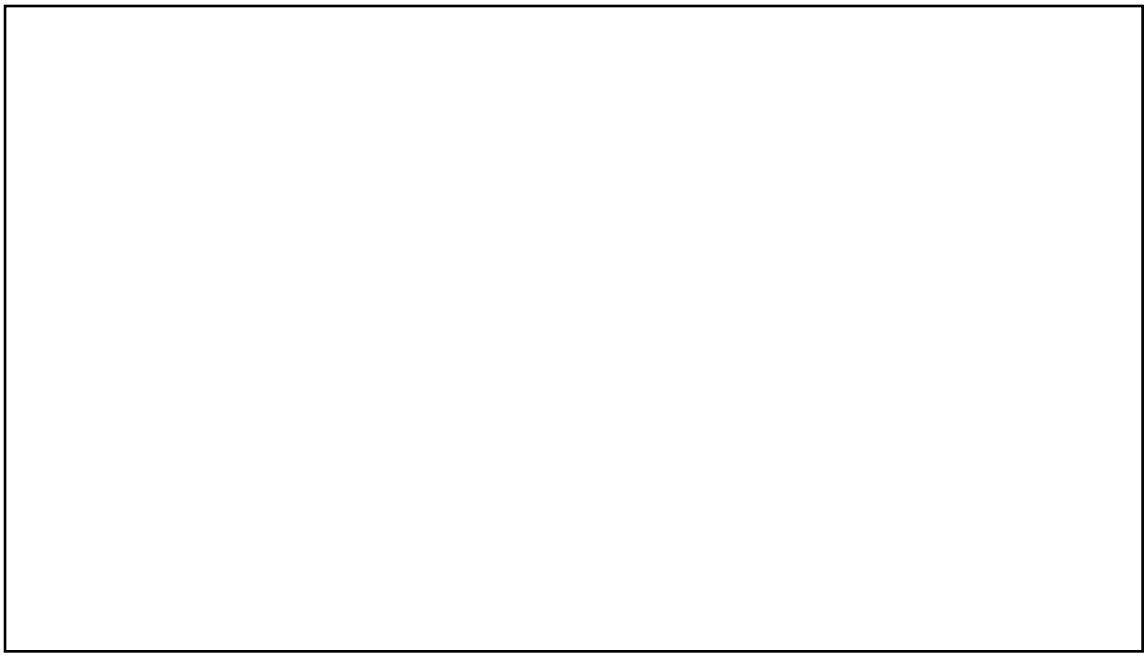

Figure 3.36. The Office of Charles and Ray Eames, photographs of the Automatic Language Translation Exhibit and reproduced from the IBM Automatic Language Translation brochure, IBM Corporate Pavilion, New York World's Fair, 1964. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

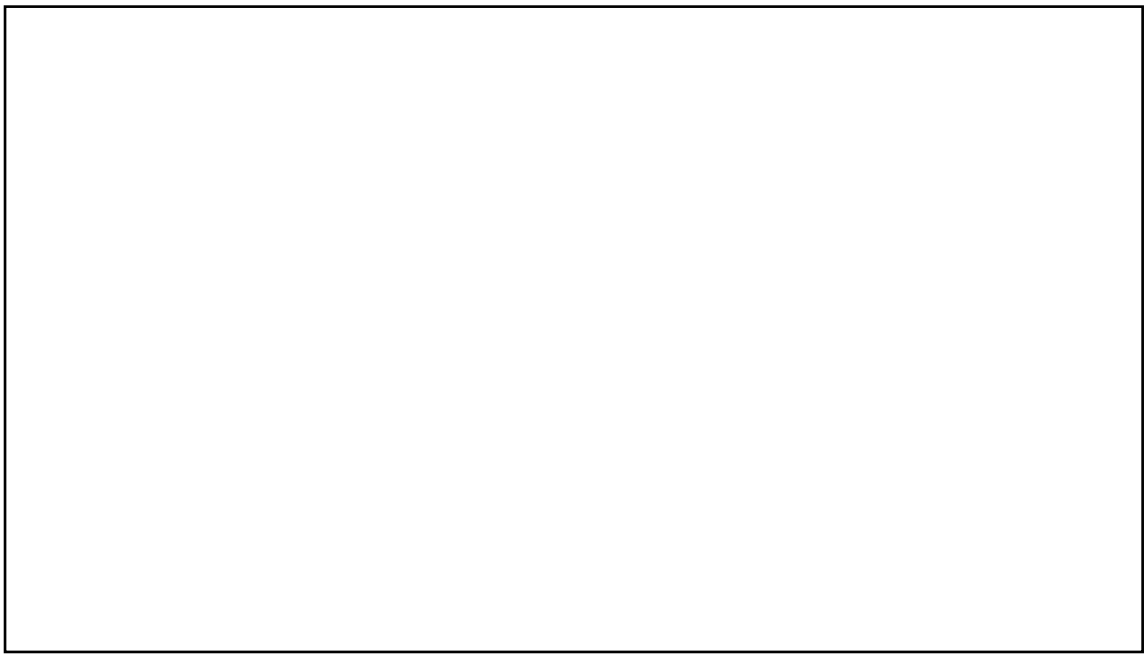

Figure 3.37. The Office of Charles and Ray Eames, photographs of the Character Recognition exhibit reproduced in the IBM Pavilion Visitor's Guide, IBM Corporate Pavilion, New York World's Fair,1964-65. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

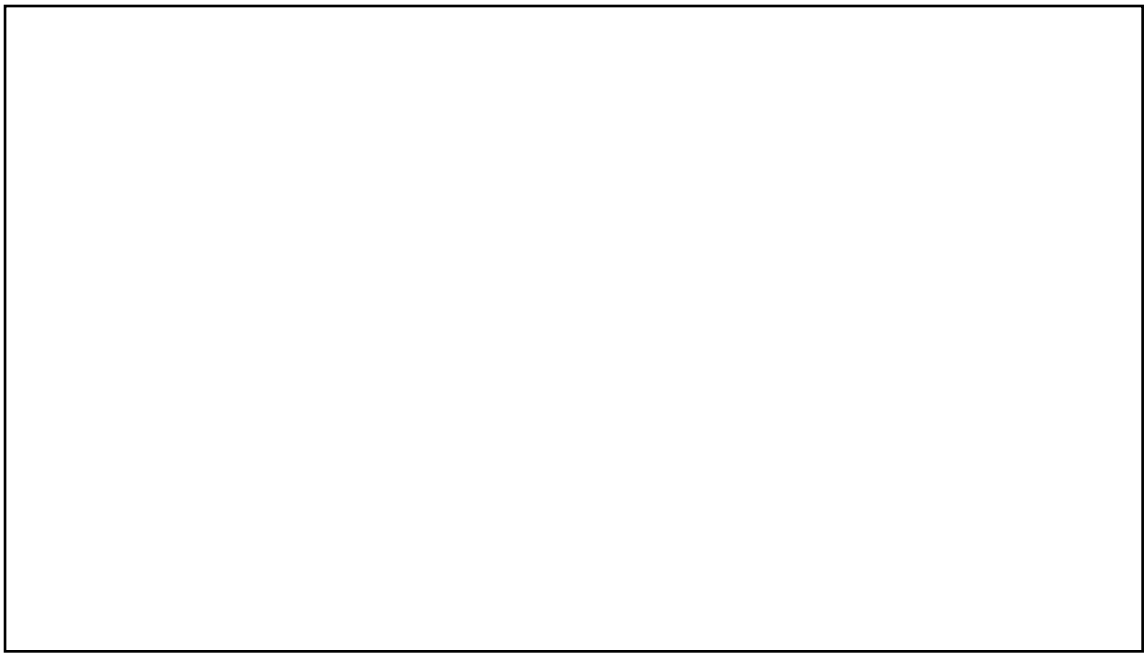

Figure 3.38. The Office of Charles and Ray Eames, photographs of the Character Recognition exhibit reproduced in the IBM Pavilion Visitor's Guide, IBM Corporate Pavilion, New York World's Fair,1964-65. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

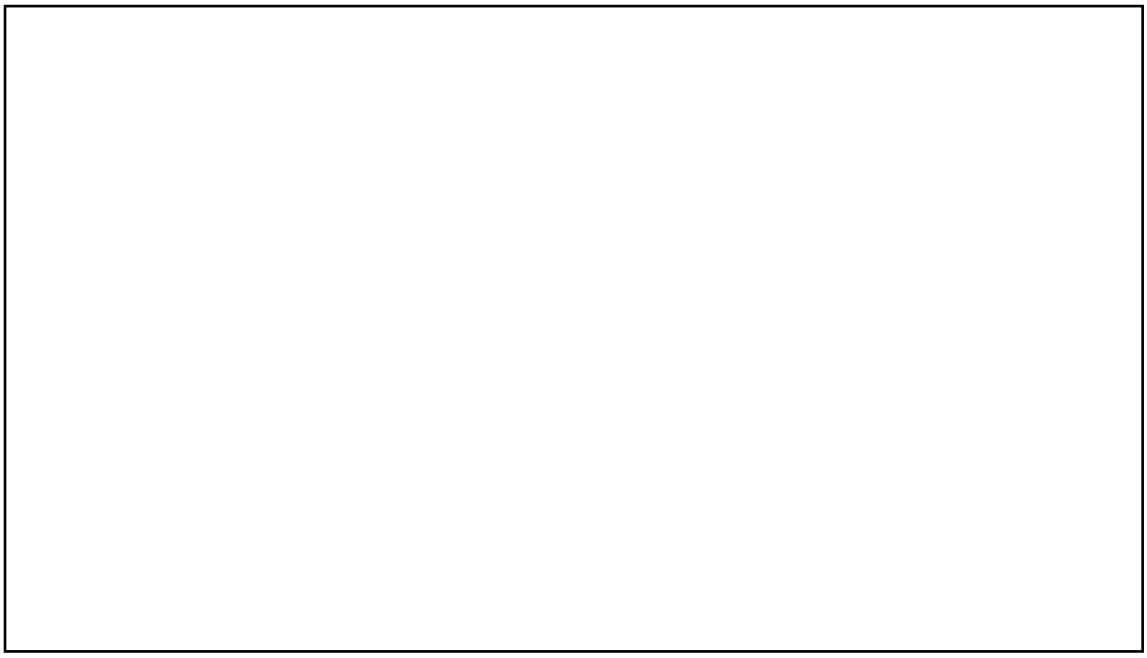

Figure 3.39. The Office of Charles and Ray Eames, printed souvenirs from the Character Recognition exhibit (Front features the date and *The New York Times* headline, back describes the computer process), 1964. Collection of the author.

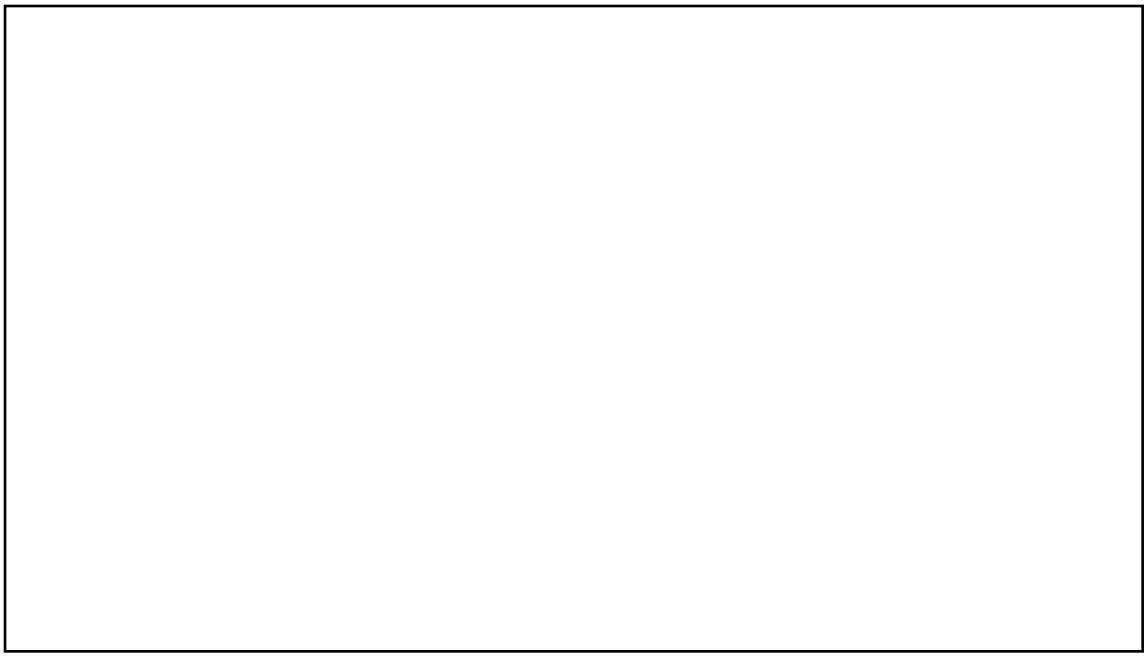

Figure 3.40. The Office of Charles and Ray Eames, printed souvenirs from the Character Recognition exhibit (Front features the date and *The New York Times* headline, back describes the computer process), 1964. Collection of the author.

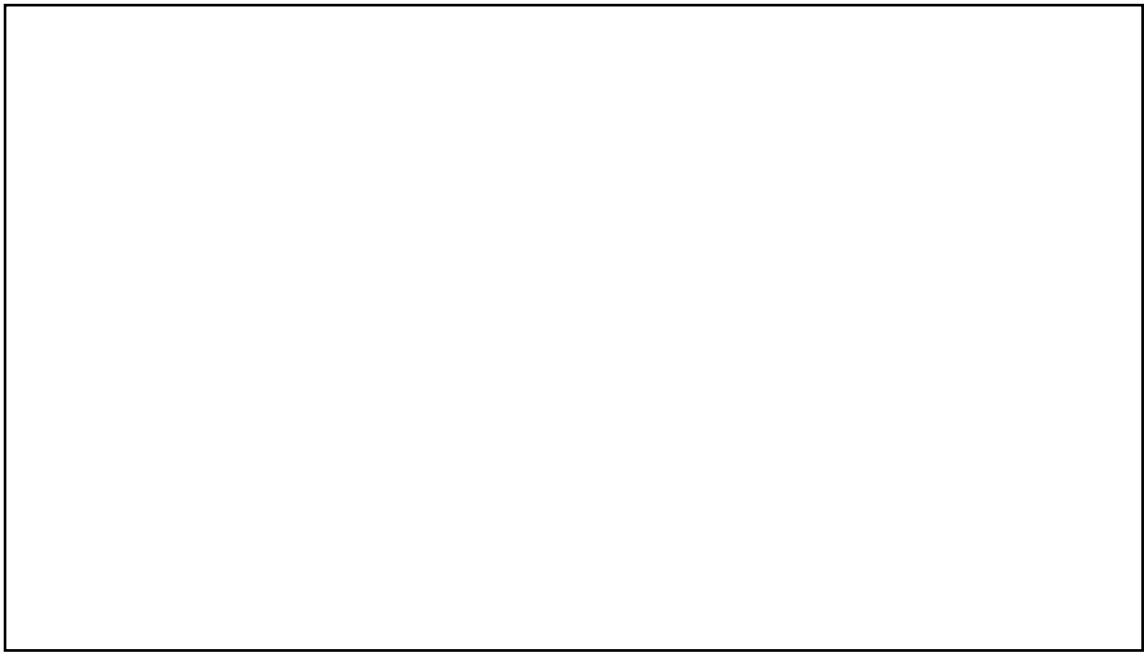

Figure 3.41. The Office of Charles and Ray Eames, view of the Little Theatres, originally printed in the IBM Pavilion Visitor's Guide, IBM Corporate Pavilion, New York World's Fair, 1964-65. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

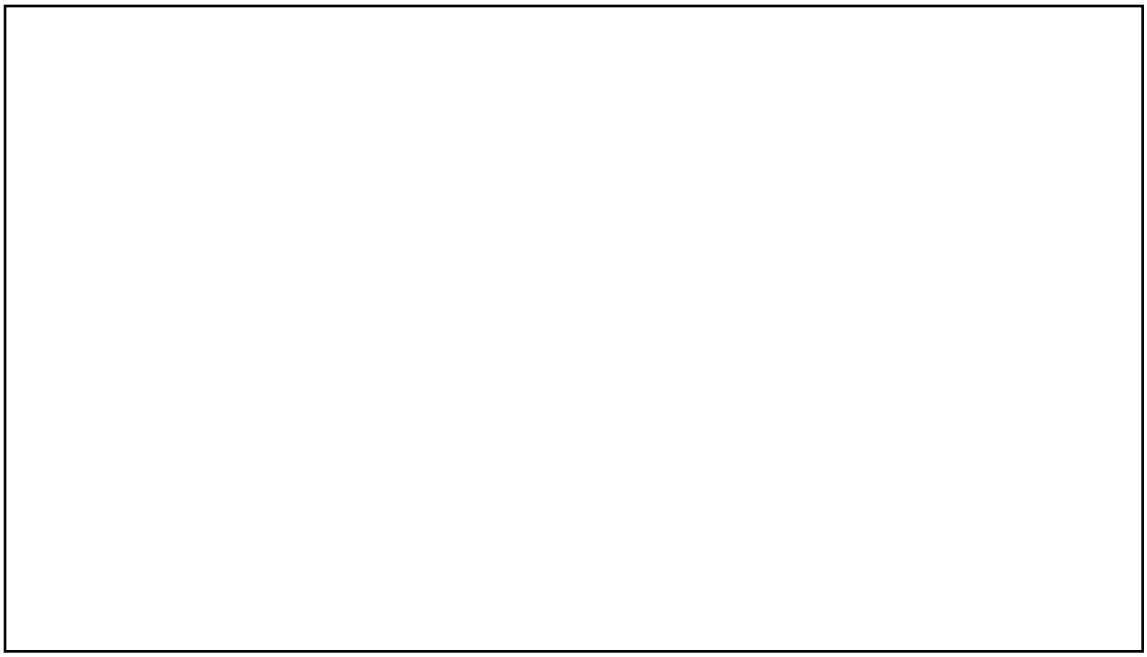

Figure 3.42. SOM Architects, IBM Headquarters, Armonk, New York, 1962-64. IBM Corporate Archives, Somers, New York.

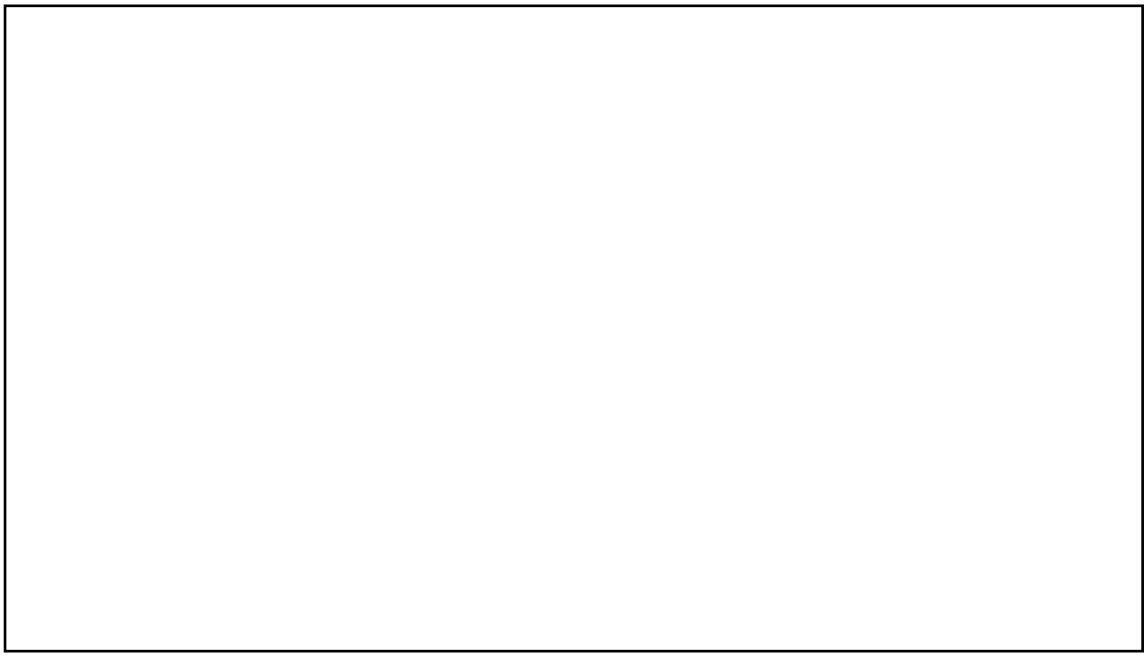

Figure 3.43. The Office of Charles and Ray Eames (Glen Flec, lead designer) and Roche-Dinterloo, project for an IBM Information Center, Armonk, New York, 1960-1970. Plan for final project, ca. 1969. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

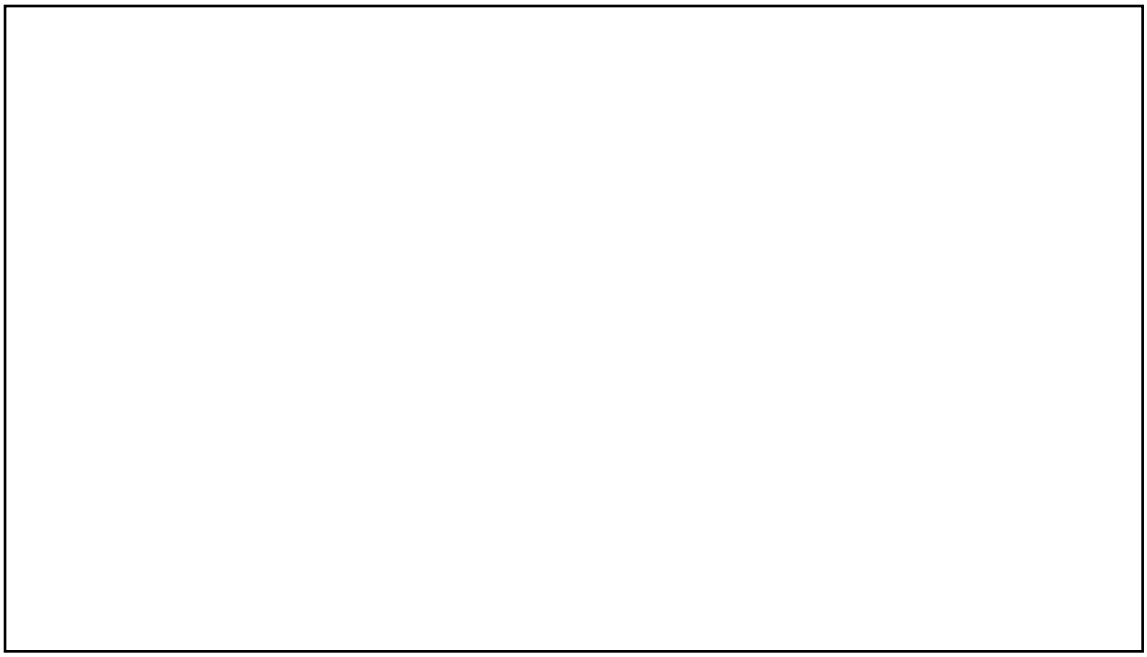

Figure 3.44. The Office of Charles and Ray Eames, *A Computer Perspective*, 1971. Sketch of the exhibition layout, ca. 1970. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

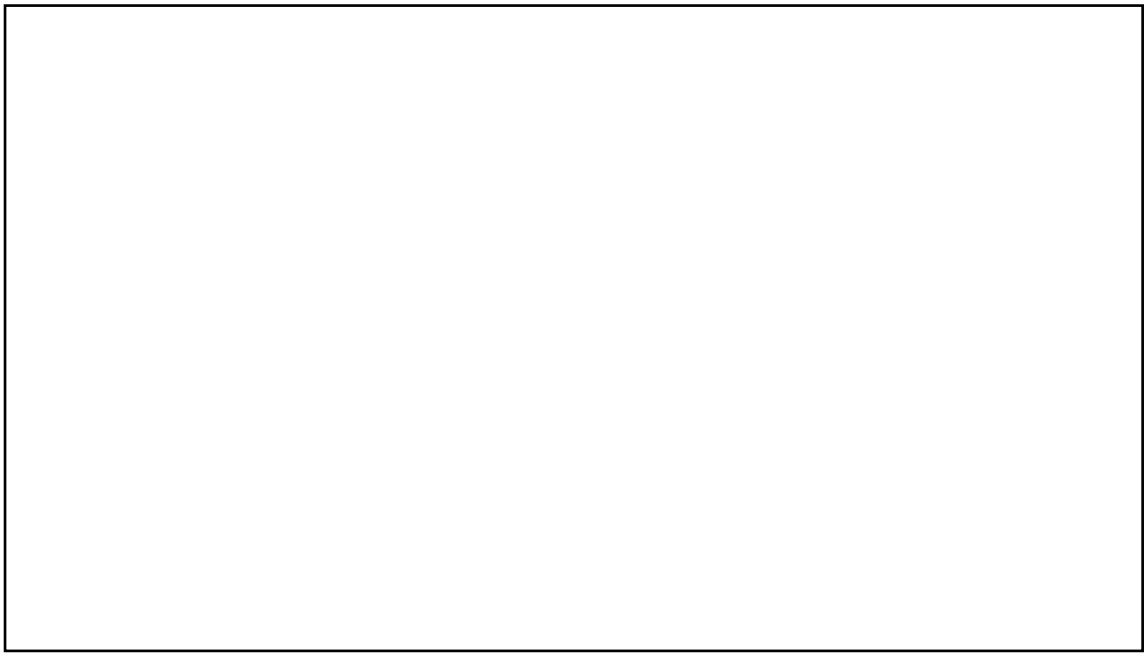

Figure 3.45. The Office of Charles and Ray Eames, “History Wall,” *A Computer Perspective,* 1971. View. © 2017 Eames Office, LLC (eamesoffice.com).

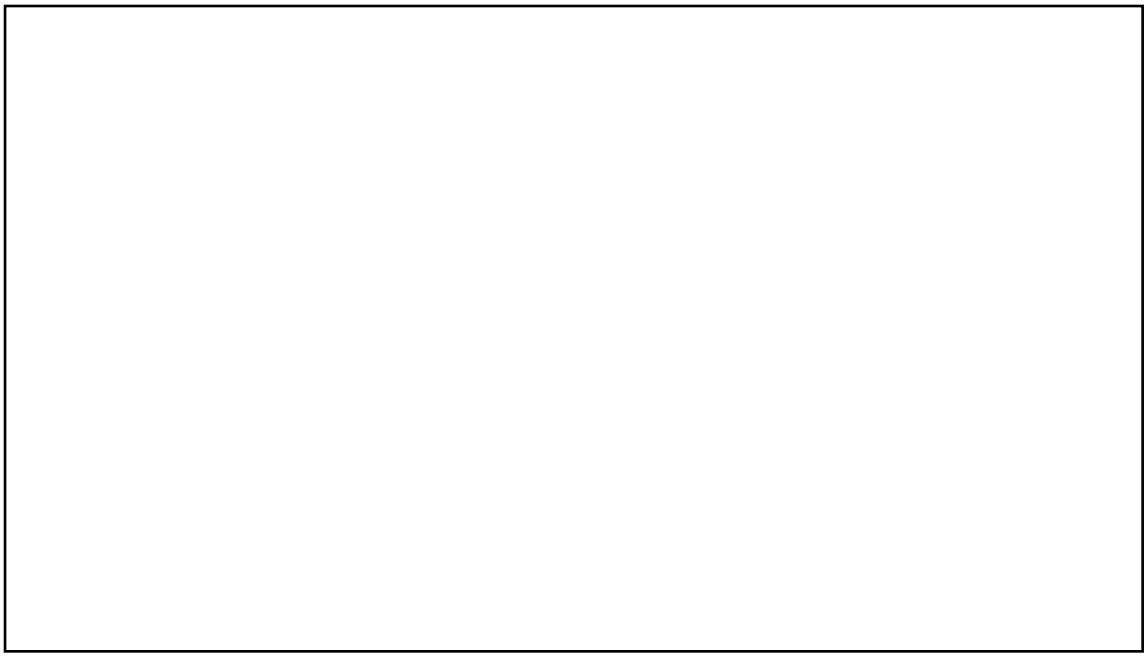

Figure 3.46. The Office of Charles and Ray Eames, “History Wall,” *A Computer Perspective,* 1971. View. © 2017 Eames Office, LLC (eamesoffice.com).

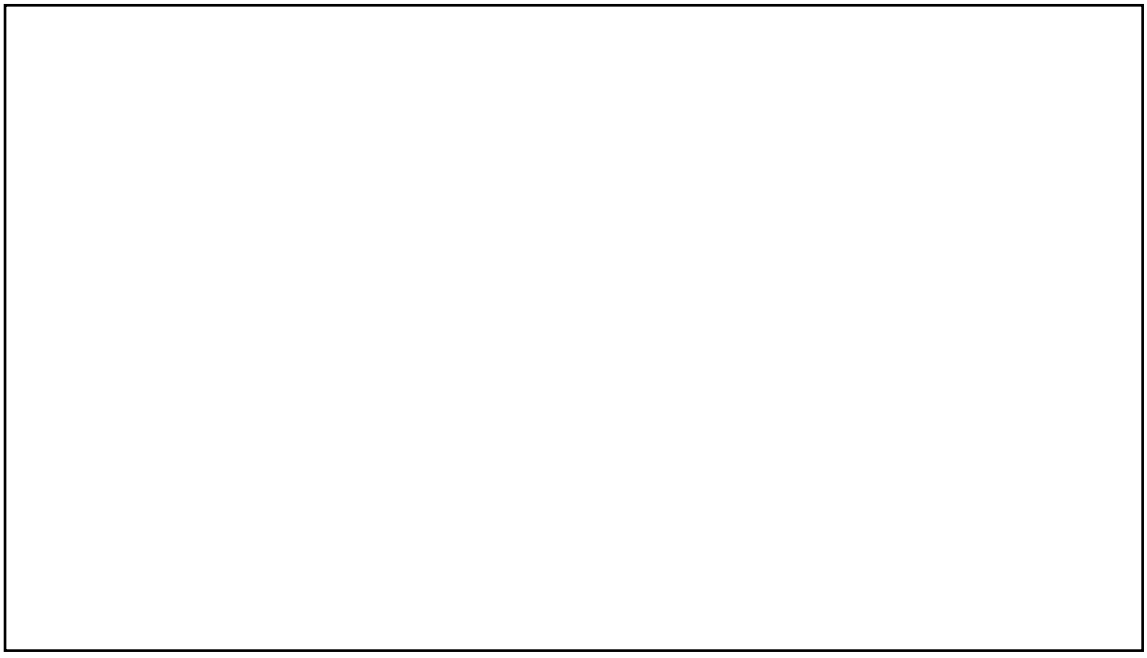

Figure 3.47. The Office of Charles and Ray Eames, “Communications Rack,” *A Computer Perspective,* 1971. View. © 2017 Eames Office, LLC (eamesoffice.com).

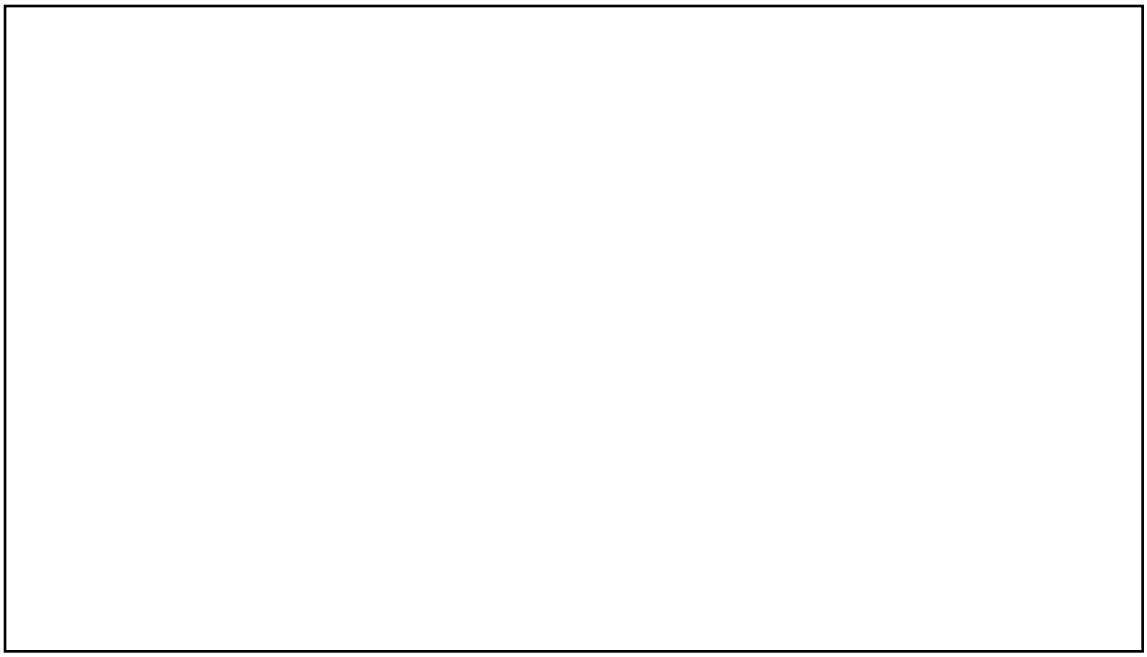

Figure 3.48. The Office of Charles and Ray Eames, “Twenty Questions Game,” *A Computer Perspective,* 1971. View. © 2017 Eames Office, LLC (eamesoffice.com).

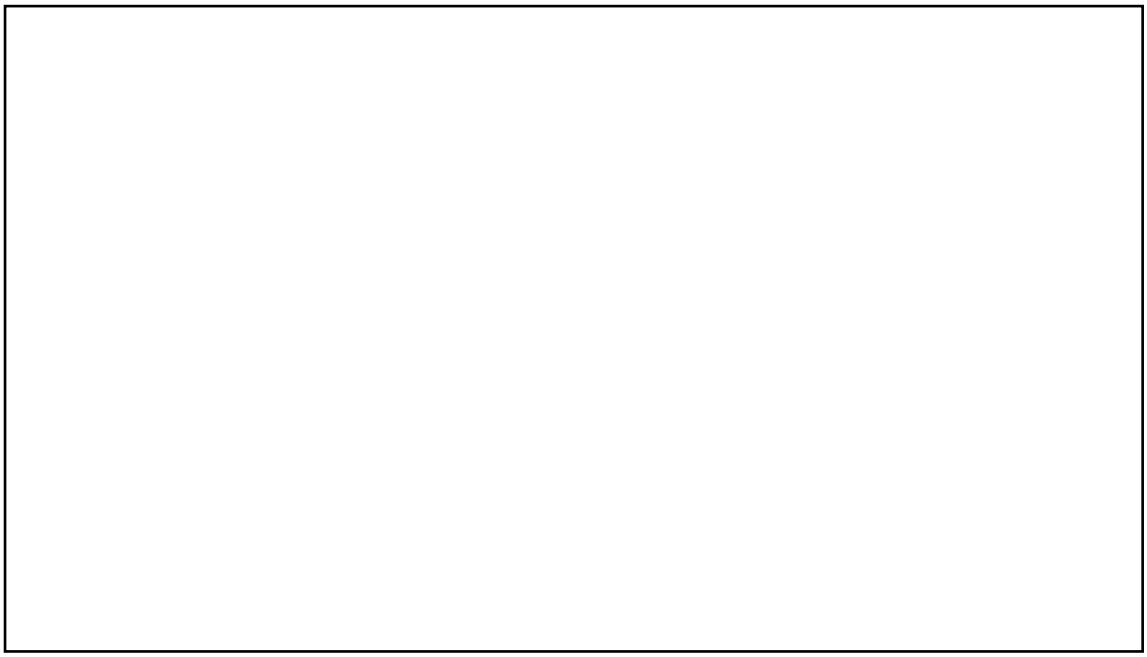

Figure 3.49. The Office of Charles and Ray Eames, “Twenty Questions Game,” *A Computer Perspective,* 1971. View. © 2017 Eames Office, LLC (eamesoffice.com).

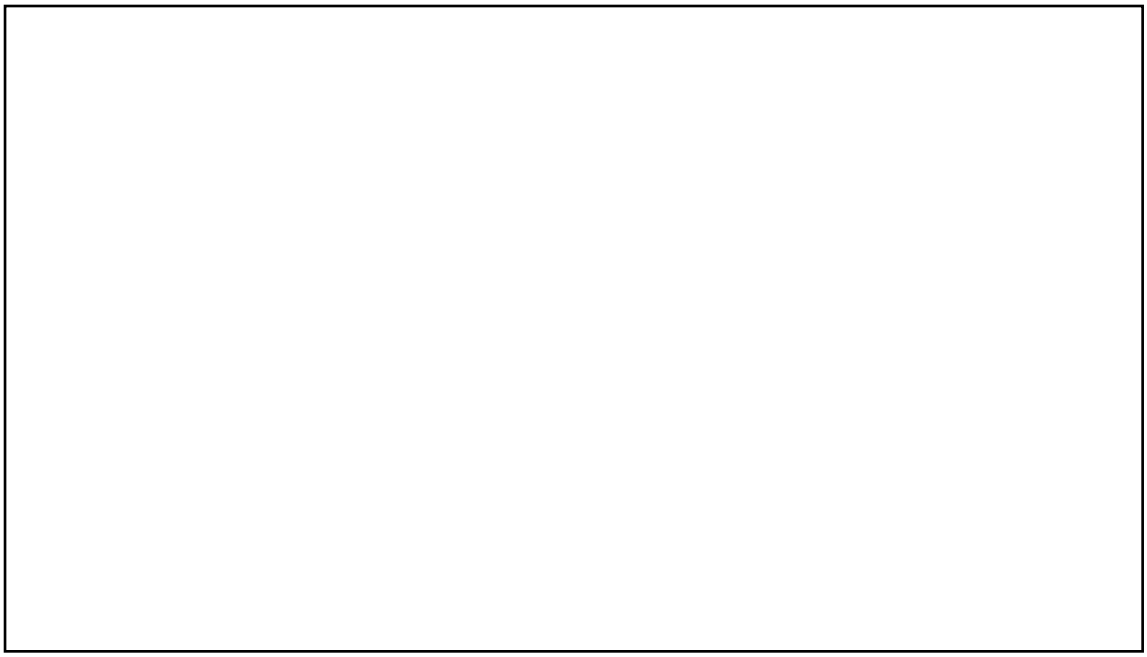

Figure 3.50. The Office of Charles and Ray*, Wallace J. Eckert: Celestial Mechanic,* IBM Corporate Exhibit Center, New York City, 1972. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

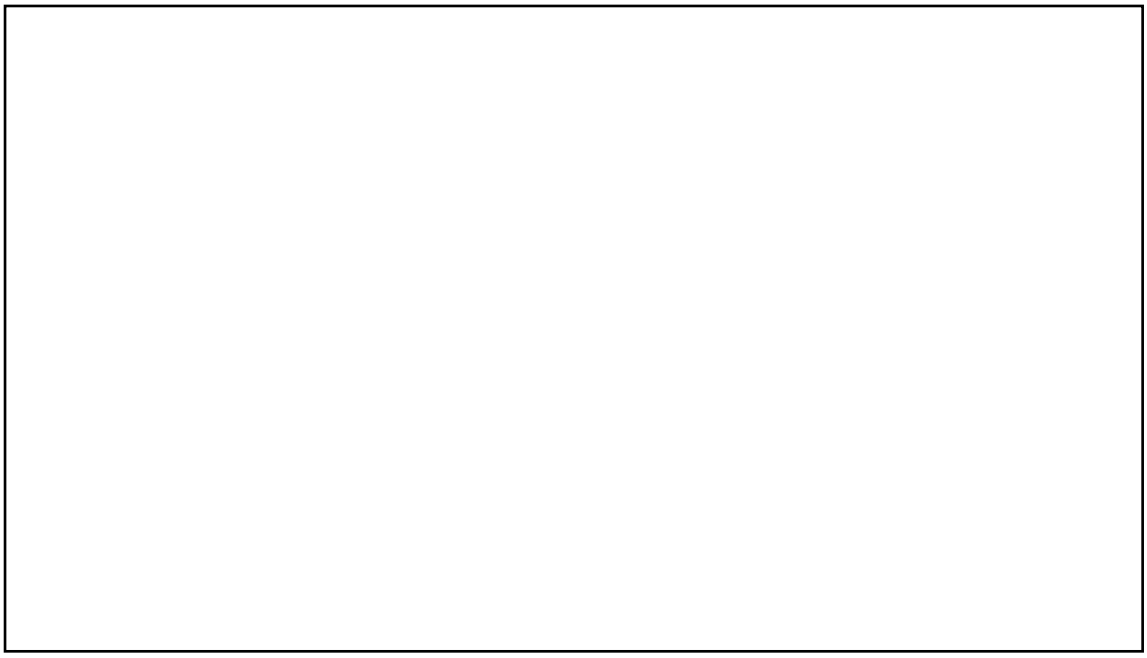

Figure 3.51. The Office of Charles and Ray Eames, *Copernicus,* IBM Corporate Exhibit Center, New York City, 1973. Installation view of *Newton* exhibition Christmas Display, 1973. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

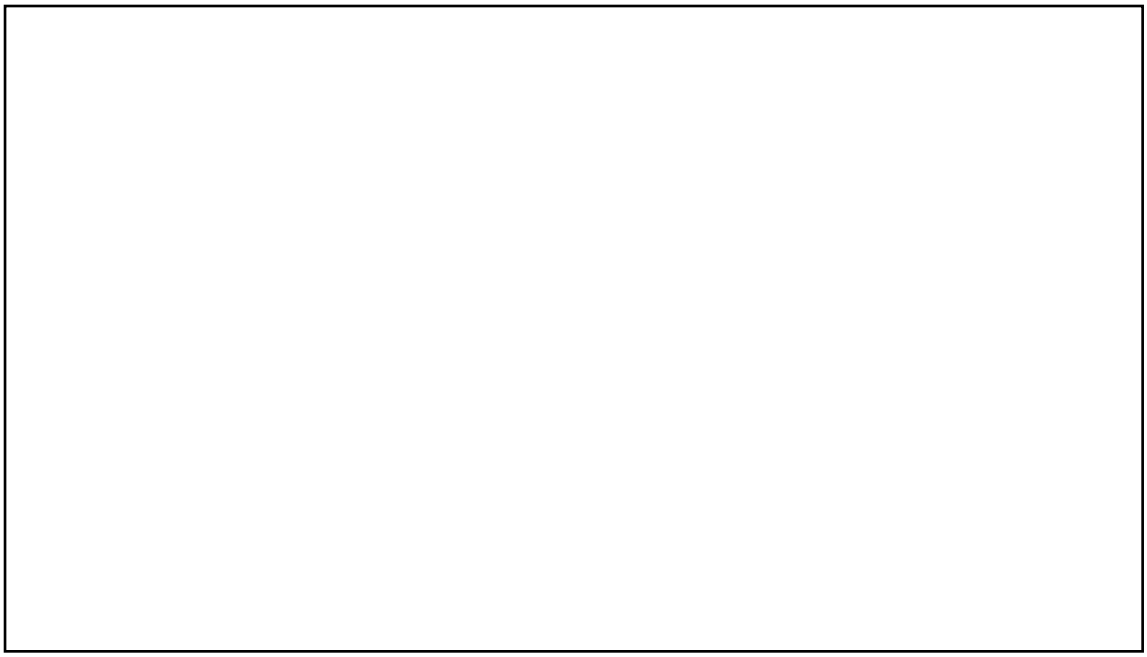

Figure 3.52. The Office of Charles and Ray Eames and Alexander Girard, “Christmas Window,” *Copernicus,* IBM Corporate Exhibit Center, New York City, 1973. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

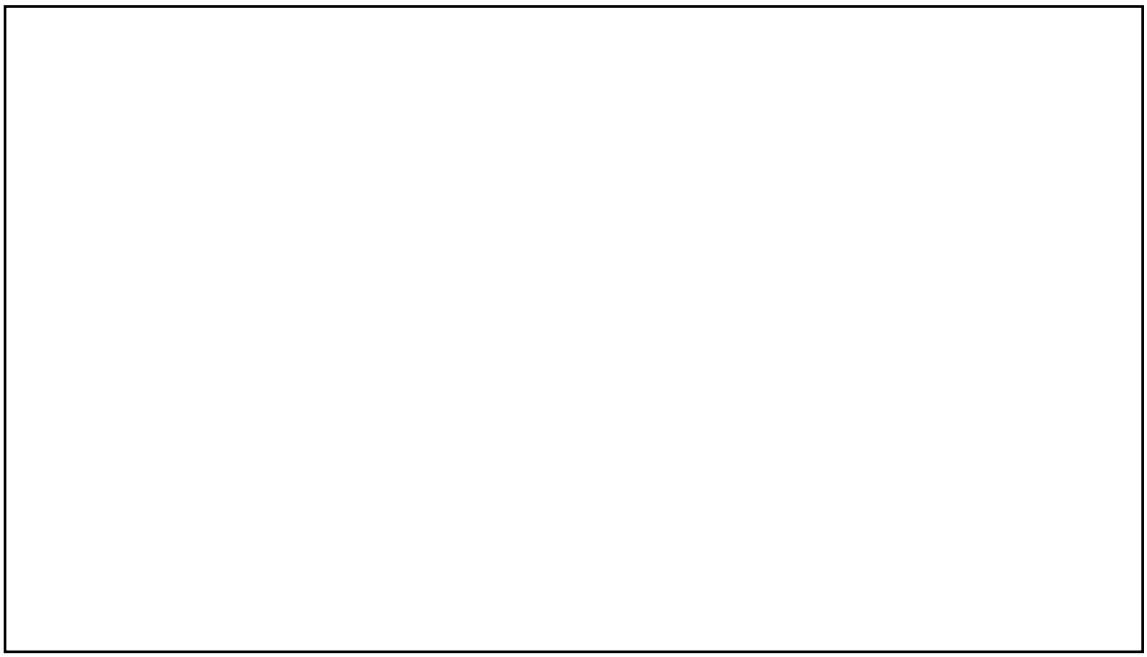

Figure 3.53. The Office of Charles and Ray Eames, *Isaac Newton: Physics for a Moving Earth,* IBM Corporate Exhibit Center, New York City, 1973. Installation view of *Newton* exhibition Christmas Display, 1974. Eames Collection, Prints & Photographs Division, Library of Congress, Washington D.C.

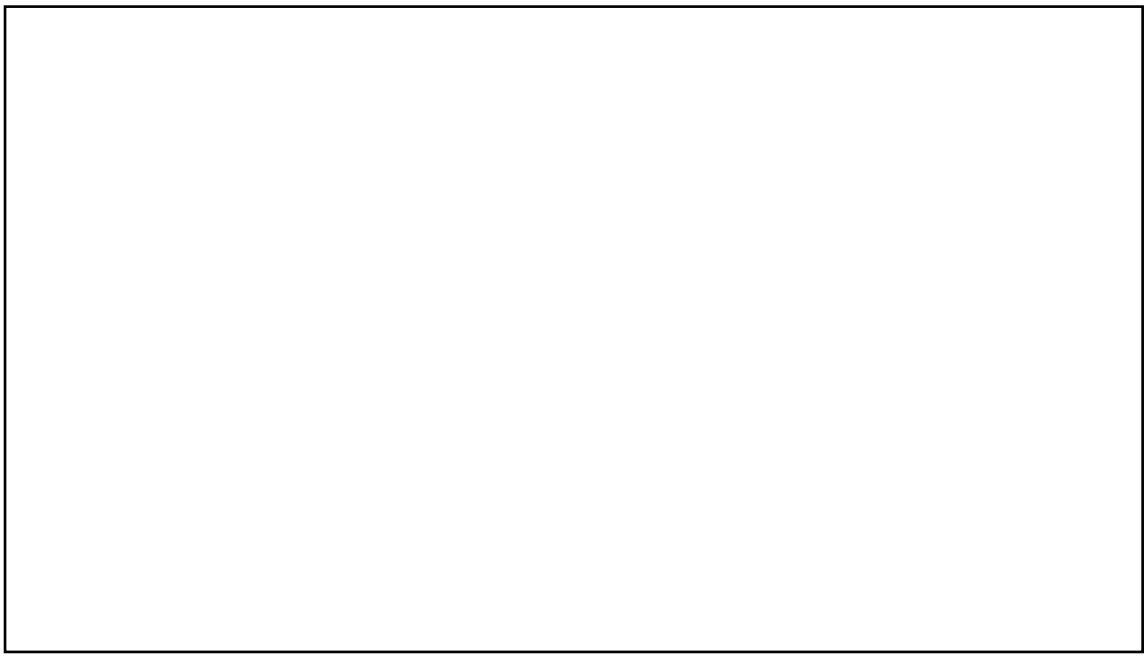

Figure 4.1. Hilton Kramer, “What Is This Stuff Doing at the Met?” *New York Times* (March 14, 1976). The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

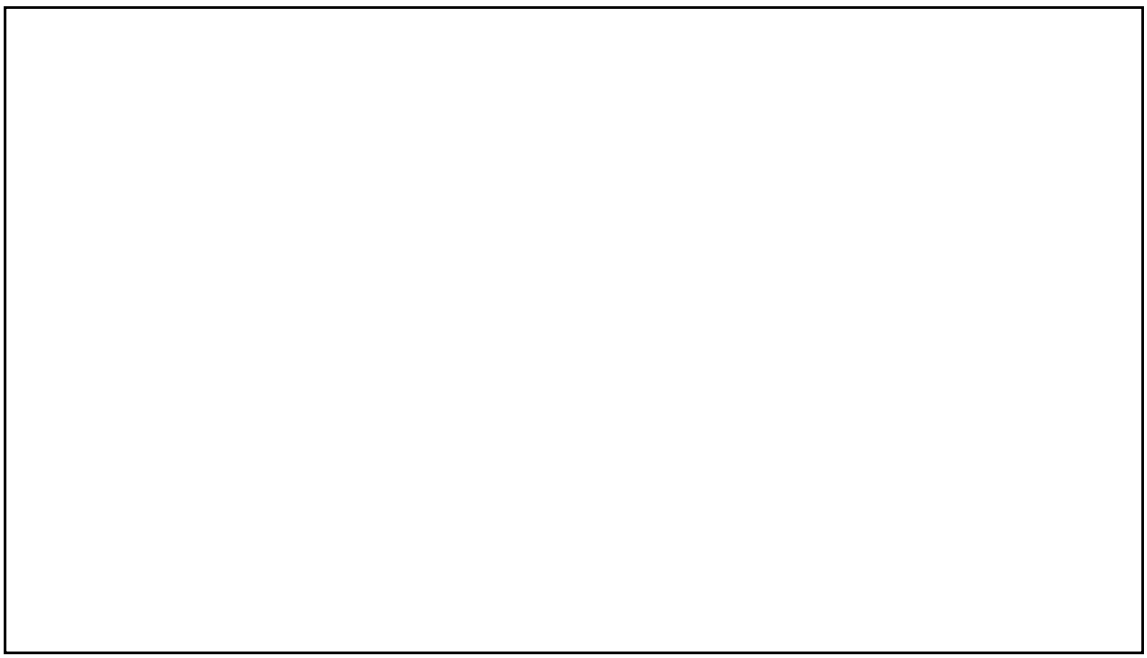

Figure 4.2. The Office of Charles and Ray Eames, IBM, the Met, and ARBA, exhibition contract defining financial commitments from each institution, The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

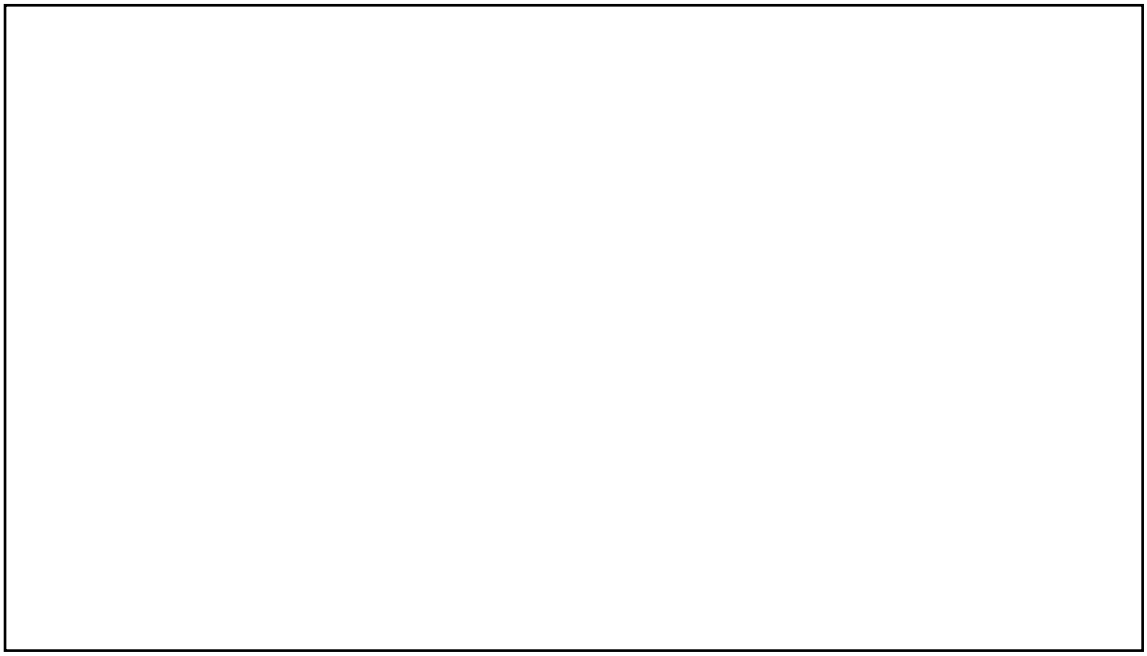

Figure 4.3. The Office of Charles and Ray Eames, “Friends and Acquaintances,” *The World of Franklin and Jefferson,* The Metropolitan Museum of Art, New York, 1976. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

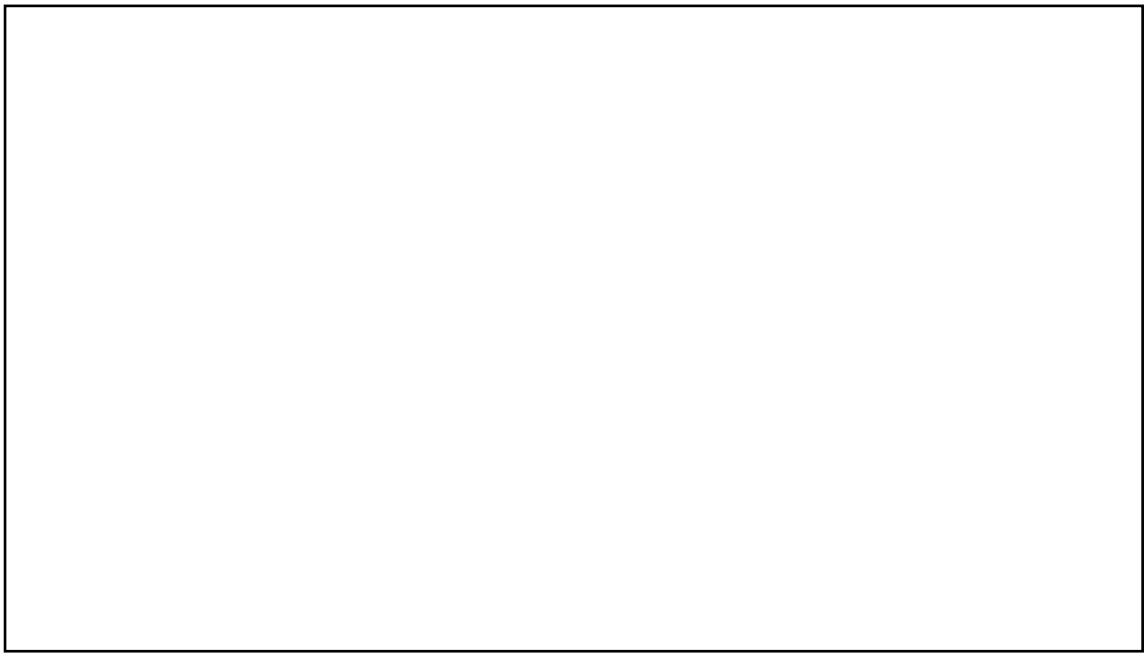

Figure 4.4. The Office of Charles and Ray Eames, “The Two Men: Contrast and Continuity,” *The World of Franklin and Jefferson,* Warsaw, Poland, 1975. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

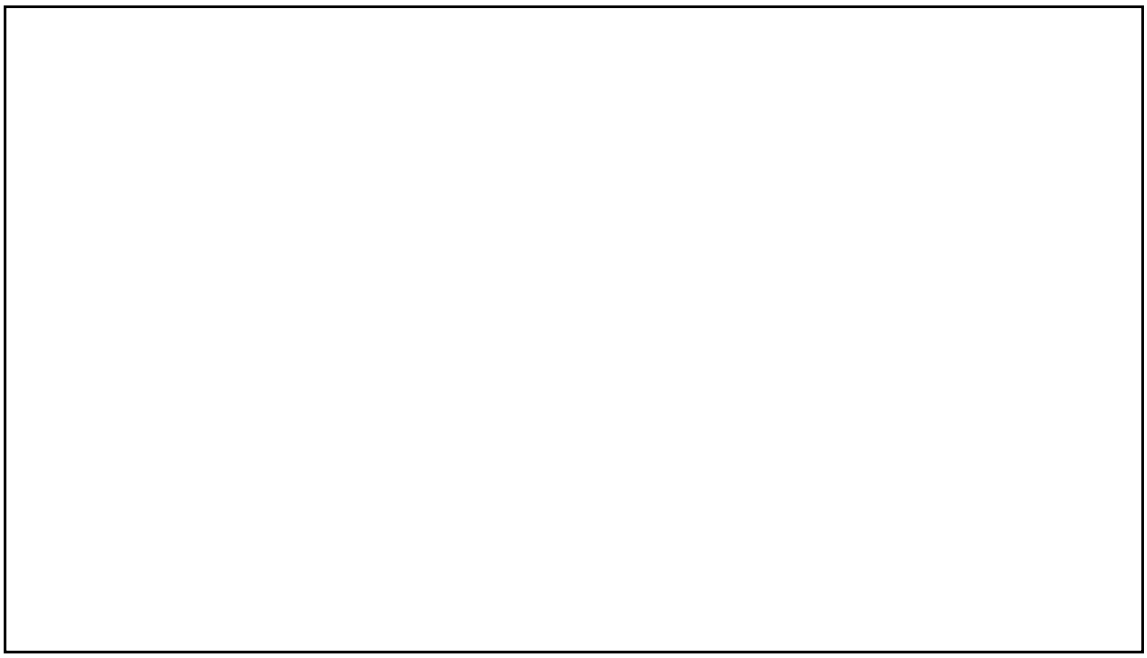

Figure 4.5. The Office of Charles and Ray Eames, “Three Documents,” *The World of Franklin and Jefferson,* British Museum, London, 1975. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

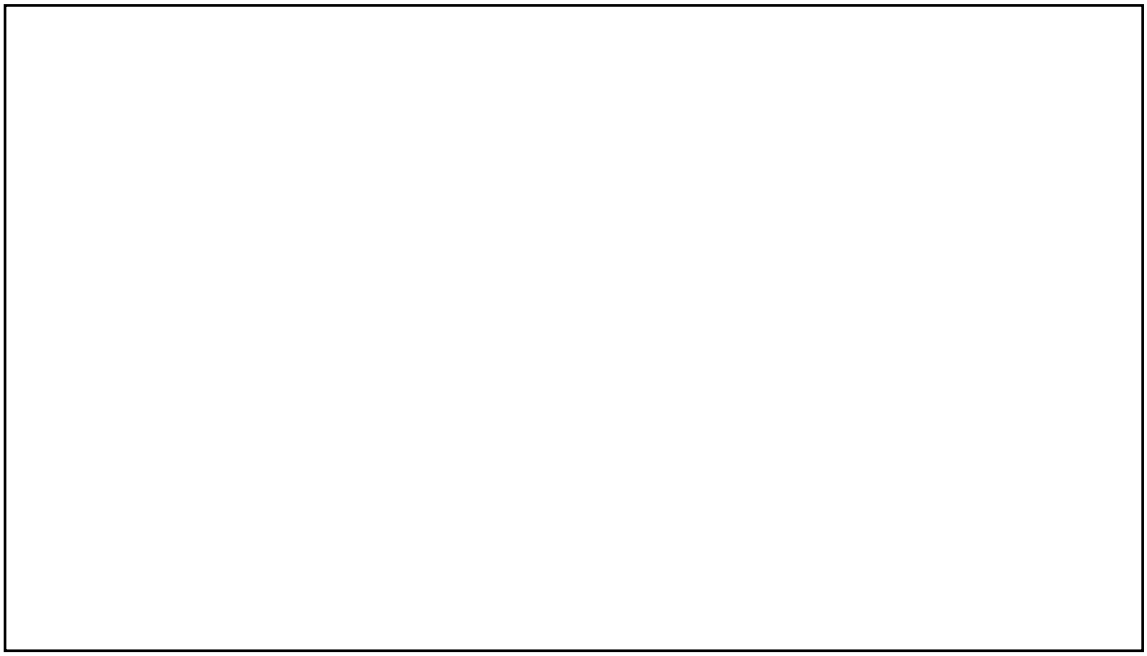

Figure 4.6. The Office of Charles and Ray Eames, “Jefferson and the West,” *The World of Franklin and Jefferson,* British Museum, London, 1975. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

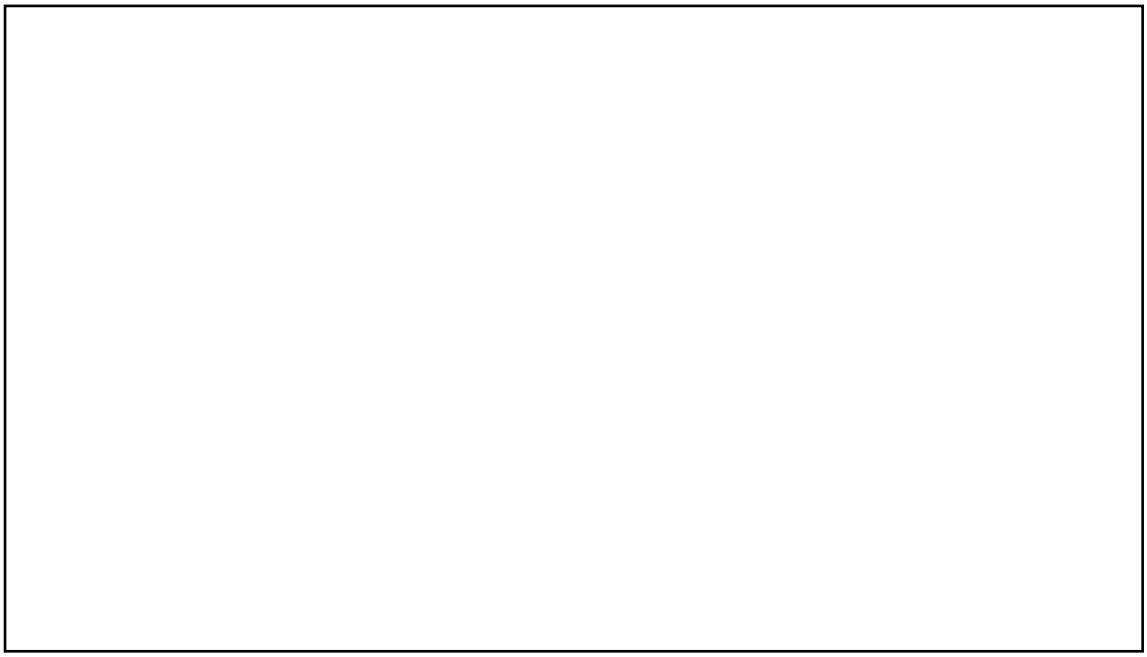

Figure 4.7. The Office of Charles and Ray Eames, “Jefferson and the West,” *The World of Franklin and Jefferson, The World of Franklin and Jefferson,* British Museum, London, 1975. The Work of Charles and Ray Eames, Manuscript Division, Library of Congress, Washington, D.C.

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VITA

Lorinda Roorda Bradley was born in Pella, Iowa and raised on her family's Century Farm in Leighton, Iowa. After graduating from Pella High School in 2009, she attended Creighton University in Omaha, Nebraska where she earned a Bachelor of Arts in Art History with a minor in Studio Art in May 2012, graduating summa cum laude. Immediately after graduation, Lorinda interned for the Bemis Center of Contemporary Art before moving to Missouri, where she completed a Master of Arts in Art History and Archaeology at the University of Missouri in 2014.

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As a regular conference participant during her graduate career, Lorinda chaired three sessions for the Southeastern College Art Conference and presented research at the Rothermere American Institute at the University of Oxford, the Smithsonian American Art Museum & Renwick Gallery, the Southeastern College Art Conference, and the Midwest Art History Society Annual Meeting. Lorinda has also served as a graduate curatorial research assistant; the Curator of Public Arts at the Missouri Student Unions; a graduate teaching assistant in the art history, art, and film studies programs; and a graduate instructor of record for three classes in art history.

Currently, Lorinda is an online instructor of art history at Marywood University in Scranton, Pennsylvania and works as the Director of the Montminy Gallery at the Boone County Historical Society in Columbia, Missouri.