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Paper: **INCENDIA AND FRACTAL ARCHITECTURE**

Topic: Fractal Architecture

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Abstract:
In spite of all correlations and coincidences between art, science, philosophy, and manufacture, with a deep root in the history of human's evolution and civilization, this phenomenon has been disclosing a new phase in close conjunctions with new technology of computers in the past decades and years. Appearance of very modern transdisciplinary discoveries with dependency on interdisciplinary fields is the prominent property of the new current. One of the well-known examples is fractal mathematics which drained many imprecise traditional apprehensions toward the essential concepts of several majors and presented unbelievably new ideas and sights. Several pieces of fractal imaging software showed up to grasp the aesthetics of fractal images crossing the new findings of mathematics, programming and new technology toward the artistic beauty. One of such software is Incendia [1] with a significant difference than the others. Seemingly, in spite of its preliminary goals, Incendia, due to its direct dependence on basically Euclidean shapes and following different fractal patterns, provides some kinds of familiar fractals. Many fractal artists use this software as a creative fractal medium to create 3D fractals. Due to their conjunctions with basic Euclidean constituents and architectural selective materials, some of its results are completely innovative architectural fractal designs, most of which could be performed in reality. This paper attempts to display some architectural fractal examples created by Incendia, almost all collected from very interactively evolutionary web site DeviantArt [2].

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Fig.1: The Medieval Fractal, by Aexion,
http://aexion.deviantart.com/gallery/#/dtwd98
Fig.2: Rock Solid , by AureliusCat,
http://incendiaryart.deviantart.com/gallery/?set=24024939&offset=48#/d2ria88

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Incendia and Fractal Architecture

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The dream of human being to shape the world as an artistic representation with infinite dimensions and colorful paintings adding to the complexity of its nature has always been repressed in the weakness of technology and limitations of dimensionality in real world. The ability of revolving the imaginative realms into realistic ones became the cornerstone of cooperation of some different, yet interrelated branches to take the idealism of minds toward the perfect realism.

This paper attempts to display some architectural fractal examples created by Incendia, which are samples of true achievement to hire technology to purify the architecture and mathematics in breaking the prisons of limitations, almost all collected from very interactively evolutionary web site DeviantArt.

1. Introduction

Parallel evolutions and correlations between art and mathematics have always been one of the well known sources of artistic creations with mathematical subject or

background. One of the very impressive consequences of such a mutual historic evolution has been architecture. Architecture as the realistic result of the mixtures between mathematics and art itself gradually became a major leading two main generating sources to evolve and present new creativities. This is the reason that, during the history, architectural constructions have been evaluated both artistically and mathematically. Architecture improving its characteristic significations gained a more tangible and every-day existence than the backing generative pure art and math or geometry. Nowadays, architecture is known as the most outstanding result of mathematical, artistic, technologic and engineering achievements of the day. Therefore, not only math and art try to feed the independent field, the architecture itself is also looking for innovations in other areas. The complexity of architecture after its independence from basic stones of math and art in a couple of centuries has made it more expert and even somehow far from pure math and art. This is due to the increment of the number of different elements playing role in the construction of a building or monument. So usually this is not an artist or mathematician who recommends a type of construction but the bounding conditions and limitations which before everything characterize the main properties of the building instead of a clear mind or a completely open pattern. One reason is the strict planning of cities which impose old limitations which must be applied due to the low degree of changing possibilities in the main old pattern. Thus, the architecture of the cities is playing a significant role in imposing limitations over constructions because the extension of cities is somehow linear. Although the patterns of their expression have been stated to be more complex and kind of fractal [1], in fact they are flat fractals with too many limitations. They are like bacteria reproduction patterns in which numerous bacteria with same size and physical characteristics provide different flat fractal patterns. The golden key we are looking for to have more mathematical, artistic and modern cities with special properties and so different than ancient flat patterns of the past might be found in the new technology of representing fractals specially three dimensional fractals.

In spite of all correlations and coincidences between art, science, and manufacture, with a deep root in the history of human's evolution and civilization, this phenomenon has been disclosing a new phase in close conjunctions with new technology of computers in representing fractals in the past decades and years. Appearance of very modern transdisciplinary discoveries with dependency on interdisciplinary fields is the prominent property of the new current in which fractal mathematics which drained many imprecise traditional apprehensions toward the essential concepts of several majors presented unbelievably new ideas and sights. Several pieces of fractal imaging software showed up to grasp the aesthetics of fractal images crossing the new findings of mathematics, programming and new technology toward the artistic beauty. Also, recently, several mathematicians and programmers have started working on providing three dimensional fractals in professional computer programs and software a few of which finally succeeded with clear differences in their basic concepts of such a new property. One such software is Incendia with a significant difference from the others. Incendia is a 3D multiprocessor fractal engine that allows you to explore the realm of the 3D fractals [2]. Seemingly, in spite of its preliminary goals, Incendia, due to its direct dependence on basically Euclidean shapes and following different fractal patterns, provides some kinds of familiar fractals. Many fractal artists use this software as a creative fractal medium to create 3D fractals. Due to their conjunctions with basic Euclidean constituents and architectural selective materials, some of its results are completely innovative

architectural fractal designs, most of which could be performed in reality. However, some other pieces of 3D fractal software use basic forms and shapes of dust or curves which could not be referenced architecturally easily. In many cases, as for example in many of the seed plants, the basic building elements, the cells, resemble in general the platonic solids of Euclidean geometry, whereas they often aggregate into clusters with fractal characteristics. In some cases the basic building elements themselves are fractal objects [3]. Never should it be forgotten that the 3D property of such fractals exposes their representation in the real world as we see them in comparison to other objects which might be one dimensional or two dimensional, but they still have fractional dimensions like any other fractals mathematically.

The very important phenomenon in 3D fractal designs is their 3D growing. In spite of flat cities, these 3D fractal-based designs bring together thousands and millions of buildings in a limited area on the ground with the least change and manipulation in the nature. In spite of the skyscrapers which have several limitations in the height, fractal cities due to their usually pyramidal shapes (a comprehensive base at the bottom) have more stable structures. A simple and very basic example based on a pyramid shape is Sierpinski Pyramid.

In these 3D fractal cities priorities of the structures and facilities could be arranged too. There could exist different levels of priority, largeness and accessibility. Namely, in constructing a city based on a Sierpinski Pyramid at first the shape starts with 4 smaller pyramids with a hole between them. Certainly the structures of more importance in reaching outside the pyramid will be sited in the three bottom pyramids. Each of these four pyramids themselves will be changed to other groups of four smaller pyramids. Naturally, in each of them there will be other priorities too. Thus, we will have a structure with the best patterns for arrays like accessibility or priority to reach.
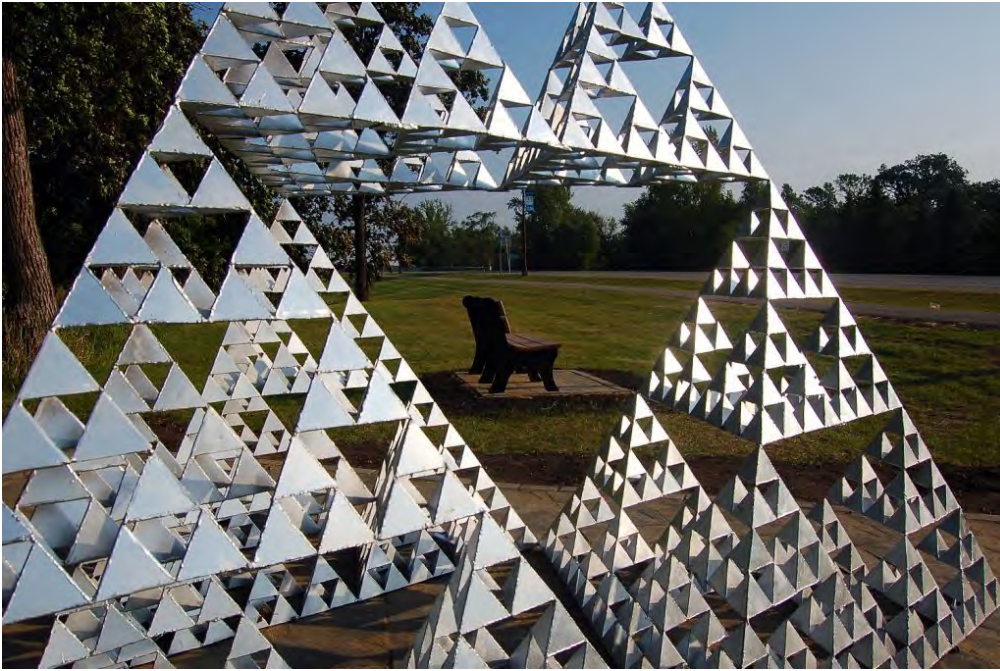
Figure 1: A Sierpinski Pyramid constructed during the summer of 1993, Breckenridge High School (The metal sculpture is located in Breckenridge, Minnesota on US Highway 75 just south of the Ottertail River bridge and Dairy Queen.), http://www.sierpinskitetrahedron.com/Who%20built%20it.html .

The other exclusivity is the self-similarity of the city. Designing facilities like the network of gas, power, communication and other continental networks will be exclusively uniform. By this way, managing them like the rate of usage or finding the failures in different regions will be easier. In this city finding addresses will be too much easier, too. Due to self-similarity everywhere in the city has a similar basic structure to other places and the whole city. Even the naming of the districts will be easier and clearer.

Such fractal cities could have very different properties than current cities we live in. The main aesthetical property is the arrangement of size of the buildings. Although the existence of large skyscrapers in large cities like New York might be interesting due to their height, they could not be conceived of aesthetically in relation to small and low buildings in their neighborhood. Fractals invite the order to the complexity of modern cities with complicated properties and needs and decrease the degree of the chaos governing them constructively and visually. Actually, the main property of fractals is their regularity among the seemingly incontrollable complexity and chaos.

Fractal geometry provides a powerful approach for the quantitative description of complex, highly irregular and random, i.e. disordered systems. Moreover, it can be used to describe the processes leading to the formation of such systems and their physical behavior. Fractal geometry relates to structures that cannot be described by Euclidean whole number dimensions of 1 (straight lines), 2 (flat surfaces) or 3 (volumes), but instead they have fractional dimensions [4].

The field of environmental psychology also inquires whether certain abstract structural features correlating with emotional responses can be extracted from natural elements and settings. Among others, researchers have found that preferred

settings often show an interesting mix of complexity and order, and are "mysterious" in that the landscape configuration promises to reveal new information beyond the current viewpoint of the subject [5],[6]. Importantly, some scholars find that there is reason to believe that the emotional responses associated with naturalness could be rooted in the type of geometry characteristic of natural elements: namely fractal geometry [7]. For example, Purcell et al. [8] hypothesize that it ". . . may be that variations in both preference and the restorative value of scenes depends on their underlying geometry, with high preference and restorativeness being associated with fractal and low preference and restorativeness being associated with, for example, underlying Euclidian geometry typical of built environments". The implication of the brief discussion of fractal aesthetics is that the beneficial effects of contact with nature could be tapped without the presence of actual representations of nature, but with the fractal geometry that is characteristic of natural elements [9].

Although Incendia, which currently has more artistic usage, can be used for more constructive real monuments and new types of cities in the postmodern world, what increases the probability of the implement of such projects is the strong mathematics endorsing them directly. They are pure mathematical forms which have aesthetical aspects too. On the other hand, they mathematically stem from nature behaviors and rules and have one of the closest relationships to nature than other mathematical structures found in the Euclidean mathematics or geometry. We have experienced that ideals closer to the nature of the universe usually work better in this world. Technology has always been patterned on details of constructive physical or chemical behaviors of diverse living or non-living creatures to gain more evolutions with dependency on natural behaviors of the rules presiding or existing in the nature. Therefore, exploiting pure mathematical patterns directly stemming from nature behaviors is not a new activity and has a history as long as the appearance of human's technology. Although the visual scenery of these fractal designs might be assumed more science-fiction, it should be paid attention that often such science-fiction ideas had been bearing the ideas of what would be produced later.

While today the evolution of many phenomena depends on the web, DeviantART [10] founded in August 2000, as stated by itself [11], the largest online social network for artists and art enthusiasts with over 13 million registered members, attracting 35 million unique visitors per month, is playing a very significant role in the comprehension and evolution of different software and art types specially Incendia and Incendiary works of art. The creator of the Incendia himself is a member of DeviantART [12]. Even though exploring DeviantART you can face plenty of artists creating Incendiary works, here we have collected a group which are more architectural and might convey new ideas for architectural minds.
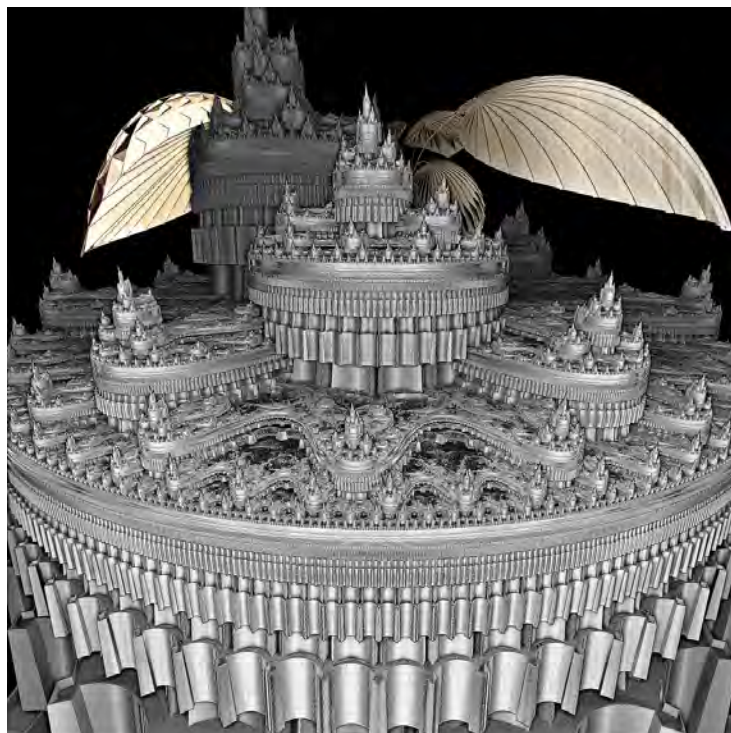
Figure 2: Domes, by Aexion, 2010,
http://aexion.deviantart.com/gallery/#/d2otq3i .

Figure 3: Winged Castle, by Juniae, 2009,
http://juniae.deviantart.com/art/Winged-Castle-137504861?qj=1&q=gallery
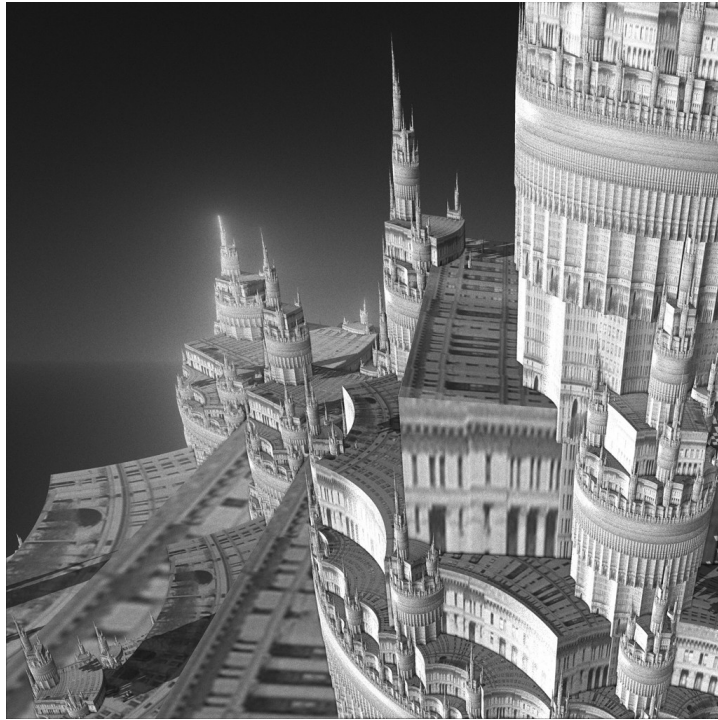*%3AJuniae%2F10675860&qo=341* .

Figure 4: Railway, by Juniae, 2010, http://juniae.deviantart.com/art/Railway-149189445?q=gallery%3AJuniae%2F10675860&qo=169 .
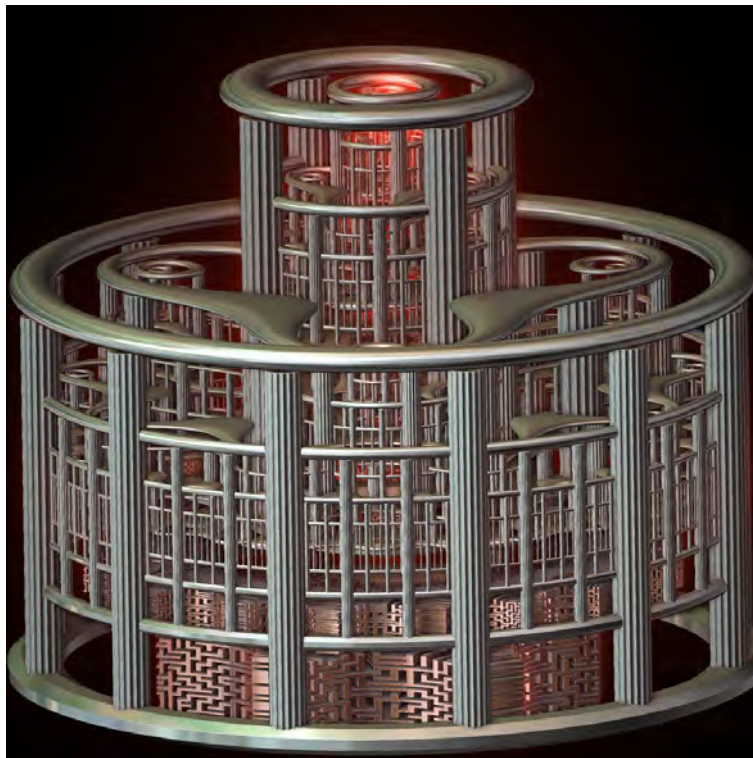

Figure 5: The White House, by Juniae, 2009, http://juniae.deviantart.com/art/The-White-House-140542129?qj=1&q=gallery%3AJuniae%2F10675860&qo=288 .
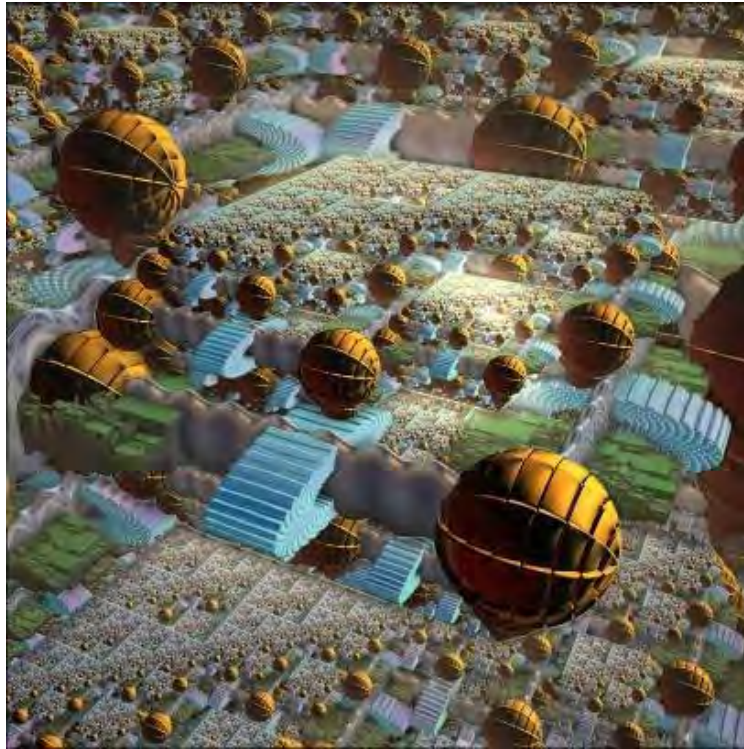
Figure 6: Incendia-Orbtopia, by RCPage, 2009,
http://rcpage.deviantart.com/art/Incendia-Orbtopia-126005050?qj=1&q=gallery
%3ARCPage%2F15393&qo=244 .
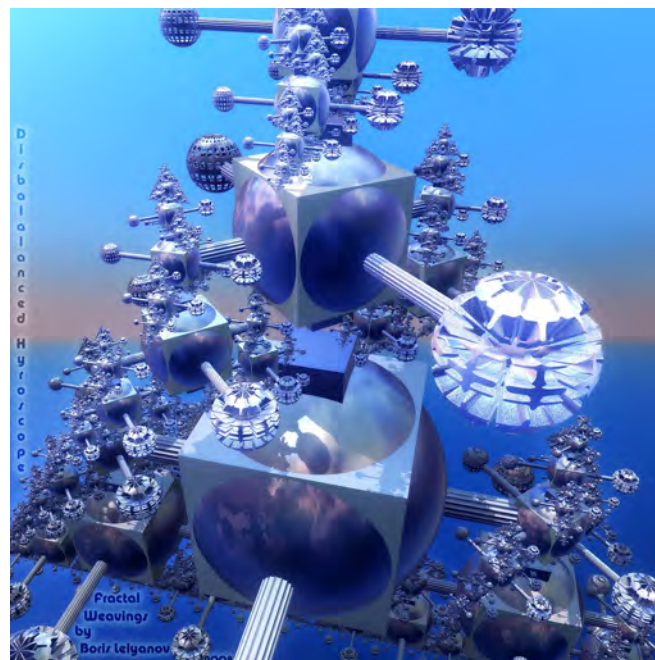
Figure 7: Disbalanced Hyroscope, by DarK--MatteR, 2008, http://dark--
matter.deviantart.com/art/Disbalanced-Hyroscope-98927906?q=gallery
%3ADarK--MatteR%2F23686502&qo=54 .
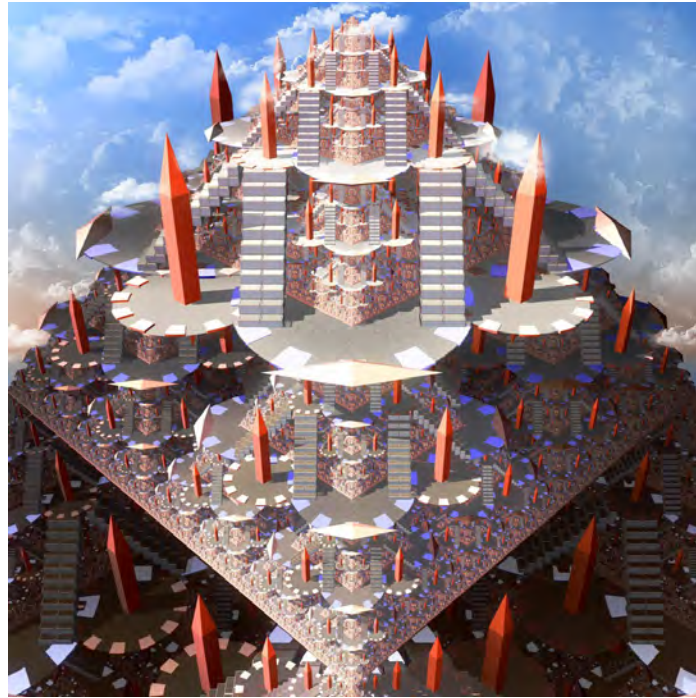
Figure 8: Ziggurat, by DarK--MatteR, 2008, http://dark--matter.deviantart.com/art/Ziggurat-100583715?q=gallery%3ADarK--MatteR%2F23686502&qo=43 .
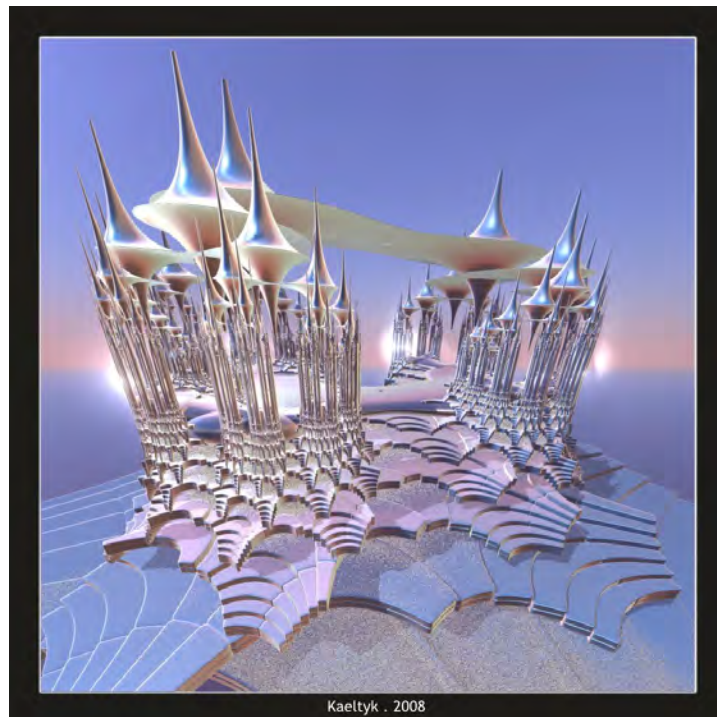

Figure 9: Incendia's Castle, by Kaeltyk, 2008, http://kaeltyk.deviantart.com/art/Incendia-s-Castle-90418573?q=boost%3Apopular+incendia&qo=27 .
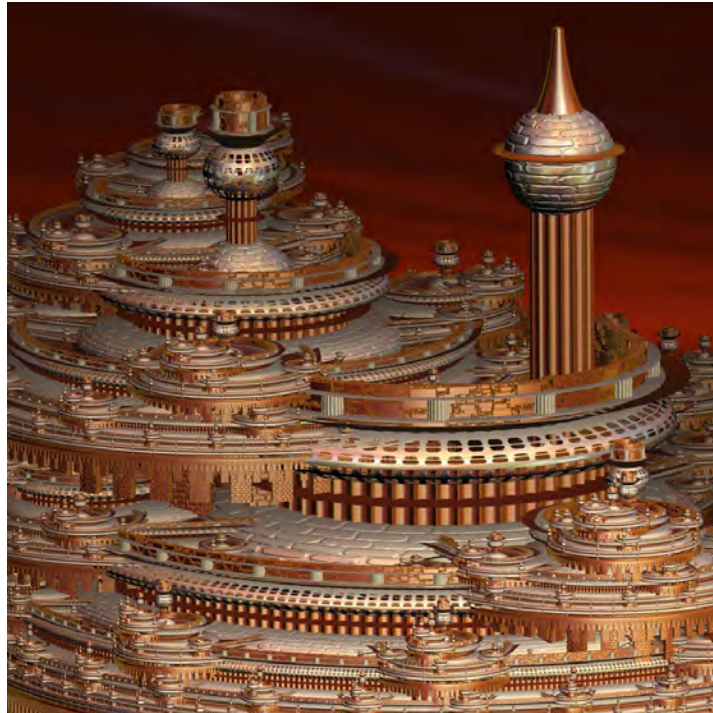
Figure 10: Incendia University, by AureliusCat, 2009,
http://aureliuscat.deviantart.com/art/Incendia-University-131333392?q=boost
%3Apopular+incendia&go=26 .

Figure 11: A Cloudy Day in Annwyn, by hiramf, 2010,
http://hiramf.deviantart.com/gallery/#/d2usglg .

Figure 12: The Medieval Fractal, by Aexion, 2007,
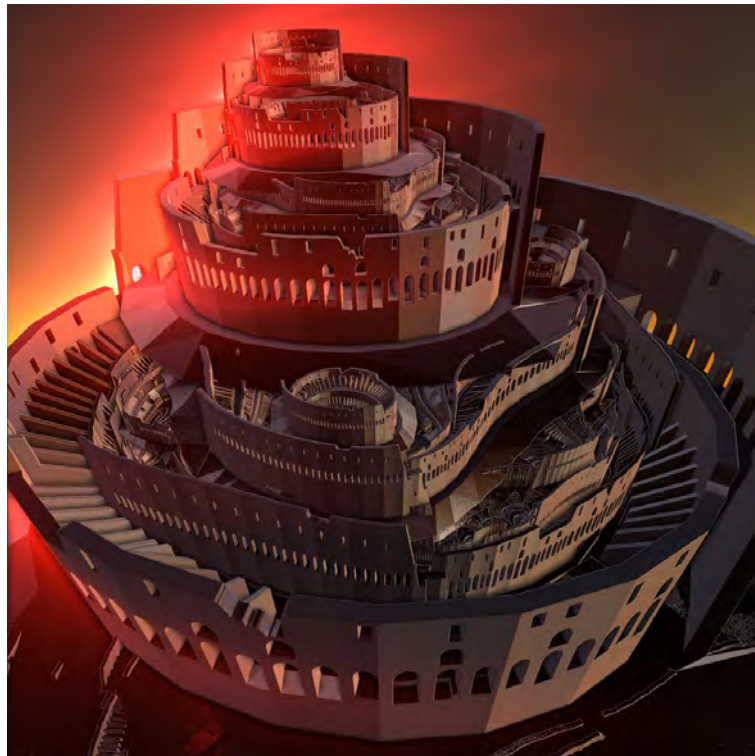*http://aexion.deviantart.com/gallery/#/dtwd98 .*

Figure 13: The Outsider, by Juniae, 2009, http://juniae.deviantart.com/art/The-
Outsider-148632341?q=gallery%3AJuniae%2F10675860&qo=173 .
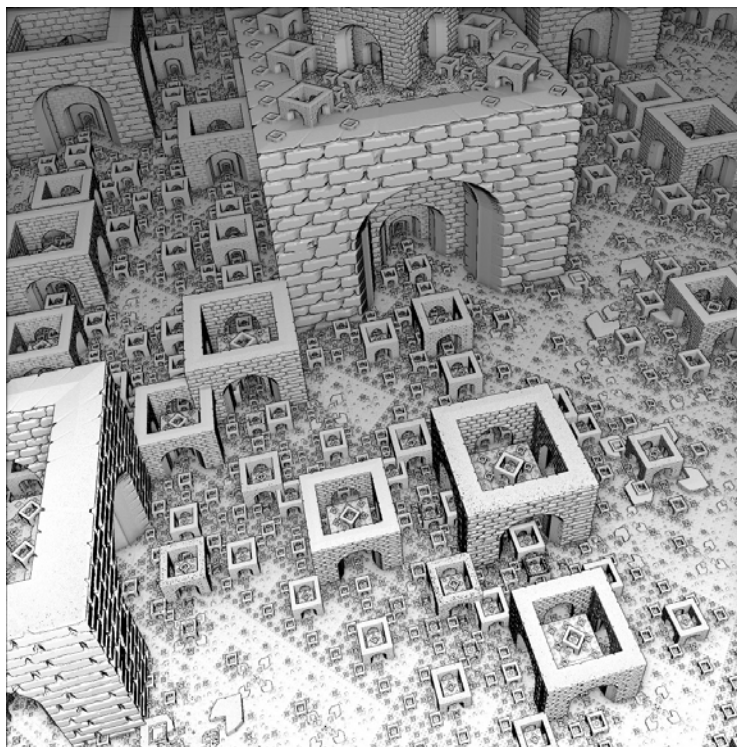
Figure 14: Rock Solid, by AureliusCat, 2010,
http://aureliuscat.deviantart.com/gallery/#/d2ria88 .

Figure 15: Dreaming Again, by Aexion, 2009,
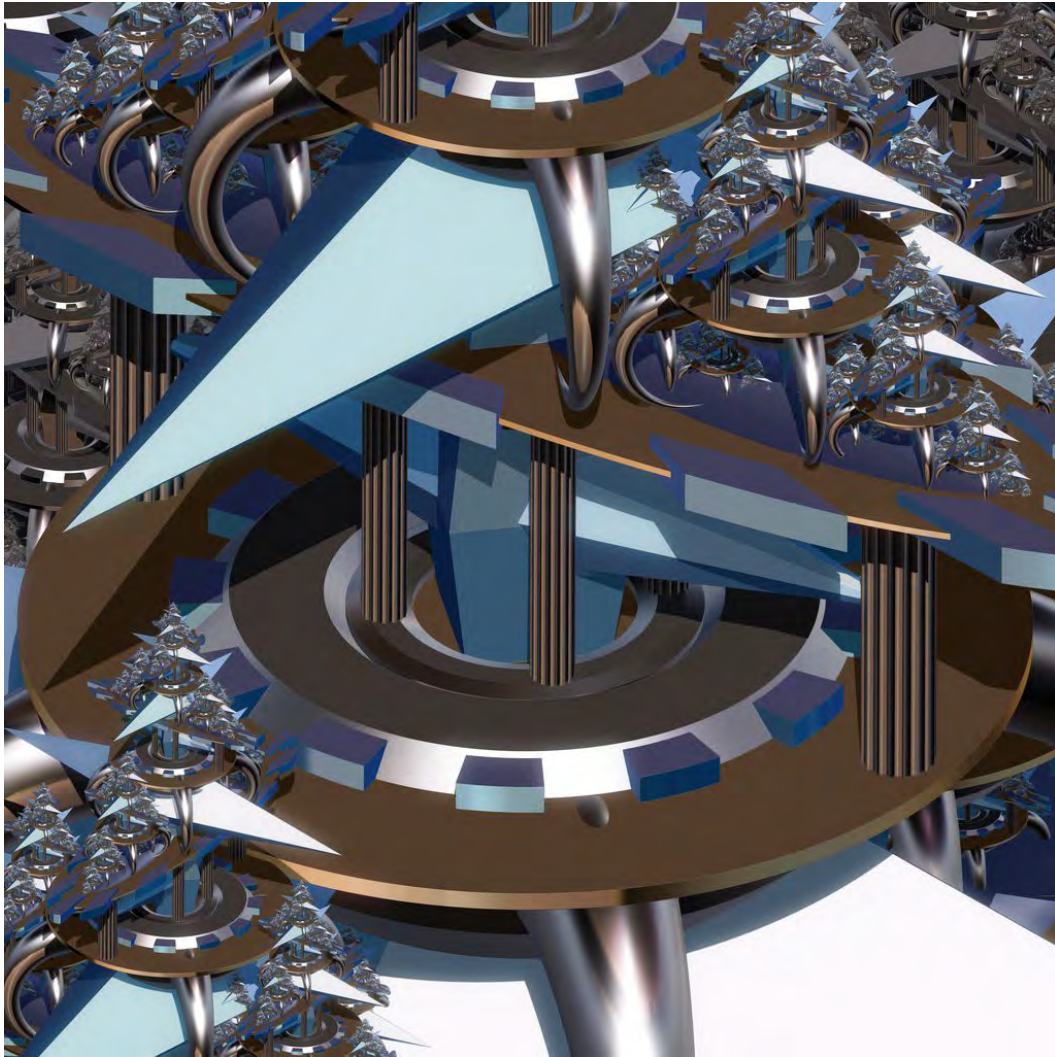*http://aexion.deviantart.com/gallery/#/d1wk4p5* .

Figure 16: Crystal Veil, by DarK--MatteR, 2008, http://dark--matter.deviantart.com/art/Crystal-Veil-100167414?q=gallery%3ADarK--MatteR%2F23686502&qo=45 .

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