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From Vision to Reality: Gyorgy Kepes and the Ethic of Collaboration

Juhayna Hilles

Gyorgy Kepes's vision of applying art to large-scale public projects culminated in the establishment of the Center for Advanced Visual Studies (CAVS) at the Massachusetts Institute of Technology (MIT) in 1967. Conceived as a laboratory for collaboration, CAVS united artists, scientists, architects, and engineers to foster interdisciplinary exchange and produce socially engaged art using emerging technologies. This article examines how collaboration functioned as a founding principle at CAVS and how artists adapted their practices within an institutional and often ethically charged environment. While the center attracted pioneering artists eager to experiment with new media and technology, collaboration also revealed tensions surrounding authorship, political responsibility, and the influence of military-funded research. Building on Kepes's lifelong inquiry into the relationship between art, science, and technology, this article argues that the theoretical tensions often attributed to the institutional context at MIT were, in fact, internal to his own theory of visual language, formulated before his arrival at the institute. Rather than treating collaboration as a compromise, Kepes conceived it as a constructive response to instrumentality and as an opportunity to reintroduce human values into systems of science and technology. Through key case studies, including the *Explorations* exhibition (1970), the political controversies surrounding the 1969 São Paulo Biennale, and later collaborative projects such as *Centerbeam* (1977), this article demonstrates how Kepes extended the Bauhaus legacy into the Cold War era. Ultimately, CAVS was not only an institutional experiment in art and technology but a laboratory for social imagination that sought to reconcile scientific progress with civic and aesthetic responsibility through the creative potential of collective work.

Keywords: Bauhaus, CAVS, collaboration, Gyorgy Kepes, MIT, new media, science, technology

On the 4th of April 1970, visitors to the *Explorations* exhibition at the National Collection of Fine Arts in Washington, D.C, were welcomed with the following introduction: 'You are about to join in a celebration of light, heat, cold, air, electricity, magnetism—forces so omnipresent in our environment that we forget to wonder at their power and beauty.'[1] During the experience that awaited them, the limits of their sensorial perception—visual, auditory, and tactile—would be put to the test.

Equipped with a two-page guide that identified each artwork and contained instructions for direct engagement, visitors stepped into a vibrant landscape of lumino-kinetic sculptures, stroboscopic lights, neon columns,

and cybernetic structures. In this interactive setting, they were transformed from passive observers to active participants.

This collaborative exhibition showcased the work of a group of artists from the Center for Advanced Visual Studies (CAVS) at the Massachusetts Institute of Technology (MIT), a program founded in 1967 by Gyorgy Kepes (1906—2001) as a laboratory for interdisciplinary artistic practices. Rooted in Kepes's long-standing commitment to integrating art, science, and technology, CAVS provided a framework for artists to collaborate with scientists and engineers, exploring new perceptual and environmental dimensions of science and technology.

What distinguished *Explorations* was not only the exhibition's engagement with technology but its curatorial strategy. Presented without wall labels, the exhibition immersed the audience in a purely sensorial experience, encouraging them to experience the exhibition as a cohesive whole, shifting focus from individual creation to collective expression. In this sense, *Explorations* was not merely an exhibition but a statement on the evolving role of the artist, one that privileged process over object, interaction over isolation, and collaboration over individualism.

The 1960s witnessed a rise in art and technology collaborations, and this intersection quickly became a key concern for the artistic, industrial, and institutional spheres of the time. Encouraged by museum institutions, industry sponsorship, and government support, artists increasingly engaged in novel art and technology initiatives. In 1966, the engineers Billy Klüver and Fred Waldhauer, alongside the artists Robert Rauschenberg and Robert Whitman, founded Experiments in Art and Technology (E.A.T.), fostering collaborations between artists and engineers. That same year, Maurice Tuchman launched the Art and Technology program at the Los Angeles County Museum of Art (LACMA), connecting artists with major corporations and research institutions in California like NASA, Bell Labs, IBM, and Lockheed Corporation.

Several factors set CAVS apart from other collaborative initiatives of its time. Situated within an academic institution, the center operated independently from the industrial and museal sectors, allowing its artists to pursue projects without external influence. Yet, its location at MIT, one of the most technologically and scientifically advanced power houses of military research, made Kepes's vision of channeling technology into socially engaged art and humanizing science appear, to many, as a paradox.

Recent studies on Gyorgy Kepes have turned toward the question of instrumentality, tracing how his work at MIT intersected with military and technological research. These issues have been explored from a range of disciplinary perspectives, including art history (Goodyear 2002; Finch 2005), architecture (Martin 2003), and science and engineering (Wisnioski 2013). This diversity reflects the wide reach and complexity of Kepes's theory, which challenged disciplinary boundaries.

Much of this work contextualizes CAVS as an initiative exploited by MIT to humanize its institutional image, a project inevitably entangled with ethical concerns within the Cold War's military-industrial complex. John

R. Blakinger (2016a) approached the question of instrumentality with care, seeking to avoid a reductive or binary framing of Kepes's relationship to science and technology. His study offers an insightful account of Kepes's interactions at MIT and the institute's ties to military research amid the ethical dilemmas of the Atomic Age.

These studies have approached this apparent paradox between Kepes's humanist ideals and MIT's technoscientific orientation as an external prolem arising from the institute's exploitation of their collaboration. I argue that this issue is in fact internal to his own theory of visual language. Understanding instrumentality as an inherent aspect of Kepes's thought, rather than a condition imposed from the outside, repositions his practice within a broader theoretical continuity. This shift allows for a reconsideration of Kepes's work as a coherent intellectual project, engaged in an evolving dialogue with the scientific and technological paradigms that defined the mid-twentieth century.

While building upon earlier scholarship, my article takes a different approach. I argue that that an awareness of the potential instrumentalization of the visual arts was central to his theoretical framework from the outset. His seminal book, *Language of Vision* (Kepes 1944), written as a pedagogical manual for visual artists, is fundamentally concerned with art as a tool of orientation.

Since instrumentality was an internal theoretical concern, I contend that Kepes conceived collaboration as a solution rather than an ethical dilemma. Collaboration not only opened the possibility of transforming systems from within but also created conditions for transparency and collective action. This perspective also enables a more nuanced reading of what some of Kepes's contemporaries regarded as naïve or opportunistic collaborations with science and technology.

The article proceeds in three parts. The first examines the theoretical foundations of Kepes's concept of visual language, showing how these ideas informed the establishment of CAVS. The second analyzes *Explorations* as a practical realization of these principles and as a case study in the possibilities and limits of artistic collaboration within an institutional environment. The third addresses the ethical tensions that emerged from Kepes's engagement with science and institutional structures, concluding with the broader legacy of his collaborative model at MIT.

The Founding of CAVS: Collaboration with Science and Technology

The concept for CAVS arose from Kepes's conviction that artists play a fundamental role in shaping both the visual and non-visual world. He envisioned art as a unifying force, one that could connect society with the rapid technological and scientific advancements of its time, offering individuals a means to reclaim agency over their evolving environment. For Kepes, the challenge of the modern era was not merely technological but perceptual, requiring new ways of seeing, interpreting, and shaping the world.

This emphasis on the artist as an agent of visual literacy was first articulated in Kepes's seminal 1944 book *Language of Vision*, where he argued that the modern world is shaped by a network of visual communications. To engage with this new reality effectively, artists needed to embrace emerging technologies and develop a new visual language, one capable of expressing the profound transformations brought about by scientific advancements. The book applied principles of visual fundamentals to painting, photography, and advertising design. It extended this consideration to the whole environment of the city, including its architecture and urban design, or what Márton Orosz (2024) aptly described as a consideration of the city's 'optical topology' (p. 200—4). Grounded in Gestalt theory, Kepes sought to reform visual experience in its totality, aiming to reshape how individuals perceived and organized their visual environment.

In a continuation of this vision, when Kepes joined the School of Architecture and Planning at MIT as an associate professor in 1946, his focus shifted toward large-scale collaborative public art projects that extended beyond traditional mediums. This transition laid the foundation for the establishment of CAVS, whose primary mission was to foster collaboration among artists, engineers, and scientists. Conceived as an experimental laboratory, the center would serve as a converging point for artists, architects, scientists, and engineers—those collectively shaping the landscape of the modern city. The artists would engage with the scientific and technological expertise of the academic institution, allowing them to work with cutting-edge knowledge and technology. The outcome of these collaborations would be a socially engaged artistic practice that leveraged the most advanced tools to address contemporary concerns.[2]

This model of collaboration closely mirrors László Moholy-Nagy's (1946: 358) concept of the 'Parliament of Social Design.' Moholy-Nagy envisioned a utopian workspace where experts from diverse fields would coordinate their efforts toward shared sociological and environmental objectives. Kepes, who had worked alongside Moholy-Nagy at the New Bauhaus in Chicago, saw CAVS as a continuation of that lineage (Davis 1968: 40). For Kepes, however, the significance of CAVS lay not in the technological novelty alone but in its capacity to generate new epistemological frameworks. While many contemporary art and technology initiatives focused on the integration of new materials and industrial processes, Kepes was concerned with the broader implications of perception, visual communication, and environmental design. His vision for CAVS aimed to redefine how knowledge itself was produced and organized across artistic, scientific, and civic spheres.

Amid the politically turbulent 1960s, Kepes's initiative to foster collaboration between art and technology resonated with MIT's broader institutional goals. At a time of significant social and scientific transformation, the center provided a platform for interdisciplinary engagement, reinforcing the university's growing emphasis on humanizing technological innovation and scientific research (Burnham 1980). Kepes's project received strong support from MIT's leadership, particularly Julius Stratton, the then-president of MIT

(Wisnioski 2013:103), and James R. Killian, a former MIT president and a highly influential political figure who played a key role in shaping U.S. science policy.[3] By 1965, Kepes had begun reaching out to accomplished artists and scientists who shared the center's commitment to interdisciplinarity. His objective was to build a collaborative network that would later define CAVS. Rather than simply fostering experimental art, Kepes sought established artists who were eager to engage with cutting-edge scientific and technological research, and whose practice could extend to an environmental scale, integrating art into public and urban spaces.[4] Following a selection process, seven artists were chosen for the center's inaugural year: Otto Piene, Harold Tovish, Vassilakis Takis, Wen-Ying Tsai, Jack Burnham, Ted Kraynik, and Stan VanDerBeek.[5]

While collaboration among artists was a well-established practice, partnerships with scientists within a technological institution such as MIT represented uncharted territory. For artists, one of the central concerns was the ethical implications of working with military-funded research in science and technology, as well as the question of individual authorship within a collective framework. Scientists, on the other hand, were often reluctant to see their theories loosely interpreted or repurposed within artistic contexts. These tensions between artistic autonomy and scientific rigor, between experimental openness and institutional constraints, ultimately shaped the nature of collaboration at CAVS, underscoring both its radical potential and its inherent limitations.

The first exhibition that Kepes organized at MIT foreshadowed many of the theoretical concerns that would later define CAVS. In 1951, the Hayden Gallery at MIT held an exhibition titled *The New Landscape* (Fig. 1). Organized and installed by Kepes and Thomas McNulty, the exhibition featured an arrangement of scientific images and abstract artworks which revealed what Kepes (1956) described as the 'images of a new world' (p. 19). As its title suggests, the exhibition explored the evolving visual landscape shaped by advances in technology and science. Featuring macro- and microphotography of trees, plants, bacteria, insects, and various natural and industrial materials, the exhibition emphasized the intersection of organic and technological worlds. Despite their diverse origins, these images shared a common trait: they revealed structural order and visual patterns inherent in natural phenomena, made visible through technological tools.

These photographs were presented without any identifying wall labels. While this practice was not entirely novel, as Elisabeth Finch (2005:189) notes, with precedents such as Moholy-Nagy's 1929 *film und foto* exhibition, in this instance, omission was intended to create a seamless visual transition, effectively elevating laboratory-generated images to the status of artworks.

In 1956, a few years after the exhibition, Kepes compiled these images in a book titled *The New Landscape in Art and Science*. Despite its critical success, the book encountered resistance from both scientists and art critics, many of whom were skeptical of the parallels drawn between artworks and scientific images. Scientists were often reluctant to see their empirical data aestheticized or reinterpreted, while art critics questioned whether scientific

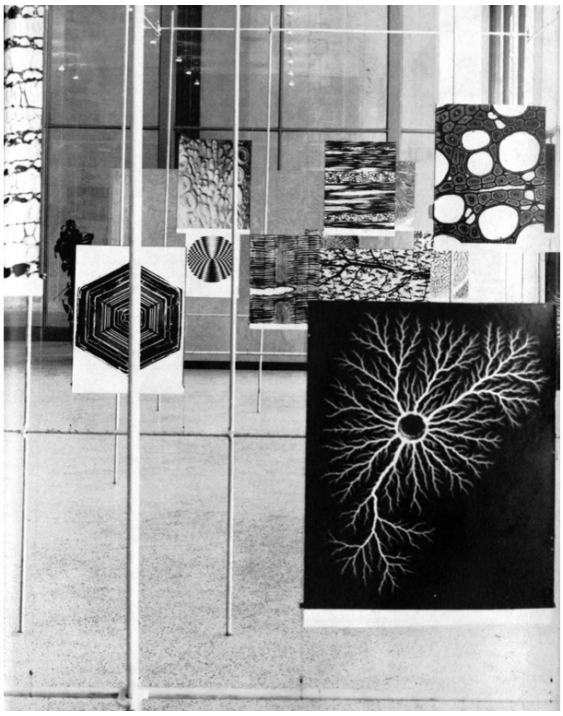

Figure 1. Installation view of *The New Landscape* exhibition, 1951, Hayden Gallery, MIT. Reproduced from *The New Landscape in Art and Science*, 1956, Paul Theobald, Chicago. © The Estate of Gyorgy Kepes.

imagery could be considered art in any traditional sense (Moholy-Nagy S: 1956). These tensions prefigured the larger debates that would emerge at CAVS, where artists and scientists grappled with the practical and conceptual challenges of interdisciplinary collaboration.

To ensure the centrality of collaboration and interdisciplinary exchange, Kepes established some guiding principles for CAVS. The center was a structured artist-in-residence program, annually welcoming six to eight established artists from various disciplines whose work aligned with its mission. In addition to developing their own individual projects, these artists were expected to participate in CAVS's collaborative initiatives, ensuring their work contributed to broader research efforts. They were also encouraged to engage in open dialogue with MIT specialists by participating in seminars, conferences, and discussions intended to deepen interdisciplinary discourse.

To maintain a constant influx of new perspectives, Kepes deliberately limited residencies to a maximum of two years, ensuring an ongoing exchange between different generations of artists.[6] This rotation prevented intellectual stagnation and fostered a dynamic in which each cohort could build upon the research and creative experiments of their predecessors. Through these principles, Kepes envisioned CAVS as an 'educational unit pioneering in visual education,'[7] where artistic innovation and interdisciplinary collaboration would drive new approached to art and technology.

Explorations: The First Collective Exhibition

During its existence from 1967 to 2009, CAVS produced numerous exhibitions, all characterized by their emphasis on kinetic art, interactive environments, and the use light as a plastic medium.[8] Most projects also defied traditional museum norms by incorporating new experimental technologies, immersive formats, and large-scale environmental interventions. The center's early years were marked by experimental proposals, many of which remained at the conceptual stage and were never fully realized.

The first group exhibition produced by CAVS was *Explorations*. Initially conceived for the 1969 São Paulo Biennale, it was first presented at MIT's Hayden Gallery from the 28th of February 28 to the 29th of March 1970, before traveling to the National Collection of Fine Arts in Washington, D.C., where it was on view from the 4th of April to the 10th of May 1970. In *Explorations* (Fig. 2–3), Kepes redefined the relationship between the viewer and the artwork, encouraging direct interaction through touch and movement. The exhibition layout, provided in a brochure handed out to visitors, contained specific instructions on how visitors could engage with the artworks—whether by walking on them, touching, looking up, clapping, or whistling.

Figure 2. Installation view of *Explorations* exhibition, Hayden Gallery, MIT, 1970. © Massachusetts Institute of Technology and the Estate of Gyorgy Kepes, courtesy of the CAVS Special Collection, MIT Libraries.

Figure 3.
Installation view of *Explorations* exhibition, Hayden Gallery, MIT, 1970. © Massachusetts Institute of Technology and the Estate of Gyorgy Kepes, courtesy of the CAVS Special Collection, MIT Libraries.

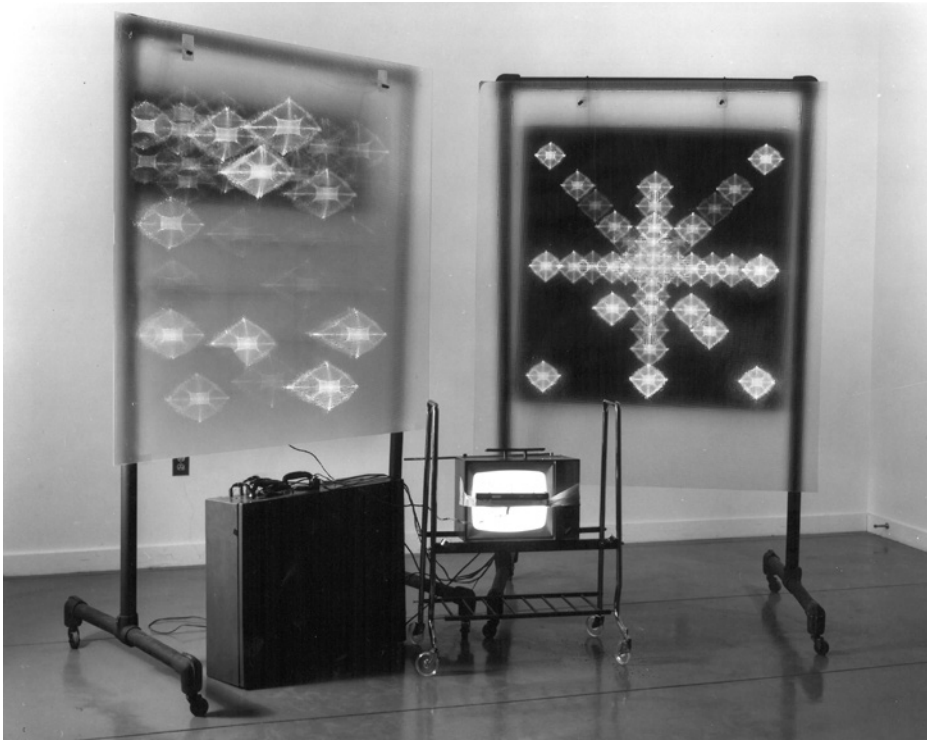

Figure 4.
Ted Kraynick, *Video Luminar Light Mural*, 1968. © Massachusetts Institute of Technology, courtesy of the CAVS Special Collection, MIT Libraries.

Figure 5. Wen-Ying Tsai, *Cybernetic Sculpture System*, 1969. © Massachusetts Institute of Technology, courtesy of the CAVS Special Collection, MIT Libraries.

Figure 6. Gyorgy Kepes and William Wainwright, *Photoelastic Walk*, 1970. © Massachusetts Institute of Technology and the Estate of Gyorgy Kepes, courtesy of the CAVS Special Collection, MIT Libraries.

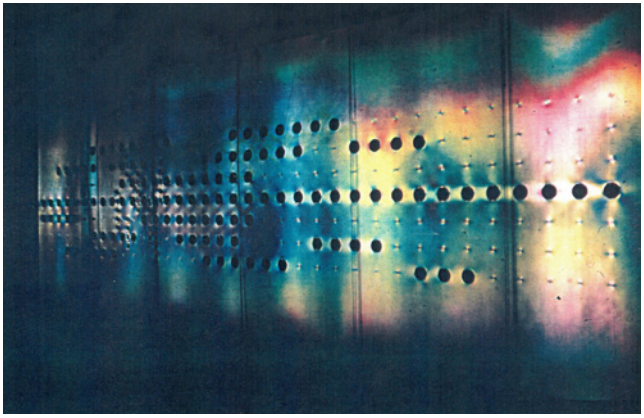

Figure 7. Gyorgy Kepes and William Wainwright, *Photoelastic Walk*, 1969. © Massachusetts Institute of Technology and the Estate of Gyorgy Kepes, courtesy of the CAVS Special Collection, MIT Libraries.

This structured interaction challenged the conventions of passive spectatorship, positioning the visitor as an active participant in the creative process. In *Video Luminar Light Mural* by Ted Kraynik (Fig. 4), the audience could manipulate the images displayed on a television, electronic sensors then transformed those image patterns into dynamic abstract light patterns projected onto a screen. Nearby in the exhibition, Wen-Ying Tsai's *Cybernetic Sculpture System* (Fig. 5) converted sound into visual patterns. Stroboscopic light, projected onto the sculpture's vibrating steel rods, was programmed to pulse in sync with the rhythm of sound produced by spectators.

Positioned at the center of the room, Kepes's interactive installation invited visitors to walk across the artwork and actively produce dynamic visual effects. In collaboration with architect and engineer William Wainwright, Kepes designed *Photoelastic Walk* (Fig. 6–7), where polarized screens embedded in the floor generated colorful reflections underfoot. As participants moved, shifting patterns of light and color emerged, transforming the floor into a responsive kinetic surface that reacted to bodily movement.

To heighten sensory immersion, the gallery walls were painted entirely black, eliminating all visual distractions and creating a space where the artworks became the sole focal points. Further reinforcing this effect, Kepes removed all labels and captions from the walls, transforming the exhibition into a collective experience. This curatorial choice emphasized interaction, encouraging viewers to engage with the works through perception and experience. The integration of the spectator into the creative process, a central theme of *Explorations*, extended beyond the artworks into its accompanying public events program, which featured concerts, poetry readings, film screenings, and performances, designed to engage.

Participation also extended beyond the museum walls. In the *Sky Event*, organized by Charles Frazier, Otto Piene, and Vera Simons, spectators played an active role in transforming the urban landscape by launching helium-filled sculptures into the sky.[9] These inflatable forms, floating above the city, turned the sky itself into a dynamic and participatory artwork, reinforcing the exhibition's broader goal of dissolving the boundaries between artist, audience, and environment.

Like many art and technology exhibitions of the 1960s and 1970s, *Explorations* encountered significant challenges, receiving both praise and sharp criticism from the press. Technical difficulties, a recurring issue in cybernetic and technological art projects of the time, affected its execution. Among its harshest critics were Lawrence Alloway and Grace Glueck. Alloway (1970) dismissed the exhibition as a naïve technological fantasy, arguing that its final presentation bore more resemblance to horror and science-fiction films than to a genuine reconciliation between art and technology. Similarly, Glueck (1970) criticized the exhibition for failing to deliver on its promise of a fully interactive environment, highlighting the gap between its ambitious vision and its execution.

Even Kepes himself acknowledged the exhibition's shortcomings. In a letter to Ida Rubin, he admitted that the exhibition's fundamental intention

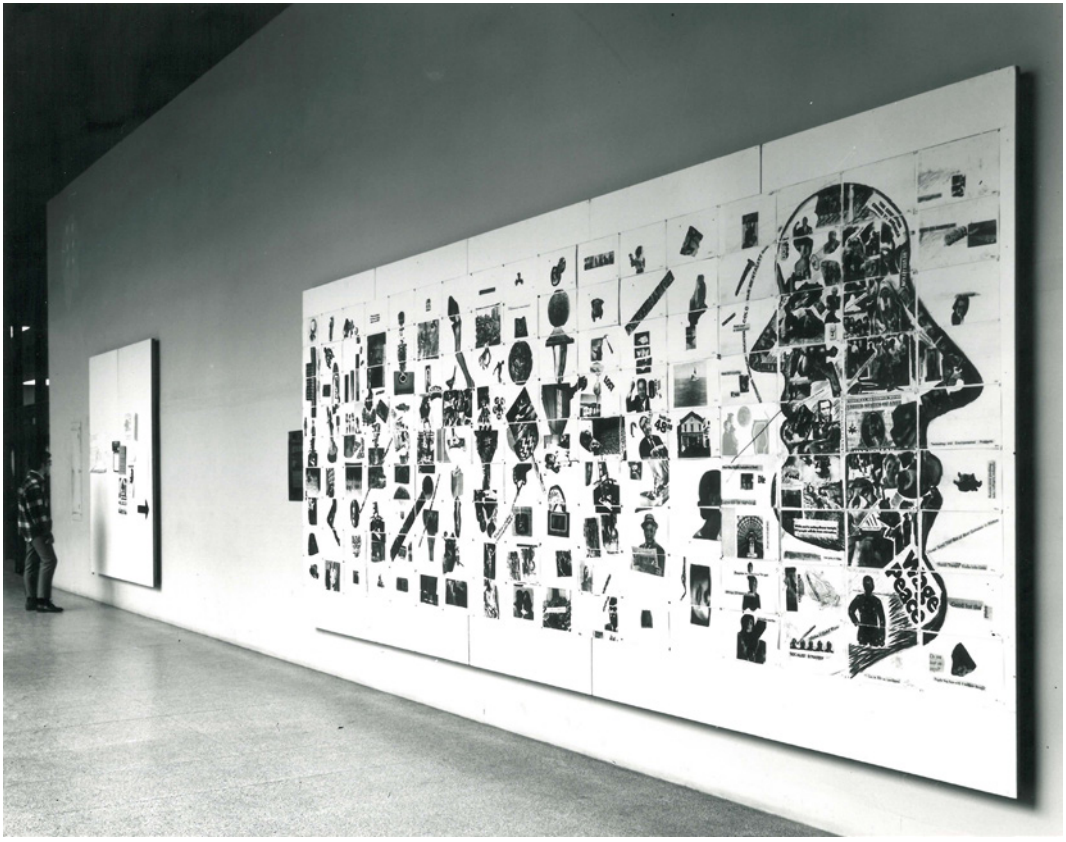

Figure 8. Stan VanDerBeek, *Panels for the Walls of the World*, 1970. © Massachusetts Institute of Technology, courtesy of the CAVS Special Collection, MIT Libraries.

was not realized.[10] The challenges of collaboration among artists hindered the development of a truly symbiotic relationship between the artworks, limiting the exhibition's ability to function as a cohesive whole. Billy Apple withdrew his work from the Smithsonian exhibition, underscoring the tensions between the exhibition's experimental curatorial approach and the expectations of its contributors.[11]

In *Explorations*, Kepes sought to create a fully cohesive configuration of interactive works, aiming to present what he described as 'the expression of an environmental community.'[12] The exhibition's primary objective was to examine the role of technology in contemporary cultural communication. Technology was not envisioned as an end in itself, but rather as a tool for fostering artistic and social engagement, reinforcing the idea that innovation should serve broader cultural and communal purposes.[13] This concept was clearly articulated in Stan VanDerBeek's installation, *Panels for the Walls of the World*. This work was groundbreaking in both its use of technology and its evolving exhibition format (Fig. 8). As part of this dynamic process-driven project, VanDerBeek employed the newly available Xerox Telecopier machine to transmit images from his office at MIT to the National Collection of Fine Arts, allowing for real time image dissemination as part of the exhibition itself.

The installation consisted of hundreds of printed mixed-media collages, which blended images from current world news with VanDerBeek's own drawings and paintings. By blending mass media aesthetics with personal artistic expression, VanDerBeek created a constantly evolving visual archive, challenging traditional notions of static exhibition formats. Using a grid system to dictate the precise positioning of each transmitted image, the artwork's form evolved progressively throughout the duration of the exhibition.

In 1969, VanDerBeek installed these telephonic panels in multiple locations across Boston, including Boston City Hall, the Elma Lewis School of Fine Arts, and the Walker Art Center. By replicating this evolving, time-based artwork in different sites, he demonstrated that contemporary artistic expression could 'exist in multiple places at the same time.'[14] The accessibility of the project was further emphasized by the fact that anyone with a fax machine could receive and participate in the dissemination of these telephonic panels, expanding the reach of art beyond traditional exhibition spaces.

VanderBeek's incorporation of media images into a structured grid system recalls Kepes's use of laboratory-produced scientific images in *The New Landscape*, where these images were displayed within the grid of a metal framework. Just as *The New Landscape* sought to visualize the intersection of art and scientific imagery, VanDerBeek's work proposed a new landscape, one shaped by the logic of mass media and visual communication. While Kepes engaged with the aesthetic and epistemological possibilities of scientific imagery, VanDerBeek extended this approach to the realm of mediated information, constructing a visual system that reflected the fragmented, networked nature of contemporary media culture.

One of the most significant challenges faced by *Explorations* was the ethical tensions surrounding artistic collaboration in a politically charged context. Originally conceived for the 1969 São Paulo Biennale, *Explorations* was set to become the first collective exhibition of its kind at an international art biennale.[15] However, the introduction of Institutional Act No. 5 (AI-5) in 1968, which severely restricted civil and political rights in Brazil, sparked global outrage. In response, an international boycott of the Biennale emerged, with many artists withdrawing from the event.

Despite the fraught political climate, Kepes remained steadfast in his decision to participate in the Biennale, a choice that provoked considerable protest among CAVS artists. Among the most vocal was Takis, who had refused in 1964 to represent Greece at the Biennale, or any other international event, in protest against the rise of authoritarianism in Greece.[16] Jack Burnham, also outspoken in his dissent, agreed to participate only on the condition of anonymity. His statement for the Biennale catalogue was so strongly worded in its critique of the government that Kepes doubted it would be translated into Portuguese for the exhibition.[17]

Kepes defended his stance to CAVS fellows, arguing that participation in the Biennale would provide an opportunity to engage directly with young Brazilian artists and make a meaningful impact on-site.

Instead of withdrawing in protest, he proposed that the participating artists issue a collective statement condemning the military regime's actions while reaffirming the universal and creative mission of artists.[18] Although some CAVS artists supported Kepes's stance, the boycott gained momentum. With over one third of the participating artists boycotting the event and withdrawing their artworks from the exhibition, Kepes was forced to withdraw CAVS from the Biennale (Goldring and Sebring 2019: 164). This withdrawal marked a defining moment, exposing the complex ethical, political, and institutional challenges that arose when art, technology, and collaboration intersected.

Beyond his ideological justifications, Kepes had pragmatic reasons for insisting on CAVS's participation in the Biennale. The exhibition, which was finally held at the National Collection of Fine Arts, represented a major financial 'gamble.'[19] Its budget was provided by grants from the International Arts Program, the National Endowment for the Arts and MIT's own Art Committee.[20] These grants, however, only covered the exhibition's costs, a major public success at the Biennale could have drawn further financial support, helping to sustain CAVS's future activities.

Ethics of Collaboration with Science and Technology

For artists at CAVS, collaboration with military-funded technology at MIT presented a more complex ethical concern. Inaugurated in 1967, CAVS emerged in a period shaped by widespread social movements. In the mid 1960s, American universities experienced a surge of student activism, as protests against the Vietnam War erupted across campuses nationwide. The same technological advancements that enabled the 1969 Moon landing also fueled the rise of environmental, anti-nuclear, and pacifist movements, reflecting the era's tensions between scientific progress and social consciousness.

MIT housed over 70 laboratories which were funded by external public and private sources. In 1969, it was the primary beneficiary of federal research grants, receiving approximately $100 million from various government agencies. The largest contributor, providing $40 million in funding, was the Department of Defense (Benthall 1975: 28). In 1968, over half of MIT's total budget was allocated to just two key laboratories: the Draper Laboratory, which developed navigation systems for ballistic missiles and NASA space missions, and the Lincoln Laboratory, which focused on advancing radar and motion detection technologies (Blakinger 2016a: 284). This financial and research structure highlighted the university's pivotal role in both military and aerospace innovation, complicating its position within the broader social and political landscape of the era.

Like many students and faculty members at MIT, Kepes was concerned with the ethical implications of military technology. In 1968, in response to MIT laboratories' involvement in the Vietnam War, more than 50 faculty members, including scientists and engineers, signed a petition calling for a temporary halt to research on campus for one day, the 4th of March

1968.[21] On this day, professors and students participated in public discussions, exploring alternative applications of technology in ecological and social fields, reflecting a growing movement within the institution to challenge the militarization of scientific research.

The entanglements of MIT's scientific community with technology presented further complexities. Many of the MIT scientists with whom Kepes sought to collaborate were deeply involved in military research. Bruno Rossi, a prominent MIT physicist and a close friend of Kepes, was recruited for the Manhattan Project due to his groundbreaking research on radar technology. Moreover, James R. Killian, MIT's president from 1948 to 1959, whom Kepes often described as a generous supporter of CAVS, served as a trusted liaison at the White House. In 1956, he was appointed the first chairman of President Eisenhower's Board of Consultants on Foreign Intelligence Activities, established to oversee and advise federal intelligence operations. The following year, Eisenhower named him Special Assistant for Science and Technology, a role in which he advised the administration on military research priorities and on the mobilization of the scientific community (Wang 2008).

These connections underscore the paradox of CAVS's position within MIT—situated within an institution deeply involved in classified military research, yet striving to advance artistic, technological, and ecological collaboration for socially engaged purposes. Amid the social and scientific upheaval of the 1960s, CAVS held significant symbolic weight for MIT. Recognizing its potential as a manifestation of progressive interdisciplinary collaboration, the administration sought to elevate the center's public profile and give it greater visibility. Its reception was complex, with some students and artists criticizing its position within MIT as a case of complicity rather than collaboration (Blakinger 2016b).

Kepes approached the relationship between artistic and institutional collaboration with pragmatism. Speaking at a lecture in 1973, he asserted that 'After Buchenwald and Vietnam <...> only creation can counter destruction.'[22] Emphasizing the transformative power of visual language, he referenced a statement made by the Committee of Permanent Creation during the May 1968 revolution in France, affirming his conviction that art could be a force of resistance in the face of historical devastation:

> 'The only weapon of the individual, and of the group, is creation, permanent contesting spontaneity at every level. Only pure creation is subversive and cannot be absorbed. Creation is dangerous for all systems of repression.'[23]

In reality, Kepes had already confronted the entanglement of artistic collaboration and military technology during his time in Chicago in the course of World War II. In 1942, while at the School of Design, he taught a course sponsored by the Office of Civilian Defense, titled 'Principles of Camouflage.'[24] Its aim was to provide practical training in rapid urban camouflage solutions. The course outline framed camouflage as an inherently collaborative problem, requiring the coordinated work of painters, architects,

and engineers to solve visual problems. Kepes's seminars were thus further enriched by contributions from experts in fields such as chemistry, physics, optics, and biology.[25]

By the time that CAVS was established, Kepes was acutely aware of ethical issues surrounding the relationship between science, technology, and art. Yet, he resisted seeing collaboration as a moral concession. Instead, he framed it as the most effective solution to these problems. Earlier in his career, Kepes had already faced criticism for applying the techniques of revolutionary European avant-garde to serve modern industry and capitalism in advertising arts (Roach 2010: 34), as well as for his attempt at uniting art and science.[26] Far from being peripheral, these criticisms were actively acknowledged by Kepes, who, as his correspondence shows, confronted them openly rather than avoid them. For Kepes, collaboration was not a compromise but a strategy to embed artists within the processes that shaped both the built environment and the broader relationship between science, technology, and society.

This commitment to engagement over withdrawal also informed Kepes's position during the proposed boycott of the São Paulo Biennale. His response was shaped not only by pragmatic considerations, but by a deep conviction in the value of collaboration over isolation. His extensive correspondence with fellow artists regarding this boycott reveals a fundamental divergence in perspective. In their letters to Kepes, many advocates of the boycott drew their position from conversations with Brazilian artists living abroad. In one letter, Jean Clay describes discussions in Paris concerning the boycott and emphasized the stance of Brazilian artists residing there, including Lygia Clark, Hélio Oiticica, Arthur Luis Piza, and Sérgio de Camargo, who denounced the climate of censorship and repression in Brazil and urged solidarity through non-participation.[27] In his correspondence with Kepes, Takis likewise referred to a similar call for boycott issued by Brazilian artists in New York.[28]

Kepes, by contrast, was in active correspondence with artists and cultural figures based in Brazil, many of whom saw the Biennale as a potential subversive act, and an opportunity to fight censorship. In a subsequent long letter explaining his position to Takis, Kepes mentioned exchanges with prominent figures in Brazil who supported participation in the Biennale, including Juscelino Kubitschek, the former president of Brazil, and the designer Roberto Burle Marx, with both offering to provide written statements endorsing CAVS's participation.[29] In this way, Kepes's approach reframed participation not as complicity but as a form of critical engagement in a politically charged context.

Measuring the depth of CAVS's influence on MIT's scientific community is not a straightforward question, as scientists and engineers responded in markedly different ways. While some remained ambivalent, others were receptive to Kepes's interdisciplinary approach, actively contributing to projects at CAVS. The physics professor Jerrold R. Zacharias went so far as to propose an exhibition that would explore, in parallel, the

evolution of scientific discoveries related to optics and the history of light in artistic creation, highlighting its significance as both a physical phenomenon and artistic medium.[30] In 1965, *Light as a Creative Medium*, an exhibition on light, was ultimately organized, incorporating this exact concept. Similarly, Professor Charles H. Townes, known for his pioneering work on laser technology, suggested that scientists and artists collaborate on shared conceptual questions, which could be explored in an interdisciplinary way, through the lens of physics, art, and psychology.

To cultivate interdisciplinary exchange at MIT, Kepes organized two complementary seminars designed to foster productive dialogue between artists and scientists: the first seminar examined the role of artistic imagery in recognizing and interpreting scientific phenomena, while the second explored how technological progress influenced and reshaped artistic imagination.[31] One of the most notable examples of such interdisciplinary collaboration was Kepes's partnership with the urban planner Kevin Lynch. In 1954, with funding from the Rockefeller Foundation, they launched a five-year study on urban perception, which directly contributed to Lynch's 1961 book, *The Image of the City*. In the book's introduction, Lynch (1960: vi) credited Kepes with providing its theoretical foundation, nearly acknowledging him as a co-author.

In 1968, MIT held a joint dedication for the newly established Center for Theoretical Physics and CAVS. To mark the occasion, a symposium on Science and Art was organized, bringing together artists and scientists to discuss the possibilities of collaboration. Robert R. Wilson, a Cornell University professor and physicist renowned for his work on the Manhattan Project, reflected on the relationship between aesthetics and function:

> 'I think that if you're making something large, that's going to be looked at, that you're going to work with, then I believe that you have a responsibility to make it aesthetically pleasing. I think that the theories we make too should be aesthetically pleasing, enough so that a generally well-educated person would want to understand the things that the scientist does instead of turning his back as has been the case.'[32]

In 1967, Wilson was appointed the first director of the Fermi National Accelerator Laboratory (Fermilab). A physicist on one hand and a sculptor on the other, Wilson played a key role in shaping the architecture of Fermilab, which also featured several of his sculptures. Summarizing his dual practice, Wilson remarked: 'I make, or I help make two types of forms, on one hand I make sculptures <...> on the other, I make, or I help make large nuclear machines.'[33]

Building on this spirit of dialogue between art and science, the *Vision+Value* anthology series encapsulates the interdisciplinary philosophy that Kepes sought to cultivate at MIT. Published primarily between 1965 and 1966, the series, edited by Kepes, explored fundamental themes linking art and science, fostering a transdisciplinary dialogue around concepts such as structure, order, rhythm and movement. The volumes featured contributions from artists, architects, filmmakers, and musicians, alongside essays by

leading scientists in fields including physics, biology, chemistry, cybernetics, sociology, and psychology. More than a collection of essays, *Vision+Value* reflected the intellectual exchanges unfolding at MIT during the 1950s and 1960s and revealed the scientific community's differing attitudes and degrees of openness towards collaboration.[34]

A Future Shaped by Collaboration

These early interactions continued to shape the projects that followed at CAVS. As its reputation expanded, the center drew artists engaged in the emerging fields of new media, electronic, lumino-kinetic, and environmental art. Within the first two months of 1972, the center reportedly received two hundred residency applications from both American and international artists.[35]

Following Kepes's retirement in 1974, Otto Piene was appointed as the new director of CAVS. Under his leadership, the center remained committed to Kepes's vision, focusing on projects that fostered dialogue between technology, the environment, and the public. According to the 1974 course catalog, the center's program was structured around a series of seminars and workshops led by resident artists, each exploring the intersections between art, science, and technology. Piene himself conducted a seminar on art and the environment, examining the historical role of environmental art across various cultures. Paul Earls focused on cataloging innovative environmental and sound art projects. Lowry Burgess explored the historical significance of light in visual communication. Avatar Moraes led a seminar on the use of computers in artistic creation, reflecting the increasing role of digital technology in contemporary art. Other artists investigated themes such as sensory perception in space, visual and sound phenomena, and the relationship between the body and the environment.[36] Together, these diverse topics shaped CAVS's ongoing commitment to interdisciplinary collaboration, expanding the dialogue between artistic practice and scientific inquiry.

In 1977, CAVS produced one of its most ambitious collaborative art projects, *Centerbeam* (Fig. 9), a kinetic, performative, and participatory sculpture first exhibited at Documenta 6 in Kassel in 1977 and later presented on the National Mall in Washington, D.C., in 1978. Fourteen artists, supported by five scientists and five engineers, collaborated to create a 44-meter-long structure that incorporated lasers, holography, steam, neon, video, and inflatable sculptures (Goldring 1980: 37). The main structure of the work consisted of a massive, inverted glass prism filled with water and elevated on a metal framework. A network of tubes and cables running the length of the sculpture, transformed the prism into a dynamic machine, acting like a central nervous system that circulated natural and artificial energy, including air, steam, water, electricity, radio signals, image transmissions, and artificial light through the sculpture.

Described as a 'kinetic multimedia dragon' (Schneckenburger 1980: 27), *Centerbeam* exemplified a collective artwork where individual artistic

Figure 9. Collective artwork, *Centerbeam*, Documenta 6, Kassel, 1977. © Massachusetts Institute of Technology and the Estate of Gyorgy Kepes, courtesy of the CAVS Special Collection, MIT Libraries.

expression was preserved within a monumental, multi-sensory experience. CAVS artists conducted extensive research and technical experimentations at MIT to develop a format that enabled group collaboration while allowing each artist to maintain autonomy and control over their contributions (Goldring and Sebring 2019: 94). Invited by Manfred Schneckenburger to participate in Documenta 6, the artists developed several proposals, three of which were seriously considered: Harel Kedem suggested a programmable habitat made from computer equipment, Otto Piene envisioned a diamond-shaped structure amplifying solar energy through various materials and media, and Lowry Burgess proposed a pipeline network sculpture connecting the urban and natural environments (Goldring and Sebring 2019: 91). Burgess's concept was unanimously adopted, as it aligned with CAVS's core themes of energy, technology, and communication.

The project was named *Centerbeam*, referencing both its structural form and its origin at the Center for Advanced Visual Studies (Alloway 1980: 5). Each artist designed their own energy pathway while interacting with the larger structure and its interconnected components. The transformation of energy served as the central theme, with modulations of steam, light, and sound producing a continuously evolving orchestra. Installed in the outdoor garden of the exhibition, the sculpture engaged directly with its surrounding environment.

Paul Earls's laser line (Fig. 10) projected ten beams of different colors along the prism, extending into the trees of the garden. As the beams moved through space, they intersected various objects in both the natural and artificial landscape. Using a system of mirrors controlled by a central computer, the beams formed complex configurations, projected onto steam, trees, and buildings. The sculpture encouraged audience participation through a series of interaction stations, offering visitors multiple ways to modify the programmed orchestra. Spectators could manipulate the flow of steam and light, adjust projection directions, and even generate their own images. A specialized device enabled participants to use their eye movements to draw with light, with their luminous creations displayed on video screens.

Figure 10. Collective artwork, *Centerbeam*, Documenta 6, Kassel, 1977. © Massachusetts Institute of Technology and the Estate of Gyorgy Kepes, courtesy of the CAVS Special Collection, MIT Libraries.

The structure also harnessed the energy lines that powered the central machine, integrating them into the artwork itself. The saline solution line, part of the machine's cooling system, was used to create ice crystals that shimmered in the sunlight. *Centerbeam* was a living installation, inhabited by both artists and spectators who activated its components (Piene 1980: 20).

While some critics dismissed Kepes's efforts to bridge art and science as superficial or idealistic, his ideas on collaboration and interdisciplinarity found strong support among theorists in both fields. This spirit resonated across MIT, inspiring the creation of several interdisciplinary initiatives. According to Jeremy Grubman (2017), the integration of art into MIT's current programs is a direct legacy of CAVS. In the late 1960s, Ed Pincus and Richard Leacock collaboratively shaped the Film and Video Section at MIT, a program dedicated to documentary filmmaking. In 1967, Nicholas Negroponte and Leon B. Groisser established the Architecture Machine Group (ARCH MAC), a multidisciplinary laboratory exploring new applications of computers in architecture and engineering. In 1974, Muriel Cooper, who maintained a close professional relationship with Kepes, co-founded, with physicist-photographer Ron MacNeil, the Visible Language Workshop (VLW), an experimental program in graphic design that pioneered new approaches to processing and visualizing complex data.

The MIT Media Lab, established in 1985 by Nicholas Negroponte and the former MIT president Jerome Wiesner and still active today, integrated several of these experimental groups, including the Film section, ARCH MAC, and the VLW. Cooper (1989) described this interdisciplinary laboratory as a 'response to the information revolution, much as the Bauhaus was a response to the industrial revolution' (p. 18). Its objective was 'eliminating the isolation of separate media by bringing together the most advanced thinking about applications with the most advanced research in imaging technologies, interactive systems, theories of computation, and the human cognitive system' (Cooper 1989: 18). This vision closely echoes the interdisciplinary collaborative work model championed by Kepes. One that not only sought to establish theoretical and formal intersections between art, science, and technology, but to position art as an active force in social organization.

During a late-1980s public lecture and conversation with Piene, Kepes reflected on his career at CAVS and the core values that guided his work:

> 'When I started the center, I started not as an aesthetic acrobat, not to create something novel in the world of art, I have to be honest, I still don't care about the world of art as a primary issue, I care about the use of art or the meaning of art in terms of its social human context <...> I believe that art is the most essential potential media, and I mean that in a very broad sense of the word media, which could bring about a new deal.[37]

Kepes's vision for CAVS was not rooted in pure formalist concerns, but in the conviction that art, when interwoven with science and technology, could act as a catalyst for interdisciplinary exchange and societal transformation. The goal was to explore new ways of collaboration, expanding the artist's perspective outside the confines of their studio and individual research.[38] Beyond the aesthetic and sociopolitical impact of the center's projects, Kepes envisioned transforming the identity of the scientist and, by extension, the broader MIT scientific community.

In a 1969 newspaper article, one journalist wrote that a new art is emerging at CAVS. He noted however that 'nobody can tell, even from projects that have been completed, what this art will look like or do. At this point, that is not very important. What is important is the collaboration' (Kirkhorn 1969). At CAVS, collaboration drew both skeptics and advocates, but the message that remained certain was that collaboration itself could become a creative act.

1. This passage appears on a page of instructions titled A Guide to Explorations (unpaginated) (Kepes 1970).
2. Gyorgy Kepes, Report to Julius Stratton, 1965. Box 82, Folder 3, Gyorgy Kepes Papers, Stanford University.
3. James R. Killian was the president of MIT from 1948 to 1959 and a key figure in founding MIT Press. He also co-directed military scientific research at

MIT during World War II. In 1957, he became chairman of the President's Science Advisory Committee (PSAC), tasked with evaluating the potential applications of new scientific discoveries. The committee played a key role in reforming the national science and technology curriculum and contributed to the establishment of NASA in 1958. See Wang Z (2008).

4. Gyorgy Kepes, Report to Julius Stratton, 1965. Box 82, Folder 3, Gyorgy Kepes Papers, Stanford University.
5. According to his correspondence with Jack Burnham and Otto Piene, Kepes required extensive discussion with artists, along with numerous studio visits and viewings. See Fellows Individual Records, Gyorgy Kepes Folder, CAVS Special Collection, MIT.
6. Georgy Kepes, Artists Speak, filmed interview conducted by Otto Piene, n.d. Author's transcription. CAVS Special Collection, MIT.
7. Georgy Kepes, Proposal for the Center for Advanced Visual Studies, 1965. Folder: Founding Material, CAVS Special Collections, MIT.
8. CAVS merged with the Visual Arts Program in 2009 to form the MIT Program in Art, Culture and Technology.
9. Program brochure accompanying the exhibition Explorations. Box 28, Folder 9, Gyorgy Kepes Papers, Stanford University.
10. Georgy Kepes, Letter to Ida Rubin/Mrs. Jerome Rubin, 9 April 1970. Projects Series, Folder: Sao Paulo Biennale-Explorations 1969–1970, CAVS Special Collection, MIT.
11. Georgy Kepes, Letter to Billy Apple, 7 April 1970. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
12. Georgy Kepes, Letter to Billy Apple, 7 April 1970. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
13. Georgy Kepes, Press release, 30 March 1970. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
14. Stan VanDerBeek, Press release, May 1969. Fellows Individual Records, Folder: VanDerBeek, Stan, CAVS Special Collection, MIT.
15. Official announcement, May 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
16. Takis, Letter to Pierre Restany, 17 January 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
17. Georgy Kepes, Letter to Takis, 17 June 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
18. Georgy Kepes, Letter to Takis, 20 June 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
19. In a letter to Gyorgy Kepes, John E. Burchard, the then-dean of MIT, noted that, due to MIT's contribution to the Explorations exhibition, the Art Committee Fund was consequently unable to support other art initiatives on campus. John E. Burchard, Letter to Gyorgy Kepes, 25 April 1970. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.

20. Memorandum from Lois A. Bingham to T. Ames Wheeler, Budget for International Art Program Exhibition, Explorations, 17 March 1970. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
21. This petition led to the founding of the Union of Concerned Scientists, established at MIT in 1969. MIT faculty statement accessible online: https://www.ucs.org/about/history/founding-document-1968-mit-faculty-statement (29/03/2025).
22. Georgy Kepes, Art in a Civic Place, 1973. Berlin lecture typescript: 13. Microfilm 5313, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution.
23. Georgy Kepes, Art in a Civic Place, 1973. Berlin lecture typescript: 13. Microfilm 5313, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution.
24. For a detailed account of how the School of Design restructured its curriculum and collaborated with the Office of Civilian Defense during WWII, see Findeli 1995.
25. Outline of the Camouflage Course at the School of Design in Chicago 1941–1942. Microfilm 5318, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution.
26. In her correspondence with Kepes, Sibyl Moholy-Nagy was critical of his relationship to MIT. Her (Moholy-Nagy S 1959) review of The New Landscape criticized the formal comparisons between scientific images and abstract artworks.
27. Jean Clay, Letter to Kepes, 12 June 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
28. Takis, Letter to Kepes, 10 June 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
29. Gyorgy Kepes, Letter to Takis, 20 June 1969. Projects series, Folder: Sao Paulo Biennale—Explorations 1969–1970, CAVS Special Collection, MIT.
30. In his report to Stratton, Kepes describes positive encounters with the scientists: Philipp Morrison, Egerton, Cerillo, Bitter, Rosenblith, Fleisher, George Clark. See Gyorgy Kepes, Report to Stratton, 1965. Box 82, Folder 3, Gyorgy Kepes Papers, Stanford University.
31. MIT Art Committee Meeting, 5 December 1965. Meeting Minutes, Microfilm 5312, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution.
32. Robert R. Wilson, Remarks delivered at the Science and Art Symposium, MIT, Cambridge, MA, 20–22 March 1968. Box 9, Folder 11, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution. Author's transcription from audio file.
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34. For an in-depth study on the conception, publication and reception of the Vision+Value series, see Arning 2008.
35. Gyorgy Kepes, Letter to William Porter, Dean of the School of Architecture at MIT, 2 May 1972. Microfilm 5308, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution.
36. Center for Advanced Visual Studies Course Catalogue, 1974: 4—11. CAVS Special Collection, MIT.
37. Gyorgy Kepes, Artists Speak, filmed lecture, c.1985—1990. Author's transcription, CAVS Special Collection, MIT.
38. 'Our function is to explore new creative ideas in art which go beyond the studio scale of the individual artist and his subjective interest.' Gyorgy Kepes, Letter to William Porter, Dean of the School of Architecture at MIT, 2 May 1972. Microfilm 5308, Gyorgy Kepes Papers, Archives of American Art, Smithsonian Institution.

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