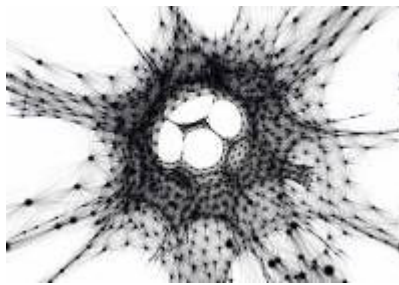


***Randomness In Digital Art: Reconstituting The Sublime Through Radiation***  
*by Luke Murphy as presented at ZKM, Karlsruhe, Germany (November 2008)*  
*as part of the lecture series "What was Old is New Again"*

I would like to start with the proposition that the use of the random number generator in digital art marks the dividing line between traditional art and this new digital one. This division is not merely that randomness has come to be an essential component in the facture of digital work, but that it reflects how our attitude and perception of randomness has changed.

The ability to invoke randomness at will is like the touch of god or a ladling of pure nature and is the engine behind that strain of art, imagery and animation that is programmed algorithmically to produce endless variations of itself. The most prevalent form of this kind of work is "generative art" and is enabled by leveraging the built-in pseudo random number generators available in computers and most software. These random number generators drive everything from the movement of an element of a program's output to the variations of texture in a 3D game. Generative digital creations range from experiments with development environments like "Processing" to advanced simulation games. The digital artist or programmer can create sometimes-stunning images or forms that seem to behave as if they had life using code and available pixel-manipulating algorithms.



Perhaps even more significantly, the digital artist can defer particular aesthetic decisions like composition by creating systems in which the work can generate variations of itself. If we limit our view to just the output of such visual and auditory works, the manifestation points back to an aesthetic of programming and the esthetics of rules into which randomness is introduced. It is interesting that some of the first things artists did with computers, which were designed to produce predictable results, was to introduce randomness. Perhaps this is because randomness is not new to art.

The use of randomness, the aleatory (from the Latin to roll dice), and chance elements or sources has a long if slightly peripheral history in art. From the Lascaux cave drawings where the forms of the animals seem to result from the forms suggested by the rock formations to Alexander Cozens and his “New Method” of random blots to Strindberg, the Surrealists, Duchamp and Cage, the relation of the artist to the random has moved from suggestion and inspiration to a kind of anti-esthetic. There are roughly three models of randomness as part of the artistic process: suggestion, inspiration, and subversion. Common to all however is that the random is a strategy to circumvent our normal controls and frames of reference. In one way, it is a cipher for nature itself both as a generative and as a destructive force. Exactly what it attempts to circumvent can perhaps find a parallel in the history of our attitude towards authenticity.



*(Italian plaster wall)*

One of the most cited references to random elements in Western art is Leonardo Da Vinci's suggestion that the artist should stare at a dirty stained wall in order to free their imagination. This practice of observing chance and random patterns in order to discover new forms seems to have been a strategy of Piero de Cosimo and Sung Ti and even finds echoes in the playwright August Stringberg. In this way, the random provides an inspiration to the imagination by freeing vision from concrete forms in order to imagine new painterly configurations. In his treatise *Method of Assisting the Invention in Drawing, Original Compositions of Landscape*, the 18<sup>th</sup> c. painter Alexander Cozens differentiates the kinds of random artifact used for inspiration. His technique, which he termed an "improvement" over Leonardo's method, was to drip and scumble ink on paper in a random manner. These shapes "enlarge the powers of invention, being more effectual to purpose than the study of nature herself alone". He is emphatic that the inkblots with the least evidence of purpose were the most valuable.



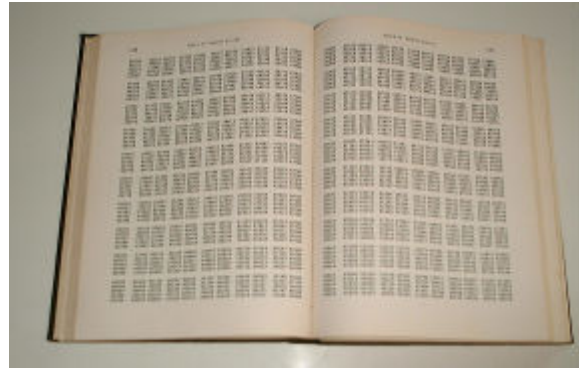
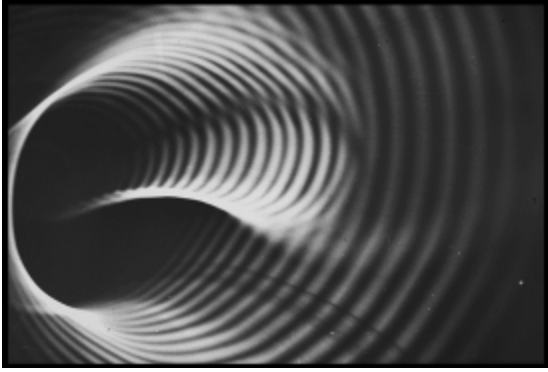
*Alexander Cozens, "blots" from New Method of Assisting the Invention in Drawing, Original Compositions of Landscape (1785)*

For Cozens, the need to unhinge the imagination by disorienting vision depended on a process of creating blots without intention, a kind of undirected play as the psychoanalyst Donald Winnicott might have described it. His argument was that this leads to a greater degree of invention albeit in the service of verisimilitude in the landscapes.



*Collage with Squares Arranged According to the Laws of Chance. (1916-17) , Automatic Drawing, ink drawing by Andre Masson, 1924, Max Ernst "Epiphany" (1940)*

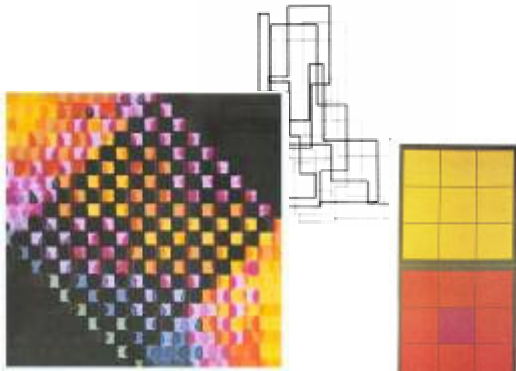
This undirected play develops into the main concern of the surrealists and psychic automatism: The greater the involvement of chance, the greater erosion of the conscious self and the greater chance that the unconscious would reveal itself. The random becomes the measure and the means by which the conscious individual dissolves. Of course, this presupposes that the unconscious is somehow aligned with the random, which is a matter of some debate, but the Dadaists and Surrealists used a variety of techniques from automatic writing to rubbing and frottage to up-end the normal means of deliberate, conscious artistic production. The use of chance was not to simply have work create itself but to subvert the conscious controls of aesthetics and in that way reveal and/or invoke the unconsciousness. However, even they had limits. When Tristan Tzara wrote a poem by drawing words from a hat, Andre Breton saw that he was expelled from the Surrealist group. Breton seems to have struggled with pure randomness perhaps because it threatened to entirely remove subjectivity from art, a fear that continues today.



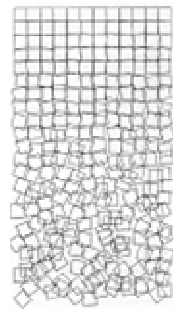
*Herbert Franke (1927, de): Lichtformen, 1953-55, | Rand Corporation. 1955. A Million Random Digits with 100,000 Normal Deviates*

By the time computer-based graphics began to emerge in the 1960s, the relation of randomness and chance to art had transformed from strategic anti-aesthetics into what in 1968 Jack Burnham termed “system aesthetics”. Indeed, this emergence finds a rough parallel to art that emerged in the early 60’s such as Hans Haacke’s Condensation Cube, itself an aesthetic descendant of Duchamp’s Three Standard Stoppages. In Haacke’s work, like the early use of random number generators, the work’s manifestation reflects the vicissitudes of external systems. In some ways, this concept prefigures a great deal of data-visualization work being done today. For Haacke driving external random system was the gallery or museum temperature, for Duchamp it was the string and the height from which they were dropped, and in the case of the early digital work, it was the flow of randomness from the another part of the machine. Randomness becomes a stand-in for the external systems of nature and the world. Randomness was no longer an aesthetic device but a service in a system or algorithm that animated both imagery and sound. In the early computer-based images, we see this new relation to randomness that prefigures much of generative work being produced today.

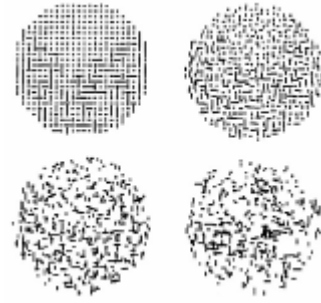
The "Algorists"



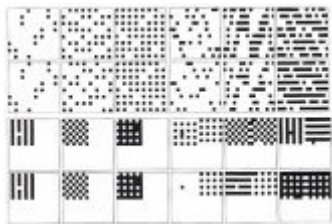
Frieder Nake, «Polygon Drawings», 1965



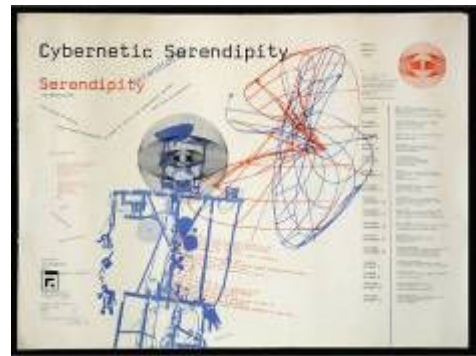
Georg Nees,  
Cubic Disarray  
1968-1971



A. Michael Noll, 1965



'SPLASH, 1972/1974'. The beginning of a splash sequence



Cybernetic Serendipity 1968



Marcel Duchamp, *Three Standard Stoppages* | Hans Haacke *Condensation Cube*

As we move closer to recent time, something strange happens with this increasingly popular use of randomness in computer-based art. The ubiquity of randomness becomes like wind or dust, a given in the digital landscape, but it is worth examining its deeper import.

Real random numbers are a valuable commodity used by statisticians and encryption code among other things. While most computers have algorithms to generate PRNs or pseudo

random numbers, they will, at some point, repeat or show statistical bias. The quest for true randomness in numbers is something that is of enormous commercial interest, but for me there is something deeper and more profound in this pursuit.

The ultimate source of randomness is radioactive decay. It is fundamentally different from other means of producing random numbers such as radio interference or water turbulence because the decay of an atom is essentially uncertain. There is no way to know when any one atom is going to produce an electron in beta-decay or an alpha particle will emit x-rays/gamma rays. There is only probability. This is the consequences of Quantum Mechanics and marks the divide between how Laplace conceived of cause and effect and Heisenberg's uncertainty principle. By listening to the ticks of radiation, we are listening to the noise of uncertainty. We are in direct contact with deterministic chaos that is the universe.

We are also listening to the building blocks of the atomic bomb. Fission is massively augmented decay through the bombardment of neutrons that create a chain reaction of decay releasing enormous amounts of energy when they collide with other atoms – the worst manifestation of  $e=mc^2$ . Randomness through radiation occupies a special position in our worldview because it is an index or figure for our new relation to the world; it has come to be one of the deepest expressions of uncertainty and anxiety. Think of it, just the words random violence intensifies the experience of the violence, somehow makes it worse.

The psychological force behind randomness has a rich history especially as it is used as metaphor for dissolution into nature. In the way Euripides's Pentheus is ripped apart by his mother and the bacchanals, randomness is a true oneness with nature. To become random is to lose yourself. It represents both actual and spiritual death. For this reason, the random is closely related to the sublime and following Burke's 18<sup>th</sup> c. definition of the sublime, reminds us of our mortality. This is probably why static on television sets is such a great device in horror films. It is both randomness and the failure of technology, which in Western societies is vastly more terrifying than natural failure or disaster.

However, unlike the 19<sup>th</sup> manifestations of the sublime that occur as nature itself is diminished, randomness through radiation is inherently resistant to being fully under human control and even when it is harnessed, creates an uneasy relationship. Radiation represents a

pure voice of nature: ancient, continuous, invisible, and pervasive. So what is it then to listen to the sounds of the ticks of radioactive decay? Physically what we hear are the high-energy particles freed from their atomic bonds and after passing through the emptiness of the universe and maybe our bodies, captured by chance by the Geiger wand. Like radio astronomers that listen to the traces of the birth of the universe, it is possible to hear these things with a simple Geiger counter, catching the particles as they follow their ancient trajectories or the ineluctable decay of atoms. Even a simple piece of uranium-based material can contain this mystery.

The time between ticks of the Geiger counter is the wholly unknown that makes up the fabric of the universe. It is the emptiness and unknowability of the machine. The computer translates that sublime unpredictability into a new sublime of information by taking the truly random intervals and making them true random numbers. Confronting that no tick interval can be predicted is like accepting the reality of a vacuum. It exposes the limits of language and imagination. Each tick reminds us of our inability to predict the next tick. This is true anxiety. Our reliance on cause-and-effect and on predictability forms early on in human development. It is the core of our being and determines how we relate to each other. Randomness, true randomness such as the pauses of the Geiger counter, are figures for the chaos that is universe's unconscious and for this reason, it is a source of fascination for the artists who endeavor to capture nature's unconscious.

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