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# Numerical Algorithmic Documentation of Architectural Intuition

## 1.0 Definition of Play In Architecture

### *1.1 A Quick History of Three Ages*

The container has been accredited as the object that gave rise to civilization and the city. As the instigator of the Agrarian Age, not only did the container create the possibility of storing surplus grains, but the city as container managed to create an environment that captured humanity's spiritual and social qualities in one location. In the city people were capable of taking on various roles that were not possible before. Lewis Mumford points out that the hunter-gatherer became the leader of the city due to their inherent aggressive and adventurous nature[1]. These leaders quickly coupled their powers with the social and spiritual qualities of the city giving rise to a power of nearly infinite magnitude. With this infinite magnitude of power came monumental architecture. In the Agrarian Age monumental architecture represented all that was sacred and powerful. As the Agrarian Age city grew in size, so did the multitudes of roles taken on by individuals living in the city. The multitude of roles spawned more roles and eventually a new age emerged: the Industrial Age. The age of physical labor, capital, and the working class shifted the social and spiritual values of the city, yet monumental architecture remained the same up until the last half century of the Industrial age.

In 1955 according to Alvin Toffler the Industrial Age crested in the United States and a new age began: the Information Age[2]. Five years before this Ludwig Mies van der Rohe addressed the Illinois Institute of Technology with the following statement: "Whenever technology reaches its fulfillment it transcends into architecture."[3] Although, Peter Behren's A.E.G. building, Adolf Loos's book "Ornament and Crime", and steel's use in building construction all date back to the early 1900's, architecture's reflection of the age in monumental fashion did not really take full effect until a few decades before the end of the Industrial Age.

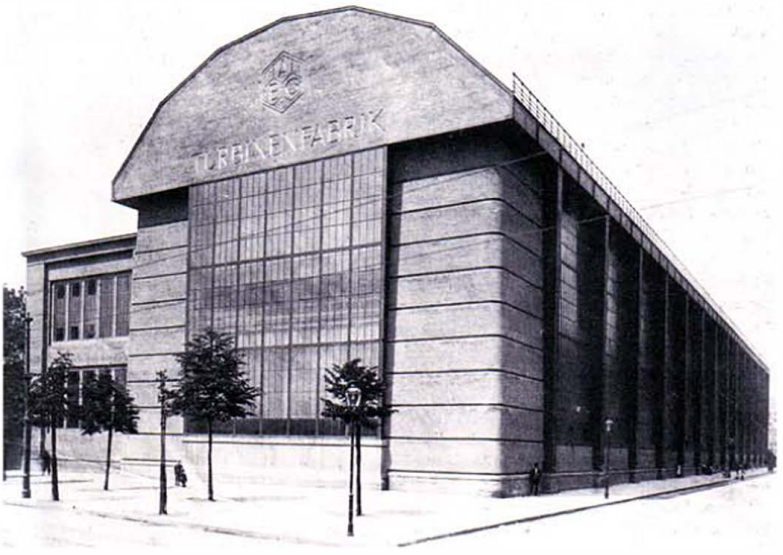



figure 1

Architecture's reflection of the Industrial Age took on a utilitarian form, a form that for most humans lacked meaning; meaning that the Agrarian Age defined through all powerful and sacred buildings. Since Mies's statement, finding meaning in architecture has ventured down many different avenues including: semiotics, deconstruction, situationism, pop culture, neo-classicism, etc…often lumped together under the classification Post-Modernism. This is not to say that the Information Age has not been speculated about from an architectural standpoint. To quote Umberto Boccioni from the beginning of Sanford Kwinter's "La Citta Nuova: Modernity and Continuity": "We are passing through a state in a long progress towards interpenetration, simultaneity, and fusion, on which humanity has been engaged for thousands of years."[4] A statement made in 1913 by an Italian Futurist obsessed with the idea of speed, an idea constantly addressed by French philosophers of the Information age, such as Jean Baudrilliard and Paul Virilio. Speed is an essential part of the Information Age's conception of space, a space that has been overcome by time and artificial light (media)[5], a space that has essentially been negated by virtual space. A virtual container has been created and a new urban environment of networked information and data has evolved, creating numerous roles of human labor outside the realm of the physical. William J. Mitchell author of "The City of Bits" states: "The (inter)Net negates geometry…The (inter)Net is ambient -- nowhere in particular but everywhere at once."[6] As the information age is in its infancy, so too is the architectural material reflection of this age.

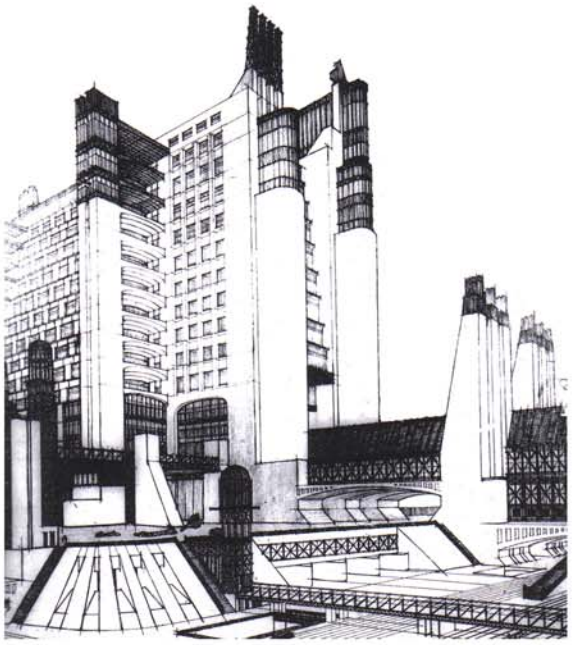
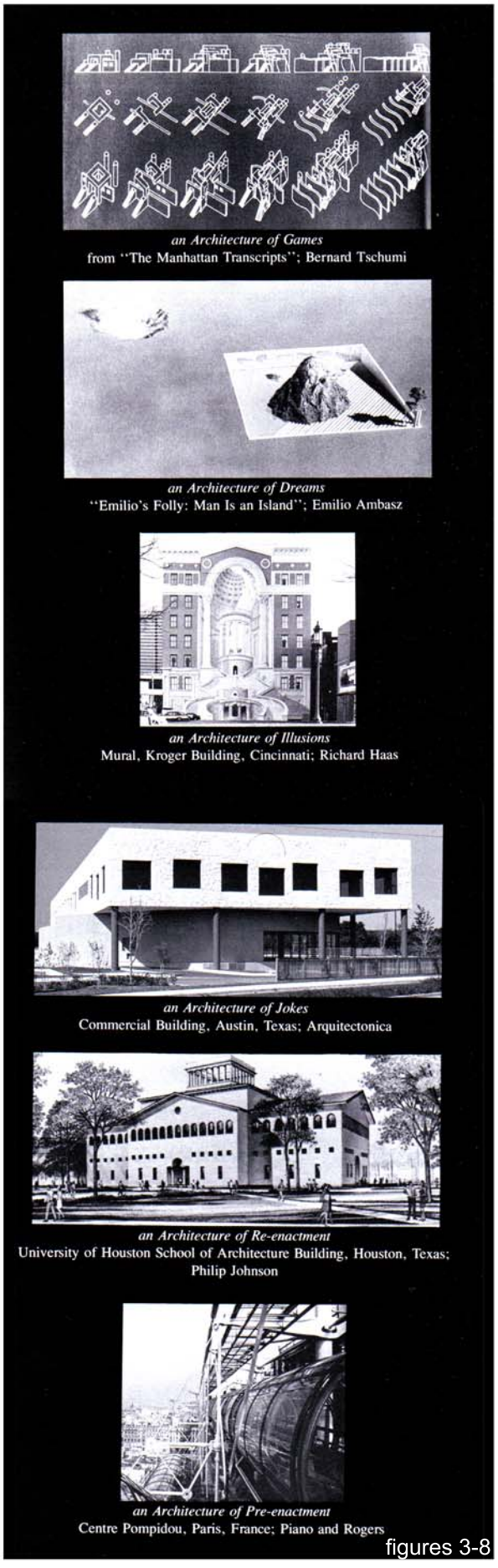


figure 2

*1.2 Avoiding the Grand Narrative*

The conflict of establishing meaning in architecture is a direct result of the very short transition of all three ages in the realm of architecture. One could more or less argue that the profession of architecture has evolved from the Agrarian Age to the Information Age all within the 20th century. This leads to an interesting dilemma similar to Jared Diamond's analysis of New Guinea in "Guns, Germs, and Steel"[7], a place where the natives have been bombarded with all the ages at once and have the choice of choosing an age instead of coming of age. Similarly, the architect has all three ages to choose from when defining meaning through design. This allows any architect to argue for a continuation of whichever age they choose, often leaving the architect open to harsh criticism. The harsh criticism typically arises from camps protesting any continuation of ages they may oppose. As the Agrarian and Industrial age have run their course in the West, their identity is complete. They are well defined and meaning can easily be extracted, but only insofar as both ages can be re-presented properly to new generations who have absolutely no attachment to these ages. It is possible to re-present history in a manner not only understood, but virtually experienced by the inhabitants of the present, but more than often any attempt at this fails miserably and at best results in a greater disconnect between the individual, society and the present. These failed attempts create delusions of "an Architecture of Games", "an Architecture of Dreams", "an Architecture of Illusions",



*an Architecture of Games*
from "The Manhattan Transcripts"; Bernard Tschumi

*an Architecture of Dreams*
"Emilio's Folly: Man Is an Island"; Emilio Ambasz

*an Architecture of Illusions*
Mural, Kroger Building, Cincinnati; Richard Haas

*an Architecture of Jokes*
Commercial Building, Austin, Texas; Arquitectonica

*an Architecture of Re-enactment*
University of Houston School of Architecture Building, Houston, Texas; Philip Johnson

*an Architecture of Pre-enactment*
Centre Pompidou, Paris, France; Piano and Rogers

figures 3-8

"an Architecture of Jokes", "an Architecture of Re-enactment", and "an Architecture of Pre-enactment"[8]. This disconnect in turn prolongs humanities detachment from its grand narrative, a grand narrative many are unwilling to address or are altogether unaware of. A narrative that in some fields of humanity's existence is in full force, yet in others nearly non-existent, case and point: architecture. Of the many methods for remaining disconnected and uninterested in methodically analyzing the current situation play and emergence are two of them. Play defined as the very action that resists all analysis and all logical interpretation by means of its lack of purpose and value and irrationality, and the allusive other, emergence, is a result of inductive reasoning and behavior, order arising from individual agents interacting with each other instead of order being deduced from the agents inherent qualities within the holistic analysis of the agent's global context. Play may cause emergence. Both concepts infer that play and emergence may never be part of any grand narrative, but upon closer review it will become apparent that neither escapes a purposeful driven world. All actions or thoughts follow other actions and thoughts, even if all actions or thoughts past, present, and future were spread out as dots across a landscape of time[9]. The dots must always be connected in some way**.** If the actions and thoughts preceding play have been rationally justified and defined meaningfully as functions of a given historical rational grand narrative then eventually play will become defined as part of this grand narrative. Play like emergence creates order, order that is realized after the fact. History can be reinterpreted, rewritten, and reformulated. If the grand narrative's inherent properties include the action of reformulation then play and emergence become part of the necessary actions for the reformulation. Yet, in the context of monumental architecture or event space architecture, play and emergence are believed to be methods of escape or asides to the grand narrative. The reasons for this conception are the following: by not stating plays purpose or intent of participating in a grand scheme of things play merely continues a trajectory it is unwilling to address or proclaim and in turn masks the logic of its creation,

which adds a level of mysticism to the act that created it. Thus, play causes seemingly emerging actions and ideas to appear, as if everything new came from thin air, but in actuality play and emergence are subservient to the grand narrative.

*1.3 The Documentation and Rationalization of Intuition*

By grand narrative we mean a narrative derivative of G.W.F Hegel and Karl Marx, but perhaps one more generation evolved. It is a narrative that defines the Information Age within a version of Marx's historical materialism. In other words, Marx's "productive forces" and "relations of production" have merely taken on different forms in the Information age, and perhaps have already been defined with new terms that the author of this essay is not aware of. The Information Age does not escape a grand narrative that is defined as part of the dialectical process between humanity and nature. The virtual has become a testing ground for ideas that in the past would have been enacted on nature directly (nature here includes other humans). The laws of existence in the virtual were created based on humanities experience in the physical. All things virtual eventually transcend into the physical. The more thought is practiced in the virtual the more thought will be documented before it is enacted upon nature. Thoughts that at best were described by words and mathematical notations with ink on paper now appear in the virtual on TV screens and computer monitors. The reader of the words or mathematical notation is not confined to their limited faculties anymore; the answer is there before their senses. Within the realm of architecture, the computer has supplied architects with a tool that can document intuitions and various processes of design. In its early stages of development, many still find the computer limiting when it comes to allowable processes of design, but as the saying goes "the computer is only as smart as its user", and surely one day the computer will be as easy to use as the pencil. Hence, theoretically all forms of design processes are possible virtually, which in turn means all intuitions, actions, and thoughts can be documented mathematically, even play and emergence. When play becomes virtual so does emergence, and a method for studying emergence as one studies a static object can be achieved. In this manner similar to mathematic formulas, emerging design and play within design take on the appearance of an algorithm – or a set of procedural rules. Whether before or after the fact, play and emergence are eventually defined within a static symbolic formula that can only be understood properly when put into action. Through the algorithm the mystical becomes attainable for all and the trajectory of play becomes traceable. Inductive reason and emergence are enacted virtually allowing the user to search for patterns that can be reduced into the scheme of the grand narrative. Currently though, the technology and software is not as expansive and flexible as the author suggests, rather what is available to the architect is fairly limited and actually requires the architect to translate his design process into algorithms numerically. This requires the designer architect to use a faculty not often attributed to the creative type: math. There are few mathematically inclined designers who have been accepted as equally creative as the typical design architect, and one in particular that will be discussed here is Cecil Balmond. Through the works of Cecil Balmond, both written, built, and unbuilt examples of how play and emergence are actually subservient to the grand narrative will be explained, but first the stage must be set and the current understanding of play and emergence in architecture must be defined.

*1.4 Architectural Monumentality and Play: A Definition*

"Monuments are human landmarks which men have created as symbols for their ideals, for their aim, and for their actions."[10]

It is clear in this statement how monuments in architecture could be part of a grand narrative. The authors of this statement in 1943 went on to explain that modern monuments had evolved into something empty and shell like, structures that could not represent modern man, unless you believed in nihilism (impossible!). Louis Kahn argued in his paper "Monumentality" a few years later that the spiritual and social mysticism of monuments like the gothic church could still be achieved with modern materials, but not via the modern materials themselves[11]. In 1955 Philip Johnson listed the seven crutches of modern architecture, mainly in reference to the International Style and its rules of form through functionalism. The seven crutches: history, seductive drawing, utility, comfort, economy, serving the client, structure were all part of the former rationalism that justified a buildings form, which in theory was a response to the social conditions. The failure Johnson points out is that art has nothing to do with intellectualism and essentially the act of creation is a sum of artistic moves, and only this method of creation could reintegrate meaning into the forms of architecture[12]. To understand intellectually the source of meaning allows the thinker to also rid the source of its meaning. All three of the above critiques merely reveal the transition from the Agrarian Age into the Industrial Age, with a nostalgia towards the former, since industrial utility as monumentality lacks the ability to provide any real meaning to humanity. None of the above solutions offered any methods of design on how architecture could relate to the Information Age. Rather, the notion of material monumentality is seen as a farce or oppressive in the Information Age, and any attempt at creating a monumental form in architecture reveals an attempt at recreating past ages that were not as democratic as the Information Age. Thus, the question remains: what is architectural monumentality in the Information Age or is it even possible?

Lebbeus Woods states in "Radical Reconstructionism": "This culture is maintained at the expense of creativity that can emerge only from an imagination stirred by confrontation with every kind of experience and actuality."[13] Woods continues by describing a state of current affairs in which mass culture has become pacified by receiving all their wishes. What mass culture desires is instantaneous stimuli, which is only possible in a virtual world. Where the virtual takes precedent over actual, material monumentality is translated into the cultural event. In the context of contemporary culture, an actual material monumentality reflecting the grand narrative becomes a feared objective, and the only means to circumventing the creation of fear is through play. Unnoticed, play merely adds more content to a trajectory of a narrative no individual would be willing to subscribe to if they knew what they were subscribing to. In order to avoid society's discovery of the core values of this grand narrative, the architecture is coupled with the cultural event, and the core value of the system is masked in signs of media consumables that mislead and deceive the reader/consumer. The monument in the Information Age has entered another realm so that is may appear more democratic. It remains in material, but hides its true statement underneath the cloak of presented and re-presented media events. In this monumental architecture play helps masks the logic of the narrative, which in turn prolongs the delusions and the misunderstanding of what the narrative really is. Without the virtual functioning in parallel with a physical confrontation of the monument and the Information Age, no true nature of the Information Age and what its monuments may materialize as will be understood and ultimately created and/or re-created.

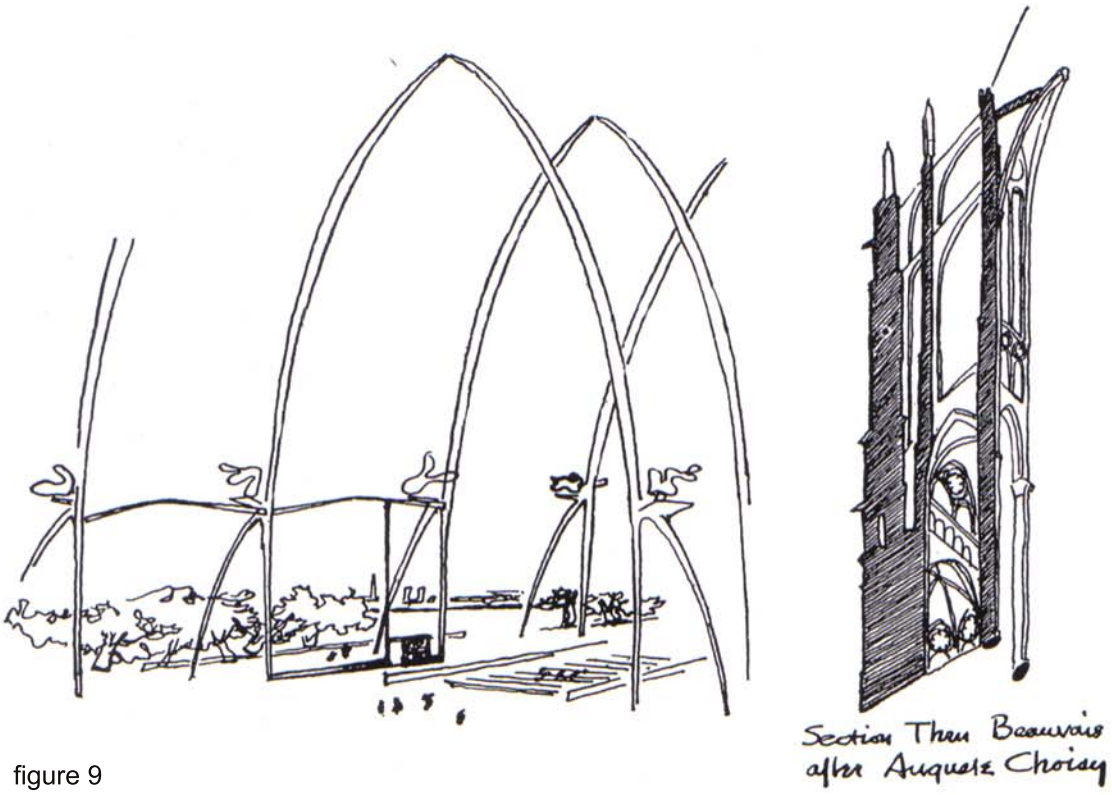



figure 9

*1.5 Event Space and Play: A Definition*

Until the Information Age, the cultural event took place in physical localities, but as Paul Virilio and Jean Baudrilliard observe, via the virtual world and the artificial light or media the cultural event has gone beyond real space and time[14]. The cultural event is embedded in all information that dissipates the environment by means of the artificial light, especially in dense urban areas and occuring globally simultaneously. This instantaneous global space is a result of the Information Age, but the importance of the Industrial Age space and its readings still influence cultural events. According to Henri Lefebvre "By the late 1920's the great philosophical systems had been left behind, and, aside from the investigations of mathematics and physics, all thinking about space and time was bound up with social practice – more precisely industrial practice, and with architectural and urbanistic research."[15]. The reading of space concerning cultural events and moments began to arise in the 1970's architectural semiological forum of thought. Lefebvre points out though that space is first produced and then read unless the space was designed to be read by someone trained to read it. As Lefebvre remarks, architects failed to design spaces to be read by the inhabiting as the architects rules for signifying the space were based on irrelevant modes of formalism and functionalism[16]. Bernarnd Tschumi in the Manhattan Transcripts explores these disjunctions in a situationist like manner[17]. The transcripts suggest that space, movement, and events are completely independent and thus the conventions of architecture can be broken down and rebuilt along different axes. Tschumi also mentions that the concept of architecture can precede its construction or be derived after its construction. Similar to situationism this method of architectural analysis is far from establishing a method for reflecting the grand narrative, but rather it establishes a local narrative from observations with the undertone of rebellion. This local narrative is then exponentially exaggerated via the virtual world masking the true intentions and logic of the architecture. This misleading information leads to misreadings and ultimately becomes fluff to hide the

core of the architecture. The core of the architecture represents the core of the cultures values, which as Lebbeus Woods states must be physically confronted not just virtually. This very situationist act of writing and reading architecture is play itself; it revolts against logical analysis and pretends to be the very act of freedom. Of course the intellectualization of these hedonistic observations is not allowed, otherwise their romantic experiential value is lost and thus the observer becomes just another brick in the wall. In event space play is a method for writing and reading architecture, a method for deluding the grand narrative with irrelevant illusions.

figure 10

**2.0 Histories, Logic, and Emergence**

*2.1 J. Huizinga's Play and Historical Language*

The definition of play in this essay has been derived mainly from J. Huizinga's chapter "A Study Of the Play-Element In Culture" from "Homo Ludens"[18]. J. Huizinga defines the main characteristic of play as freedom itself. The second characteristic of play is that it is neither ordinary nor real, and that it is accepted as pretend. One can quickly draw parallels between this definition and our architectural event space definition of play. The former half of the definition would be accepted by almost all situationists, but the latter would most likely be disputed. To the situationist, their hedonistic subjective observations of the temporal are very real. In fact in their opinion this is reality at its most visceral moments, but any proper communication of these moments would only rid these moments of their significance. Any intellectual, rational, historical, or reasonable explanation of an experience in a situationist's mind renders its unreal. The objectification of the subjective is an annihilation of the emotive value inscribed in the situationist's memory. "For us, as architects, time is spatial because space is what we construct, and time is there to activate these spaces, occasionally to transform them by challenging the perception of their boundaries."[19] The situationist can not escape the grand narrative that designed the space they experience, even if the designer believed they might have escaped the grand narrative while designing it. The belief in escape is a delusion. Delusions like play and emergence are subservient to the grand narrative anyway. Thus, in terms of the grand narrative event space play is identical to J. Huizanga's definition of play (in its modes of action).

Huizinga suggests that play does not necessarily mean non-seriousness; rather play can be very serious, just as one may take their delusions seriously. The seriousness of play is best exhibited in Huizanga's explanation of the religious rite. The religious rite is an event one can participate in, in order to escape ordinary life. "The rite produces the effect which is then not so much figuratively as actually reproduced in action."[20] In this sense, and this is an important point in Huizanga's historical documentation methodology, the past event is actually relived and is not just a mimetic act. The religious rite here can be compared to our definition of play in monumental architecture. As the savage puts on his mask to re-enact a moment of the past so does play in this manner attempt to create monumental architecture. The mask of the

monument is meant to be taken seriously, even though we all know who or what is really behind the mask. As Huizinga mentions no one likes a spoil-sport. The individual who unveils the truth behind the mask is disdained and considered criminal by the partial and full believers. The illusion can not be robbed, and thus the illusion becomes an event within the grand narrative. Can the observer through this illusion really experience the moment being signified? Why is it important for the possibility of the observer to truly experience the moment?

Huizinga doctoral thesis was in linguistics and he was very much influenced by the Dutch literary movement of the 1880's, most notably the writings of Lodewijk van Deijssel. Deijssel believed that "sensation" was the most intimate contact we could have with reality[21]. Housing's approach to historical documentation was through the language of "historical sensation". Through historical sensation words are used to create a feeling of déjà vu in the reader of past historical events. In this very aesthetical method Huizinga attempts through subjective yet calculated language to provoke sensations in the reader. The language used is directed more towards tactile sensations than towards visual, which in turn avoids Edmund Husserl's critique of the early 20th century crisis in Western science. Edmund Husserl critique clarifies that the source of the crisis was due to the broadly accepted practice of Galileo's methods for doing science. This method took for granted that our geometrical visions only needed to be proven by the art of measurement and that this was enough for a proper description of nature. This mode of thought limits science's ability to accurately describe many aspects of reality, especially sensation's of touch and smell, and as was later determined the relationships between entities in the world[22]. Huizinga attempts to deintellectualize the historical account so that it may materialize in front of us, and through his employment of mysticism actually bring us closer to the originally experienced moment. Although nothing ever repeats itself in the grand narrative, the ability to re-present history in the manner of historical sensation is important to us for the following reason: it gives us the ability to communicate important moments of change in the logic of the grand narrative to the present inhabitant of history, so that they may extend and progress the current logic instead of repeating the logic of the past. A linguistic approach to historical sensation is far too subjective due to its very inherent aesthetic qualities but as we shall see in the work of Cecil Balmond there is another route.

### *2.2 Hegel, Marx, and the Third Generation of Dialectical World History*

The grand narrative of architecture is really architecture's manifestation of all elements at work or play in the continual formation of the universal grand narrative. As one eliminates a dimension in a math problem by adding a constant, so does the materialization of architecture eliminate a dimension of the universal grand narrative. Architecture materializes a culture's values, not just socially but also technically and scientifically. The unknown variables become constant in built form. This is valid for all architecture, not just the monuments. Architecture is the most static materialization of history's grand narrative.

The following will by no means do justice in explaining the work of G.W.F. Hegel and Karl Marx. It will also surely fall short of explaining exactly why the grand narrative referred to in this essay is actually a third generation of the previous mentioned philosophers conceptions of history. There is neither time nor the space to even begin a proper theory of an Information Age Historical Materialism in this essay, a subject the author of this paper is not quite sure even exists, but what will be inferred here is very important for establishing a variant of

historical materialism as the only true form of history and theory. G.A. Cohen in his book "Karl Marx's Theory of History: A Defence"[23] summarizes the difference between Hegel's and Marx's concepts of history as follows:

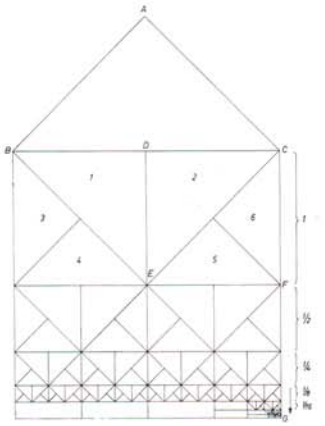
*Hegel:*
*"History is the history of the world spirit (and, derivatively, human consciousness) which undergoes growth in self-knowledge, the stimulus and vehicle of which is a culture, which perishes when it has stimulated more growth than it can contain."*

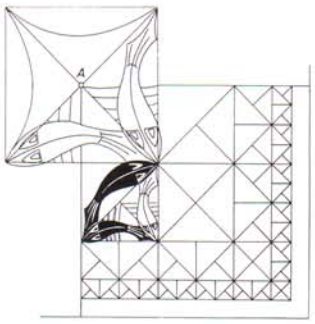
*Marx:*
*"History is the history of human industry, which undergoes growth in productive power, the stimulus and vehicle of which is an economic structure, which perishes when it has stimulated more growth than it can contain."*

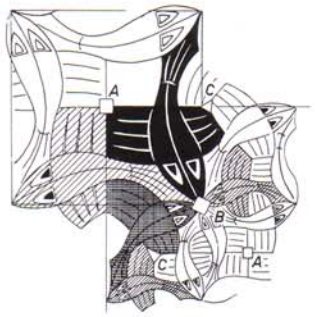
*Third Generation Dialectical World History:*
*History is the history of the human consciousness and production in the form of numeric code and algorithmic formulae, which undergoes growth in a coupled virtual and material world, the stimulus and vehicle is the electronic dissemination of information via networks of signs and signifiers, translating occasionally into the material environment and back again into the virtual; containing the growth of information is unlimited, and at best the material world growth may not be contained, but the virtual is not confined by space.*

Our concept of history is ultimately a synthesis of both. Through the virtual world of the internet and media Hegel's spirit is embodied by virtual as an organism in and of itself and through our physical and mental labor the power of production remains. Labor is more than just physical, the labor of the mind has become a "productive force". As Jean-Paul Satre suggests in "Critique of Dialectical Reason"[24] scarcity is the variable that led to the rise of all the forces that caused history's development, but the virtual world is exempt from this. As long as there are humans with an electronic connection there will never be a world scarce of information, rather a world flooded with information and with each flood the network of information will expand. What is important here is the concept of the dialectical reason between humanity and nature. Humanity thinks and acts upon nature, nature responds, man re-thinks and re-acts ad infinitum…This is the very nature of the grand narrative: thesis, anti-thesis, synthesis. Humanity as thesis. Nature as anti-thesis. The outcome as synthesis, which becomes the new thesis for humanity. Within our concept of history, thesis as represented by the virtual creates another world of dialectical reason within itself, one in which our thoughts can be tested against our representations of reality.

Play and emergence are two subservient factors to the nature of the grand narrative. Play as unconscious acts evokes a response from nature causing us to become conscious of those very acts. When we become cognitive of our actions we begin to learn our inherent rules of procedure. Thus, rules of existence emerge, or in other words, a complexity unrealized about us is shown forth. In nature our actions also cause logics we were unaware of to emerge, hence emergence is more a form of consciousness becoming aware than an unpredictable outcome. Within the virtual of the grand narrative there are already clues to what humanity is to be conscious of, and if the virtual cannot through its own dialectical process synthesize possible emerging logics then human action on nature is required.







figures 11-14

*2.3 Kant and Emergence*

“ Everything in nature, in the inanimate as well as the animate world, happens according to rules. Water falls according to the laws of gravity, and the locomotion of animals also takes place according to rules. The fish in the water, the bird in the air move according to rules. All nature actually is nothing but a nexus of appearances according to rules; and there is nothing at all without rules. When we believe that we have come across an absence of rules we can only say that the rules are unknown to us.

The exercise of our own powers also takes place according to certain rules which we first follow without being conscious of them, until we gradually come to cognize them through experiments and long use of our powers, and finally make them so familiar to us that it costs us great effort to think them in abstraction. Thus, for example, general grammar is the form of a language as such. One also speaks, however, without knowing grammar, and he who speaks without knowing it actually does have a grammar and speaks according to rules, even though he is not conscious of them.”[25]

This quote by Immanuel Kant sums up our conception of humanity's virtual consciousness, the virtual of the grand narrative. What is also being suggested here is that Kant's system of logic is the very nature of humanities mode of consciousness. All logic is a priori, hence the impossibility of emergence. Kant further states "In logic we do not see how presentations arise but solely how they agree with the logical form."[26] This he leaves to metaphysics and so do we, since the emergence in question in architecture as it is currently being employed is derived from the "non-linear" aspects of science. Emergence in the "non-linear" aspects of science is not a result of something beyond the very study of nature, but rather emergence is the alternate explanation of linear logics failing in predicting an outcome of an experiment in which new logics and unexpected results seem to appear. The study of the part does not necessarily lead to the whole in non-linearity. As P.W. Anderson states "more is different"[27]. The linear mode of thought, one of deduction and reduction a priori, is trumped by what seems to be emerging logics in nature, logics that we believed upon initial analysis were not possible of construction from our a priori logic. But, in theme with this essay we must establish emergence as a delusion similar to play, therefore we define emergence as a presentation of logics that we were not conscious of, and to believe in them as separate from our virtual grand narrative is to be delusional. In theory we could of become conscious of these logics, had we in the manner of Kant's system of logic given it some considerable thought to what we a priori already knew and from this then synthesized new emerging logics. To further explain this point an expert on complexity and emergence Doyne Farmer is quoted here: "I'm frustrated in talking about all this. There's a real language problem. people are thrashing around trying to define things like 'complexity' and 'tendency for emergent computation'. I can evoke vague images in your brain with words that aren't precisely defined in mathematical terms. It's like the advent of thermodynamics, but we're where they were in about 1820. They knew there was something called heat, but they were talking about it in terms that would later sound ridiculous."[28] At this moment in time the linguistic description of emergence in architecture is lacking logical precision, but as this quote suggest in time an accurate explanation will come. It will come not as a result of discovery in nature, but rather a discovery of our own already inherent logics through our reflection of ourselves in nature and a more elaborate study of our virtual consciousness.

Kant subdivides the a priori cognitions into two categories: quantitative and qualitative. The quantitative logics are of pure intuition and usually take the form of mathematics. Unlike the aesthetic qualititative logics, the quantitative can be constructed and proven true. By truth Kant means the agreement of the cognitive with the object within the a priori system of logic. By object we mean the object of reflection, not the object in and of itself. Qualitative logics are produced by the senses and therefore are considered subjective and can not be trusted for an accurate account of the real. This also renders the qualitative logics as a means for a Weltbegriff useless. Weltbegriff as defined by Kant is "the concept that concerns what necessarily interests everyone."[29] At the advice of the translators of Kant's logic we are not redefining this word in English[30]. Only a quantitative logic that can be intuitive constructed by all can become the Weltbegriff, an agreement on the qualitative logics between all is futile. The Weltbegriff is then the defining algorithm of the vehicle of information and data to our virtual grand narrative. Unlike Huizinga's historical sensation through words, we now have a method for a historical sensation through the intuitions that can be grasped and understood by all via numerical encoding and algorithmic synthesis of logics a priori.

## 3.0 Intuitive Mathematics

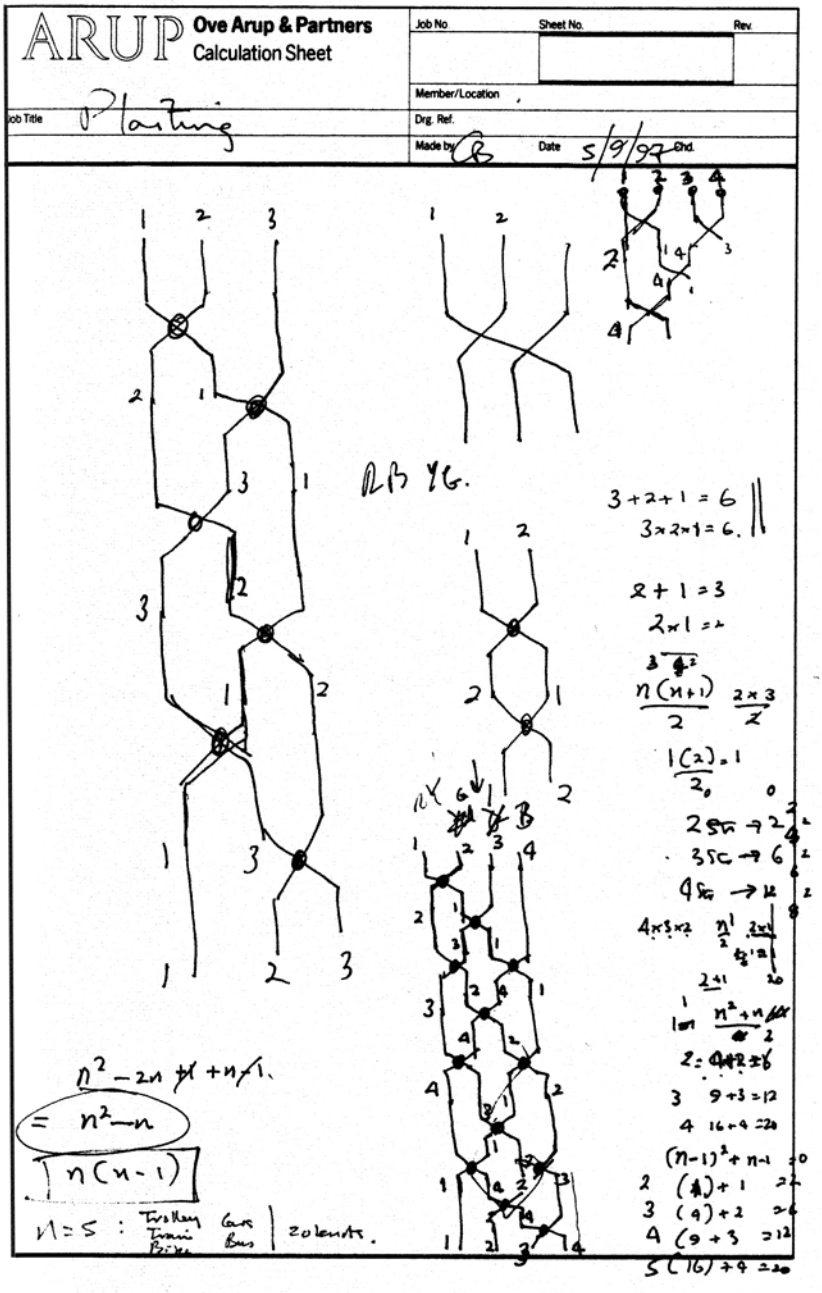
### *3.1 Brouwer's Intuitionist Mathematics*

Since Kant's intuitive logic of mathematics many theories of logic and mathematics have emerged. Two in particular which have supposedly rendered his approach to mathematics inadequate are Logicism and Formalism. To the average observer all these approaches seem very similar, but the fine differences here are very important. To differentiate Cecil Balmond's methods of engineering compared to the typical engineer the following point made in this section is key. Logicism is a direct continuation of classical mathematics a whose greatest proponent was Betrand Russell. "Logicism is the thesis that mathematics is reducible to logic, hence nothing but a part of logic."[31] Betrand Russell and Alfred North Whitehead attempted in "Principia Mathematica" to establish a mathematics built upon logic alone. In this system logics build upon other logics in order to construct new logics, thus from the basic foundational logic of the system all of mathematics in theory can be defined. The popular proof of Kurt Gödel: "the incompleteness theorem" proved that no formal system is complete in describing the natural numbers and that no formal system itself can prove its own consistancy. This theorem has been quoted so many times in so many papers and books that one has become quite sure that the only way to create mathematics has to be through the formal. It then typically follows that one assumes we as humans can surely never create a system of mathematics that can not avoid the problem of the "incompleteness theorem" or even emergence. This theorem has become somewhat of a pop justification for anyone incorrectly developing an argument that humanity can not know anything a priori. Gödel's theorem also addressed David Hilbert's Formalism, a system even more removed from intuitive concepts and attachments to meaning in mathematics, a system that suggests that mathematics is merely a game of numbers and symbols. The question of meaning in mathematics is a complicated one. In this essay meaning in mathematics is defined as the ability for human intuition to attach the math to its virtual grand narrative, its Weltbegriff of logic.

Georg Cantor a mathematician of the late 19th century attempted to prove that there were varying levels of infinity, or in other words as he presented it, varying powers of sets of infinity. Put simply, Cantor implies that there are infinities "larger" than other infinities. This is a crude definition, but it should bring to light in the mind of the reader the absurdity of such a proof, or perhaps not. If not, the reader has just jumped ship and joined the camp of the Logicians Formalists, and the typical engineer. A camp that finds it unessary to intuitively understand mathematics, but rather views mathematics as a symbolic system to help solve problems in the world, but not a meaningful system to help understand the world. A world that can be intuitited by all in the sense of the Weltbegriff, and a world that can ultimately be learned and experienced intuively through the quantitative synthetic construction of a priori logics; through the logics of mathematics as pattern or algorithm.

"The question where mathematical exactness does exist, is answered differently by the two sides: the intuitionist says: in the human intellect, the formalist says: on paper."[32] L.E.J. Brouwer another Dutch thinker from who we will borrow to finalize our language for describing Cecil Balmond's work was the proponent of mathetmatic's Intutionist philosophy of the early 20th century. Intuitionism is in strong opposition to the charcteristics of Formalism and Logicism. Brouwer describes the key element lacking in Formalism and Logicism as ***"consciousness of legitimacy"***[33]. This very notion, or intuitive moment within ones own

logic, is the very source that provides meaning to a mathematical statement and more over meaning to the patterns and algorithms in our minds a priori, the patterns and algorithms that help us interpret nature. It might be suggested that reling on intuitionist logic to create interpretations of patterns and algorithms in nature is limited and surely no advances may be made into evualting seemingly emerging logics, but our analysis of Cecil Balmond's work as compared to the typical engineer will clearly refute this point. The typical engineer similar to the mathematical Formalist blindly accepts the applicability of Formal systems in describing nature. This type of engineer further thinks that by manipulating the symbols of logic they can invent new and better methods for doing the calculations of engineering. If they do invent new methods, they actually intuit their new method, but instead of remaining involved at this level they once again detach themselves intuitively and create new sentences of symbolic syntax. As we will see in Balmond's work, more than often the symbolic syntax of logic actually comes after the intuitions have been clarified.




"When this idea was introduced to the design team we were well into the scheme..."[34] figure 15

*3.2 Thesis*

The words “play” and “emergence” have managed to facilitate an employment in architectural theory which few truly understand. Both words by their very nature are intended to prevent a proper understanding, or an analysis that could deduce and reduce these words into simple concepts that all may comprehend. These two words are merely words describing concepts within the evolution of architecture that no one has yet been able to pin point or acquire theoretical control over. In a few fields of study outside of architecture, these two words have been more thoroughly analyzed, from which we have borrowed as much as possible to help us clarify our current situation. Our clarifications can be listed as follows, logically chronologically:

1. *play can cause emergence*
2. *emergence does happen*
3. *play is action without conscious reflection*
4. *emergence is action without conscious prediction*
5. *human collective consciousness acts upon nature*
6. *nature reacts to the human collective consciousness*
7. *human collective consciousness changes*
8. *human collective consciousness has become embodied in the world of digital networks and computers*
9. *the embodiment of the human collective consciousness is the virtual*
10. *the virtual is documented mathematically*
11. *thought processes are defined by sets of procedural rules*
12. *algorithms are sets of procedural rules*
13. *within the virtual the relationship of the human collective consciousness to nature is recreated without matter*
14. *algorithms, thought processes, natures reenactment virtually by computers, and all numerically documented processes are classified as logics*
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18. *truth is the agreement of the conscience with nature within the a priori system of quantitative logic*
19. *truth is reality*
20. *the virtual is a collection of truths collectively quantitatively intuited*
21. *the evolution of the virtual is the human half of the grand narrative*
22. *the confrontation of the virtual with the material is natures half of the grand narrative*
23. *to know the grand narrative is to intuit all things*
24. *at the end of the grand narrative all things will be known*

As this applies to architecture the following statement can be made: algorithms documented in the virtual are a collection of intuitions, and thus play and emergence within architecture can be quantitatively defined and communicated and most importantly added to the evolution of the collective human consciousness. To prove this a case study is needed, and for this we choose the work of Cecil Balmond. The proof to follow will not be presented in essay form. Rather, a poetic play with Cecil Balmond's words, sketches, calculations, and images in contrast with our **24** point thesis will be presented. This presentation as performance intends to clarify the logics that have been emerging in the readers own a priori logic while reading this essay.

Of course there is a disclaimer, but not one that accuses the reader of being a narrow minded Formalist if they do not quite intuit the logics at the moments the author wants them to. The literary works employed here are the following: “The Search for the Sigma Code”, “Informal”, and the introduction of “Pamphlet Architecture #27 Tooling”. All written by Cecil Balmond. Balmond’s use of the word ‘informal’ is a hybrid of our two definitions for play and emergence. Balmond uses play to cause logics to emerge. The method for becoming conscious of these logics is intuition alone and as we suggest complete logical clarity should become possible, but Balmond does not present his endeavors to us this way. Instead of insinuating possible logical clarity as the outcome, Balmond leaves us with a tinge of mysticism and points us in the direction of doubting our own systems of thought. This methodology for presentation of such intellectual material has a duality that is helpful on one hand and dangerous on the other. For the strict formalist who can not break free of their engrained outdated modes of thoughts, doubt in strict formal thinking throug a belief in mysticism is a necessary ontological action for becoming free and creative. On the other hand though, for the already free and creative thinker, adding more mysticism to their modes of thought may actually lead them farther away from ever intuiting their own logic for a better understanding of the world. It may even give them license to remain in the ridiculous and absurd. The absurd is valuable in ontology, but we are concerned with the study of the built environment, a study that transcends into the global and material world, requiring a little more practical thought. Balmond also refers to Cantor’s set theory of infinites in “Informal” on page 376. The introduction of Cantor directly follows the enumeration of the natural numbers versus the even numbers, proving that both are equally populous in amount of numbers contained within their respective sets. In this short passage of text it is impossible to understand exactly to what extent Balmond agrees with Cantor, but what is clear is Balmond’s point concerning the self-similar concept of the sets. In context with the rest of the book, this use of self-similar is referring to patterns and fractals, hence our argument that Balmond is an intuitive engineer probably still holds true. All that can be disclaimed has been disclaimed. For all that will be written true or false, the author of this essay can be blamed.

# 1. play can cause emergence

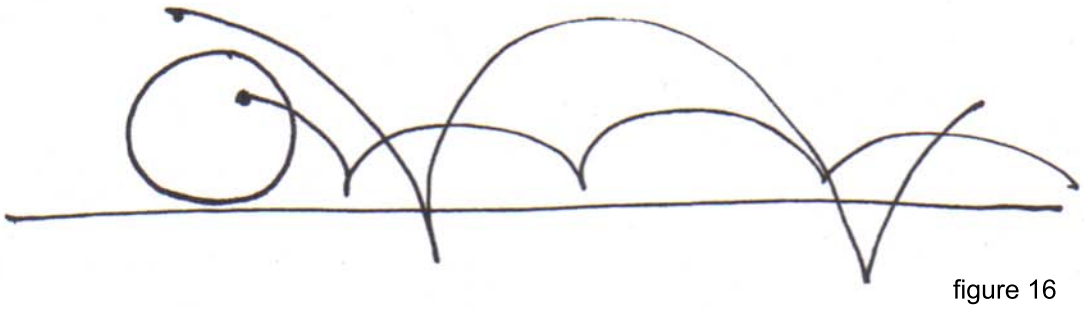


figure 16

"Remember the only thing that will slow you down or stop you is the amount your mind has grown up to be like the Elders, the brain of an expert. The problem I set is for a child, with a mind that in innocence questions everything and finds new beginnings."[35]

# 2. emergence does happen

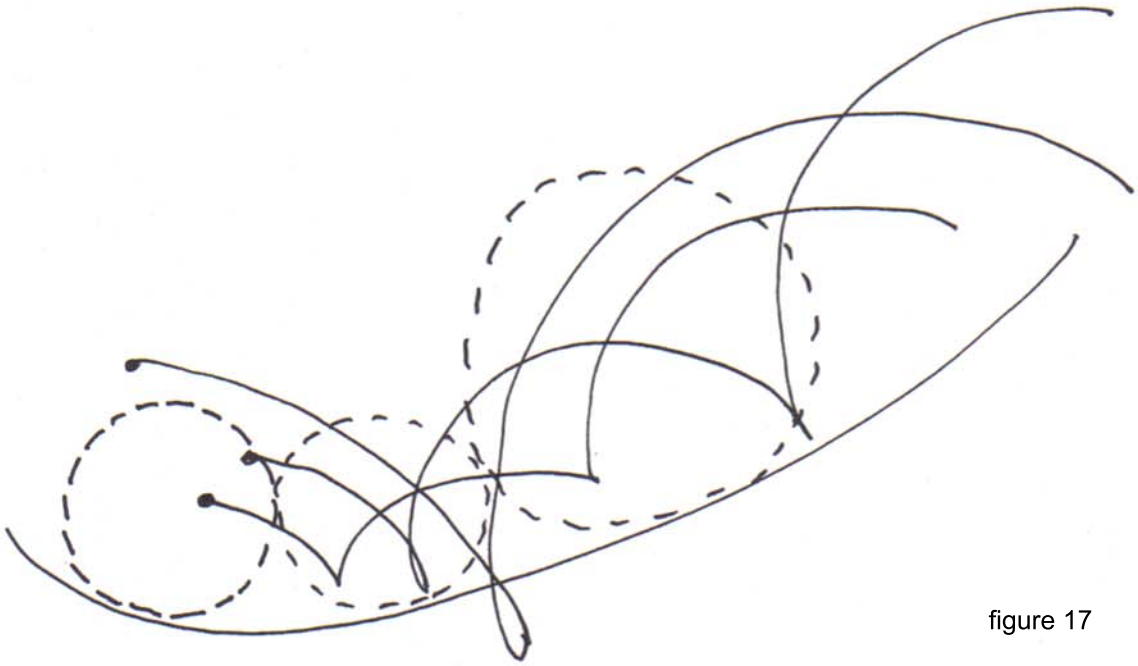


figure 17

"The approach poses a puzzle, for not being obvious is a virtue of the informal: as there is no endorsement of the familiar or fashionable, there is no one-statement structure either.

The consequence is an architecture full of suprise. Now you see it, now you don't. Informal is that chameleon, a change-artist;"[36]

1. play can cause emergence
2. emergence does happen
3. play is action without conscious reflection
4. emergence is action without conscious prediction

"It is not ad hocism, which is collage, but a methodology of evolving start points that, by emergence, creates its own series of orders.

When we attempt to trap chaos and convert it to our preconceptions, Order! becomes an enormous effort. We try to eliminate fault or error. We try hard but the effort turns to dullness and the heavy Formal."[37]

3. play is action without conscious reflection
4. emergence is action without conscious prediction

Σ

“In an idle moment one day, as the sun shot its ninety nine thousand rays over my desk, I wrote down the integer values 1 to 99 in serial fasion, in rows of nine:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
| 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 |
| 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 |
| 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 |
| 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 |

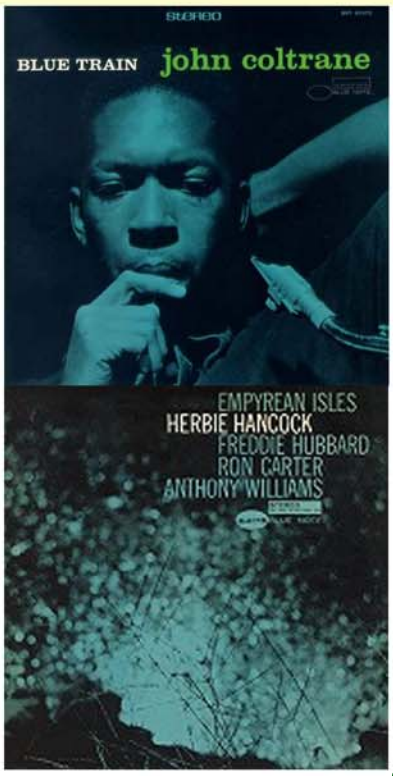
add the digits of each number together. rewrite the final number over the original.

example: 10 is 1 + 0 = 1
11 is 1 + 1 = 2
12 is 1 + 2 = 3
13 is 1 + 3 = 4
14 is 1 + 4 = 5
15 is 1 + 5 = 6
16 is 1 + 6 = 7
17 is 1 + 7 = 8
18 is 1 + 8 = 9

19 is 1+9 = 10 is 1+0= 1
20 is 2 + 0 = 2
etc...

As I scanned the numbers I realised suddenly that the entire table was but a repeating pattern.”[38]

4. emergence is action without conscious prediction
5. human collective consciousness acts upon nature
6. nature reacts to the human collective consciousness
7. human collective consciousness changes




$$9 \times 1 = 09 \qquad 90 = 10 \times 9$$
$$9 \times 2 = 18 \qquad 81 = 9 \times 9$$
$$9 \times 3 = 27 \qquad 72 = 8 \times 9$$
$$9 \times 4 = 36 \qquad 63 = 7 \times 9$$
$$9 \times 5 = 45 \qquad 54 = 6 \times 9$$

figures 18-19

"The more subtle approach is to seek the notion that chaos is a mix of several states of order. What is an improvisation is in fact a kernal of stability, which in turn sets the sequences that reach equilibrium.

Several equilibriums coexist. Simultaneity matters; not hierarchy."[40]

1. play can cause emergence
2. emergence does happen
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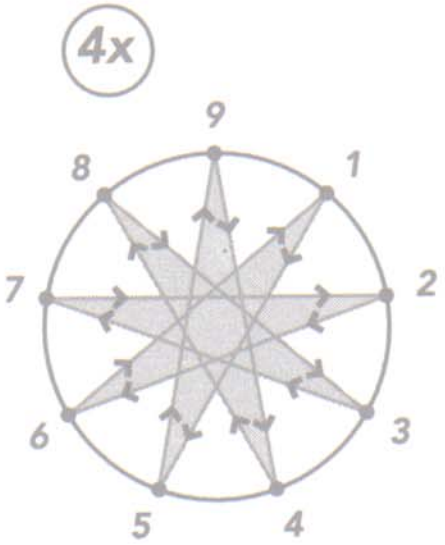
5. human collective consciousness acts upon nature
6. nature reacts to the human collective consciousness
7. human collective consciousness changes

15. logic is a priori, it is inherent within the human conscience
16. logic a priori is intuition



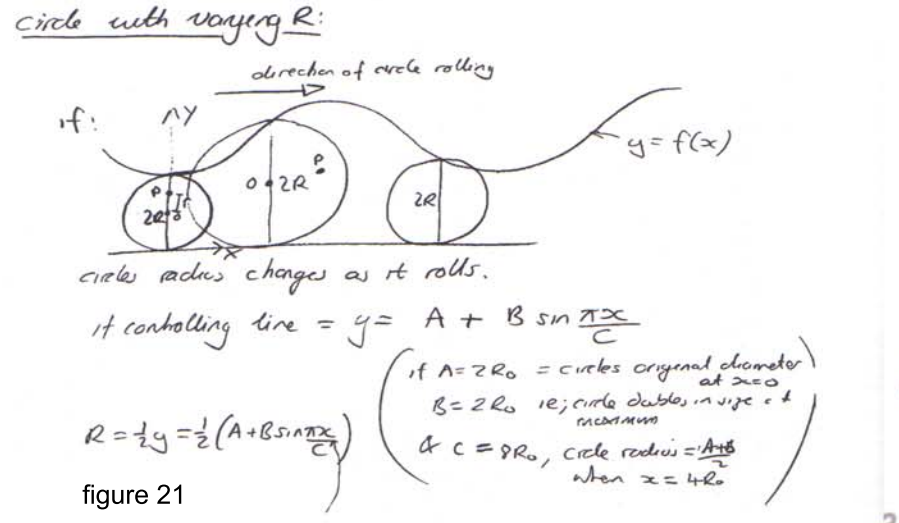
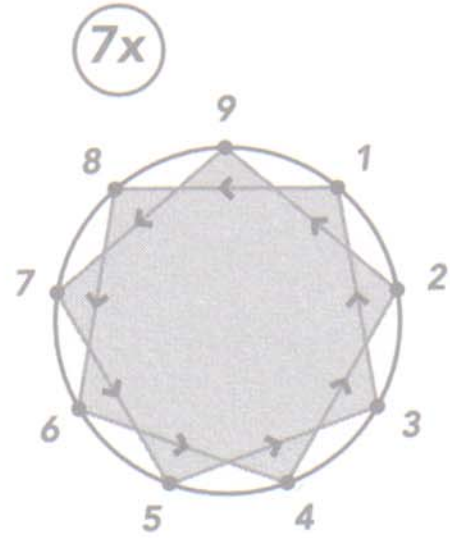



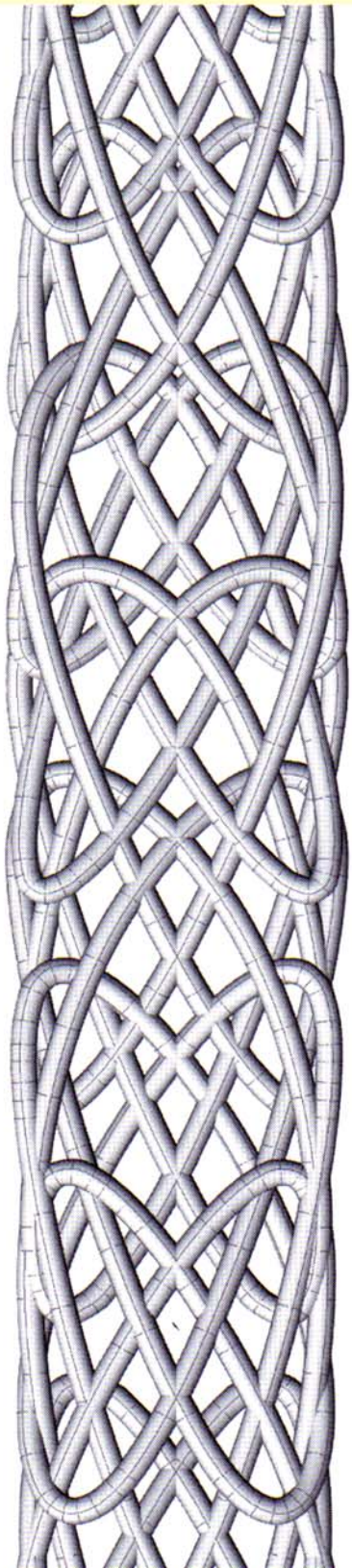

figure 21

“What matters is pattern and its connectivity.




Clues to these solutions lie deep in nascent structure in a shadow world of emergent patterns and geometric transients. In the very process of assembly a structural logic is seeded, if there is a connecting path there is meaning.”[40]

*8. human collective consciousness has become embodied in the world of digital networks and computers*
*9. the embodiment of the human collective consciousness is the virtual*
*10. the virtual is documented mathematically*
*11. thought processes are defined by sets of procedural rules*
*12. algorithms are sets of procedural rules*
*13. within the virtual the relationship of the human collective consciousness to nature is recreated without matter*
*14. algorithms, thought processes, natures reenactment virtually by computers, and all numerically documented processes are classified as logics*



"Now the computer opens a door and gives unparalleled freedom to explore - the result is a bewildering and mind bending free-for-all where anything goes. But cool new shapes and blobs are nothing more than mere facade if they are propped up by standard post and beam constructions. To create an integrity in the establishing of a free shape a new method is needed for configuration with flexible start points. Instead of line - surface; instead of equi-support - scatter; instead of fixed centre - a moving locus; and instead of points - zones."[41]

"The nature of their search is algorithmic, the repeating dynamic that compiles and reaveals a series of embedded orders. What we choose depends on materiality linked to scale. At the infinite, the propoals may hint at cosmic organizations; at the micro and realm of compact densities, they-intuit biological process. In between is the world of inventive speculation, where the imperative of a particular pattern drives the response toward a choice dictated by local features."[42]

*figure 22*

*12. algorithms are sets of procedural rules*
*13. within the virtual the relationship of the human collective consciousness to nature is recreated without matter*
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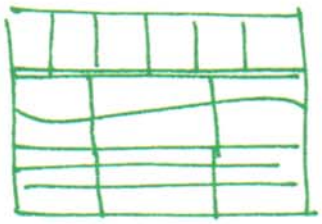

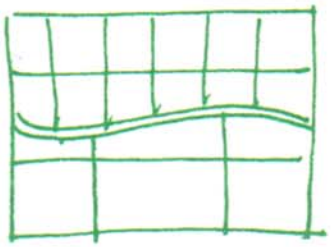

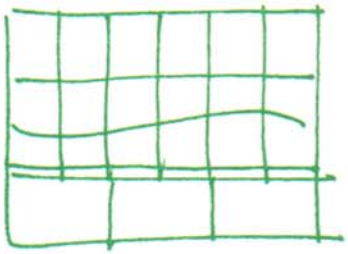

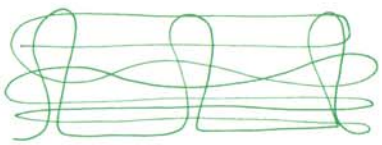

*figures 23-26*

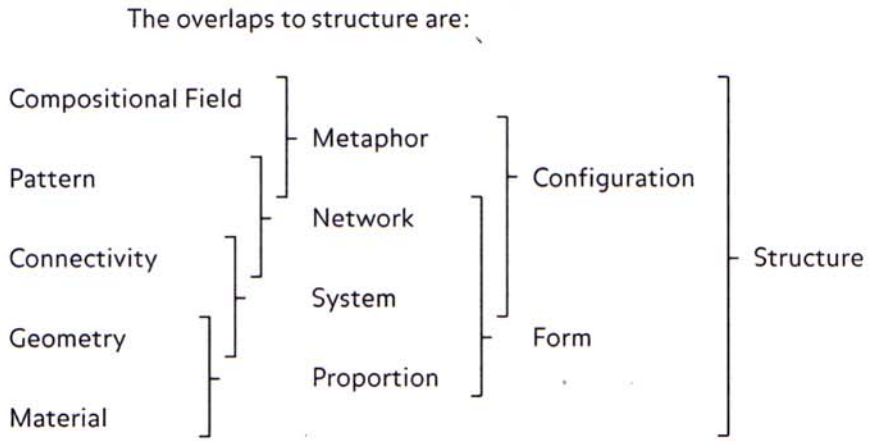


*figure 27*

"We had the notion of seamlessness in our concept, was there a way out through Diagram?"[43]

"The diagram acts as catalyst, and continues its private haunting, attacking certainties. Whatever is seen in a reduced reality seems to have a ghost in another dimension - the mystery denies dogma as a natural state. Mind seems to have its own subversive strucutre: to find out, I run the templates."[44]

"Templates are like shadow plays, movements and projections of a dimension other than the one at hand. They are faint tracks leading towards an unknown region, the design space of one's imagination."[45]

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*15. logic is a priori, it is inherent within the human conscience*
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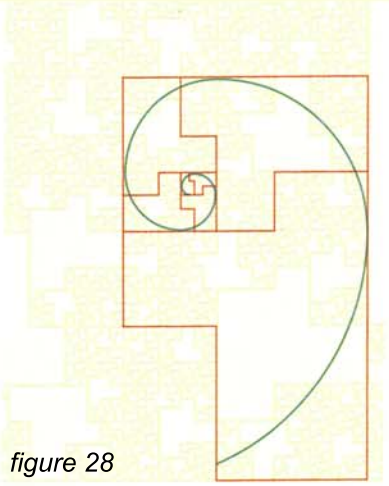

figure 28

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ×1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| ×2 | 2 | 4 | 6 | 8 | 1 | 3 | 5 | 7 | 9 |
| ×3 | 3 | 6 | 9 | 3 | 6 | 9 | 3 | 6 | 9 |
| ×4 | 4 | 8 | 3 | 7 | 2 | 6 | 1 | 5 | 9 |
| ×5 | 5 | 1 | 6 | 2 | 7 | 3 | 8 | 4 | 9 |
| ×6 | 6 | 3 | 9 | 6 | 3 | 9 | 6 | 3 | 9 |
| ×7 | 7 | 5 | 3 | 1 | 8 | 6 | 4 | 2 | 9 |
| ×8 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 9 |
| ×9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |

| | |
|---|---|
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| 1/198 | .005050505050505050505 |
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| 1/495 | .002020202020202020202 |
| 1/594 | .001683501683501683501 |
| 1/693 | .001443001443001443001 |
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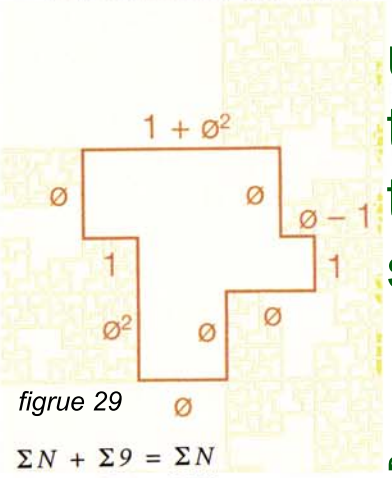


figrue 29

$\Sigma N + \Sigma 9 = \Sigma N$
$\Sigma N - \Sigma 9 = \Sigma N$
$\Sigma N \times \Sigma 9 = \Sigma 9$
$\Sigma N \div \Sigma 9 = \Sigma N$ *(remainder)*

"What pattern is buried within the code?"[46]

"The essence of mathematics is to look for patterns."[47]

"The sigma value of a number is the ultimate essence of a number. It is the hidden mark which lurks within the greater construction; in this sense it is a primary code, a blueprint."[48]

"The sigma code leaves a permanent trace."[49]

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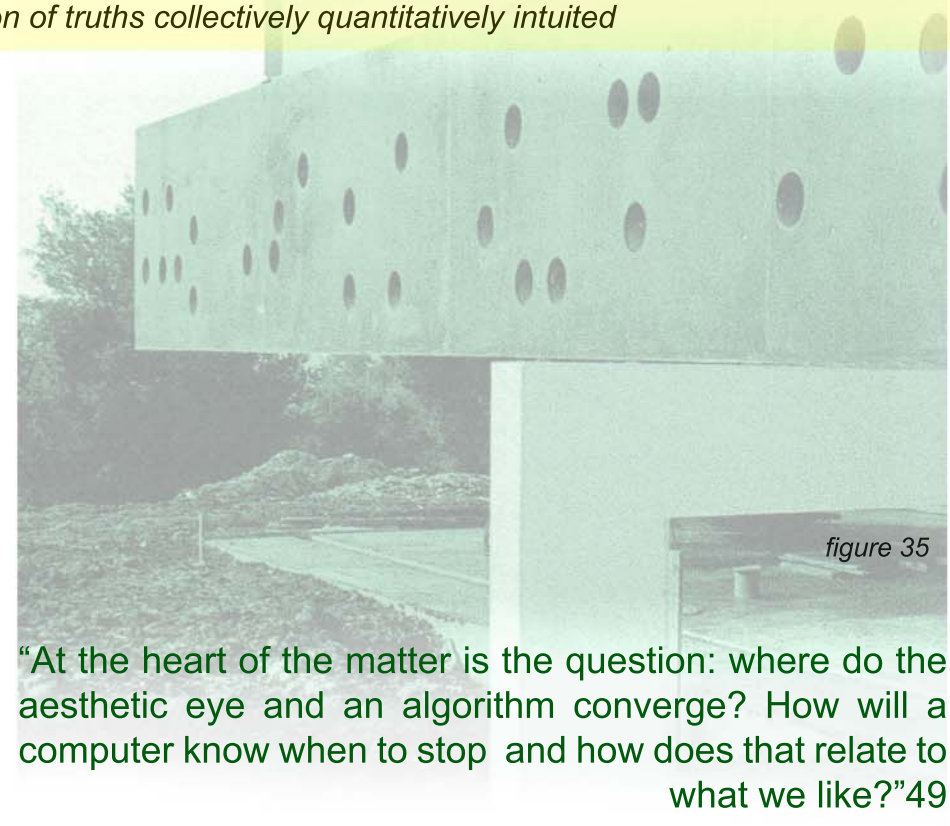
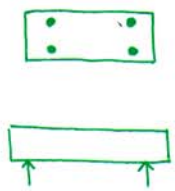
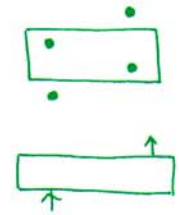


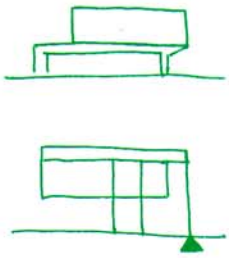
*figure 35*





"At the heart of the matter is the question: where do the aesthetic eye and an algorithm converge? How will a computer know when to stop and how does that relate to what we like?"49

"In mathematics, differential equations which describe the world have two parts, a particular solution alongside a more generalised expression - a cohabitation of the specific with the generic. The generic informs the class of solution and lends character, but the exact answer is shaped by the particular solution which just fits the boundary conditions of the problem area. What we begin to see as reason, or order, is a particular area of logic mixed in with a more general region of instinct and intuition. Our mind engages that multiplicity and learns and grows."50



*figures 29-34*

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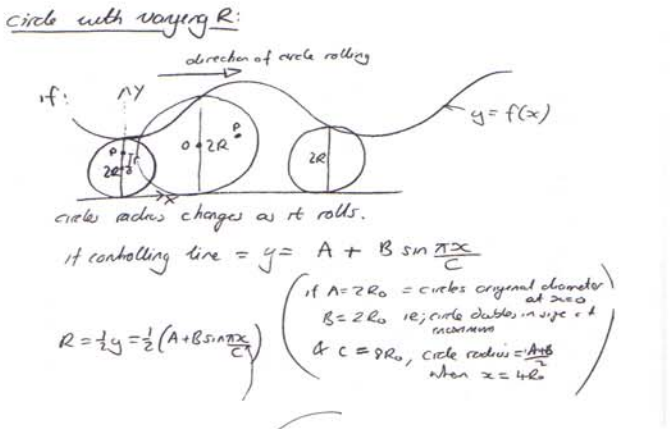


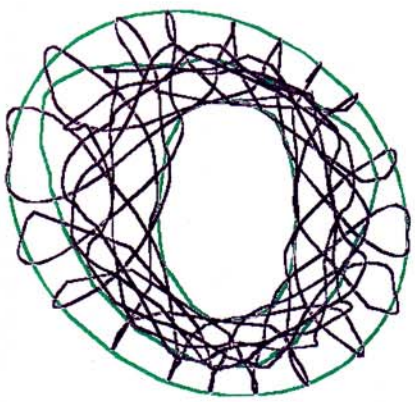

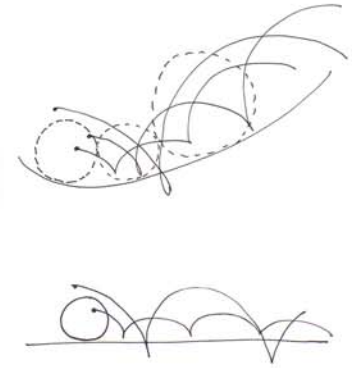

"A cycle of invention and post rationalisation runs from one start to another - and in between are the judgements and criticisms one makes."[51]

*figures 36-39*

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