

The Electric “Now Indigo Blue”: Synthetic Color and Video Synthesis Circa 1969

Carolyn Kane

Assistant Professor
Department of Film and Media
Hunter College, CUNY
695 Park Avenue, Room 433 Hunter North
New York City, NY 10065
USA
carolyn.kane@hunter.cuny.edu

Carolyn Kane

ABSTRACT

Circa 1969, a few talented electrical engineers and pioneering video artists built video synthesizers capable of generating luminous and abstract psychedelic colors that many believed to be cosmic and revolutionary, and in many ways they were. Drawing on archival materials from Boston’s WGBH archives and New York’s Electronics Arts Intermix, this paper analyzes this early history in the work of electronics engineer Eric Siegel and Nam June Paik’s and Shuya Abe’s Paik/Abe Video Synthesizer, built at WGBH in 1969. The images produced from these devices were, as Siegel puts it, akin to a “psychic healing medium” used to create “mass cosmic consciousness, awakening higher levels of the mind, [and] bringing awareness of the soul.” While such radical and cosmic unions have ultimately failed, these unique color technologies nonetheless laid the foundation for colorism in the history of electronic computer art.

“[With] television ... you’re on the way to being a starchild ... inner and outer space become one in unknown velocities of a cosmic zoom ... the now indigo blue of life merges with the glowing beauty of man at his most human ...”

-Ron Hays (1971) [1]

Introduction

In 1969, electronics engineer Eric Siegel asked: “After a trying day, why can’t the viewer ... sit down at his TV set and listen to music while watching the screen burst with beautiful colorful displays?” These “visual phantasies,” he explained, “would relax you better than any tranquilizer and at the same time give your spirit a wonderful lift ... working through your audio-visual senses into your mind and soul” [2]. Siegel was by no means alone. In 1970, Gene Youngblood wrote: “Television will help us become more human. It will lead us closer to ourselves” [3]. In their 1973 article, “A Color Video Collaborative Process,” artists Dan Sandin, Jim Wiseman, and Philip Lee Morton wrote: “Central to our experience ... is the use of high technology as an adjunct to personal and spiritual growth” [4]. Today these attitudes seem less optimistic than deluded, even a bit foolish. As contemporary television viewers—consumers rather—we know full well that the medium is commercially driven and seeped in fear-based content dealing in war, crime, scandal, horror, voyeurism, and atrocity occurring on global and local scales, 24 hours a day, seven days a week, punctuated only by brief commercials attempting to sell impossible fantasies. In the 21st century, television couldn’t be further from the “soulful” embrace of the “glowing beauty of man at his most human.” But given the not-so-distant past of these views, and their sheer abundance, one wonders how such mystical notions of television ever seemed logical, let alone normative? How did a group of technically minded artists, in collaboration with engineers, immerse themselves in sophisticated and challenging technological environments only to turn out a genre of work that conjured spiritualism and a mystical beyond? This article seeks to provide an answer through an aesthetic analysis of color in analog video synthesis circa 1969 in the work of Eric Siegel and Nam June Paik.



Eric Siegel's Generative Color

Born in 1944, Eric Siegel attended high school in Brooklyn, and at age 13 he built his first TV set “from scratch.” In 1960, he won second prize in a science fair for a “home-made closed circuit TV,” a vacuum-tube device built from second-hand tubes and miscellaneous parts. The following year, he won yet another award: an honorable mention for his “Color through Black and White TV.” While Siegel was dyslexic, when it came to electronics, Woody Vasulka notes, he was clearly a “whiz kid,” and indeed, his contributions to the history of color in video synthesis are no less impressive.

From the late 1960s on, Siegel built innovative electronic systems, including color synthesizers, which he used to produce psychedelic video artworks [5]. His Process Chrominance Synthesizer (PCS, 1968) was the first device capable of taking a black-and-white video signal from half-inch tape or elsewhere, such as a portapak, and transforming it to color through the video-synthesis process (Figure 1) [6]. Siegel used the PCS to create *Psychedelavision in Color*, a single-channel program consisting of *Symphony of the Planets*, *Tomorrow Never Knows*, and *Einstine*, first shown at Howard Wise’s infamous 1969 exhibition, *TV as a Creative Medium*. In the third piece, *Einstine*, the face of Albert Einstein is lit by rich oranges, purples, and magenta flames (Figure 2). For several minutes, the face shimmers and morphs into different hues,

orchestrated to a Rimsky-Korsakov soundtrack. After viewing Siegel’s *Einstine*, Woody Vasulka wrote: “I always wonder why it took Eric to introduce this new image so convincingly. Something extraordinary happened when we saw that flaming face of Einstein at the end of the corridor. For us, something ominous, for me, something finally free of film” [7]. Even while watching *Einstine* in 2012, something extraordinary still occurs: the colors, despite decades of degradation, are still rich and otherworldly, a testament to Siegel’s truly unique color system. A closer look at the PCS helps explain how Siegel generated such awesome colors.

The PCS is a colorizer, meaning that it can add color to a monochrome signal. In the US patent application for the PCS, Siegel explains the device’s unique ability to provide a means for “producing a color burst signal.” A color burst signal is specific to analog video and television, a code used to monitor the synchronization of the color signal, or “chrominance subcarriers,” at the beginning (“back porch”) of each video signal [8]. In other words, Siegel introduced color information into a black-and-white signal by cleaning the incoming signal of any aberrations and then re-inserting a color-sync signal, adjusting its brightness, contrast (also known as “gain”), luminance component (lightness), hue (color, also known as “phase”), and saturation (also

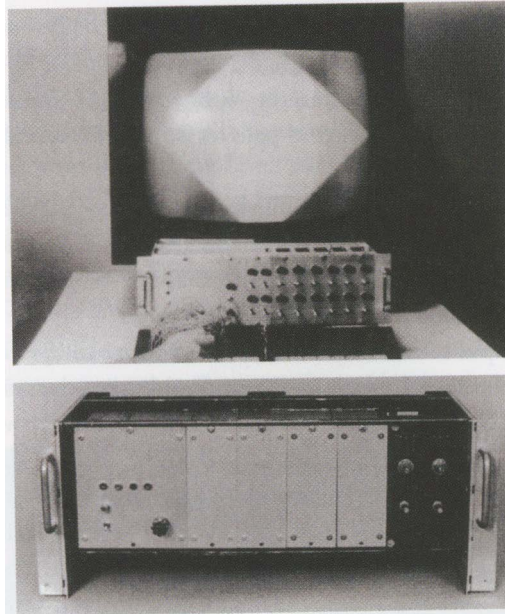


Figure 1. *Process Chrominance Synthesizer (PCS) 1968*, used in *Psychedelavision in Color*, first shown at Howard Wise’s 1969 exhibition, *TV as a Creative Medium*. © 1969 Eric Siegel.

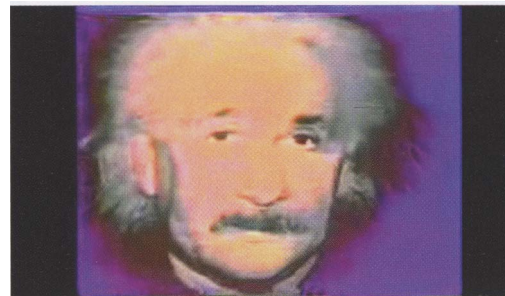


Figure 2. *Einstine in Psychedelavision (1968)*. Psychedelic electronic colorism made with Siegel’s *Process Chrominance Synthesizer*. © 1968 Eric Siegel.

referred to as “amplitude”). The PCS could then generate chromatic signals for the new subcarrier because it had a new pseudocolor (pseudo implies “false” or machine-generated) component added to the input source [9]. The result was an entirely new electronic color palette, in wild and beautiful palettes beyond FCC and NTSC broadcast standards.

This beauty is again illustrated with Siegel’s Electronic Video Synthesizer (EVS, 1970). The EVS was the world’s first open-system analog electronic color synthesizer, “an instrument for the creation of color visual information,” Siegel explains, “with the possibilities of at least one thousand different pattern variations” [10]. The EVS could generate images independent of an input source (from film or other forms of optical media), though live camera input was possible. The abstract forms were produced using the system’s own self-generated colors and free-form patch matrix pulled from an IBM card sorter with connections formed by mini-banana plug cables of “adorable colors.” The first circuit board was built inside a color television set. The processing amplifier (“proc amp”) generated a raw signal and provided it with a black level, blanking signal, burst signal, and sync pulse. (In analog video, the vertical blanking signal refers to the rate at which each scan line is rendered on screen, usually in a black burst or black wave used to coordinate the broadcast signal with the reception signal, known as the “sync pulse.”) The EVS was built on BIC-VERO rack (a patch matrix board) with front knobs and switches that could be used to track changes on a monitor in real time. By manipulating the knobs, a “wide variety of patterns, colors, and motions could be created” [11].

These technical details, while likely obscure to contemporary readers, nonetheless illustrate the technical challenges circa 1969: what had to be mastered in order to get any color, let alone colors of an “almost unbelievable intensity and richness.” Siegel’s colors, as noted, continue to appear magical, even on degraded videotapes seen 40 years later. He developed a color system that could, unlike others at the time, activate the phosphors on the TV tube directly, without the intervention of a video camera. That is, they utilized the full potential of the CRT tube which the camera did not do because most analog video signals were at the time AC-coupled, meaning both AC and DC circuits were connected (the latter blocked by the former) to produce signals that were “highly inaccurate and resulted in an incorrect brightness level on the TV screen” [12].

Both synthesizers (the PCS and the EVS) point to the advent of the historical distinction between images produced by optical and indexical media like film or photography, versus those produced post-optically, through synthetic and informatic means, such as computer-generated imagery. The former bears a causal link between event and image artifact: a photograph is a literal sample of light from a particular historical moment. With electronic visual media, this link is broken. To put it differently, any image that appeared from the EVS or PCS did so only through the synthetic generative processes, *ex nihilo*, and thus they were not only “free of film” as Vasulka puts it, but also, of optical media, and therefore “natural” vision altogether. Herein lies one rationale to understand how electronic color in video synthesis became magical and otherworldly: it literally was.

WGBH & the New Television Workshop

Since 1951, WGBH has been a non-profit, education-based, public radio station based in Boston. In 1955 they incorporated the public television channel two to become the first non-profit television station in New England and a pioneer in public television. In the early years, the studio was full of “Harvard guys who produced boring, black and white television.” But this all changed in 1958 when visionary producer and director Fred Barzyk arrived and “began experimenting, pushing the studio’s envelope” [13].

In 1967, WGBH transitioned to color, and new video switches arrived at the studio. The switches were capable of basic chromakey (the process of removing a color from an image so that another image element may replace it) and titling effects. Artists interested in the new but still expensive media were drawn to WGBH's artist-in-residence program, the New Television Workshop (1972–1992). The workshop was supported by grants from the National Endowment for the Humanities, the Ford Foundation, and the Rockefeller Foundation, and from it emerged many pieces central to the history of video art. Early artists in residence included Nam June Paik, Stan VanDerBeek, Max Almy, Douglas Davis, Peter Campus, Trisha Brown, Ed Emshwiller, and William Wegman. Fred Barzyk oversaw the New Television Workshop for 10 years, during which time he watched, invited, and experimented with “hundreds of artists” who flowed in and out of the studio, all enthusiastic and eager to pioneer a new genre of electronic art (Figure 3).



Figure 3. Left to right: Fred Barzyk, Shuya Abe, and Nam June Paik with the Video Synthesizer at WGBH-TV, Boston, circa 1969. Image courtesy of Paik Studios/Nam June Paik Estate. Photograph © 1969 Conrad White.

But even before artists arrived at the New Television Workshop, Barzyk and his WGBH colleague, director David Atwood, were broadcasting experimental programs. In the mid 1960s, Atwood recalls, “we started ... doing these light shows where we just did whatever came into our head. We mixed black-and-white cameras with telecameras, light show images, and then feedback ... [we] broke all the rules” [14]. At the time, Barzyk and Atwood saw themselves as directors “fooling around with TV: in hopes of making a change and bringing out the 60s feel to some of our shows on public television” [15]. After realizing the vast possibilities for video in this relatively open-minded setting, they got a grant, and the doors opened. Most doors opened.

Those behind the doors to management and on the executive level viewed the incoming artists as a disaster waiting to happen, and after Paik's early residences at WGBH it is hard to argue with them. At the same time, the wild and unruly experiments that Paik conducted at WGBH (noted below) are today heralded as cornerstones in the history of video and electronic art, which add esteem to the WGBH name.

WGBH's national broadcast of *The Medium is the Medium* in March of 1969 featured the work of six artists: Allan Kaprow, Nam June Paik, Otto Piene, James Seawright, Thomas Tadlock, and Aldo Tambellini, each of whom made a short video using WGBH equipment. By far the most "controversial" contribution came from Paik with his *Electronic Opera #1* (Figure 4). For the segment, he brought a dozen "prepared televisions" into the studio, used three color cameras to mix the images with a nude dancer, tape delays, and positive-negative image reversals. Paik's *Opera*, as



Figure 4. Nam June Paik, *Electronic Opera #1* (1968). Nixon's swirling head was broadcast in *The Medium is the Medium*. Image courtesy of Paik Studios/Nam June Paik Estate. © 1969 Nam June Paik.

Youngblood puts it, consisted of "dazzling silver sparks against emerald gaseous clouds; rainbow-hued Lissajous figures [which] revolved placidly over a close-up of two lovers kissing in negative colors; images of Richard Nixon and other personalities in warped perspectives [which] alternated with equally warped hippies." The piece was set to the soundtrack of the *Moonlight Sonata*, interrupted periodically by Paik, who looked at viewers, yawned, and announced, "Life is boring." He instructed them to "close one eye" or "close one eye halfway" and finally, "turn off your television set" [16].

The *Opera* was controversial for its strange technical setup and unorthodox use of Nixon's head twisting through synthetic video effects, but above all, because it featured a topless dancer. The dancer was supplied by a "WGBH type," Atwood explains, who had "connections everywhere in Boston. We never knew from where she came and never asked. She showed up, took off all but panties, stood on a pedestal, was directed by Paik, was recorded, and left ... [It] was a minor scandal at the time." A topless dancer was definitely not what the station expected or hoped to see from a show on "the arts." But at this point the show was already receiving national recognition and strong support from the Ford Foundation, so the studio (reluctantly) honored such requests [17]. After *The Medium is the Medium*, the Rockefeller program was created, and Paik returned to Boston as a full-time artist in residence.

After the studio made the transition to color in 1967, a new financial arrangement mandated everyone to pay for studio time. This became expensive, because with color, the set-up time multiplied exponentially, and it would take "all day to get it right," whereas with black and white, they would "be ready to go in minutes" [18]. Frustrated with this, in 1970 Nam June Paik set out to create a low-cost alternative, a color manipulation system that resulted in the Paik-Abe Video Synthesizer (PAVS).

The Paik-Abe Video Synthesizer

Initially dubbed "The Wobbulator," the PAVS was a homegrown project engineered by Paik and his childhood friend and engineer Shuya Abe (Figure 5). They built the PAVS from the ground up with limited financial resources. The budget from WGBH was \$10,000, which included airfare to and from Japan. In the haphazard and scavenger style that came to define him, Paik built the system using second-hand wires, television sets, and hardware parts (a method that stands in stark contrast with Siegel's systematic control and organization of every color and function). Barzyk recalls finding Paik setting up in the studio one day wearing tall rubber boots. Upon inquiry, Paik explained: "If I don't wear them, I get electrocuted" [19].

For special effects, Paik sought low-cost, highly creative alternatives. He “bought all manner of crap,” Atwood says, “plastic dishes, cheap busts of famous composers, and anything plastic that cost nothing and would distort light.” He even used a record turntable to construct and spin objects at either 33 rpm or 78 rpm. Barzyk once found “a mound of shaving cream ... whirling around on top.” A roommate of Paik’s recalls he even made his own bed out of old console TVs with a mattress placed on top. He ate off disposable paper plates and used plastic utensils, which he cited as the “greatest American invention.” Paik’s style was fast, cheap, and messy, but effective: under the studio lighting, the rotating shaving cream “transformed into a mélange of color and images” [20].

On August 1, 1970, the PAVS embarked on its maiden voyage on channel 44 in a four-hour debut called *Video Commune: The Beatles From Beginning to End*, a broadcast of “far out imagery never before seen by the world.” *The Commune* featured a variety of images, such as Japanese television commercials remixed through the synthesizer and set to the Beatles soundtrack, providing at least one element of continuity in an otherwise unstructured visual spectacle. While *Video Commune* marked a “milestone” in the transformation of broadcast television, using the PAVS, let alone controlling it, was another issue altogether. Even Paik admits the PAVS was a technical nightmare. It’s a “sloppy machine” Paik said, “like me,” and Atwood concurs: it was “a miracle that it even made an image.” The WGBH engineers, who sat at the mixers and switchboards in the control room, loathed the PAVS even more, just as they abhorred the ways in which the artists “incorrectly” used the expensive studio equipment (“holding down three and four buttons at once,” a [Cagean] method that had the engineers “in agony”) [21]. There was also a time when, during the PAVS’s debut on channel 44, it burned up the studio’s very expensive chromo filter transmitter. Paik had simply ignored FCC color limits, which is also to say he neglected to run his colors through the vector scope and compress them. Eventually, Paik saw value in the vector scope and, after he left WGBH in the early 1970s, artist Ron Hays arrived and developed a systematic method for controlling color and image synthesis patterns with the PAVS.

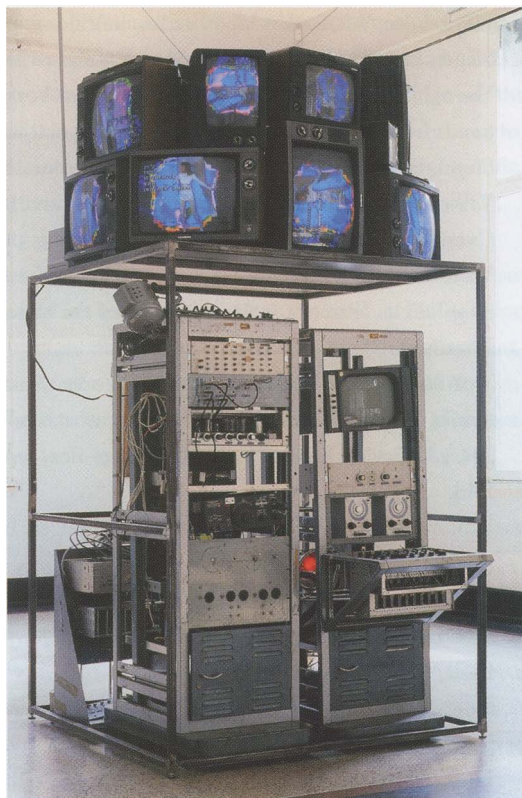


Figure 5. The Paik-Abe Video Synthesizer (PAVS), 1969 / 92. 183 x 56 x 66 cm. 12 monitors, two video disc players. Image courtesy of Paik Studios/Nam June Paik Estate. © 1992 Nam June Paik and Shuya Abe.

The End of the Liquid Rainbow

By the late 1970s, these wild and psychedelic color experiments had been harnessed for stable commercial applications. Nonetheless, the colorful world of video synthesis circa 1969, illustrated above in the work of Paik and Siegel, was one of transcendental immersions and cosmic union between humans and machines, and this world, it must not be forgotten, created the groundwork for a future of vibrant electronic art.

In sum, while the mystical video synthesis produced in the late 1960s and the early 1970s may have seemed misguided, given the radically new and unstandardized technology, the utterly alien color palettes these pioneers generated, the relatively free and unfettered experimental approach to the work, and progressive cultural contexts that bolstered them, these mystical and utopic visions should now seem grounded by material fact. The “now-indigo blue” of video synthesis symbolized an “equipment-free aspect of reality” that Walter Benjamin once identified as the “blue flower” in the land of technology [22], a revolutionary hue that could only appear, circa 1969, if televised.

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