

# Material Generative Art

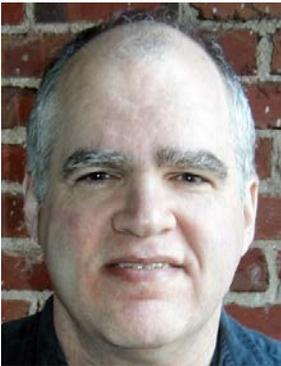
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## **Abstract**

Generative art can be described as a way of making art where the artist surrenders a degree of control to a somewhat autonomous system. Generative art is frequently the product of a digital system. But not all generative art is digital generative art. Autonomous systems can also include material-based processes in the physical world. This can be called material generative art.

The relatively recent trends of NFT art and AI art have conspired to temporarily boost, but ultimately undermine, the perceived value of digital generative art in the artworld.

The art historian Heinrich Wölfflin has offered an analysis of the development of the baroque style from its classical roots.

This suggests a generalization that style tends to begin with simplicity and then increase in complexity over time.

The psychologist Colin Martindale has described how when art movements reach a point of maximized complexity, artists will seek a paradigm shift that invites a new round of evolution from simplicity to complexity.

Somewhat related is Denis Dutton who takes an evolutionary psychology approach to understanding why art creation is essentially universal among humans. From this point of view the ease of creation offered by AI art may not satisfy this “art instinct,” and could require a restorative change.

It is suggested here that at least in the realm of fine art, we are about to see a paradigm shift from digital generative art to material generative art.

## **1. Introduction**

In previous writing I’ve described generative art as being a way of making art where the artist surrenders a degree of control to a somewhat autonomous system. [1, 2] From this view generative art isn’t always a digital result from a computer-based system. Autonomous systems can also include material-based systems in the physical world. Such art can be called material generative art.

In this short paper I would like to explore what material generative art has to offer, and why in this moment generative art may swing towards the material.

## 2. NFT Art and AI Art

The NFT market allows speculative investment in artworks using blockchain technology to securely manage a distributed ledger of ownership and provenance. While this ledger could be used to track ownership of physical works, in this context it is typically used with digital images that others may copy, print, and otherwise use. This notion of ownership is more about bragging rights than controlled access. It reintroduces an artworld patronage system that can be joined one piece at a time. More advanced NFT systems can include contracts that include resale residuals being paid to the original artist. It remains to be seen if the potential benefits of NFTs for artists will be sustained over time.

The relatively recent trend of NFT art has begun to popularize the term “generative art” as a kind of computer art. This use is primarily due to the pragmatic application of automated digital techniques to generate large numbers of digital image files with greatly reduced effort relative to traditional manual media. For the most part this new wave of NFT collectors seem unaware of the broader history of generative art, and in particular material generative art.

This de facto narrowing of the notion of generative art as a subset of digital art is unfortunate. It ignores what is essential, the systems-nature of generative art, while it pushes to the front the incidental use of a computer. What should be a useful scholarly term with a rich art

theoretical foundation is reduced to a trendy marketing label.

In terms of art theory there is no reason to think digital generative art and material generative art require separate bodies of theory. Proponents of new art forms tend to overstate how “special” their new discoveries are. Often standing theory can accommodate them with little change. The burden of proof for exceptionalism should be on those making the special plea.

During this same approximate time frame there has also been rapid growth in what is becoming known as AI Art. In previous writing I've argued that theory for AI-based generative art is congruent with general generative art theory. [3] What counts as artificial intelligence has been a moving target since the 1950's, and that is no different today. The most recent flavor, so called “prompt-based AI art,” requires very little effort or thought on the part of “prompt artists.” Using a diffusion model trained by others, the prompt artist merely types in a suggestive set of phrases. For example, something like “cats riding dogs enter a castle” will generate a corresponding image. To be fair, more experienced prompt artists learn phrases that can control rendering style, color palette, aspect ratio, and so on. Some may even use a tool like Photoshop to clean up and retouch disappointing areas of the image.

Prompt artists, possibly without any previous artmaking experience, can easily create images of unprecedented diversity and complexity. AI art represents both a breakthrough in generative art and a possible end-stage of digital generative art. Just as scarcity

creates value, ubiquity can drive down value.

### 3. Digital Generative Art and the Evolution of Style

One reason to suspect that a shift from digital to material generative art is ahead has to do with the development of style. I have described some of the following theories in greater detail in a previous paper, and they are briefly referenced here. [4]

Art historian Heinrich Wölfflin is perhaps best known for his *Principles of Art History* where he presents a framework for the analysis of art in the 15th and 16th century *classic* style as compared to the 17th century *baroque* style. [5] He breaks down the transition using five pairs of polar concepts. In the move from the classic to the baroque he sees transitions from the linear to the painterly, depth from the planar to recessional, form from closed to open, parts collected as a multiplicity moving towards unity, and clarity shifting from the analytical absolute to the contemplative relative.

This kind of progression seems to reoccur in other arts and in other periods. It can be generally viewed as movement from simplicity to complexity. But when complexity is maximized, where is there left to go?

Psychologist Colin Martindale has a theory for that. [6] Martindale builds on the peak shift phenomenon that describes how a response to a stimulus will intensify when the stimulus itself is exaggerated relative to its initial presentation. The aesthetic response, called arousal potential by psychologist Daniel Berlyne [7], would otherwise diminish over time due to habituation.

Simply put, what was once exciting becomes boring after repeated exposure.

According to Martindale, this combination of peak shift and habituation creates a dynamic such that artists will seek novelty via increased complexity. Over a period of years, the arousal potential of works within a given style will increase monotonically up to a limit where diminishing returns approach a physical or cognitive limit.

When that limit is reached the culture experiences what Martindale calls "regression into the primordial." The primordial is the source of truly novel ideas and unexpected associations. As obvious associations are "used up" the primordial must be mined to new depths in the search for novelty. Once the primordial content is maximized only the invention of a new style can introduce novelty and further increases in arousal potential.

What Martindale refers to here can be more simply described. When an art movement reaches a point of saturation, and incremental exploration has run out of new options, what is called for is a paradigm shift.

For example, abstract expressionism was the late stage of an evolution that started with impressionism, lead to cubism, and then ever-increasing degrees of abstraction. Viewing the works of Mondrian or Pollock in chronological order makes this process of increasing abstraction quite clear. In the late 1950's one could legitimately ask how much further abstraction could go, and the answer seemed to be "not much further." A paradigm shift was required, and it was found in the form of pop art most famously practiced by Andy

Warhol, Claes Oldenburg, Roy Lichtenstein, and others.

With the advent of prompt-based AI art and prompt artists, where images of great complexity can be generated with very little effort, it's legitimate to wonder whether digital generative art is approaching an end much like abstract expressionism did in the late 1950's.

#### 4. Digital Generative Art and the Output Problem

In *The Art Instinct*, Denis Dutton takes an evolutionary psychology approach in proposing that art making developed as a form of mate selection behavior in early humans. [8] Like the displays of a peacock, or more precisely the blue constructions made from scraps by bowerbirds, Dutton proposes that early humans used artistic creation to establish their suitability as mates. After all, the creation and collection of art implies a surplus of resources and time, not to mention intelligence and skill, well beyond what is required to eke out an impoverished existence. Out on the Serengeti among early humans an artist would be viewed as a "good catch."

Following Dutton, art over the millennia has involved the use of rare and expensive materials. Digital art, generative or not, usually only uses generic inexpensive materials such as inkjet prints, computer displays, video recordings, or 3D prints. The manual or code-based creation of digital art can indicate a surplus of available time, but in the case of prompt artists very little time is required.

One need not support this evolutionary psychology approach to appreciate the general problem. A non-psychological

corollary might be called "the output problem." In the typical case a digital image is generated as immaterial numbers in computer memory. The image at that point is fixed, but it must be translated into some form of physical presentation to be seen.

For some a high-quality print, screen, or projection lacks the visceral impact of a painting. To some extent this is a matter of subjective taste. But there is also an underlying ontological problem that destabilizes the value of digital art. In the case of a painting there is no distance between the image and the material substance of the paint and support. In a high-quality digital print, however, the image is alienated from the material. The already fixed image from the computer is merely copied to the paper, and there is no significant material difference from one print to the next. In a significant sense the art already exists prior to any material creation.

In traditional paintings the image is inseparable from the materials. And with this comes the trace of the hand of the artist. Walter Benjamin famously worried about the impact of "mechanical reproduction" on the "aura" of art. [9] Photographers somewhat addressed this by taking care to remain a presence in their art objects by not sharply cropping the film image at the edges; by using exotic print materials; or at least carefully editing and numbering their prints. Along with keeping the artist's hand in the work, this also preserved a sense of scarcity, increasing perceived value.

To summarize, it could be that digital generative art as fine art (as opposed to design or other utilitarian crafts) is reaching an end stage. AI-based

generative systems barely need human prompts at all. There are already people using AI technology to generate prompts. The output lacks the compelling physicality found in other forms of fine art. The image (or sound, etc.) is alienated from the material and lacks the aura of the human hand and the implied subjectivity of the artist. And perhaps most of all AI-based generative art is reaching the upper limits of complexity even as little more than the push of a button required.

It is thus suggested that a paradigm shift is due, and that shift could be a move to material generative art.

## 5. The Future of Material Generative Art

With regard to content, the exploration of material generative art engages the audience in ways similar to digital generative art. Some works are purely formal without symbolic meaning or semantic content. An ancient example would be the use of glazes in ceramics. Ceramics aren't typically "about" something, but glazes create form beyond the detailed control of the artist.

Other works of material generative art are self-referential. They are "about" the very generative process that created them. For example, Bio-Art is generally about the generative nature of the biological materials shown. The form it takes is not directly controlled by the artist. The artist creates a biologically viable environment within which natural processes determine form.

Still other works have semantic content, and they make a statement about more than the literal system in front of the viewer. Bio-Art can also participate here,

perhaps offering commentary on ecological or medical issues.

The suggestion of moving from the tools of computer science to the technologies of material science, chemical engineering, biology, and physics is probably daunting to most current digital generative artists. But there are viscerally compelling material processes to be found there.

Many of these fit comfortably under the umbrella of complexity science. Examples include new technologies using nanoparticles and nano-machines, systems of chaotic chemistry, metal corrosion, crystallization, smart materials, materials with optical properties that react to changes in heat, electrical charge, or magnetic flux, liquid crystals, ferrofluids, and more.

AI-art is, of course, a fascinating digital generative art practice. Prompt-art systems that exploit diffusion models are powerful tools that will probably revolutionize the commercial design industry, gaming industry, and nascent VR industry.

Beyond these practical applications, AI-art now provides a relatively safe way to experiment with, and ponder about, what happens when machine intelligence advances beyond our intuitive understanding and control.

But as a fine art practice, it may well be that digital generative art is reaching a dead end, and the turn to material generative art is what comes next.

- [1] Galanter, P. *What is Generative Art? Complexity theory as a context for art theory.* in *International Conference on Generative Art.* 2003. Milan, Italy: Generative Design Lab, Milan Polytechnic.
- [2] Galanter, P., *Generative Art Theory*, in *A Companion to Digital Art*, C. Paul, Editor. 2016, John Wiley & Sons Inc.: Hoboken. p. 146-180.
- [3] Galanter, P., *Artificial Intelligence and Problems in Generative Art Theory*, in *Proceedings of the conference on Electronic Visualisation and the Arts.* 2019, BCS Learning & Development Ltd.: London, United Kingdom. p. 112-118.
- [4] Galanter, P. *The Evolution Of Style And Gigantism In New Media Art.* in *International Conference on Generative Art.* 2011. Rome, Italy: Generative Design Lab, Milan Polytechnic.
- [5] Wölfflin, H. and M.D.M. Hottinger, *Principles of art history, the problem of the development of style in later art.* 1932, London,: G. Bell and Sons, Ltd. xvi, 237 p. incl. front., illus.
- [6] Martindale, C., *The clockwork muse : the predictability of artistic change.* 1990, New York, N.Y.: BasicBooks. xiv, 411 p.
- [7] Berlyne, D.E., *Aesthetics and psychobiology.* 1971, New York,: Appleton-Century-Crofts. xiv, 336 p.
- [8] Dutton, D., *The art instinct : beauty, pleasure, & human evolution.* 1st U.S. ed. 2009, New York: Bloomsbury Press. 278 p.
- [9] Benjamin, W. and Ralph Ellison Collection (Library of Congress), *Illuminations.* 1st ed. 1968, New York,: Harcourt. 280 p.