Curating *The American Algorists*: Digital Art and National Identity

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Abstract: This essay details the curating strategies and central premise behind the 2013 traveling exhibition *The American Algorists: Linear Sublime*. This group exhibition, which showcased the artwork of Jean-Pierre Hébert, Manfred Mohr, Roman Verostko, and Mark Wilson, marked the 20th anniversary of New York Digital Salon. In organizing this exhibit, I attempted to expand the discourse of digital art curation by linking the Algorists, a group formed at the Los Angeles SIGGRAPH conference in 1995, to the broader narrative of American art. Through the exhibition catalogue, I constructed a detailed history of the Algorists and connected the movement's narrative to ideas of national identity and myth. To cultivate this nexus, I interpreted the Algorists' unique approach to linear abstraction through the various theories of the sublime active within the history of American art. Ultimately, this case study reveals the incongruities of aligning this group of digital artists—who shared a decidedly internationalist outlook—with a national narrative. While the Algorists resisted parochial characterizations, the concept of the sublime provided a useful vehicle for theorizing the aesthetic response to computer-generated abstraction. The travelling exhibition also offered a potential model, based on effective partnerships and resource sharing, for small college and university galleries.

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1. Introduction

As an art historian who studied the reception and criticism of early computer art, I always took great interest in an individual's response to digital art in the gallery environment. At every digital art exhibit I attended, I paid special attention to the audience's response to the computer-generated prints hanging on the wall. My approach differed from other theorists in that they gave most of their attention to dynamic, participatory, and time-based objects—those artworks that engaged viewers with interactive interfaces. Interactivity no doubt transformed spectatorship and challenged the notion of the art object, even producing a new category of aesthetics. But what of the relationship between traditional forms of static digital art and the audience? Is there something beyond conventional aesthetics active in these computer-generated images? As these questions piqued my interest in tracking audience reception, I began to see a common response to abstract forms of digital art. Whether the prints were produced by pen-plotters, the machine that can be traced back to computer art's earliest history, or the inkjet printer, the modern technology that eventually made the plotter obsolete, there remained a similar reaction. It became clear that audiences were fascinated with the striking complexity of linear and geometric forms created by the artist and the computer. Impelled to move closer to examine the print, viewers were captivated by the intricacies of mechanical precision that allowed for seemingly impossible dimensionality (Figure 1). The contemplative viewer, one with a basic understanding of the algorithmic process underlining the art, expressed how they were overwhelmed when considering the power of the artist's code.

Figure 1. A viewer closely examines the pen plotter's calligraphic brush mark and intricate self-similar lines in Roman Verostko's *Nested Swallow*, Version 1, 1997. From the exhibition *The American Algorists: Linear Sublime*, 2013. Used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College.

The way these abstract linear compositions resonated with the audience eventually triggered a curatorial idea in me. Beginning in 2011, I began to wonder if I could stage an exhibit primarily focused on computer-generated abstraction and its unique linear aesthetic. Fortunately, there existed a loosely networked group of artist called the Algorists, whose abstract art was computer-generated and almost exclusively linear. Importantly, the story of this digital art movement remained largely untold.

2. Curatorial Models for Digital Art

Over the past five years, and following some remarkable scholarship, curators and directors have mounted some impressive exhibitions in the United States. Bolstered by expanding private and public collections, the importance of digital art seems more secure than ever. As proof of this success, The Museum of Modern Art and the Whitney Museum of American Art recently held overlapping exhibitions, each bringing much-needed attention to the impact of computers in the arts. MoMA's *Thinking Machines: Art and Design in the Computer Age* (1959–1989) opened in 2017 and was curated by Sean Anderson and Giampaolo Bianconi. Only months later, in 2018, Christiane Paul and Carol Mancusi-Ungaro offered *Programmed: Rules, Codes, and Choreographies in Art* (1965–2018) at the Whitney. Coming from premier museums, these consecutive exhibits were arguably the first of their type in both scale and scope in the United States. While they differed in focus, both exhibits brought fresh perspectives on the rich history of digital processes in the arts. *Thinking Machines* examined how practitioners at the intersection of art and technology engaged the computer in the fields of art, design, and architecture, whereas *Programmed* took a broader approach, exploring how artists working in a variety of media (including traditional, electronic, and digital) employed system and algorithmic

approaches in their creations. Looking to draw connections between objects within each respective intuition's collection (and to showcase new acquisitions), the curators broadened the narrative of computational arts and gave voices to artists who were previously marginalized. This is good news, especially when we consider how elite museums, such as MoMA, ignored, resisted, or rebuked computer-generated art in the early decades (Taylor 2014) Considering the leading role the United States took in the development of the modern computer, and how a raft of artists responded to the new medium in novel ways, it is a great relief that institutions—the Whitney being the prime example—are actively broadening their collections to expand the discourse in what remained a neglected field. In 2017, the Whitney inaugurated the Digital Art Acquisition Committee and began a crusade to collect some of the key works from the early phase of computer arts.

Both exhibits also marked a maturing of curatorial practice regarding the exhibition of digital art in the US The most common curatorial approach to early digital art remains the international survey. Within this model, the most recent example is the Victoria and Albert Museum's exhibition *Chance and Control: Art in the Computer Age* (July 2018–November 2018), in which artworks from various global centers of production are presented chronologically, matching the development of computer technology in advanced industrial nations. Early digital art emerged almost simultaneously in a number of countries, with the first computer art exhibitions mounted in the US and Germany only months apart in 1965. These pioneers of computer-generated art, who worked in various public and private research laboratories, saw themselves as part of an international community. As a result, the first large-scale exhibition in London, *Cybernetic Serendipity* (1968), mirrored the multinational expansion of computers in the arts. In the proceeding decades, a plethora of annual and biannual conferences, festivals, and symposia proliferated (examples include SIGGRAPH, ISEA, and *Ars Electronica*), with each organization's exhibition program reflecting a distinctly international scope. While this broad approach accurately reflected the medium's developmental phase, it also had the effect of limiting the scope to include only those practitioners concerned primarily with digital production. This model seemed to perpetuate a ghettoization of digital art, essentially making it a niche area on the periphery of the art world. More recently, exhibitions with national focus have been curated, such the 2008 *Bit International* held at ZKM in Karlsruhe (Rosen 2011). While this exhibit focused on computer art production primarily in Zagreb, Yugoslavia, the *New Tendency* movement that animated the activities in Zagreb was pan-European in nature and included practices that were non-digital. Recent exhibitions at MoMA and the Whitney have a broader approach, by either taking the computer as the central medium and looking at all of the acts of creation within an expanding digital sphere, as was the approach in *Thinking Machines*, or the curator looking to the immense interconnectedness between traditional and computational forms of practice, often placing them side-by-side and having them speak to each other through shared themes of production. The *Programmed* exhibit is a great example of this emerging methodology.

3. Travelling Exhibit: Periphery to the Center

As large-scale surveys and thematic exhibits have become more prevalent, there still remains a need for focused shows designed for smaller exhibition venues. Francesca Franco's recent *Algorithmic Signs*, a thematic exhibition on early computational art held at the Bevilacqua's historical gallery in St. Mark's square, Venice (October–December 2017), is a prime example of a focused and nuanced show. Like the other recent exhibitions, these exhibits are organized in major cities and local venues where a strong culture of arts exists. My original plan was to design an exhibit for those modest-sized galleries at small colleges and universities, similar to the liberal arts college gallery space at which I teach. On the campus of Lebanon Valley College, in rural Pennsylvania, the Suzanne H. Arnold Gallery is a typical college gallery. The building, a converted Lutheran church, holds a small one-room exhibition space (832 square feet) and an auditorium for presentations and symposia (Figure 2). Because the space matches the average size of the small college galleries, a venue that holds 20–45 artworks, I felt it was an ideal testing ground. With over three thousand 4-year postsecondary colleges in the US,

most situated outside metropolitan centres, a travelling exhibit could expose new student populations, and their surrounding communities, to digital art and its rich history. Such a model could expand the audience for digital art beyond the main cultural hubs that serve urban centres.

Figure 2. Suzanne H. Arnold Gallery, Lebanon Valley College, Annville, Pennsylvania. Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College.

As a result of space limitations at the college gallery, a curated exhibit needed considerable focus. Finding a narrative or thematic that delimited scope was important. The Algorists seemed like a new and accessible topic for both a general and specialist audience. However, the Algorists as a group had become rather nebulous, with many declaring themselves adherents from around the world. Choosing which artists to include was imperative. My decision to curate the exhibition in relation to national identity helped limit the choice to those artists practicing in the United States, though there remained many artists in the United States who had varying association with the Algorists. I wanted four artists with far-reaching careers and who had been featured in monographs on digital art and who had been exhibited extensively in the US and abroad. I finally settled on the practices of artists Jean-Pierre Hébert, Manfred Mohr, Roman Verostko, and Mark Wilson. Importantly, these artists could be linked to the American narrative in a number of ways. First, the artists' tales had a certain quality that naturally lent itself to the American myth. As I explained in the exhibition catalogue, these artists, ostensibly self-taught in computer programming, struggling at the "peripheries of the intractable world of early computing", seemed to align with the epic narrative of American art (Taylor 2013, p. 20). Like the Hudson River School, whose artists captured the expanding Westward territories of the New World, the Algorists were the first to explore the new terrains of the digital frontier. Secondly, the Algorists' artwork could also be interpreted through the key theories that underpin our understanding of American abstraction. In the story of American art, discussions of sublimity took center stage in the mid-twentieth century when the concept was employed to theorize the phenomenological response to large, abstract paintings by a new generation of American Expressionists. The audience's reaction to the Algorists' abstraction linear configurations, as mentioned in the opening paragraph, shared many similarities to critical responses to abstract expressionism.

When beginning to curate an exhibition of digital art, many issues face a curator. There are difficulties of presenting time-based and interactive artworks, a challenge that is amplified by the changing platforms and the continual obsolescence of technology (Paul 2008). Beyond the problem of

presenting and preserving digital forms of art, computer art possesses idiomatic elements that make it a challenge for the curator. If the curator is approaching the topic as a survey, archival material is often fragmented or limited. If one is looking at early computer art, the subject requires technical knowledge of its viewer, or at least a rudimentary understanding of computer programming and the evolution of the modern computer. The rapid diversification and proliferation of digital technology is often disorienting to those first entering the terrain. Because early digital art, or computer art as it was known, is intertwined with the history of graphic design, it was always difficult to conform to conventional art historiography, even within a basic survey study. My curatorial idea hinged on finding a central collection that was broad in scope and held a comprehensive archive. To draw most artworks from a private collection would assist in the shipping costs and extend the limited budget of an institution of higher education. At the time, the largest private collection of digital art in the United States was the *Anne + Michael Spalter Digital Art Collection*, which is housed in Providence, RI. I had a long association with the Spalters through my scholarship and I had visited the collection multiple times. As early as 2011, the Spalters offered their collection for any future curatorial project, and I knew their commitment and generosity would make any exhibit successful. Michael Spalter was excited by the vision of expanding the audience for digital art to colleges and universities and hoped for an academic approach to the catalogue, one that provided a detailed history of the development of the Algorists. The collection's accessibility could also facilitate a travelling exhibition that would appeal to colleges and universities, especially those on the east coast of the United States.

Working with Barbara McNulty, the director of the Suzanne H. Arnold Gallery, allowed me to leverage the project. As an ambitious gallery director, she helped design the exhibition to be more accessible to the broader digital art community through a printed and online catalogue and wall panels with QR codes (abbreviated from Quick Response) that directly linked to the artists' websites. Importantly, Barbara was fully supportive in acquiring technically demanding works, such as Hébert's kinetic sand table, which needed to be shipped from California and assembled by the artist (Figure 3). Following the installation, Hébert provided detailed instructions for the gallery staff to follow for the duration of the exhibition.

(**a**)   (**b**)

Figure 3. (**a**) From left to right: Gallery assistant Crista Detweiler, gallery director Dr. Barbara McNulty, and artist Jean-Pierre Hébert. Hébert explaining the protocols for running the kinetic sand table. (**b**) Table top showing sand pattern in progress, Suzanne H. Arnold Gallery, Lebanon Valley College, Annville, Pennsylvania. Images created by author.

As I worked on a preliminary checklist, our vision of a traveling show materialized sooner than I expected. Corresponding with Bruce Wands on another project, I mentioned what I was planning for the *American Algorists*. Wands was a leading author, artist, and educator in digital art for over three decades and was the chair of the renowned MFA in the Computer Art Department, School of Visual Arts, New York. In 1993, Wands also curated the first New York Digital Salon (NYDS) in conjunction

with the New York City chapter of ACM/SIGGRAPH. Between 1994 and 2002, the catalogue for the New York Digital Salon, which showcased the premier work from around the globe, was published by *Leonardo: Journal of the International Society for the Arts, Sciences and Technology.* The color plates from these special issues were the first high-quality glossy prints of digital art readily available. Perusing these journal pages was the catalyst for me becoming interested in the subject as an undergraduate at the University of Western Australia. When I outlined my project to Wands, the 20th Anniversary of the New York Digital Salon was approaching and he was looking for a project to appropriately celebrate the milestone. Wands recounts here:

> My first thought was to do a retrospective, but when I looked at the hundreds of artists we had featured over the years and the huge diversity of their creative work, the prospect of mounting such an exhibition was daunting. I then learned of an exhibition titled *The American Algorists: Linear Sublime*, which would open at the Suzanne H. Arnold Art Gallery at Lebanon Valley College in Pennsylvania in August 2013. The exhibition, curated by Grant D. Taylor, featured four American artists who were dedicated to making work from their own original algorithmic codes: Jean-Pierre Hébert, Manfred Mohr, Roman Verostko, and Mark Wilson. . . I decided that we would present this exhibition in 2013 after its showing at the Suzanne H. Arnold Art Gallery (Wands 2019, p. 64).

Because I was early in the process of developing the exhibit, I jumped at the chance to collaborate with Bruce Wands. We agreed that the *American Algorists* would travel to NYC following its debut exhibition. In addition, Wands would contribute an essay to the catalogue, effectively producing a publication that served both Lebanon Valley College and the School of Visual Arts. Following the exhibit in Pennsylvania, the work would travel to the SVA in New York City to be hung in their first-floor Flatiron Gallery (formerly the Westside Gallery), which was similar in size to the Suzanne H. Arnold Gallery (Figure 4). The exhibition opening would be followed by a symposium, which would complement the various events and artist lectures that were held at Lebanon Valley College (Figure 5). Though I had designed an exhibit that could travel to galleries outside the major metropolitan areas, I was delighted to have the exhibit at a renowned and nationally ranked institution of art education. Having the exhibit connected to the New York Digital Salon was also very significant. It provided global exposure and prestige that a regional exhibition would not necessarily achieve.

Figure 4. Flatiron Gallery, 133–141 W. 21st Street, School of Visual Arts, New York, *The American Algorists: Linear Sublime* Image created by author.

Figure 5. School of Visual Arts/New York Digital Salon exhibition opening, 9 November 2013. From right to left: Dr. Grant D. Taylor, Mark Wilson, Jean-Pierre Hébert, Anne Morgan Spalter, Roman Verostko, Manfred Mohr, Bruce Wands, Michael Spalter, and Dr. A. Michael Noll. Flatiron Gallery, School of Visual Arts, New York, *The American Algorists: Linear Sublime*. Image used by permission, care of Dr. Barbara McNulty.

4. History of the Algorists

One of the key pursuits of the exhibit and catalogue was to give historical context to the creation of the Algorists. As an entrance to my catalogue essay, I began with Hébert's now famous Algorist dictum, for which I identified as the group's defining manifesto (Taylor 2013):

if (creation && object of art && algorithm && one's own algorithm) {

*include * an algorist **

} else if (!creation || !object of art || !algorithm || !one's own algorithm) {

*exclude * not an algorist *}.*

For me, the simple elegance of the code communicated the precise and logical beauty of the algorithm, for which the group was named. Hébert's succinct declarative statement, written in 1995 following the annual SIGGRAPH conference in Los Angeles, is one of the most distinctive manifestos in the history of art. By giving primacy to the authoring of code, it stated the necessary conditions for being considered an Algorist. The manifesto was an important way to position the group in the ever-diversifying field of new media arts. The proliferating nature of digital technology meant new forms were perpetually surfacing, especially through the late 1980s. No longer made on the early mainframe computers, art was being made on multiple devices, with the personal computer being the most prominent. It would be at the dawning of the age of the Internet, with the expansion of mobile and web-based technologies, that provided the backdrop to the formation of the Algorists. At the time, the artists felt indifferent to the term "computer art", which was heavily maligned by the mainstream artworld, and sought a new name that adequately defined their digital practice (Taylor 2014). Principal in the minds of this group of artists was the need for a term that differentiated themselves from the new generation of digital artists who did not write their own programs. The Algorists had witnessed over the previous decades the development of the Graphical User Interface (GUI) and user-friendly interfaces, which eventually became paint programs, electronic palette systems, image synthesizers, and other off-the-shelf software. Emerging artists did not have to wrestle with the complex symbolic and command-line system of programming as the new interfaces embodied traditional media and practices. Artists interested in using the computer would not necessarily need to script or code their art ideas, a process that was at the center of digital practice for over two decades. The Algorists, however,

were thoroughly committed to the algorithmic method and wanted to form a group that celebrated such methods.

While the concept of the algorithm had been increasingly theorized by Verostko and others at conferences in Europe and Australasia since the mid-1980s, it was at the Los Angeles SIGGRAPH conference where the group coalesced. The three key figures in the formation of the Algorists were Roman Verostko, Jean-Pierre Hébert, and Ken Musgrave. At the conference panel entitled *Algorithms and the Artist*, the creative potential of the algorithm was debated by Stephen Bell, Peter Beyls, Brian Evans, Musgrave, Hébert, and Verostko. Those present witnessed a notable sense of congeniality and shared purpose among this group of artists, but it was Verostko, Hébert, and Musgrave who formalized the key elements of the group following the SIGGRAPH conference and exhibition program. Hébert proposed the name "Algorists" for the group, a term influenced in part by Donald Knuth's 1968 canonical computer-science text, *The Art of Computer Programming* (Knuth 1968). In the history of the algorithm (as outlined in Knuth's first chapter), Hébert recalled the mathematician's debate between the Abacists and Algorists. This dispute, which lasted through the medieval period and into the Renaissance, focused on the best system to perform basic arithmetic. There was something in the controversy between the Abacists and the Algorists that resonated with Hébert. The Algorist manifesto, recorded in the quotation above, embodied a similar sense of division between those who coded and those who did not. Following the conference, Verostko, who had experience as an encyclopedist, carefully traced the "complex etymology of the word 'algorithm' back to the ninth-century Persian mathematician Mohammed al-Khowârizmî who is credited with providing the step-by-step rules for adding, subtracting, multiplying, and dividing ordinary decimal numbers" (Taylor 2013, p. 16).

As the group started to unite around the leadership of Hébert and Verostko, others were asked to join, including Charles Csuri and Manfred Mohr. Though it appeared to preclude membership, the Algorist manifesto was very inclusive. If one created their art using an algorithm—digital or otherwise—they could be considered an Algorist. Acting retroactively, Verostko identified a variety of artists who conformed to the algorithmic ideal. As a result, those attributed grew to include Herbert W. Franke, Vera Molnar, Frieder Nake, Hiroshi Kawano, Charles Csuri, Harold Cohen, Hans Dehlinger, Channa Horwitz, Helaman Ferguson, and others. As the first art movement of the digital age contingent on cyber presence, the Algorists became more virtual than physical. A central locale was not essential for the group. All correspondence and discourse surrounding the movement remained on the artists' websites. Via the internet, the Algorists increased in number through virtual affiliations. In fact, a likeminded group in Paris asked Hébert if they could call themselves "les Algoristes", the French version of the Algorists (Taylor 2013, p. 18).

5. Aesthetics and the Linear Sublime

While an emphasis on US-based artists brought necessary focus, only examining practices based on linearity would further limit the pool of artists to choose from. The majority of Algorist artists practiced within the tradition of geometric abstraction, yet a good number were based in Europe. Some artists were based in the United States, but worked figuratively, such as Charles Csuri. Ken Musgrave, a leading figure in the formation of the Algorists, worked with fractal landscapes. Therefore, I chose four artists who held long careers and who explored linear expression in unique ways from each other. However, I did decide to include one artwork from an artist not considered an Algorist. To explore the genesis of linearity in the history of digital art, I decided to include the iconic *Gaussian-Quadratic*, which was of one of the first examples of computer art (Figure 6). Produced in 1962–1963 by A. Michael Noll, a scientist and engineer working at Bell Telephone Laboratories, the computer-generated image showed the development of the vector line as the defining geometric entity in early graphics. Early computer images linear aesthetics were a result of the vector graphics system, an imaging system based on Euclidian and Cartesian geometry; this vector system remained the core of the Algorists' practice. While Noll was not considered part of the Algorists, I thought it necessary to trace the linear coordinate system for linear image construction. In addition, I sought

to show that the computer age resulted in a new kind of precision line allowed by the pen plotter, and this mechanical device could exceed the exactitude of the human hand. In this first example of computer art, the basic image-making properties were present and provided the first sign of a linear aesthetic that would be fully expanded by the Algorists.

Figure 6. Clockwise from top-left: A. Michael Noll, *Gaussian-Quadratic*, 2003 copy of 1962–1963 original, IBM 7090, Stromberg–Carlson S-C 4020 microfilm recorder; Mark Wilson, *Douat Dump A2*, 1981, plotter drawing; Manfred Mohr, *Program 21*, 1970, plotter drawing; Jean-Pierre Hébert, *Self Similarities*, 1986, plotter drawing. Exhibition: *The American Algorists: Linear Sublime*, 2013. Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College. Photo: Scot Gordon.

For the exhibit, I wanted to adequately display the immense variety of linear compositions produced by the four artists. The capability of the computer-guided pen plotter was fundamental to how each artist achieved their vision. I included a number of major plotted prints from each artist, including Manfred Mohr's *Program 21*, which was shown at Mohr's first solo exhibit at *Musée d'Art Moderne de la Ville de Paris* in 1971 (Figure 6). The artist's randomizing programs created a playfully rhythmic zig-zagging line similar to improvised musical notation. From Verostko, I included masterworks from his *Derivations of the Laws* and *Nested Swallow* series, which were produced through the artist's highly innovative robotic brushwork technique (Figures 1 and 7). This unique contribution to mark-making resulted from a highly experimental approach that reimagined the pen plotter through the art of Chinese and Japanese calligraphy. By attaching a brush to the machine's drawing, he was able to replicate the expressionistic energy of the human hand. I also sought out some of the most complex plotted works ever completed. Hébert's *Spirale Calme* is arguably one the most meticulous and complex single-line drawings ever completed on a plotter (Figure 8). The effort to create such prints was immense. Some works took over 60 hours to plot and any impurity in the ink, which could clog the pen, or a power outage could ruin a print. When the print was successful, such as *Spirale Calme*, the finely rendered line created an intricate tapestry, almost like an oscillating permeable membrane. In Wilson's intricate structures, we witness the extreme form of exactitude and precision of the plotter as it rendered details far beyond traditional hand-drafting techniques. Mirroring the dense divisions and connective lines of chip diagrams and circuit boards, his *SKEW FF10* created a unique abstract topography, one based on schematics of radial lines and intersecting forms (Figure 9).

Figure 7. Roman Verostko, *Derivation of the Laws. . .* by George Boole (1815–1864), 1990, book (edition #69). Exhibition: *The American Algorists: Linear Sublime, 2013.* Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College. Photo: Scot Gordon.

Figure 8. From right to left: Jean-Pierre Hébert, *Spirale Calme*, 1988, plotter drawing; Jean-Pierre Hébert, *Triptych: Bright Wavelets 1–3*, 2008, inkjet drawing; Jean-Pierre Hébert, *Un cercle trop étroit*, 1995, plotter drawing; (floor installation) Jean-Pierre Hébert, *Sand Installation: Ryoan-ji*, 2000, mixed media. Exhibition *The American Algorists: Linear Sublime*, 2013. Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College. Photo: Scot Gordon.

Figure 9. From right to left: Mark Wilson, *csq3604*, 2008, inkjet print; Mark Wilson, *SKEW FF10*, 1984, plotter drawing; Manfred Mohr, *p-197a*, 1977, plotter drawing. Exhibition: *The American Algorists: Linear Sublime*, 2013. Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College. Photo: Scot Gordon.

While the pen plotter remained central to the practice of the artists, when the Algorists formed in the mid-1990s, this technology was fast becoming obsolete. The Algorists were quick to master the next generation of technologies, again pushing the boundaries of print media. Wilson shifted his practice toward the new technologies of the ink-jet printer and its possibilities of printing on various substrates, including canvas, metal, and plastics. Wilson's geometric tapestry of forms could be printed on a larger scale, allowing for increased complexity and color control (Figure 10). Hébert also found the new capabilities of ink-jet printers to open a new world of linear configuration, one with a more expansive scale and finer detail. As seen in *Triptych: Bright Wavelets 1–3*, the new generation of printers enabled the artist to make even smaller, more intricate lines, which amplified the moiré patterns and subtle visual effects (Figure 8). Because the artists' exploration of lines went far beyond print media, I included other multi-media projects in the exhibit. From California, we shipped Hébert's kinetic sand installation, *Ryōan-ji*, which confounded the audience with an elegantly designed low table that saw a metal ball on a field of sand produce exquisite spiral patterns (Figure 3). Complementing Hébert's installation, I included Mohr's recent color animated-screen works based on his hypercube series, which further explored the spatial relationship of his linear structures by allowing the viewer to witness his algorithm deconstruct and reconstruct the cube in real-time (Figure 11). The algorithm that generated Mohr's animation could run continually, only repeating the same image in a cycle of every 100 years.
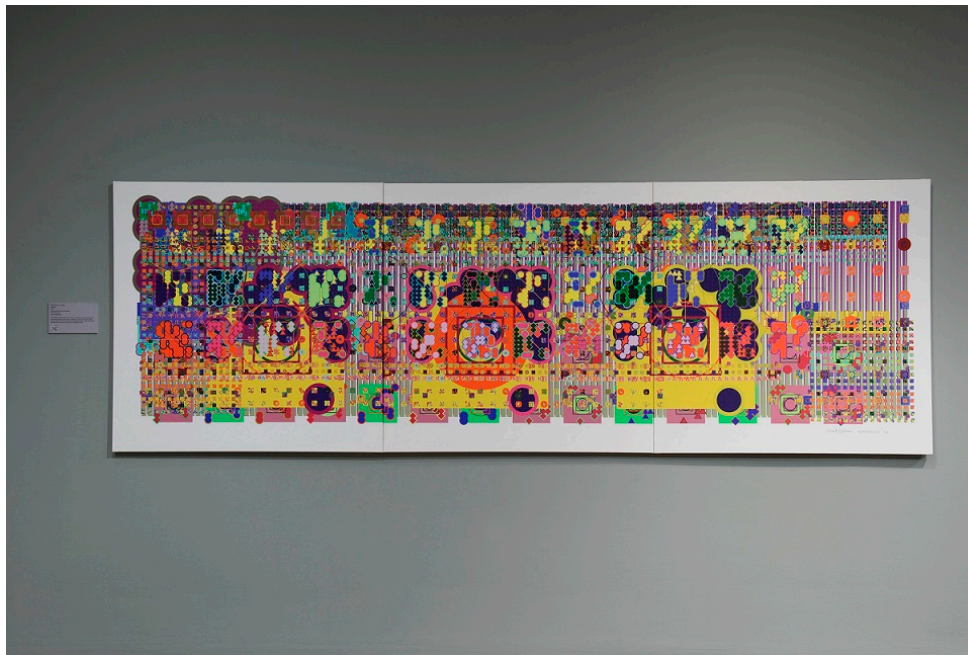
Figure 10. Mark Wilson, *e20808, 2011*, inkjet print on canvas. Exhibition: *The American Algorists: Linear Sublime*, 2013. Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College. Photo: Scot Gordon.

Figure 11. Right to left: Manfred Mohr, *P1622-screen*, 2012, NEC screen + Mac mini; Manfred Mohr, *P1611_2, 2012*, pigment ink on canvas; Manfred Mohr, *P1611_24*, *2012*, pigment ink on canvas. Exhibition: *The American Algorists: Linear Sublime*, 2013. Image used by permission, Suzanne H. Arnold Gallery, Lebanon Valley College. Photo: Scot Gordon.

6. American Art and National Myth

Beyond the commonalities of the algorithm and linearity that united the four artists, I believed the artists' practices could be placed into the broader narrative of American art. This was contrary to the ethos of digital art and seemingly challenged disciplinary norms. Since its beginnings in the 1960s,

digital art was largely defined as international or transnational in scope. Digital artists proudly resisted any attempt to align their digital practice with a single national identity, preferring to celebrate the particular universal nature of the digital process. International conferences centered on digital practices, which remained the primary venue for showing computer art in the early decades, reinforced this self-perception. For the artists, digital modalities overcame geographical boundaries, thus fostering a global outlook. As a result, a strong internationalist sentiment described much of the digital artworld. Although Hébert, Mohr, Verostko, and Wilson were American-based artists, to fit them into a national narrative did seem unnatural. Each artist had exhibited internationally, and all were active in the international community of digital art. In reality, they were internationalists by nature, continually traveling between Europe, Asia, and America. Some members were American-born, such as Verostko and Wilson, while others, such as Mohr and Hébert, were born in Europe (Germany and France, respectively). Also, their non-objective art had no discernible traces of American life—no figure or landscape that further contributed to the discourse of national identity. Moreover, their success and acclaim has been more acutely felt in Europe than in the United States.

Digital art's innately transnational character was difficult to challenge. Incongruous as it seemed, though, there were a number of reasons why the Algorists could be integrated into the story of American art. Each Algorist spent most of his career in the United States, and Mohr was elected a member of the American Abstract Artists in 1997. While their non-objective art was devoid of national themes or sentiment, it was hard to deny a sense of place when considering their artwork. As I closely examined each artists' computer-generated forms, I felt it reverberated with the artists immediate environment. As I wrote in the exhibition catalogue, I entertained the idea that there were subconscious echoes of place in Mohr's triangular vertices. After I visited his Manhattan studio, I could not help but see the same forms in the angled, crisscrossing Tribeca streets. In Hébert's oscillating waves, I felt I witnessed the optical reflections generated by the blue Pacific waters moving on the sandy shoals of Santa Barbara. His studio is positioned high above the sea. Present in Versotko's sinuous, organic lines are the cracks and crevices I recognized in Diamond Lake, which is the water body behind the artist's studio that freezes in the Minneapolis winter. In Wilson's linear banding I saw the strata of gneiss rock that curved along the Housatonic River, the tributary in front of the artist's Connecticut studio (Taylor 2013).

But it was also the similarities of the artists' stories, which were at times immense struggles, that seemed to connect to the pioneering spirit inherent in early American art. To me, this group of self-taught artists, struggling far from the artworld and within the shifting terrains of early computing, seemed epic in nature. I immediately thought of the nineteenth-century artists of the Hudson River School who built a mythology around the lonely artist charting the outer edge of the American frontier, tenaciously recording the mysteries of a vast and untamed landscape. Members of the Algorists, such as Manfred Mohr, were the first to explore a "new frontier—not the expanding Westward territories of the New World, but the emergent digital terrain made possible by the modern computer" (Taylor 2013). This was also the first generation of artists to create new creative pathways allowed by the pen plotter, a periphery device that was exceedingly difficult to master. Each of the four Algorists produced wholly original marks generated with the exactitude and control of the pen plotter.

However, it is not just the role of these artists pushing back new territories in computer-generated imagery that linked to narratives of progress in American art. The Algorists' shared a kinship with those American landscape painters who celebrated the sublime power of nature. Rejecting the European picturesque, with its charming and contained vision of nature, the American landscape painters of the Hudson River School imagined nature as an overpowering force that could access the transcendental. There existed a parallel between the American Romantic painter's concept of the sublime, which was emphasized by the spiritual dimension of God's natural world, and the algorithmic processes of the Algorists. The computer algorithm could be harnessed as a powerful generator of previously unimaginable geometric and linear form, one that unfurled a new virtual world. As described in the opening of this essay, when audiences were confronted with the intricate linear forms, they were often

confounded by the complexity—and the understanding of the code exceeded their comprehension, which mirrored the artists own surprised reaction when their form-generating algorithms created vast arrays of linear form.

Employing a combination of the philosophies of two influential eighteenth-century philosophers, Edmund Burke and Immanuel Kant, I explored in my exhibition catalogue essay the romantic reception of the sublime experience in nature and art (Taylor 2013). In *A Philosophical Enquiry into the Origins of Our Ideas of the Sublime and Beautiful* (Burke 1757), Burke identified a set of sublime experiences that produced a kind of thrilling terror, as opposed to the softer and temperate experience of beauty. Kant had an even greater bearing on the consciousness of nineteenth and twentieth century artists. In his *Critique of Judgment* (Kant 2007), Kant argued that the sublime response was a result of the tension experienced when the mind attempted to apprehend the immensity or limitlessness of a concept. In the Kantian sense, sublimity is, as Philip Shaw described it, the "moment when the ability to apprehend, to know, and to express a thought or sensation is defeated" (Shaw 2005, p. 3). This reminded me of the audience's response to the Algorists' algorithms. As a result, I theorized the aesthetic experience of algorithmic art as a type of "generative sublime" (Taylor 2013).

Importantly, the generative sublime held an important parallel with mid-twentieth century American abstract movements. The phenomenological response to large, abstract paintings by Abstract Expressionists was frequently described as mesmeric and overwhelming. The art critic Harold Rosenblum wrote in his influential 1961 essay, *The Abstract Sublime* (Rosenblum 1961), that he believed the clash with the boundlessness linked the American non-objective painters to the Romantic sublime of the 19th century. Barnett Newman in *The Sublime Now* (Newman 1948) denied much of the European interpretations of the sublime, advocating instead for a sublime based on the creative force of the individual artist rather than recourse to notions of God. For Newman, there was little beyond the painted surface, and if transcendence and exaltation were reached, it was, as I wrote in the exhibition catalogue, a "result of the exchange between the painted field and the spectator's consciousness" (Taylor 2013, p. 22). When faced with the linear complexities of the Algorists, audiences described the same aesthetic response. The complexity of the lines was often visually overpowering and, combined with the tremendous power of the algorithm, reinforced the sublime response of impenetrability in the audience. This aesthetic response I described as: "Whether it is the n-dimensional hypercubes of Mohr, or the dizzying symmetry and self-similarity of Verostko's lines, or the intricate linear rhythms of Hébert composition, or the layered geometries of Wilson, there is often the feeling of a cognitive failure in the viewer, an inability to comprehend the astonishing power of computation" (Taylor 2013, p. 23).

Following postmodern theorist Jean-Francois Lyotard's description of the extreme space-time compression of global media, critics employed the concept of the technological sublime to describe the disorientating effects of digital age (Lyotard 1994). Historian David Nye, an author who shaped discourse on the technological sublime, understood it more broadly as convergence of technological forces supplanting the dynamic power of nature (Nye 1996). Technology generates fear and awe because our creations in a post-human age are fast becoming fully sentient (AI is the chief example), and will ultimately threaten human existence. Though both conceptions are rooted in Kantian aesthetics, Nye's use of American history as an exemplar of the technological sublime, especially in the development of the modern computer, resonated with me. However, my understanding of the generative sublime, as applied to the Algorists, kept an element of Kant's mathematical sublime in the vast combinatorial powers of the algorithm and the dynamic form of sublime found in nature. The colossal energy of nature's unfolding, forcefully expressed in the artists' linear and self-similar geometry, is made visible in the algorithmic process. Rather than the negative pleasure associated with Enlightenment sublime, or even the contemporary anxiety over the collapsing boundaries between self and machine, the aesthetic experience of the Algorists hinges on an intellectual or emotional response to an encounter with a finite abstract object (the print) within the evolution of code. Though the flows between the artist and the machine are sometimes indistinct, the aesthetic effect is not one of dehumanization, but rather a fluent expression between the two entities as one shapes and informs the other.

7. Outcomes and Impact

In retrospect, it was the connection made between the Algorists and the aesthetics of the sublime that gained the most traction with audiences and critics. In the most comprehensive review of the exhibition, Taney Roniger, writing for *On Verge: Alternative Art Criticism*, said of the artwork in the exhibit, "... the cognitive failure occasioned here is as exhilarating as it is unsettling" (Roniger 2013). The reviewer wrote extensively on the aesthetic experience of viewing each artist through the lens of the sublime, thus echoing the theoretical ideas in the catalogue. However, linking the Algorists to the narrative of American art was less convincing—emerging as more of a speculative than a concrete curatorial idea. Perhaps the incongruities of the Algorists existing within a national narrative of art overwhelmed this line of inquiry. First and foremost, the artists held an internationalist attitude. Due to the fact that the computer itself had its own strong mythology independent of national narratives, the Algorists did not need to be linked to the American saga. Any exhibit focusing on digital art naturally has a propensity to develop the myths already existing within digital culture. Nevertheless, expanding our understanding of abstraction, particularly digitally generated forms of abstraction, has expanded the history of American art in previously unimagined ways. On a fundamental level, the exhibition successfully displayed the astonishing diversity of linear form made possible by computation, thus expanding the paradigm of abstraction.

As a model for a small-scale travelling show, there were many successes. The sharing of recourses and funding between two institutions proved effective, allowing us to extend the reach of the exhibit with promotions and co-sponsored events. After the show's run at the Suzanne H. Arnold Gallery and the Flatiron Gallery, there was interest from many institutions about hosting the exhibit. However, the cost associated with shipping the kinetic sand table remained cost-prohibitive for small college galleries with limited funds. Because Hébert's sand-table installation was so popular with audiences, the gallery directors felt this important work must be included. In addition, not all the artworks for the *American Algorists* came from the Spalters' collection. There were instances in which the artists' personal collections held exceptional examples of prints with remarkable linear configuration. Drawing artworks from the artists' collections, many in different parts of the country, increased the cost of shipping for the travelling show. However, in the years following the exhibition, gallery directors and curators (motivated by their own thematic ideas) have since lent from the *Anne + Michael Spalter Digital Art Collection.* Many exhibits, including *Thinking Machines* at MoMA, used the Spalters' collection extensively. Consequently, it emerged as a major lending collection.

Perhaps the greatest impact of the catalogue and exhibition was providing a full historical context to the development of the Algorists. The exhibit brought attention to the larger implications of the group and elevated the movement in cultural discourse. The use of the term "Algorists" also became more prevalent, though it is difficult to attribute this to the exhibition as the sole reason. The exhibition was successful in showcasing how each artist, working independently of each other, built highly experimental practices based on algorithmic processes. Unifying the four artists in the way that the exhibition did allowed a new understanding of computer-generated abstraction, and what role linearity plays in digital art practice.

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