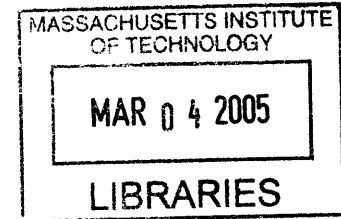


# Bridge : Information as Material for Design

by

Sawako Kaijima



B.A. in Environmental Information Keio University, 1999

Submitted to the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of  
Master of Architecture  
at the  
Massachusetts Institute of Technology  
February 2005



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## Abstract

This thesis investigates architectural design as a sensory device that mediates the relationship between the body and the environment. I used a bridge as a site since the body is fully exposed to an open environment, yet often one is barely aware of the environment due to the linear and repetitive nature of the bridge form. My attempt is to amplify and variegate the experiences of the bridge by using environmental information itself as a material for design.

In order to capture the nature of environmental information I employed computation and developed generative processes as tools for design. The possibility of this mode of design can be contested by means of digital computation through algorithmic processes which allow one to operate on relationships and attributes and implicitly evolve a final design product without preconditioning the outcome by formal biases. Thus, rather than allowing the logic of a predetermined form to dictate architectural choices, such as material and structure, the form emerges out of a computationally calibrated distribution of properties in space.

Thesis Supervisor: Mark Goulthorpe  
Title: Associate Professor of Architecture



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Last but not least, I would like to thank my parents, Tadao and Kiyoko, and my sister Makiko for supporting me in all the possible ways.



# Bridge : Information as Material for Design

by Sawako Kaijima

## Introduction

Anthony Vidler's (Vidler, 1992), "Architectural Uncanny", describes a progressive transformation of architecture's conception of the body from the classical absolute, proportional and figurative; to 18-19th century's temporal and psychological; to the contemporary revelation of the imperfect body. The contemporary idea of the body is defined by its relationship to the environment; an environment which portrays a body of partiality and imperfection. Coop Himmelblau, Bernard Tschumi, and Daniel Libeskind, forefathers of the deconstructivist paradigm, perceived the body as a fragmented apparatus rather than a figure of unity or harmony. Their work expresses this condition through "discomfort and the unbalancing of expectations" (Tschumi 1977). Vidler concludes that their architecture positions the "owner of the conventional body" under interrogation.

While the perception of the body as a distributed open-ended system is quite intriguing, an examination of the design processes behind their projects reveals strong bonds to rather traditional paradigms and the reuse of direct formal metaphors and/or banal formal transformations. A "progressive transformation" seems to suggest the absence of a "traditional form" whatsoever, and the evolution and growth of a new one. Should we attempt to reveal the body within the current environment, the form would have to rather

be a product of emergence from a design of the relationships between the body and its context rather than its beginning.

The possibility of this mode of design can be contested by means of digital computation through algorithmic processes which allow one to operate on relationships and attributes and implicitly evolve a final design product without preconditioning the outcome by formal biases. Thus, rather than allowing the logic of a predetermined form to dictate architectural choices, such as material and structure, the form emerges out of a computationally calibrated distribution of properties in space.

Considering the contemporary relationship between body, architecture, and environment; and employing digital computation, I propose a bridge that highlights the awareness of the body in the environment.

For investigating the proposed design project, I devised a methodology which I employed in bridging the unbridgeable. In that sense the thesis is a documentation of an evolving process along its immediate/concurrent application in design.



Fig. 1. "Rooftop Project" [Coop Himmelblau, Vienna 1988 - 1989 image source: <http://www.ptutt.de/architectour/coophimmelblau-01.html>]



Fig. 2. Jewish Museum [Daniel Libeskind, Berlin, 2001, image source: <http://www.archiweb.cz/builds/kultura/images/jewish/libes4.jpg>]





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## Overview / Perspective

### Environment

We reason the external perceived complexity as an accumulation of simple behaviors. For instance, a pond of water behaves according to the form of the land, wind forces, and obstacles submerged within it. The water reacts to stimuli, such as reflecting and refracting light. We can indistinctly appreciate some of the simple relationships happening with the water at a certain scale; yet we can not separate each entity acting up on the water. Therefore we comprehend "water" as a whole. The resistant integrity of the environmental patterns is what makes the environment beautiful.

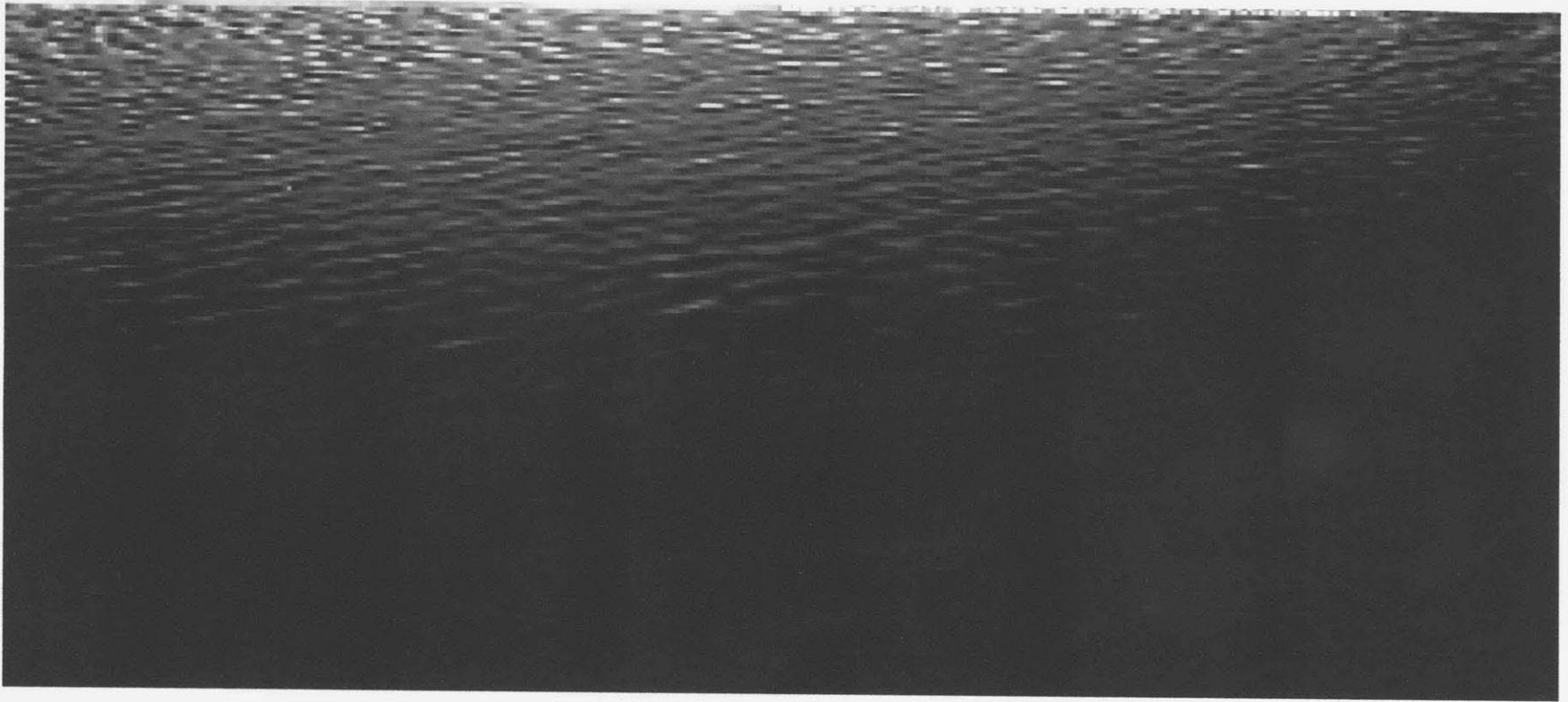


Fig. 3. Accumulation of simple behaviors constitute water.

## Senses

Sense organs are the devices that mediate between the body and the environment in a systematic way so we can filter information out of chaos. Within these organs, receptor cells react to specific sensory information and send nerve impulses to the brain. For example, in the eye, there are cells that only react to brightness, cells that only react to color, and cells that only react to the luminance threshold between dark and light in the visual field (Reisberg, 2001). All of the separate information is processed in parallel by the brain and then reconstructed into a coherent mental construct. In other words, the sensory organs operate on environmental information as an accumulation of separate entities in order to reconstruct the whole. Needless to say, the senses serve an important role in the way in which the body reacts to the environment and are strongly connected to our emotional and rational intelligence (Hoffman, 1998). However, we are often not consciously aware of our body since the sensory organs, which are the interface between the body and environment, function

automatically and habitually. Awareness often occurs when the sensory system in the body is malfunctioning or over functioning due to internal or environmental stimulations.

An example of the over functioning of the body can be traced in the physiological condition of "synaesthesia". Synaesthesia is the neurological mixing of the senses where one hears colors, sees sounds, and tastes tactile sensations. It is additive; that is, it adds to the primary sensory perception rather than replacing one sensation for another. (Sean A. 2001) In a documented case of a synaesthetic state the flavor of spearmint persistently felt like "cool smooth glass columns" (Cytowic 1989, 1993). In this synaesthetic condition, the perception is systematically related (in constant relation) to the relational world (environment), but the relationship is arbitrary. This suggests that systematic translation of environmental information is a way of bringing the awareness of the environment to our experiences.

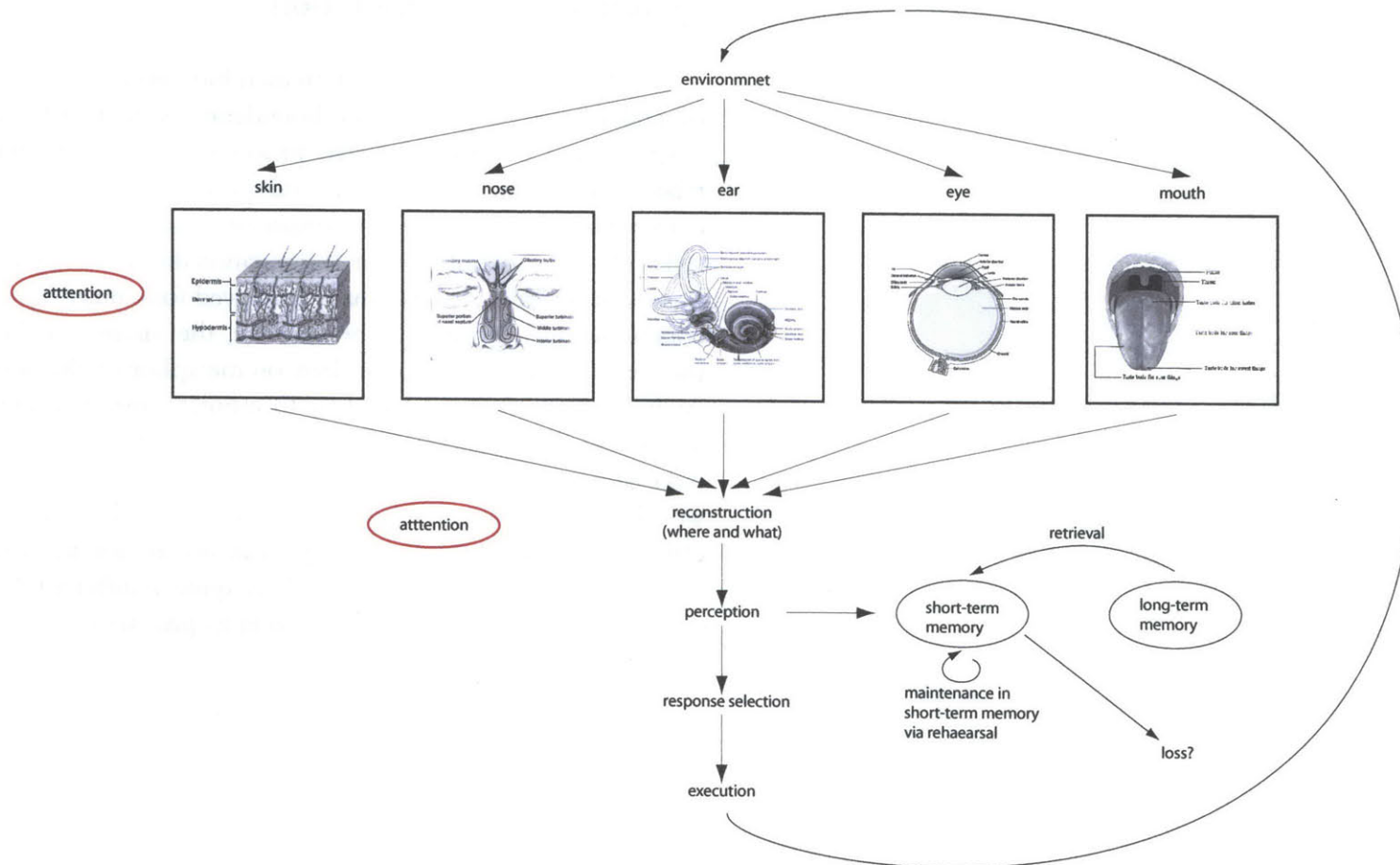


Fig. 4 . Structure of Perception [by Daniel Reisberg "Cognition." The diagram reconstructed by author]

## Methodology

### Materiality of computation

Computers have had a tremendous impact on the field of architecture by pushing the boundaries of imaginable forms / spaces and imaginable design processes, and questioning the relationship between designing and producing. Computers are commonly used in, automating, organizing and simulating physical tasks. The typical expression of computation through its applications is metaphoric because it is usually employed for emulating physical conditions and processes. For instance, the visual interfaces of the current operating systems draw on metaphor of the desk-top. Architectural Design is Aided by Computers, through interfaces inspired by the paradigm of the drafting board. Yet, computation's internal representation was not meant for mimicking the physical world but to perform symbolic calculations quickly, accurately and efficiently (Turing). While these applications are not unreasonable or without a driving cause –which is quite indifferent for this essay– I would consider computation in its primary essence.

## Algorithmics

"An algorithm is a formal process that can be counted on-logically-to yield a repeatable result whenever it is run or instantiated. Every computer program is an algorithm, ultimately composed of simple steps that can be executed with stupendous reliability by one simple mechanisms or another". (Danett, 1995)

Most users do not operate computers on this level, but use computers through various high-level applications that eventually translate the numeric digit sequences into human-friendly messages. Thus, most people are not acquainted anymore with the basic elements of computation, which are numeric in nature. The means for operating closer to the internal logic of computation can be found in programming languages. Programming languages are simplified subsets of natural languages that interface with computation at a lower level: just like talking directly to the machine. The machine is a finite state automaton, which operates on explicit instructions, described by constitutently abstract symbolic information which by conventions and design acquires meaning and allows for expression.

For capturing the nature of environmental information in an explicit format I employed this mode of computation and developed generative processes as tools for design. The nature of computation allows me to manipulate simple relationships and engage with separate entities not as a unified whole but rather as non homogenous entities.

## Information as a material

The intention was not to simulate the physical environment by computation. The aim was to use environmental information as the primary material for design. In this process, information is seen as a form of simplification in order to find meaning out of chaos. The difficulties are found in actually extracting architecturally relevant information from the environment and treat it as material for design.

## Monster

Historically, "monsters" were often associated with unknown lands and unfamiliar things. What constitutes a monster at any given time or place is a contextualized and localized set of characteristics, defined and accepted by the community (Hanafi, 2000). Before the scientific revolution monsters were associated with nature and sacred. Thus, unexplored areas on maps were marked indicating that monsters lived there. After the scientific revolution, the monsters changed their form to technological figures. Literature, science fiction and films have depicted monsters, from Frankenstein to the Cyborg and often the monsters in contemporary culture embody the dominant fears of the era. For example, Godzilla was being caused by a mutation from atomic bombs and Hulk was a resulting from a failure of genetic experiment. It is clear that in many ways robotic and computational figures are one of the main fears today "as if there were any unhappier situation than that of a man under the domination of his own invention" (Hanafi, 2000).

Today, in the map of architecture, the territories of computation would typically be marked as highly monstrous. I am using this term monster in this thesis since, even today, the design using computers is seen with suspicion and has less legitimacy than that of other traditional media. This is due to the general fear of design being taken away by this new medium and the association of the medium as inhuman or monstrous. The only way to defeat the fear of the medium is by exploring and understanding it. In this thesis, I hope to present my attempts to overcome the mental fear towards computation and share my experience of the research and exploration in this field.



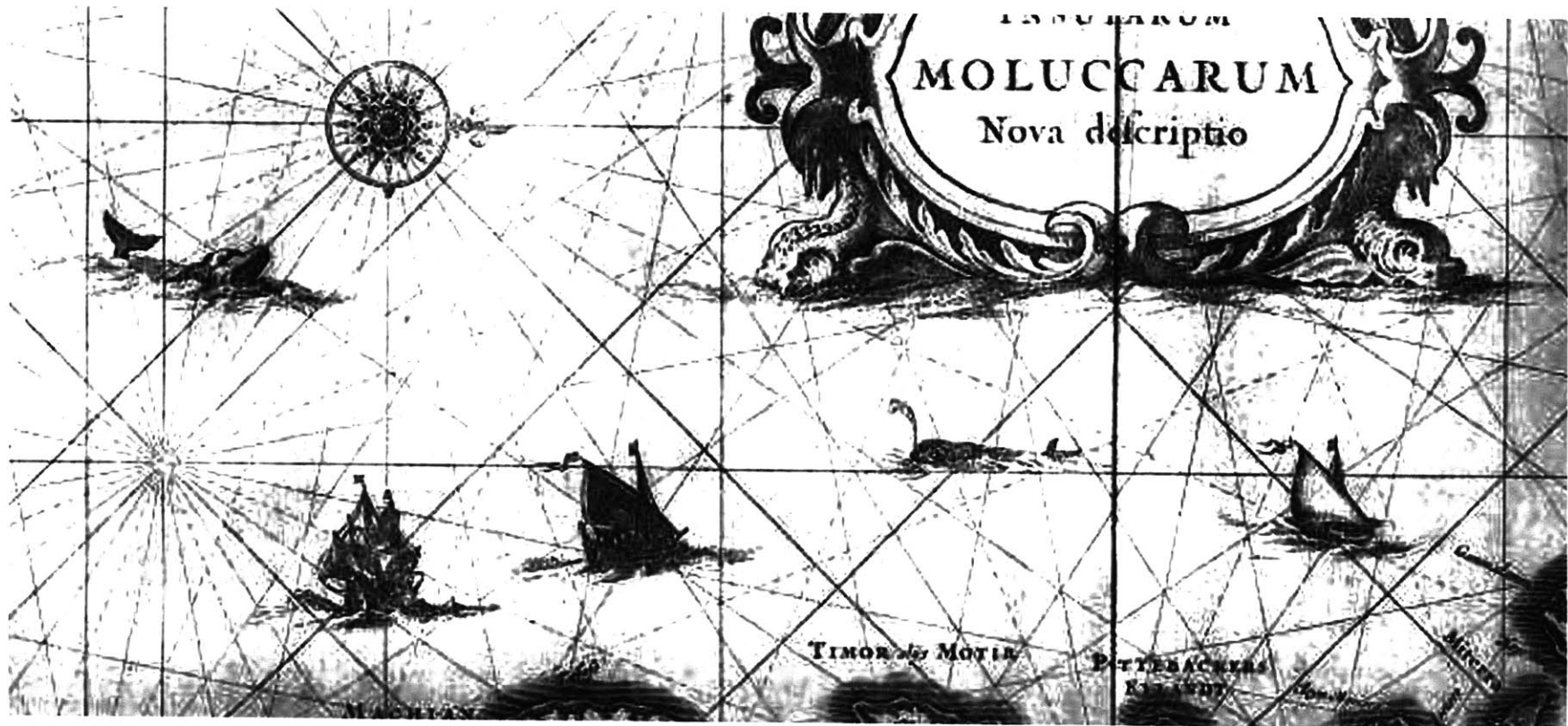
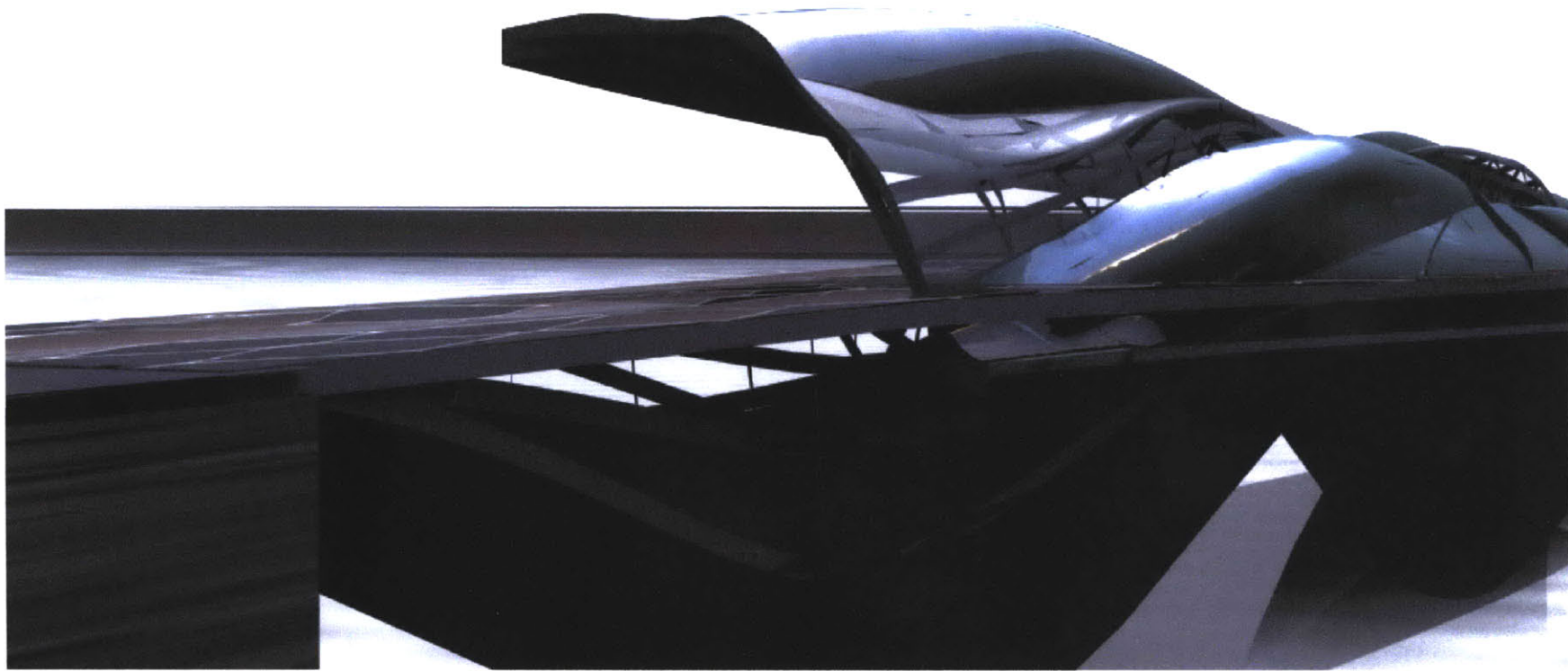


Fig. 5. Partial view of a large 17th Century map of the Mollucas, in Latin.  
[[http://simplethinking.com/home/antique\\_maps.htm](http://simplethinking.com/home/antique_maps.htm)]

## **Project**



**Site**

Fig. 6. Image of Harvard Bridge in Boston MA.  
[[http://web.periodic-kingdom.org/Galleries/Photos/Half/Sweeps200106/Boston\\_4.jpg](http://web.periodic-kingdom.org/Galleries/Photos/Half/Sweeps200106/Boston_4.jpg)]



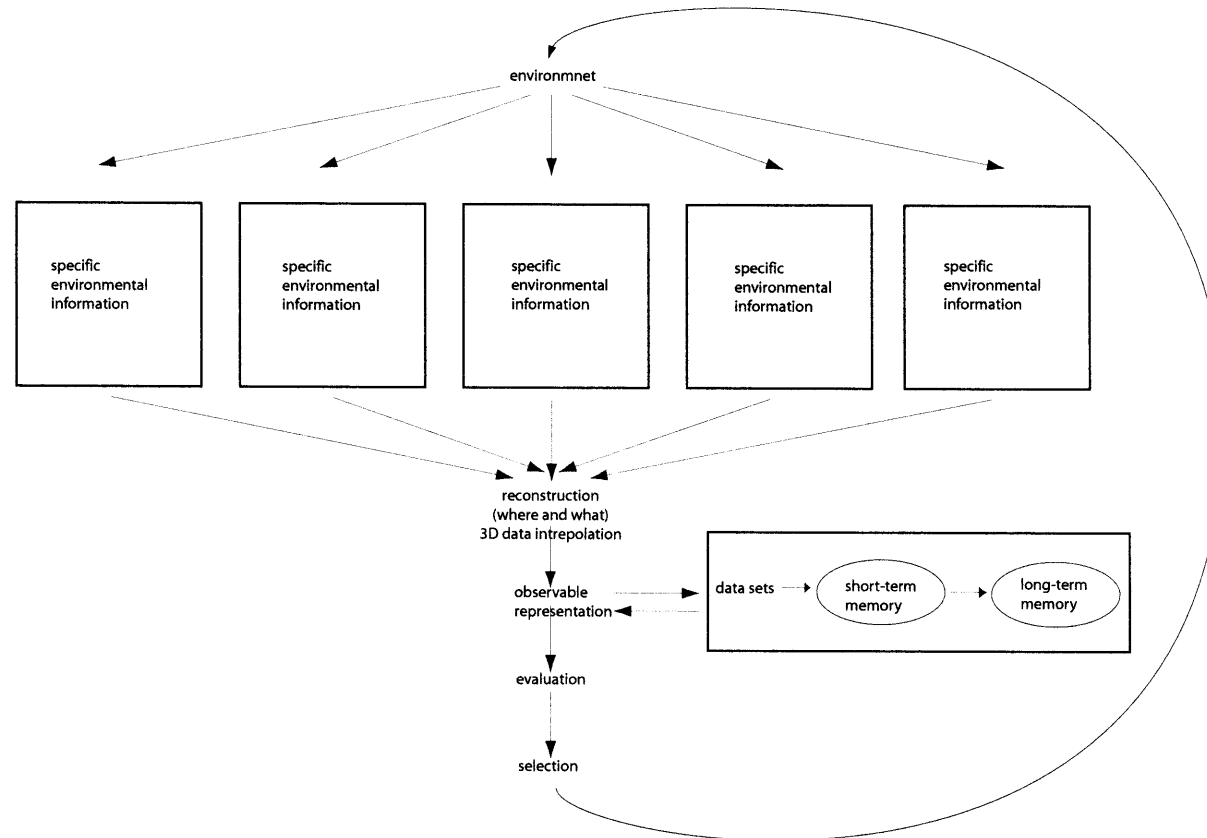
As a site, I used a bridge for pedestrians over an imaginary river since I see a peculiar duality in how we experience the environment in crossing a bridge. For example, if you imagine a bridge in the image above, on the one hand, the body is fully exposed to an open environment and becomes susceptible to the natural phenomena such as sun, wind, temperature and so on. But on the other hand, since the bridge is a transition place between two objectives, the mind is absent from the immediate environment. Moreover, the linear form of the bridge and the repetitive action we take over the bridge drags our attention away from the environment. In this way, a bridge is a place where the body and the environment are both present and absent at the same time. My attempt is to amplify and varigate the experiences of the bridge by using some of the information from its environment that are present yet absent in our attention, as a material for design.

## Process 1 : Monstrization



Fig. 7. [image source [<http://pao.cnmoc.navy.mil/educate/neptune/images/monster.gif>]]

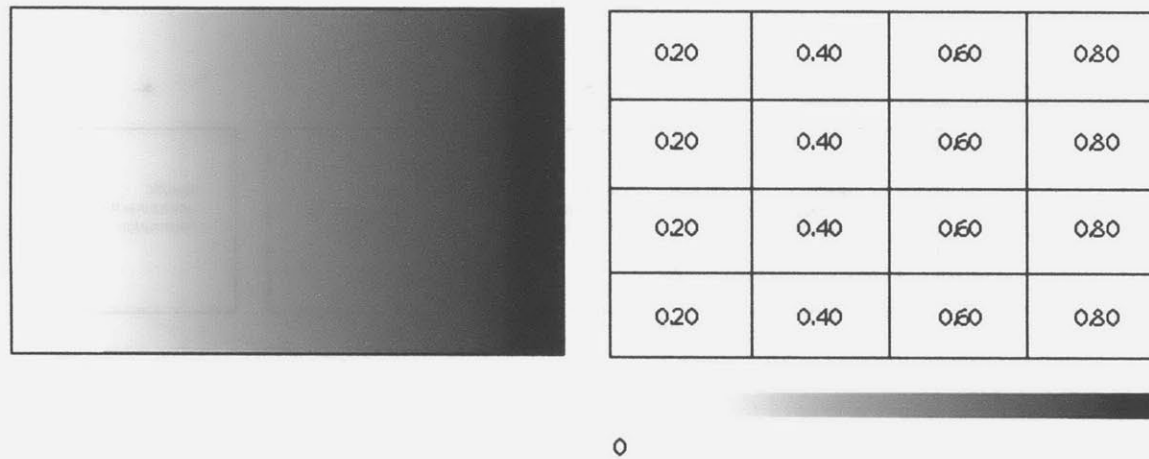
Fig. 8. Algorithmic structure for information acquisition and reconstruction



## Algorithmic Design

The first step of the project was to design an algorithm that is analogous to the human perceptual system. This algorithm takes a specific data set from the environment, translates the data according to the magnitude and the position of each data entry, and then translates the processed data set into a representational form so that I can evaluate, select and refine the results. This algorithm is not designed or intended to simulate the environment through a perceptual mechanisms. I designed my own system being inspired by the sense organs.

Fig. 9. Image map based data acquisition

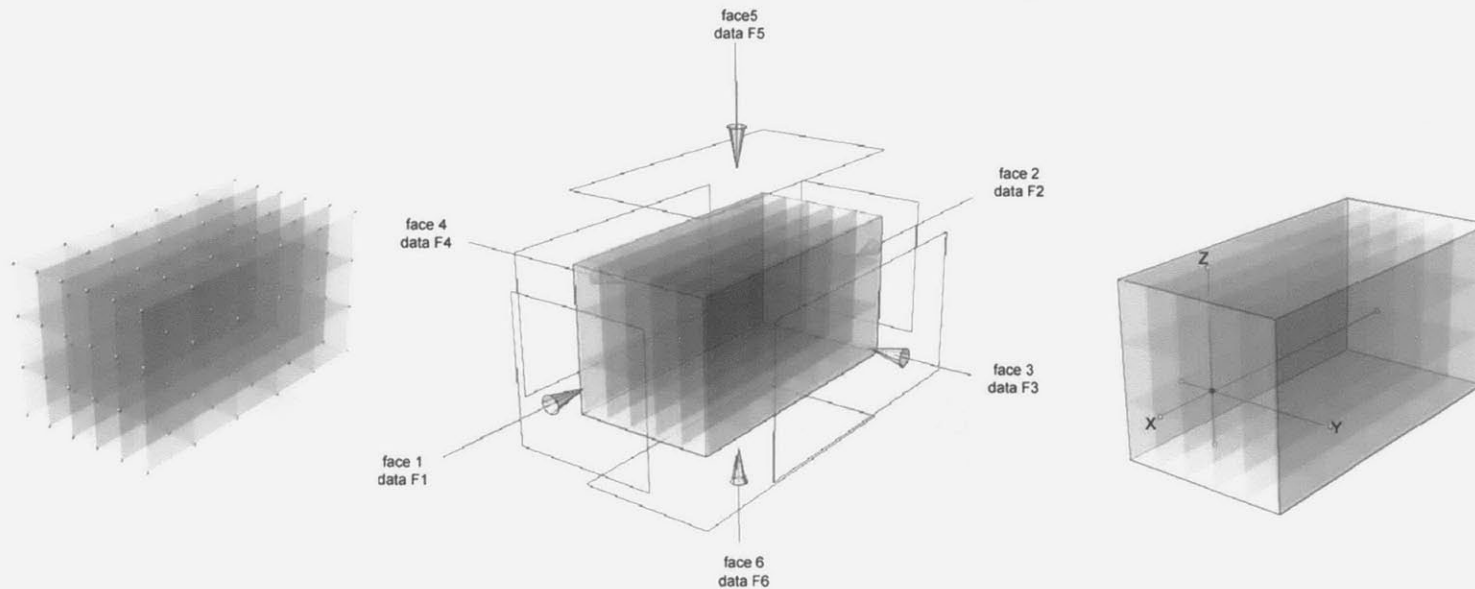


## Data Acquisition

The initial data acquisition from the physical environment to the computational environment was based on a two-dimensional image map. The color gradation in the image from black to white represents numbers from 0 to 1. Therefore any black and white image will be translated into a matrix of number between 0 and 1.



Fig. 10-12. 3D information construction in voxel space



## Data manipulation

A "voxel" is a place holder of information, which is the equivalent of a pixel in two-dimensional images which typically represent color information. Voxels live inside a three-dimensional grid bound by a "containing condition": Voxel space. The matrices of values generated from the source image were mapped onto the 6 faces of the boundary hull. The data from all 6 faces were interpolated according to their proximity to each of the surfaces. The data on each voxel is designed to be

$$\begin{aligned} & (\text{data F1} \times \text{distance from F1} / \text{y dimension} + \text{data F2} \times \text{distance from F2} / \text{y dimension}) \\ & + (\text{data F3} \times \text{distance from F3} / \text{x dimension} + \text{data F4} \times \text{distance from F4} / \text{x dimension}) \\ & + (\text{data F5} \times \text{distance from F5} / \text{z dimension} + \text{data F6} \times \text{distance from F6} / \text{z dimension}). \end{aligned}$$

In this way I was able to elevate and reconstruct two dimensional data into three dimensional data. This dimensional shift was important since architecture is inherently three dimensional.

In the second manipulation process, three-dimensional data was processed and manipulated by attaching new meaning to it. My intention was to attach forces that would create specific effects with respect to the numbers. Being inspired by how the forces create landscapes, I designed the voxel space grid to be affected by the intensity of information. Therefore, the algorithm is designed so that the degree of whiteness of the image becomes the force of displacement.

Fig.13-15. Information interpretation



0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
1.00	1.00	0.00	0.00
1.00	1.00	0.00	0.00

Fig.13

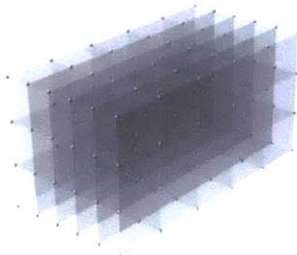


Fig.14

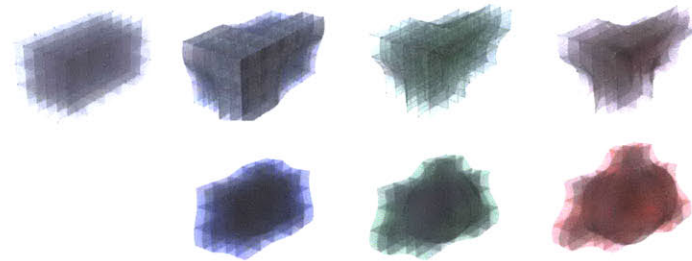
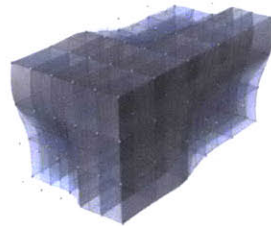


Fig.15

## Data Accumulation

One of the characteristics of landscape as well as the perceptual systems is their ability to store and memorize the previously experienced force and information. This algorithm is capable of taking multiple data sets (6 images) and each of the processed data set is stored in the program so that the next data set can operate taking into account the previous results..

For example, if you map the image on Fig 13, which is the matrix of numbers, onto all the 6 faces of a voxel scaffold, the resultant shape will be as shown in Fig 14. And if you apply the forces multiple times, their effects accumulate and the form gradually shifts. Also, since the data is set to be a force of displacement, it can contract or expand the form.(Fig 15).

Another example shown in Fig 16 explains how the different initial data sets (each image is used for 6 faces of the voxel space) can be processed and overlaid to create a single form. The final form, on the right of Fig 16, contains all the attributes of the 3 images.

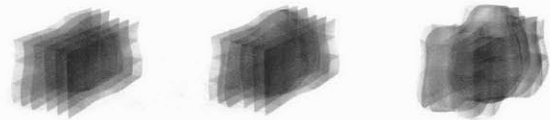
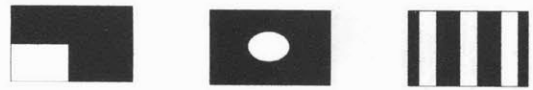


Fig.16

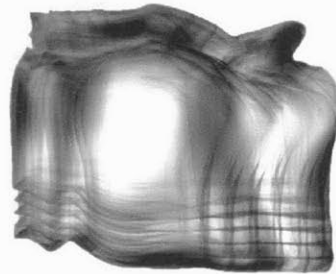
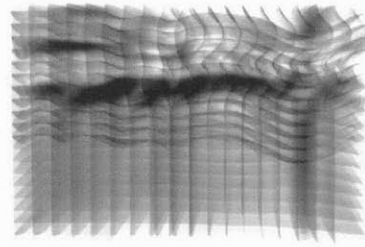
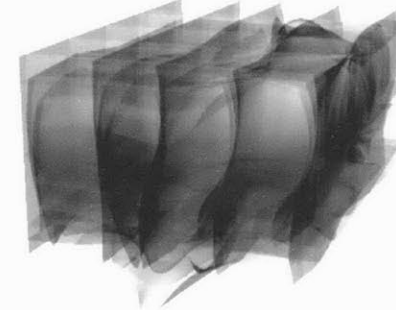
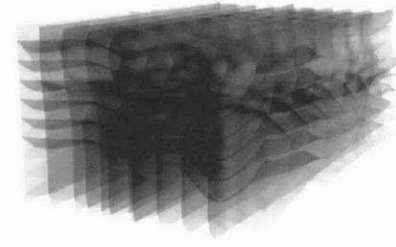


Fig. 16-17. Multiple forces and variations



### Data Representation

According to the original two-dimensional information and the displacement patterns this algorithm is able to produce an infinite number of different shapes.

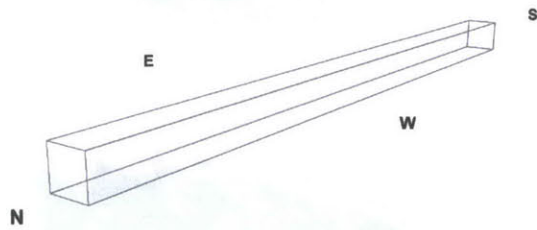


Fig. 18. **Voxel scaffold for the bridge**

In order to design a bridge, I used a voxel scaffold that is 10m x 200m x, 10m and the global orientation is set as shown in Fig. 18. I pick three types of influencing factors from the site, which is wind, light, and the movement of the water.

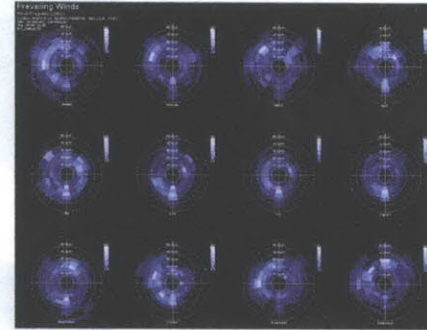


Fig. 19. **Wind information**

For the wind data, I unrolled wind roses into a flat image, mapping the orientation and the intensity of the wind and created an image. The resultant image was cropped to match the faces of the scaffold.

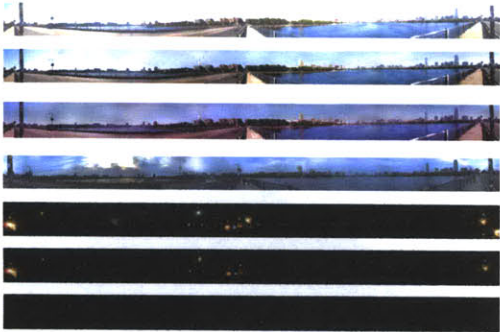


Fig. 20. **Light information**

For the light information, I took multiple picture of the site over time, overlaid them, and then extracted the light characteristics from the images.

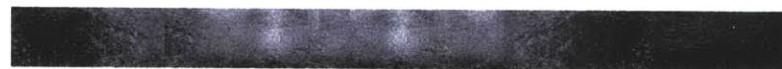
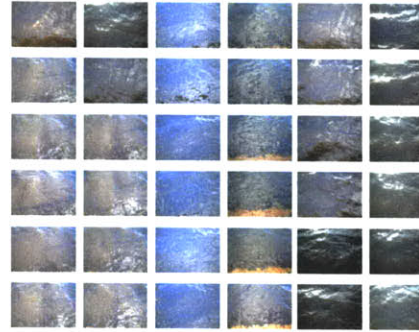


Fig. 21. **Water flow information**

For the water, I photographed water over time at multiple locations on the bridge. I processed the images to detect the edges of the water fragments, translated the edges into numeric values and overlaid the results on top of each other,, More fragmented water area becomes more intense and vice versa.

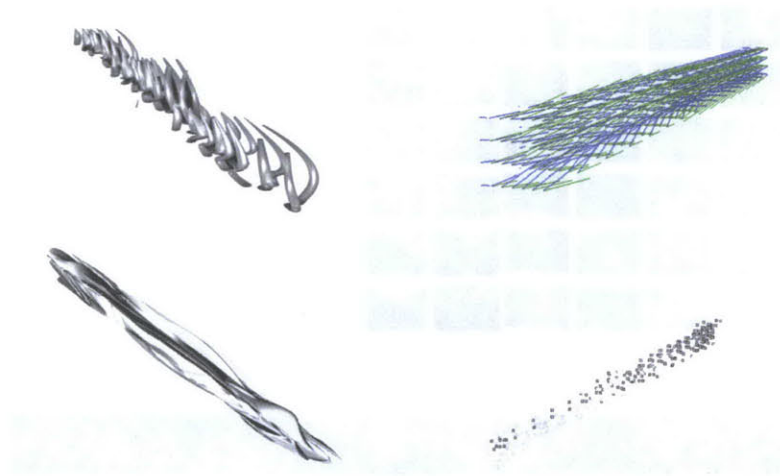


Fig. 22. **Various representations of the voxel information**

The formal representation of the processed data is not fixed since, essentially, it is a matrix of numbers. The representation can be cylinders, lines, points, surfaces, or any other formal output.

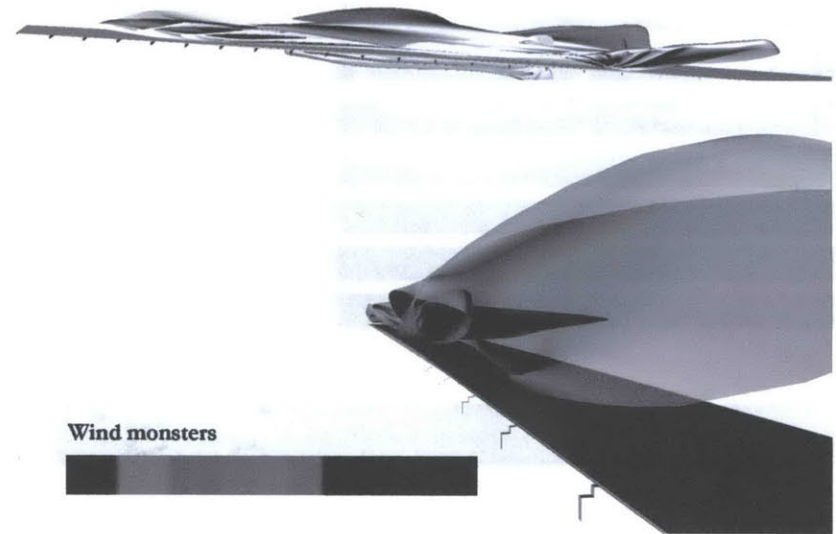


Fig. 23-27. **Bridge monsters**

I applied the site information on the voxel scaffold. I generated hundreds of forms using this algorithm in different combinations of the variables in the algorithm.

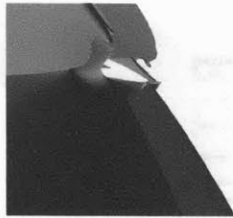


light monsters

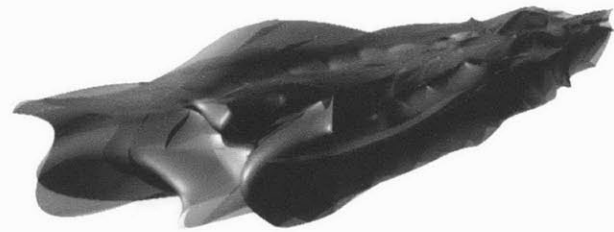


Water monsters





**Mixed monsters (water and light )**



**Mixed monsters**





The resultant forms are highly complex yet, not unexpectedly, I saw fragments in them that captured my initial ideas. The process "Monstrization" is named so because the forms generated by this process were nothing like a traditional bridge thus they seemed monstrous to me.

## Process 2 : De - Monstrization

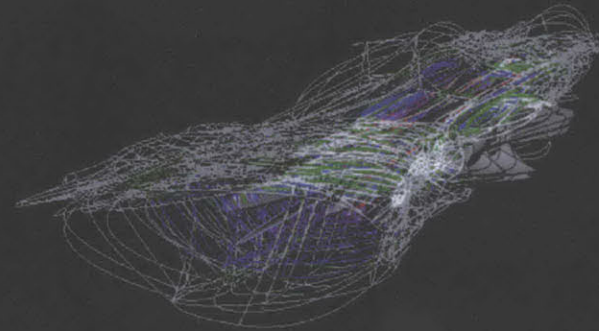


Fig. 28. **Bridge monsters**

The next step was to analyze and understand the result of the previous process. I used many different approaches which were not entirely satisfactory yet informed me on how to deal with the highly complex forms and data.

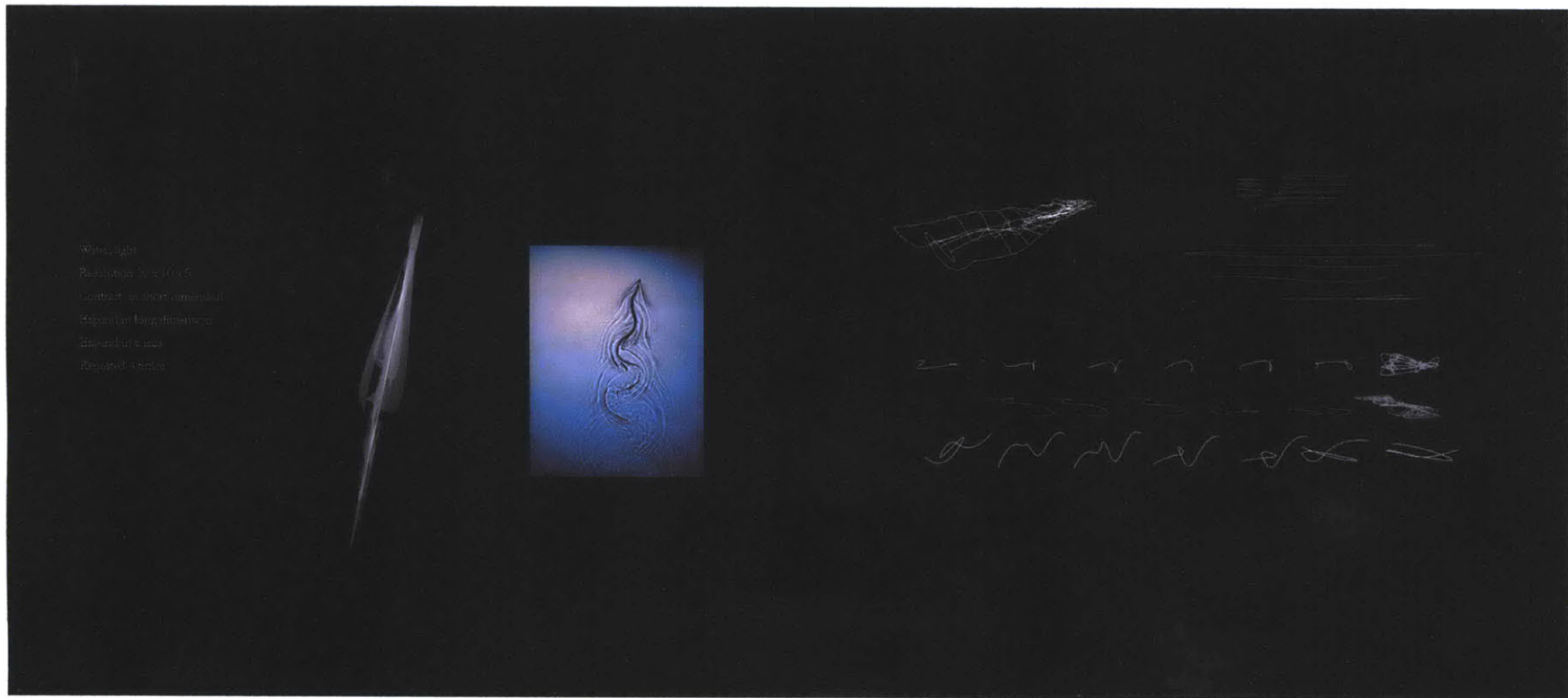


Fig. 29. **Assosiation**

The first approach I took was association. I tried to make formal association between the generated form and some objects or organisms that I knew. Then, I went back to see the variables in the algorithm in order to understand the specificity of the form.

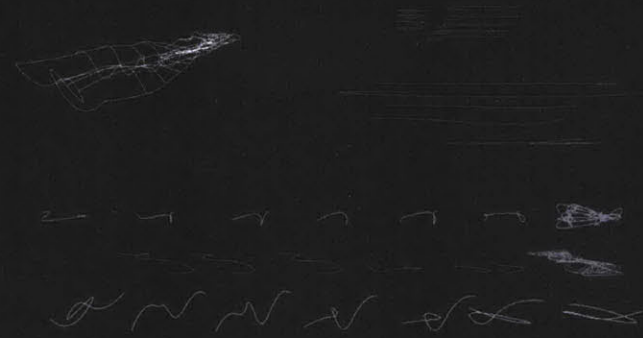


Fig. 30. **Decomposition**

The next approach was decomposition. I took the forms and decomposed the surfaces into lines in order to find the traces of the displacement that were caused by the environmental information.

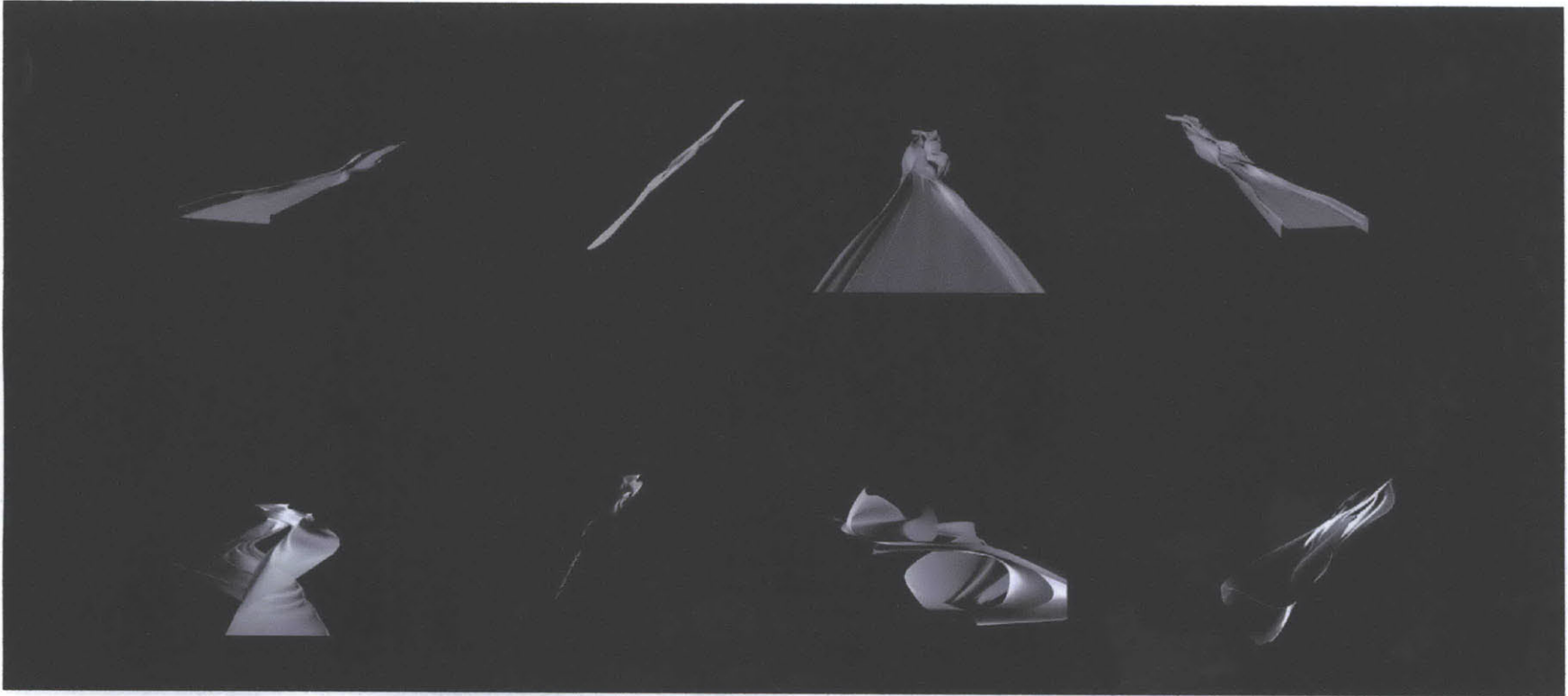


Fig. 31. **Lost in form**

Although I spent a long time on this analysis, eventually I found myself lost in forms trying to mimic the monstrous forms in order to make something that resembles a bridge.

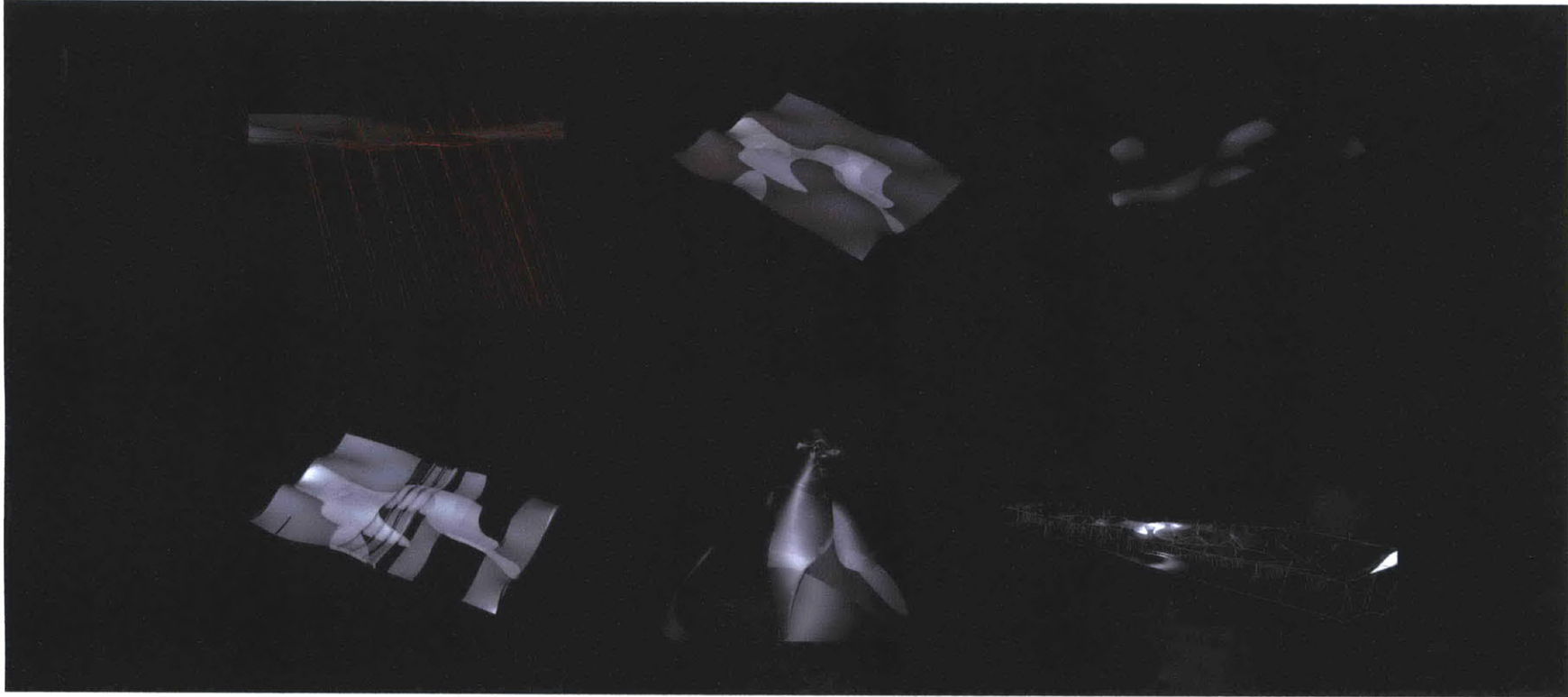


Fig. 32. **Imposing meaning on forms**

The next attempt was to give the monster meaning. I made an algorithm that mimics the relationship between the sun and the water reflection. The algorithm was designed to understand the direction of the sun on the site. It returns a pattern on a surface according to the angle of incidence of the light on the surface. When the angle of incidence is greater than 48 degrees it makes a patch on the surface to represent total reflection. This approach had some interesting results but it did not allow me to understand the monsters since I was imposing a meaning on them. These failures are quite interesting since it seems like many designers using this media get caught in similar pitfalls. A possible reason is that we are so used to design visually

WIs = strong wind	( WIs , Ss , WAs ) = White
WIs = week wind	( WIs , Ss , WAw ) = Blue
Ss = strong sun	( WIs , Sw , WAs ) = Cyan
Sw = week sun	( WIs , Sw , WAw ) = Green
WAs = strong flow of water	( WIs , Sw , WAw ) = Green
WAw = week flow of water	( WIs , Sw , WAw ) = Green
	( WIw , Ss , WAs ) = Pink
	( WIw , Sw , WAs ) = Red
	( WIw , Ss , WAw ) = Yellow
	( WIw , Sw , WAw ) = Black

Fig. 33. **Computational analysis**

Finally, I realized that I should computationally identify and analyze the distribution of properties that I already had. I characterized each of the information as strong or weak. I used the resulting eight possible combinations to color code them. (Fig. 33)

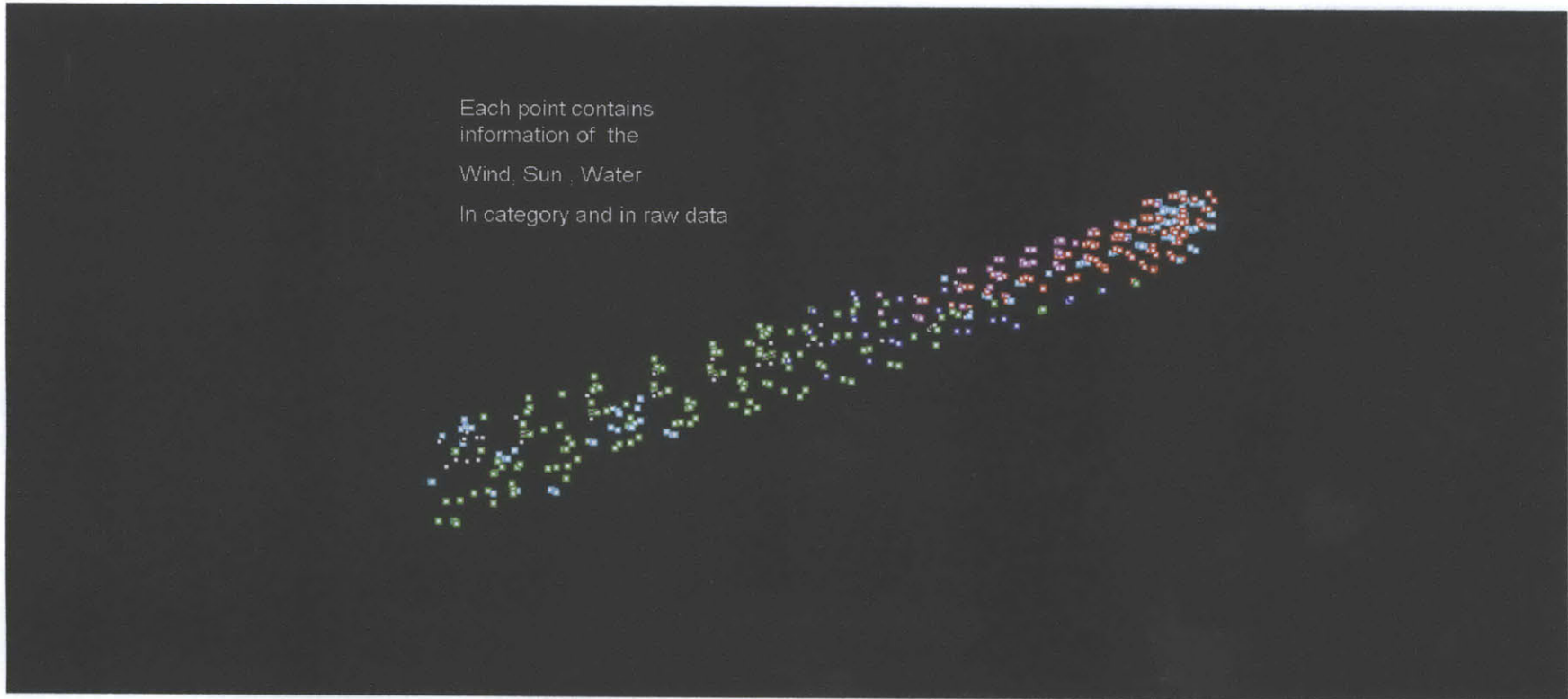


Fig.34. **Information grouping**

Each point in the voxel space contains specific information of the wind, light, and water, as well as of the category it belongs to.



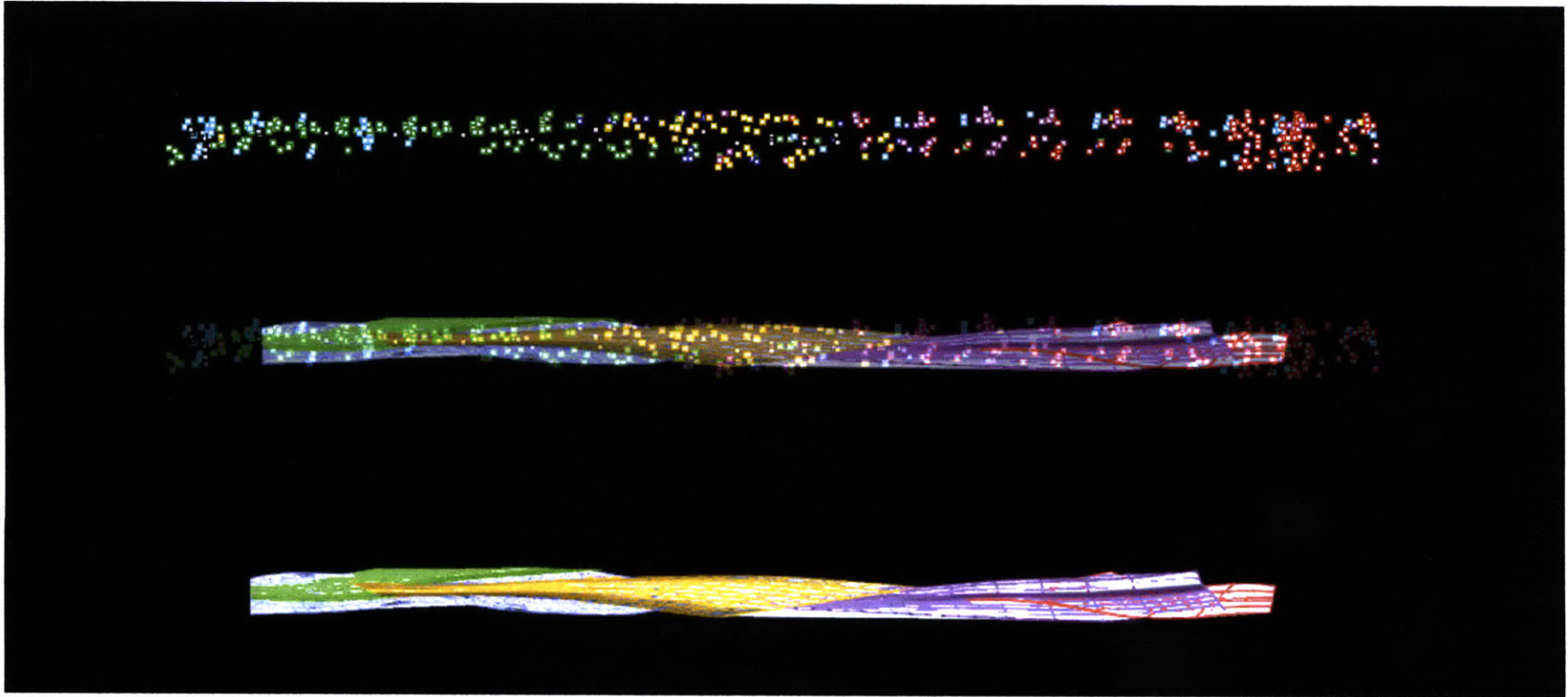


Fig. 35. Lowering information dimension

And then, I projected the area of the categorized groups on to a flat surface in order to lower the dimension of the information back to two-dimensions.



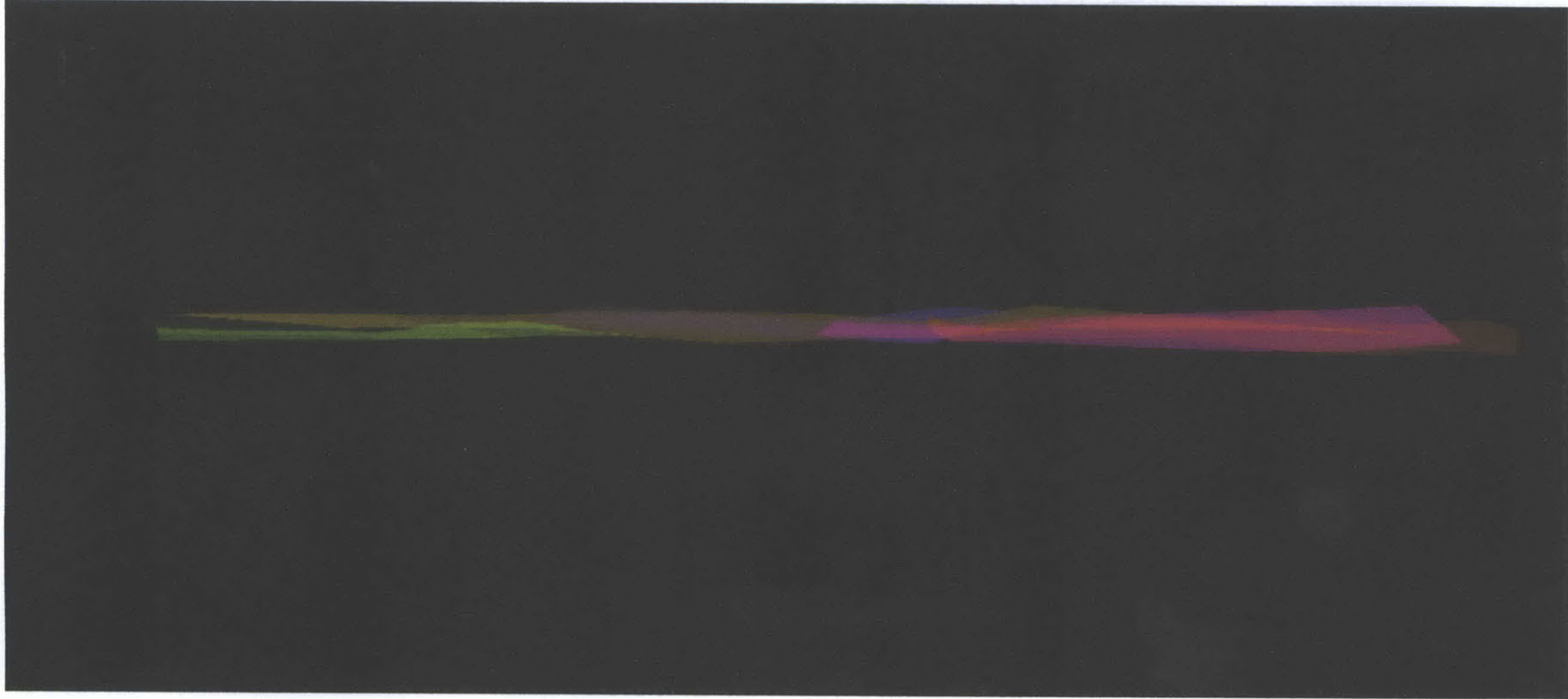


Fig. 36. **Flattend surfaces**

This last approach, I believe, was more true to my process and initial idea. This approach allowed me to re-see what I had. Again, the difficulty of this demonstrization process was to overcome the strong tendency to design by operating on forms. The computational complexity is handled as an accumulation of separate entities inside the algorithm so that the analysis can be easily done by operating directly on the separate entities rather than on the resultant form.

## Process 3 : Re - Monstrization

The previous de-monstrization gave me a color coded flat surface, which I was able to comprehend yet the complexity and the multiplicity of the information was lost. This re-monstrization process attempts to bring this aspect back.

Being inspired and learning from the presentation by Stilyanos Dritsas, Alexandros Tsamis, and Lydia Kallipoliti in the non standard praxis conference, at MIT in September 2004, I decided to regenerate the flattened surfaces using the original information in the voxels.

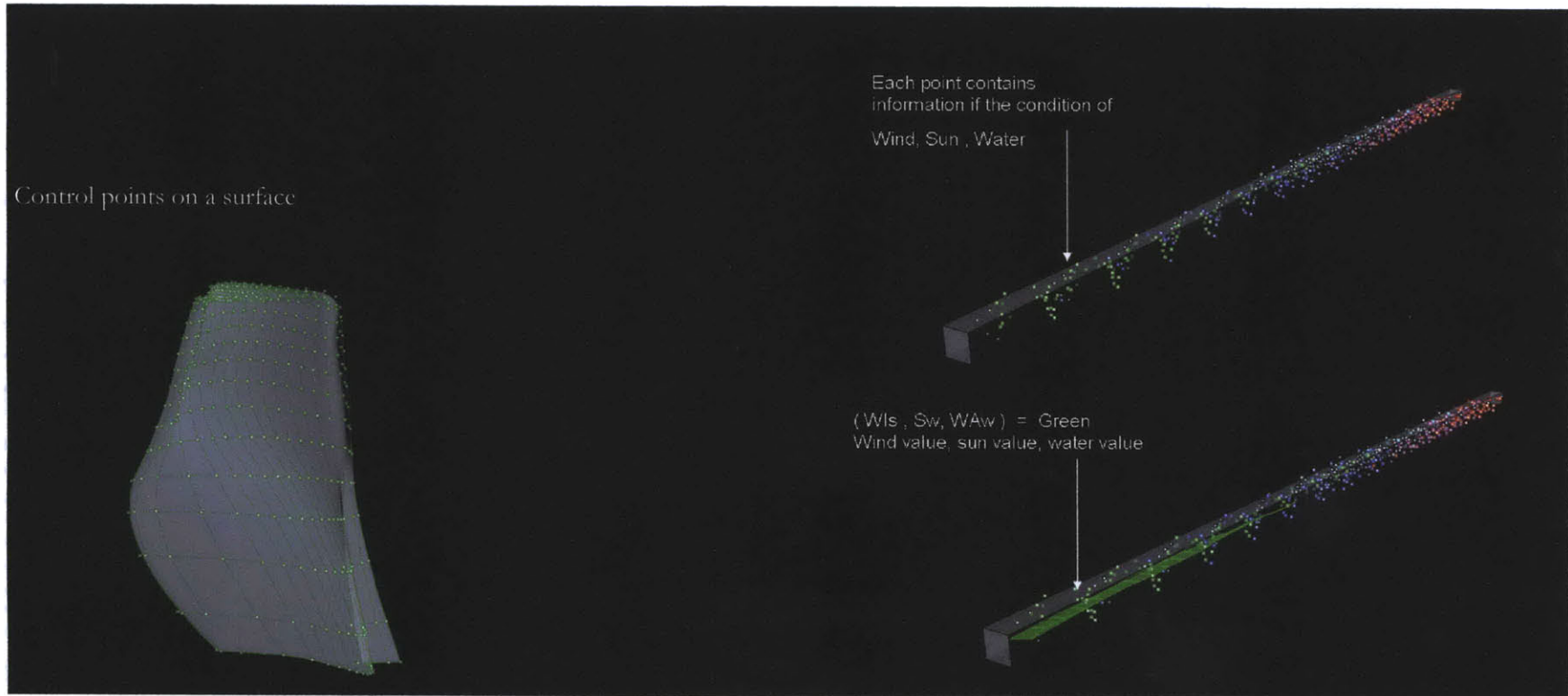


Fig. 37. **Compact monster generation**

The algorithm used for this process is designed so that each control point on the surface understands the closest voxel information. According to the information, which is a number, the control points are displaced (force = displacement) and the surfaces were designed to regenerate themselves. I placed each of the color coded surfaces separately inside the original voxel space. As expected, the regenerated forms are somewhat of a smaller version of the monsters in the Monsterization process. Therefore, I needed a way to control the objects so that I will be able to incorporate more architectural consideration into the form.

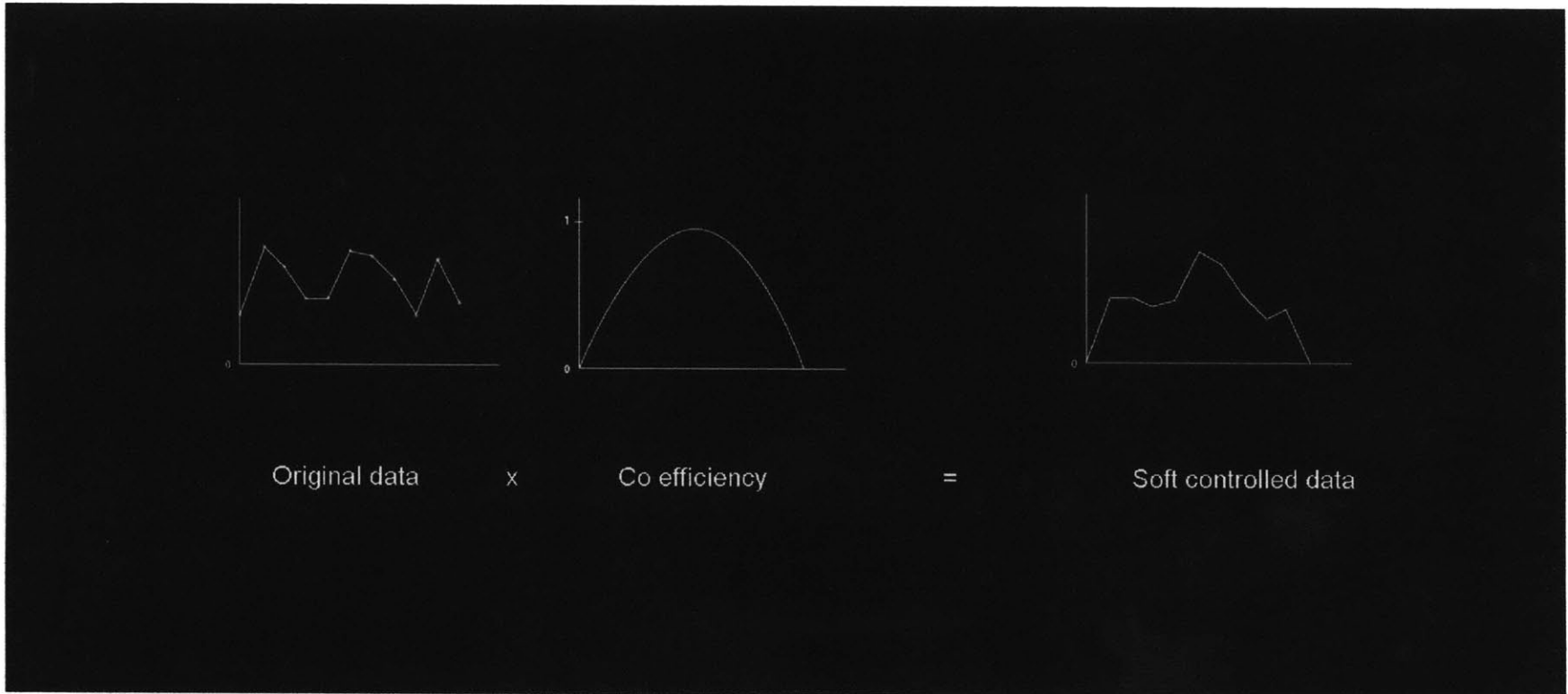


Fig. 38. **Data controlling mechnism**

In order to do so, I designed a plug-in algorithmic system that used coefficient graphs. A coefficient is a number or symbol multiplied with a variable or an unknown quantity in an algebraic term, as is 4 in the term  $4x$ , or  $x$  in the term  $x(a + b)$ . [Houghton Mifflin Company, 2000] By using a coefficient graph, I was able to control the numeric values gradationally. The diagram above shows the section of original information being controlled softly by the coefficient graph.

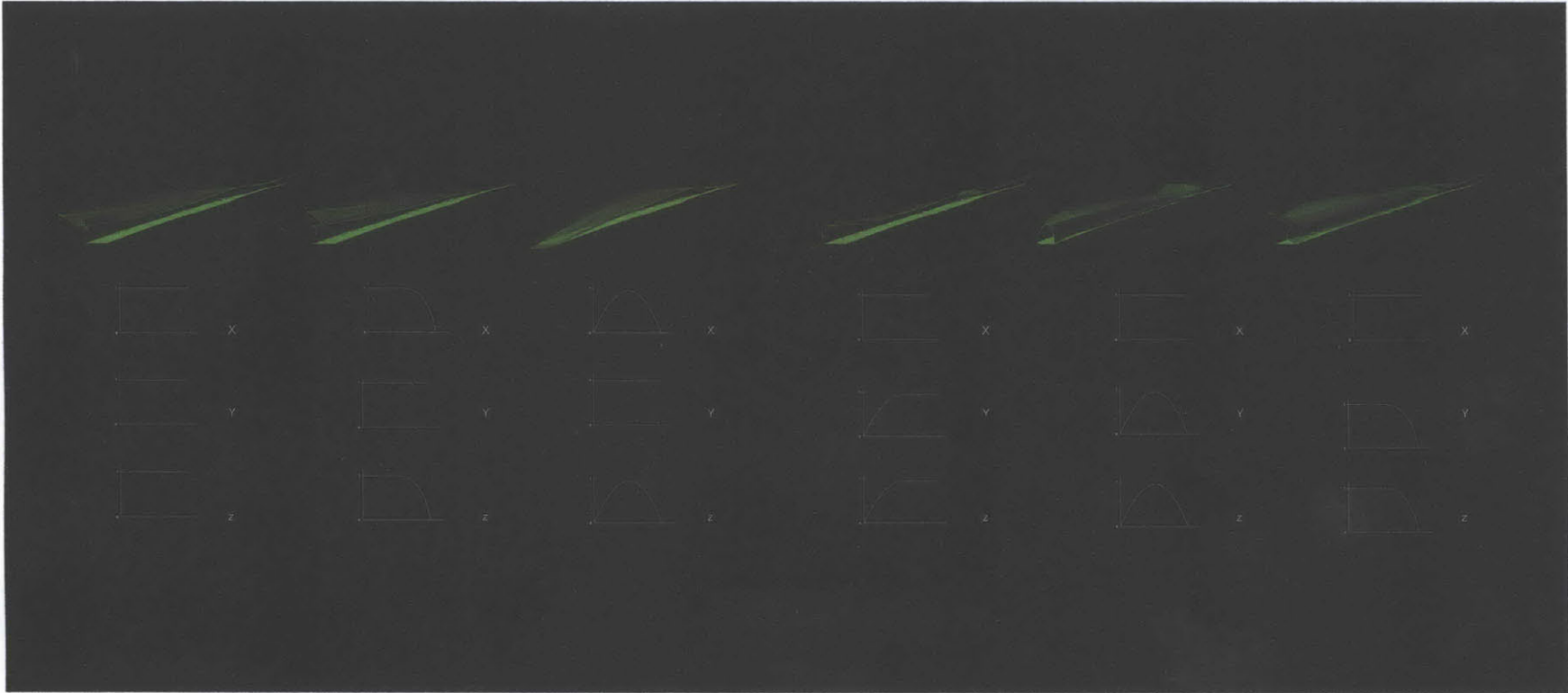


Fig. 39. **Suface control mechanism**

By applying coefficient graphs on the x, y, and z axis, the regenerating surfaces are controlled. This control mechanism allowed me to operate on architectural and gravitational consideration without losing the multiplicity of the information.

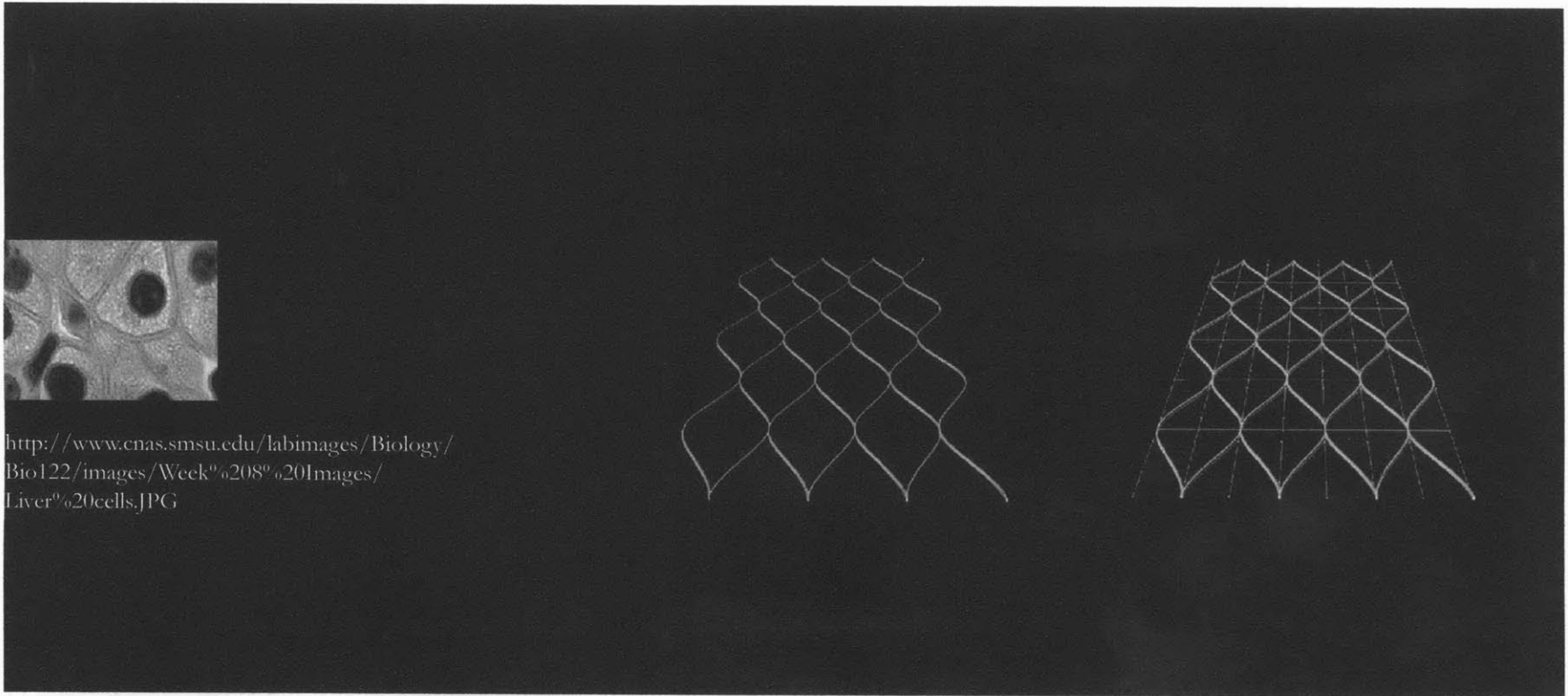


Fig. 40. **Tectonic consideration**

The other essential architectural consideration was the incorporation of tectonics. I am using tectonics here in a loose way in the sense of what the things are made from. Being inspired by the forms of cells, I decided to use mesh tectonic shown above as a material.

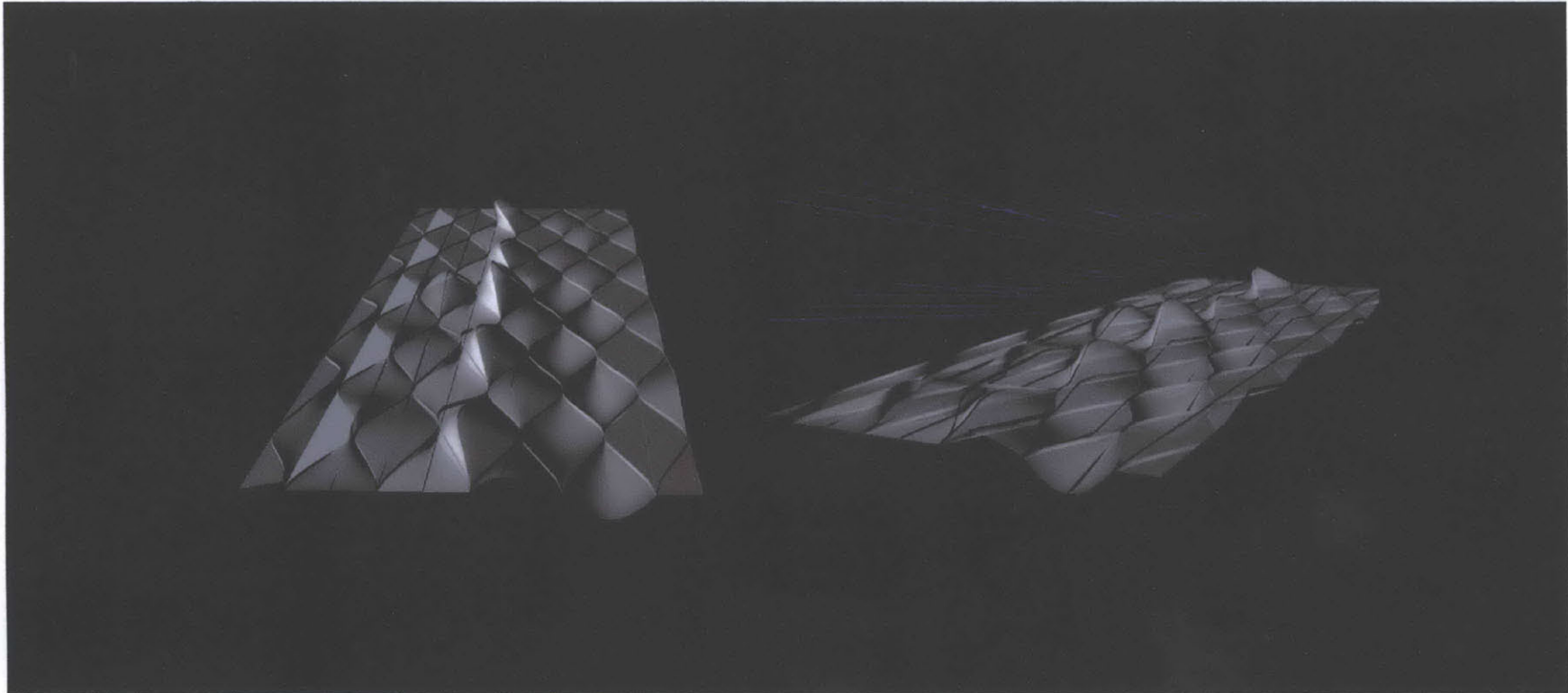


Fig. 41. flexible mesh

This mesh structure also has control points that move related to the voxel information.



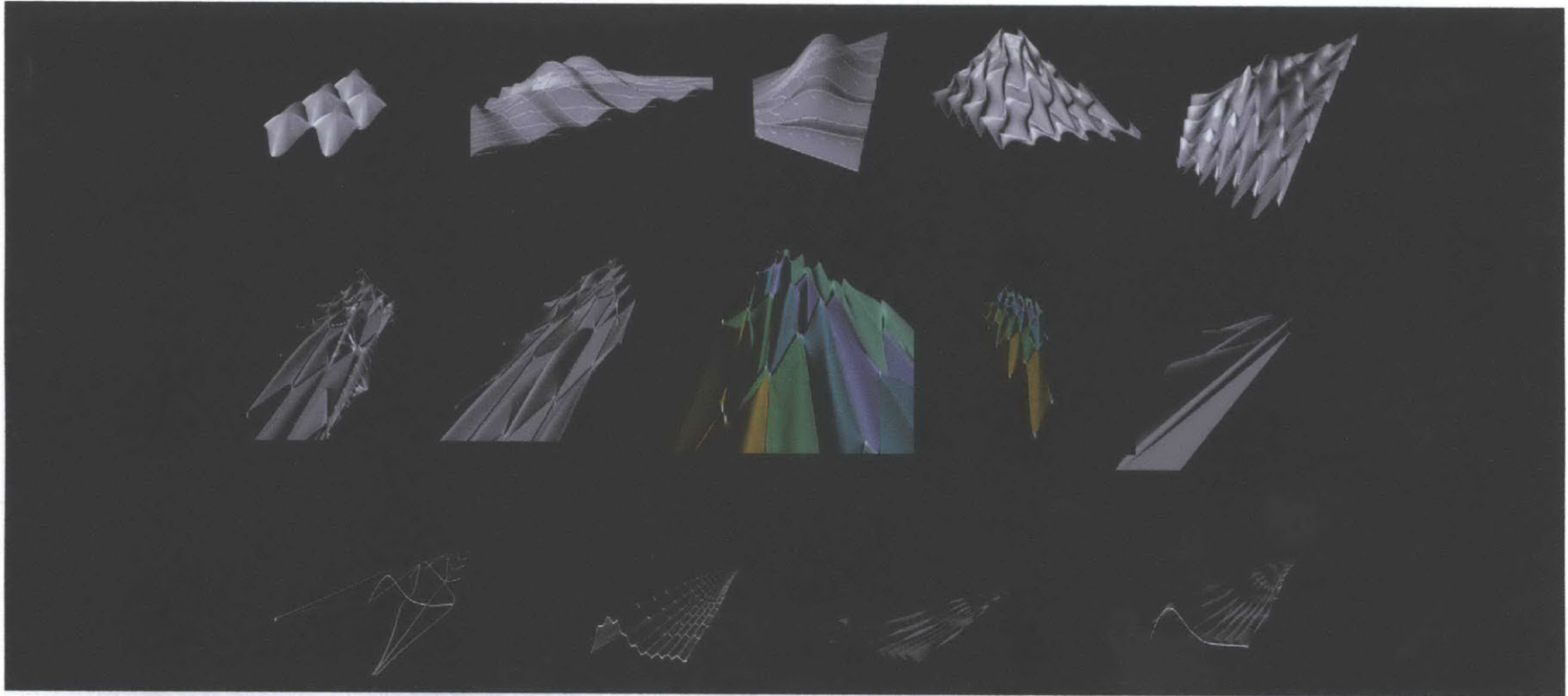


Fig. 42. **Possible formal expressions**

I tested many possible expressions that can be achieved by this simple mesh system as shown above.



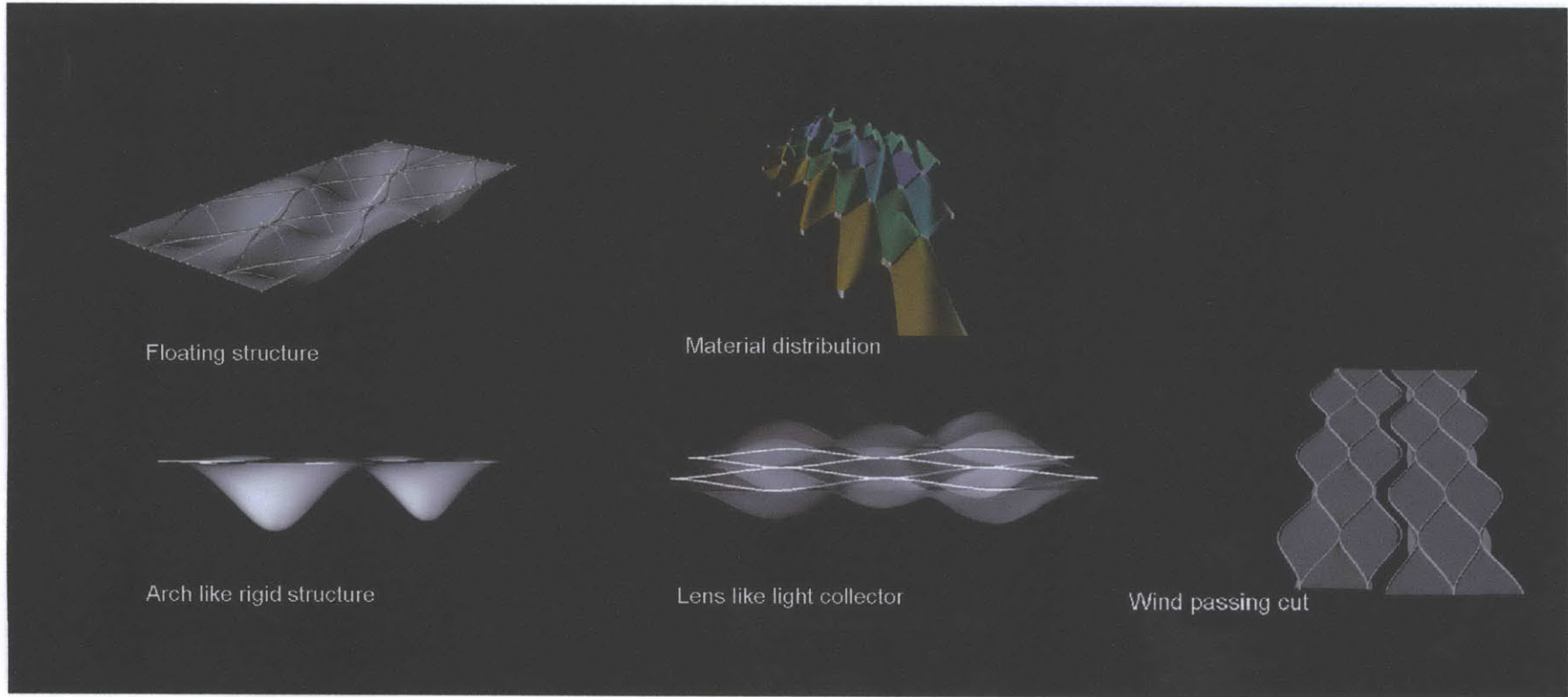


Fig. 43. **Expressions for the conditions**

After testing the multiple expressions, I was able to find ways of expressing the original information, which were wind, light, and water movement, using this simple system.



Fig. 44. **Wind sensitive skin**

One of the areas in the voxel information where the wind was strong, and light and the water movement was weak, (which was color coded green in the previous process), was regenerated in the voxel space using a coefficient graph. In this area I focused on bringing the character of the wind forward.

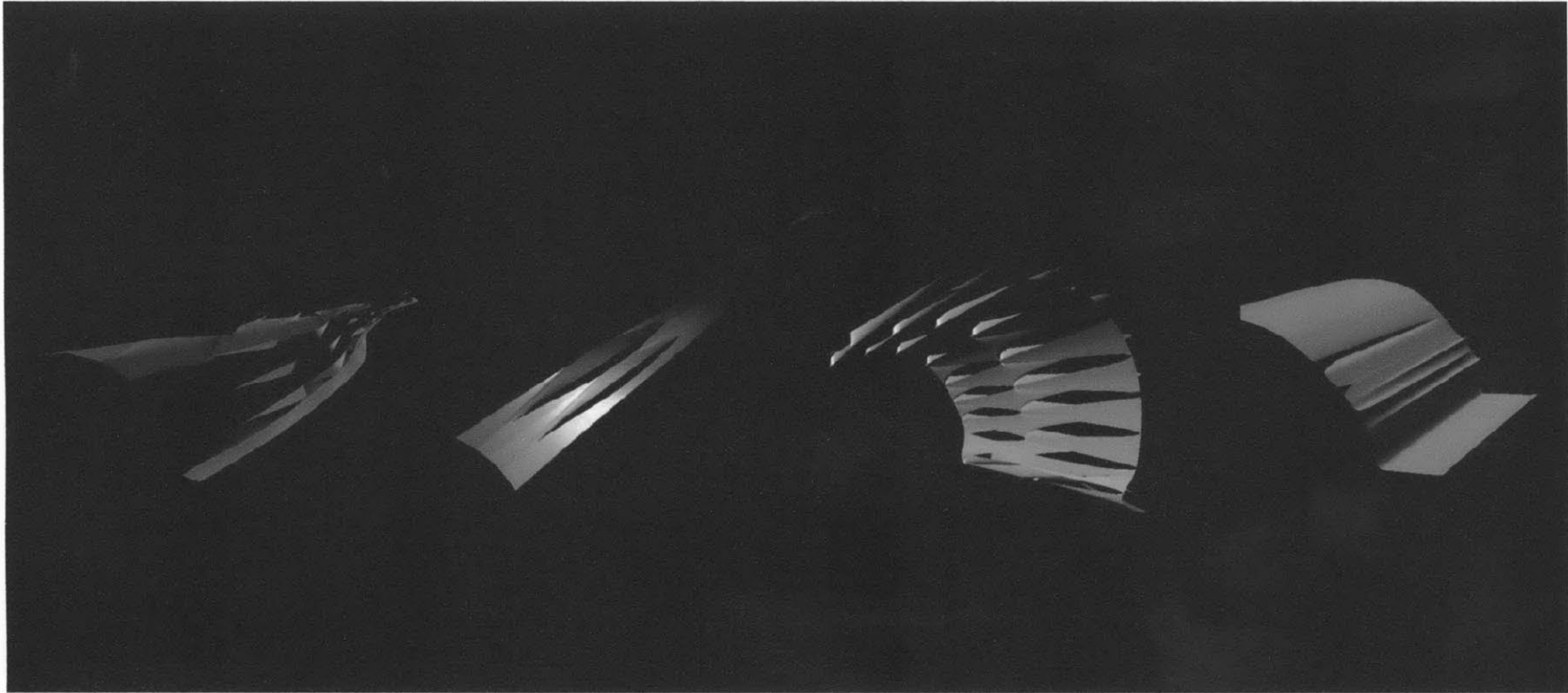


Fig. 45. **Possible wind sensitive skin**

I tested various ways of cutting the surface based on the mesh tectonic in order to arrive at a satisfactory expression for this area.

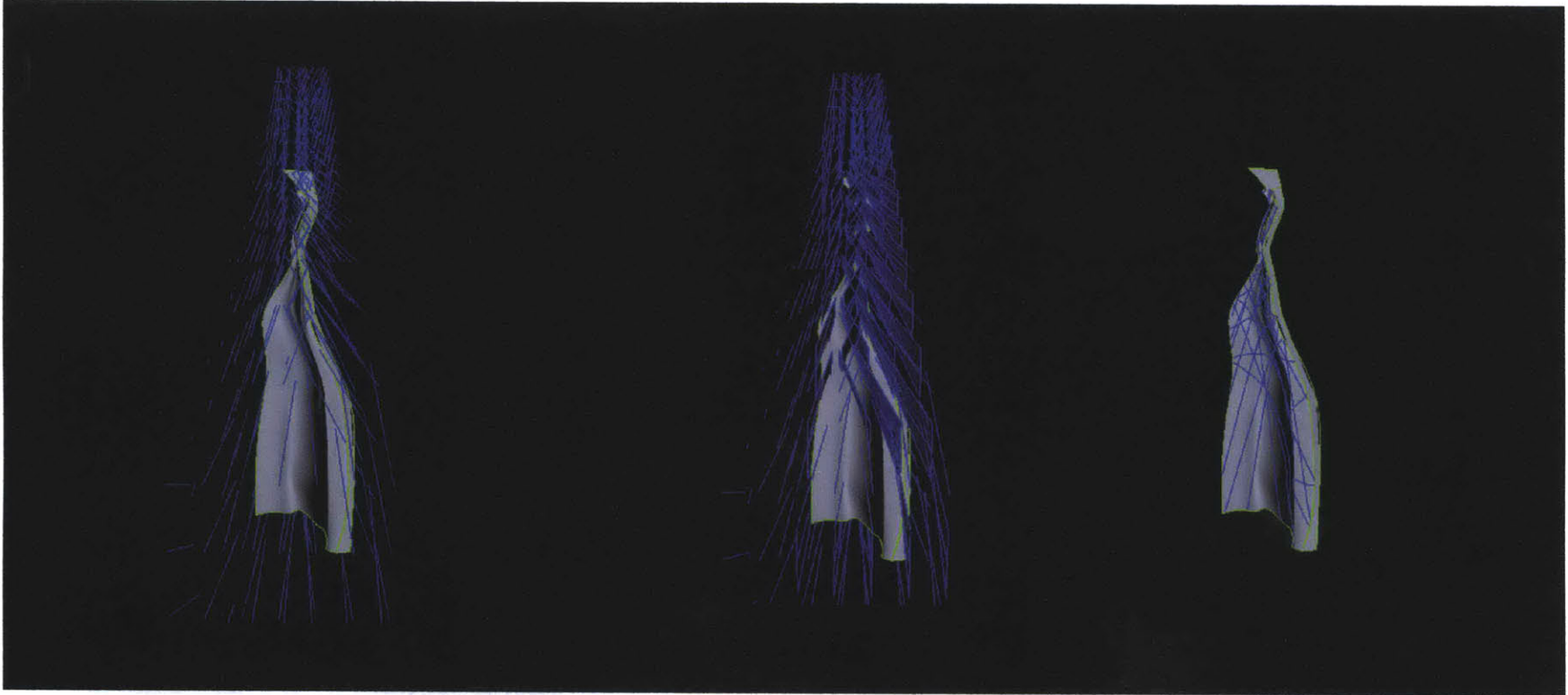


Fig. 46-52. **Process of generating a wind sensitive form/space**

This process involved, representing the voxel information in line so that it shows the directionality of the wind. The surface was split when the wind information is especially strong so that in this area, the wind penetrates only from the specific directions. Then the split surfaces were regenerated again in the voxel space with coefficient graphs in order to apply thickness.



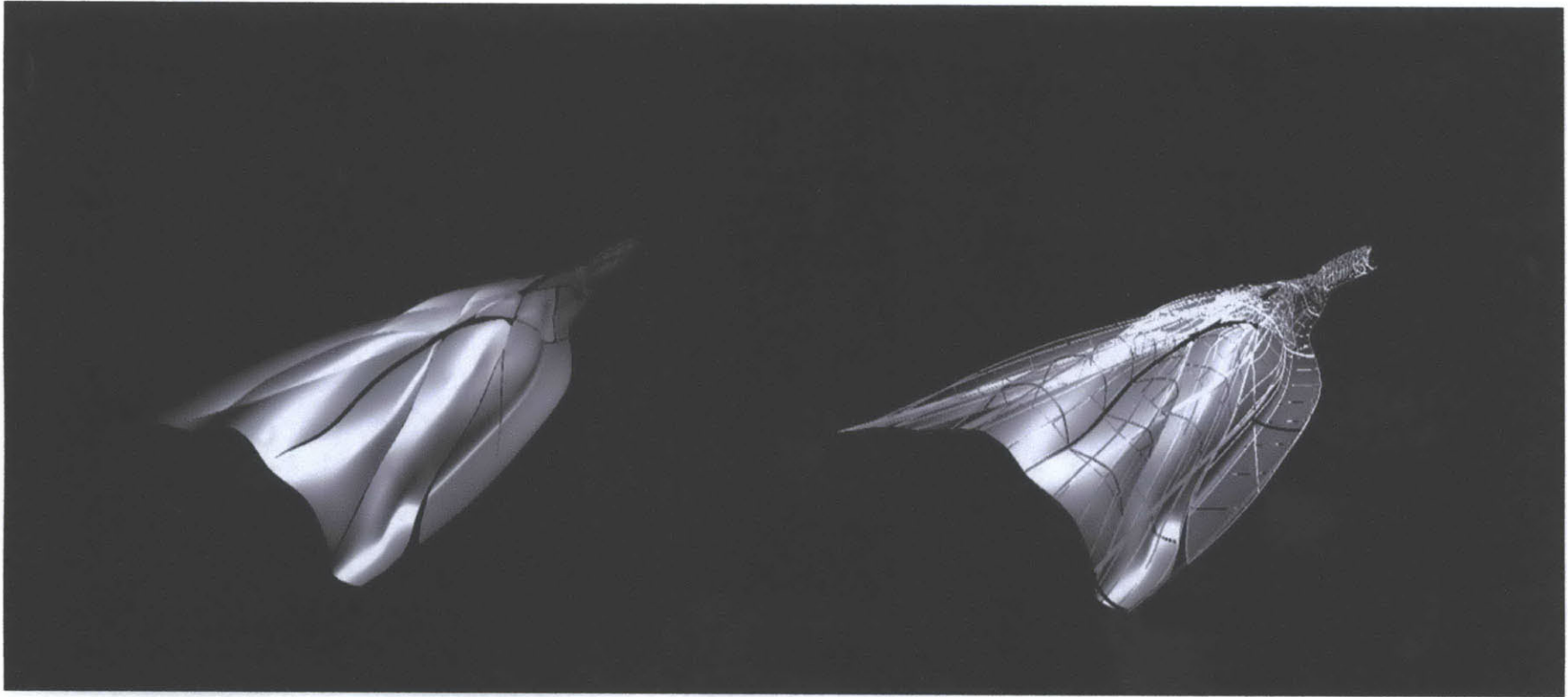


Fig. 53. **Wind sensitive form/space**

As a result, the initial flat surface was regenerated with the specificity of the wind information with the tectonics



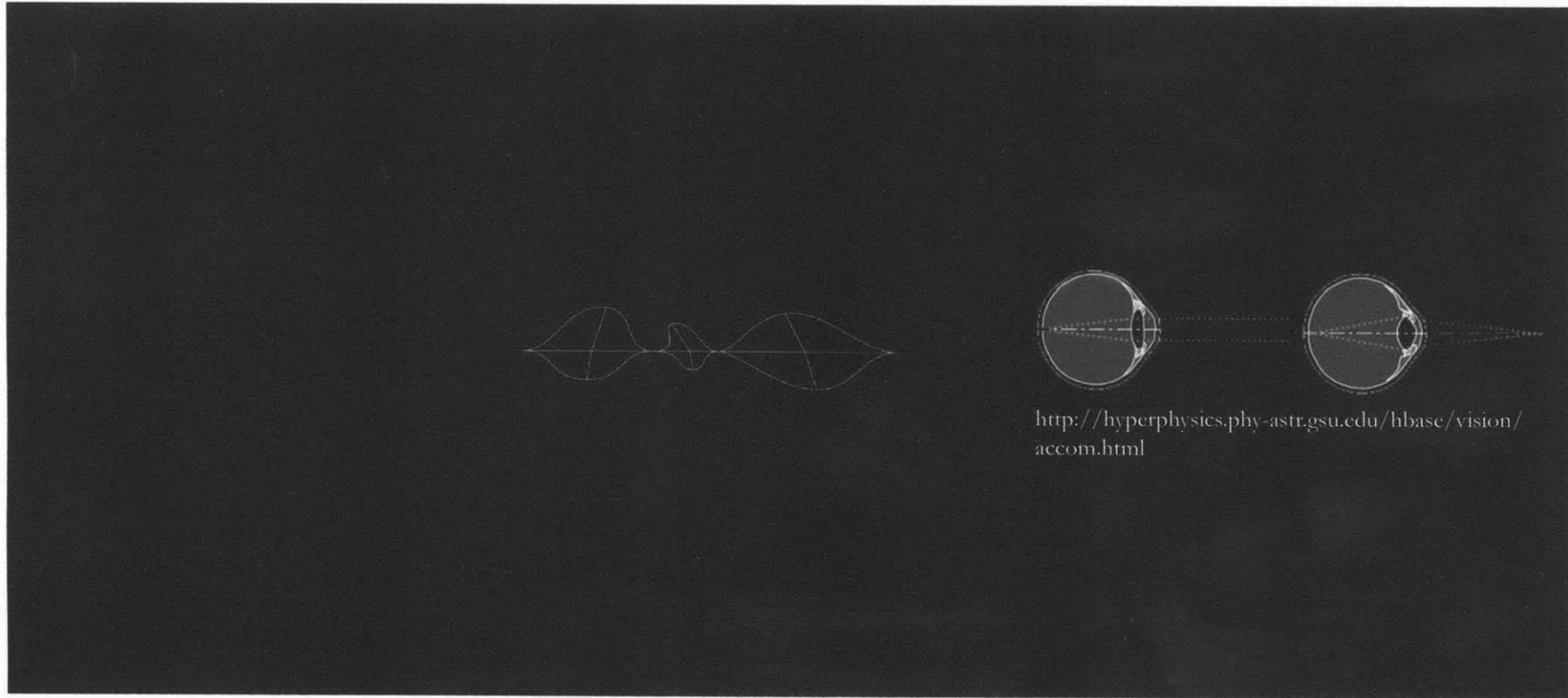


Fig. 54. **Light sensitive form/space**

Areas where light was strong, wind was weak, and the water movement was slow, were regenerated in a similar manner.

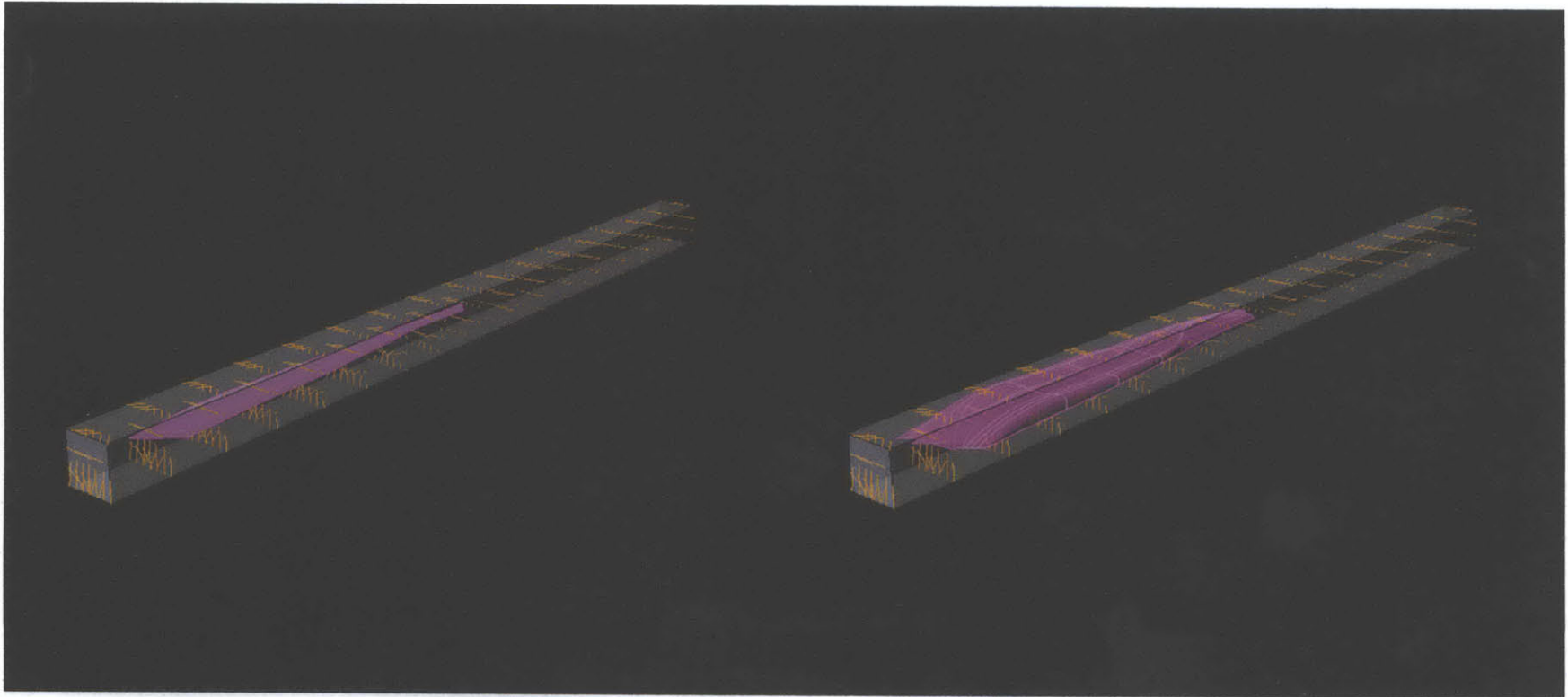


Fig. 55. **Process of generating light sensitive form/space**

The original surface was placed in the voxel space to regenerate.



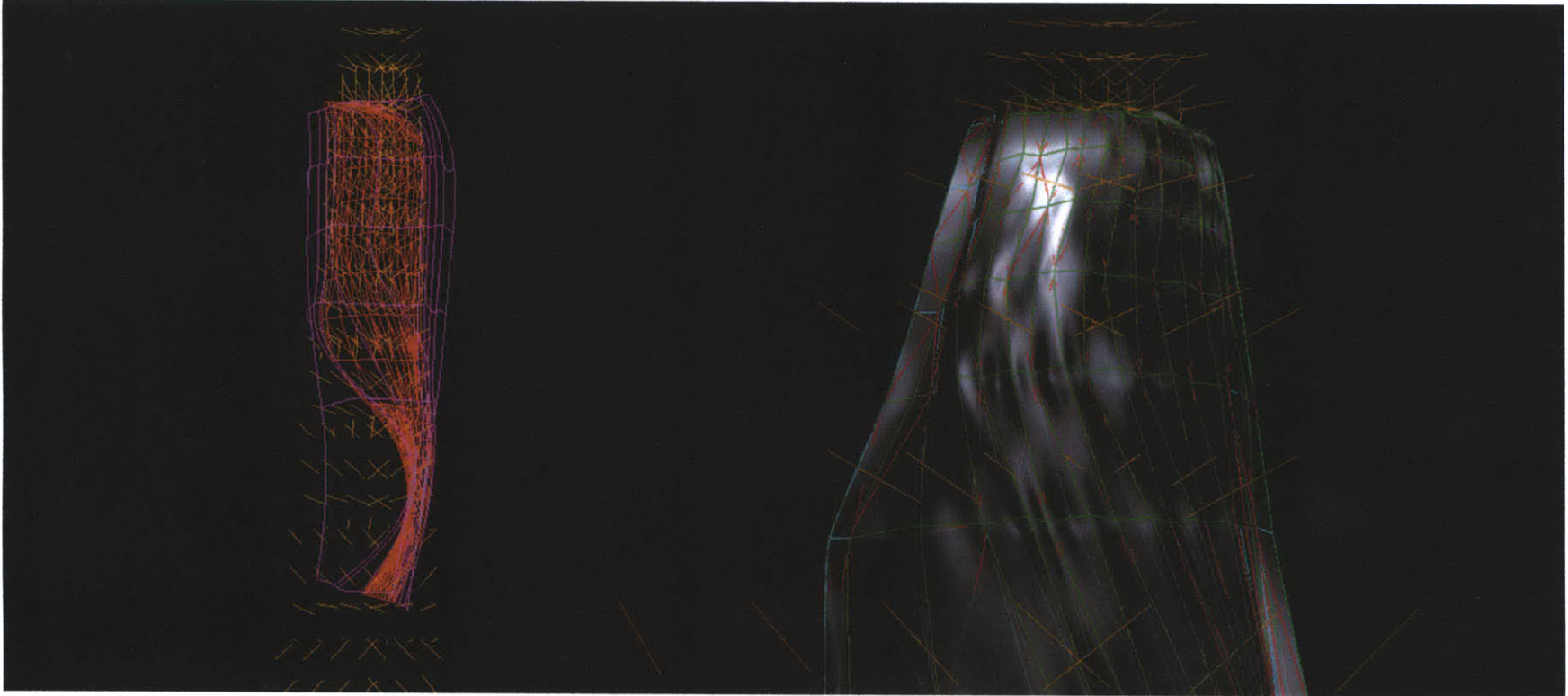


Fig. 56. **lens-like texture**

And then, each of the mesh cells was moved by the information along with the mesh tectonic to create a lens-like texture and effect.

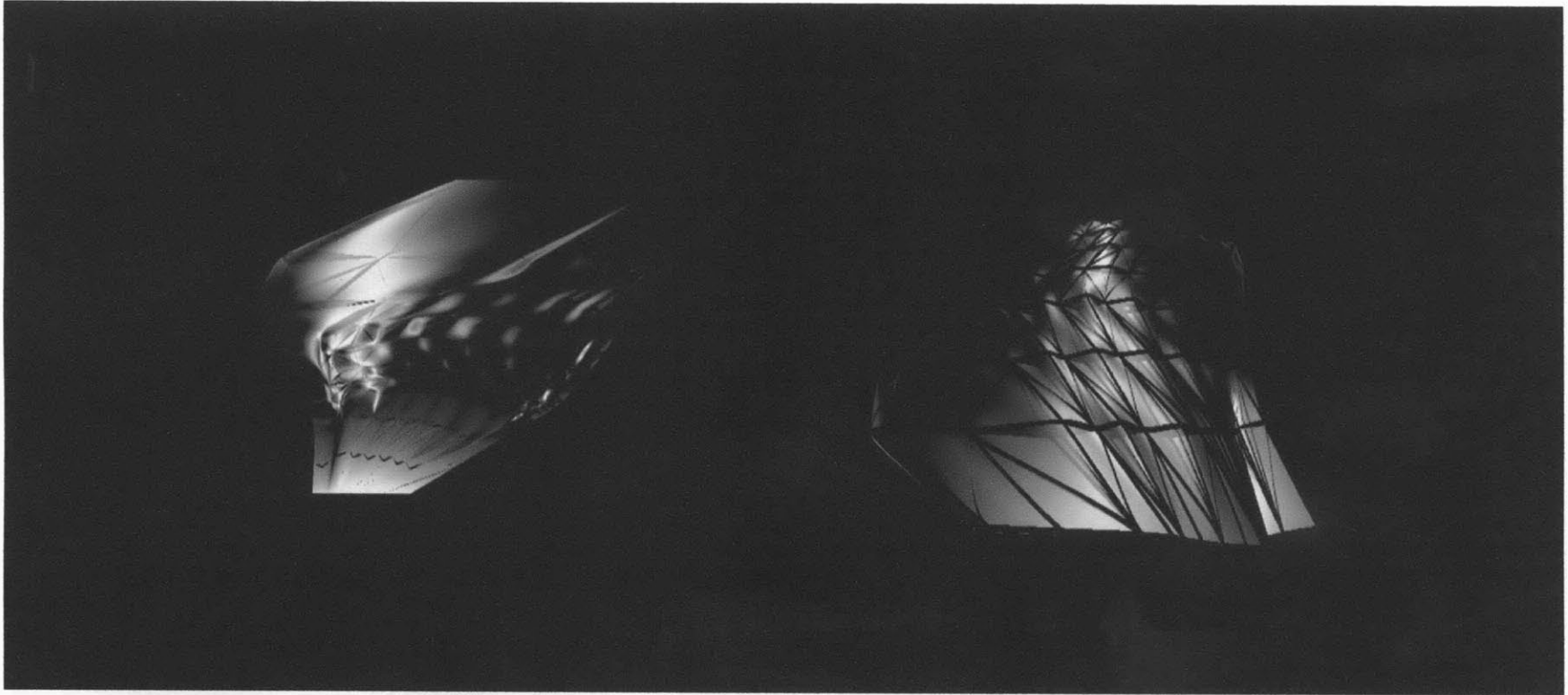


Fig. 57. **Light sensitive form/space**

As a result, the initial flat surface was regenerated with the specificity of the light information in combination with the tectonics.

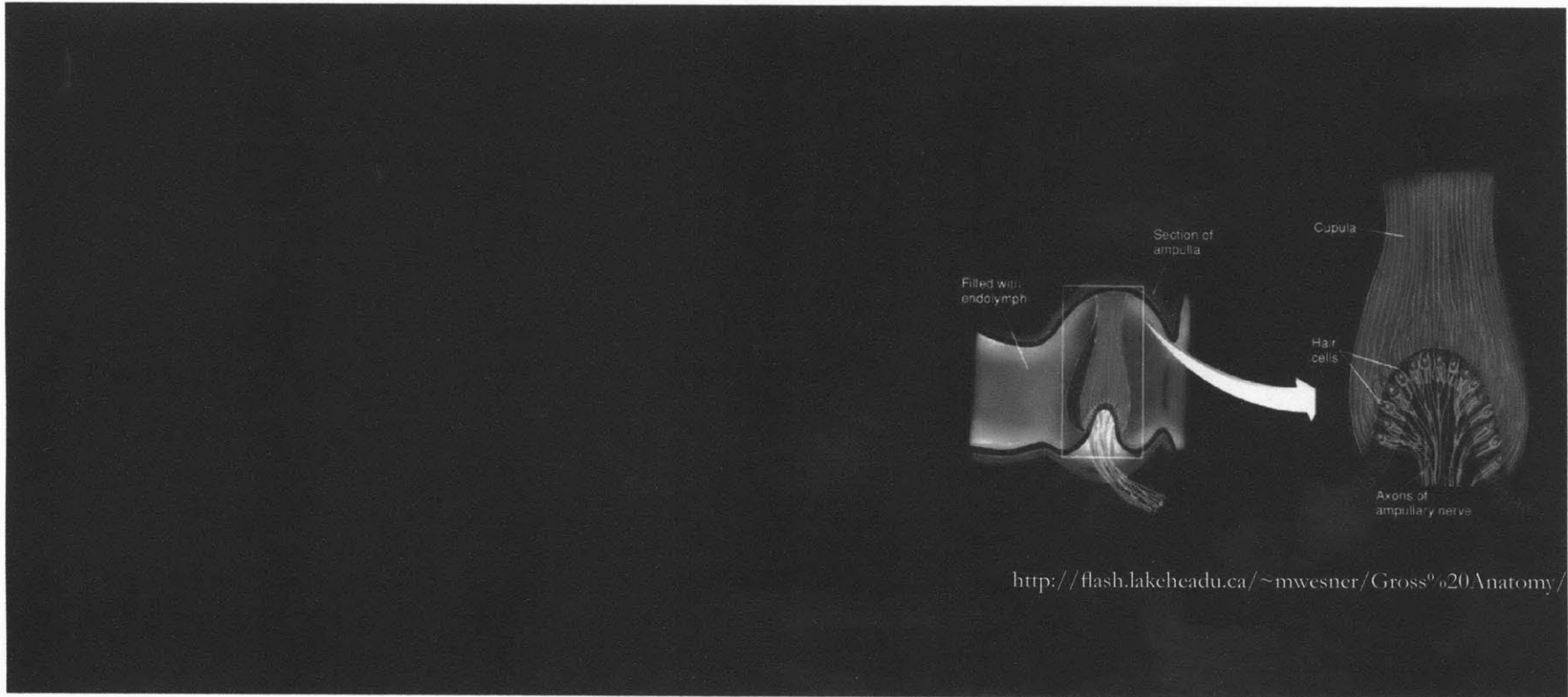


Fig. 58. **Water flow sensitive form/space**

The movement of the water was related to the structure of the bridge.



Fig. 59. **process of generating floating structure**

The original flat surfaces were regenerated in the voxel space with coefficient graphs and then, where the water flow was strong the bridge became a floating structure and where the water flow was weak, the bridge became a rigid structure. The structure is a variation of the original mesh tectonic: the floating structural parts are designed to become a pillow-like inflatable form, and the rigid parts became an arch-like structure. The rigid structure supports the floating structure as well as some of the roof structure.

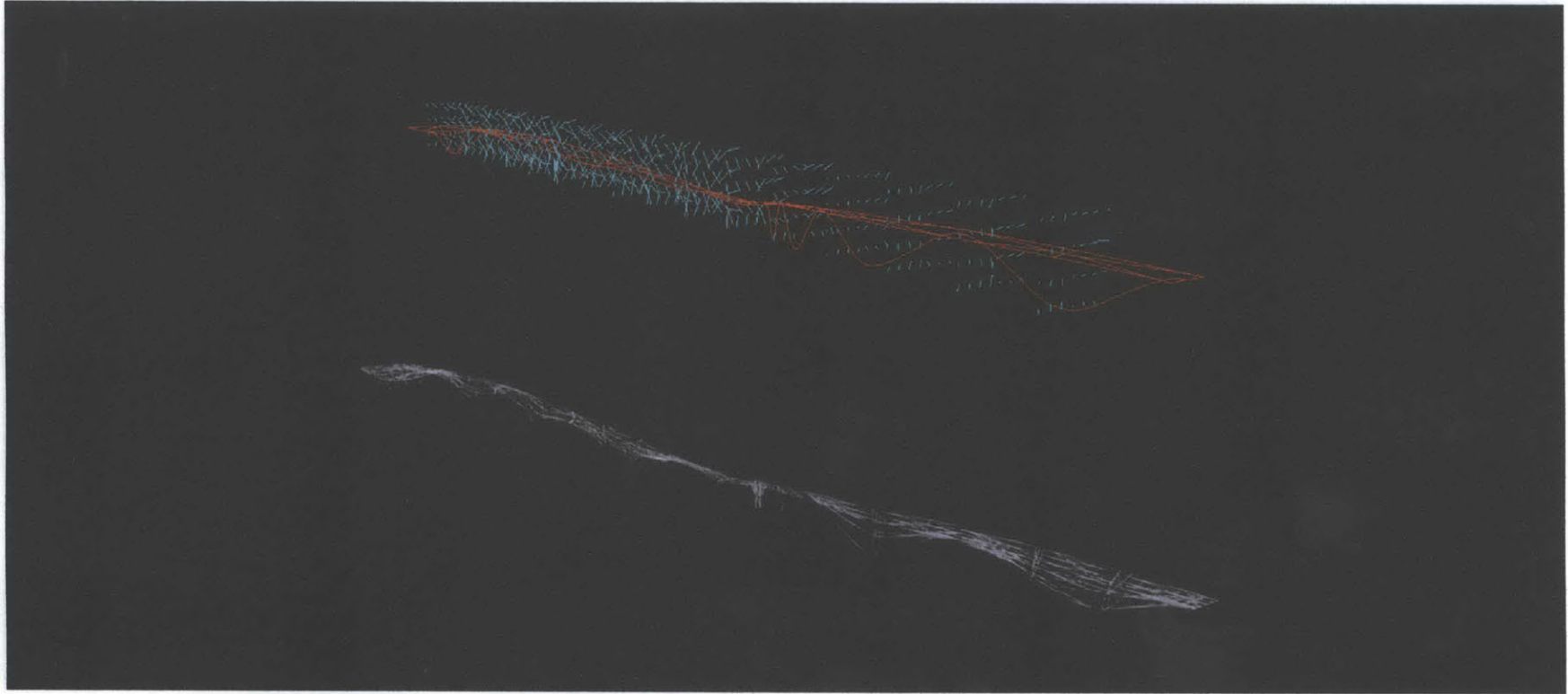


Fig. 60. **Process of generating rigid structure**

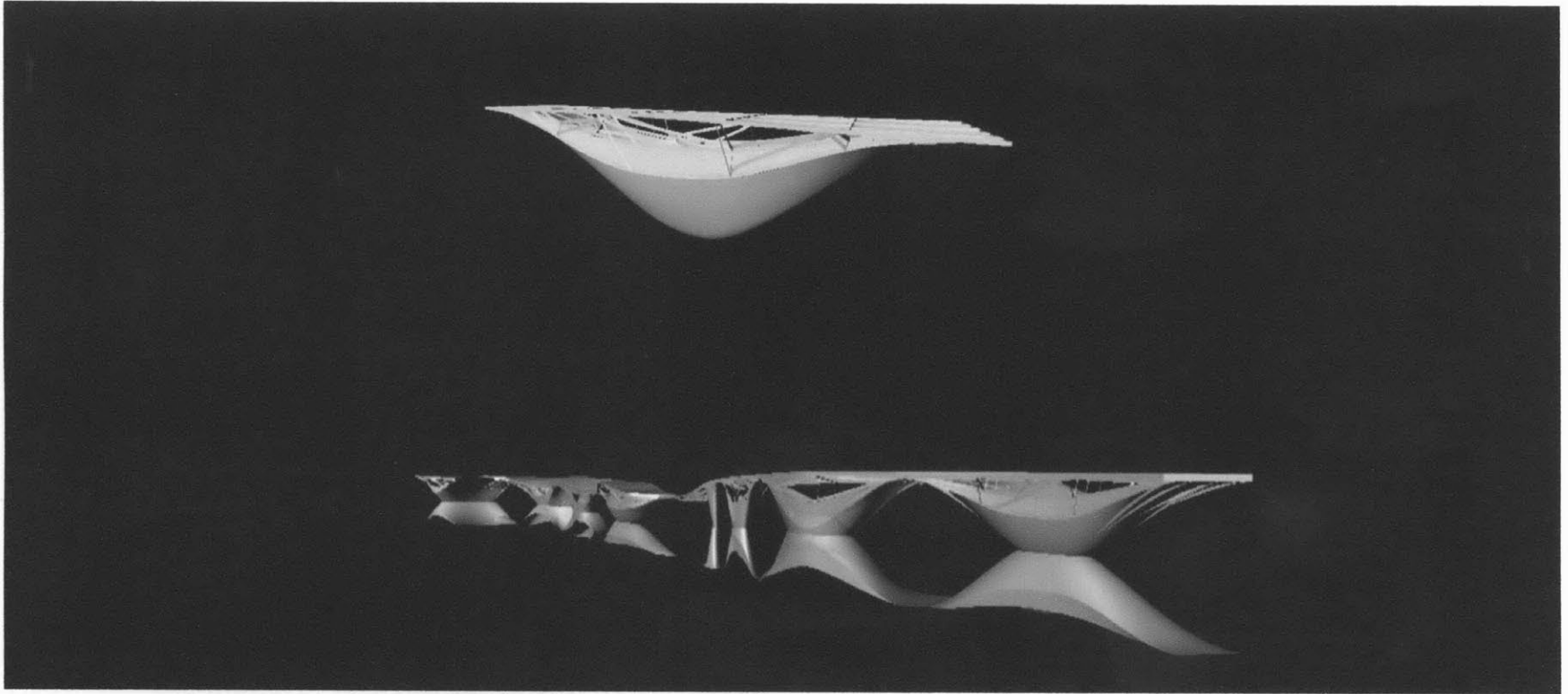


Fig. 61. **Process of generating rigid structure**

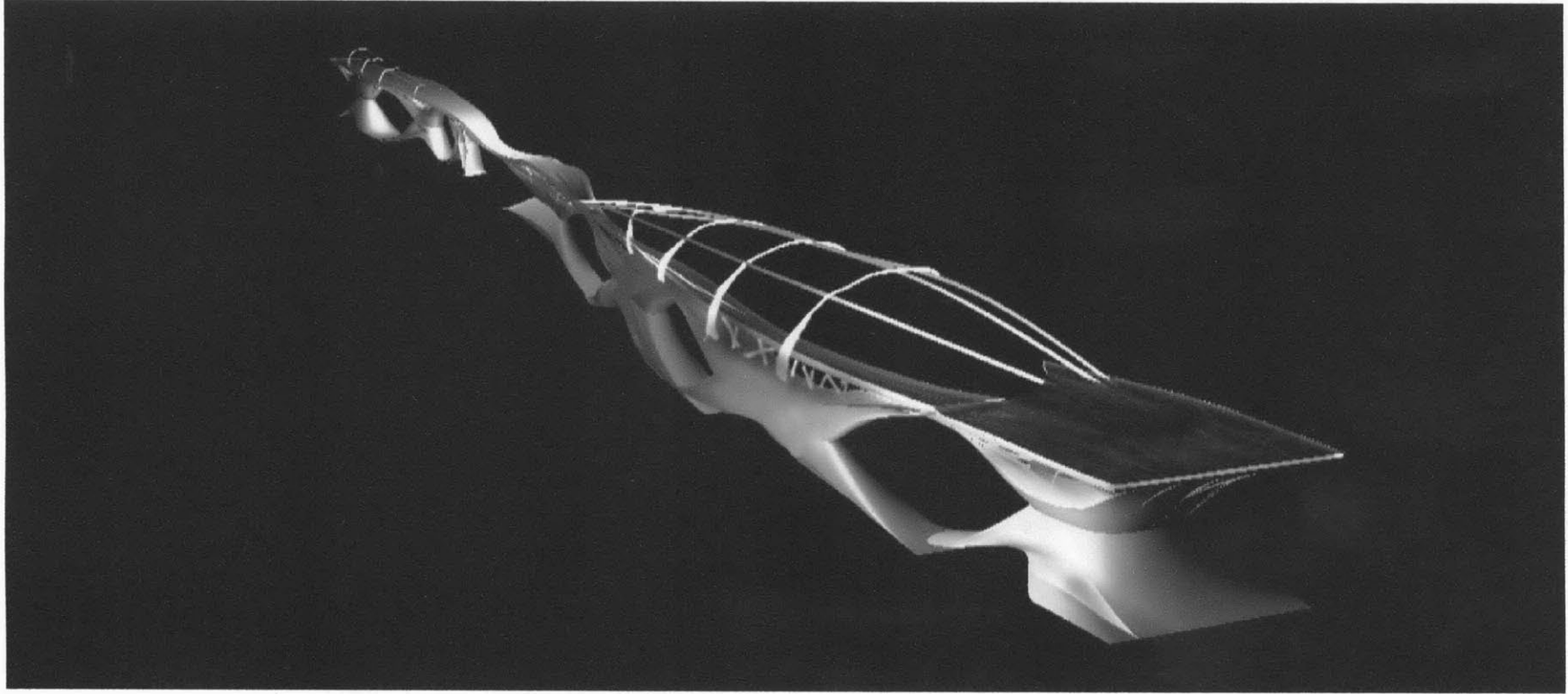


Fig. 62. **Process of generating rigid structure**



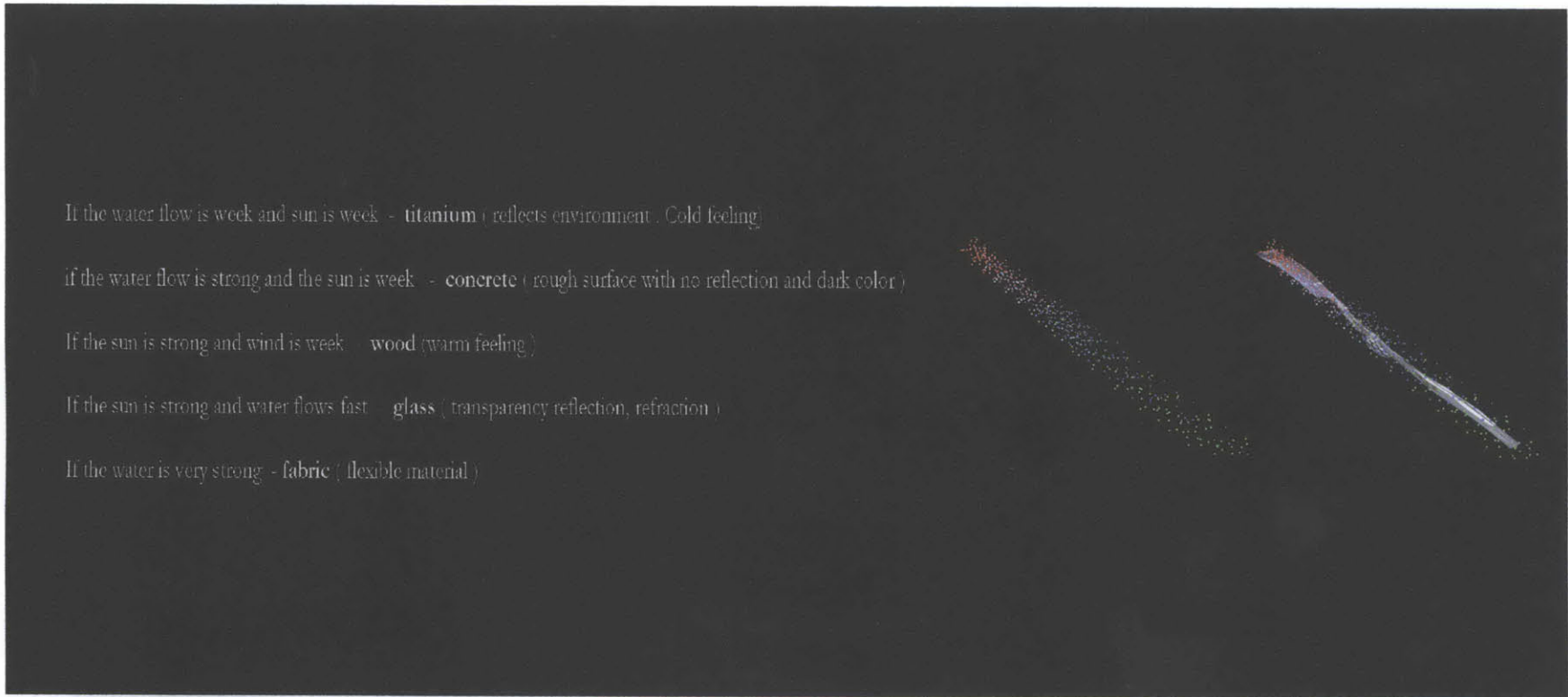


Fig. 63. Material palett

Finally, I created a palette of materials by identifying material properties already existing in each place. For example, where the water flow is weak and the light is not intense, water tends to act like a mirror, which I associated with titanium. The algorithm is designed so that each cell in the mesh identifies its material by referring to the closest voxel information.





Fig. 64. **Material distribution**

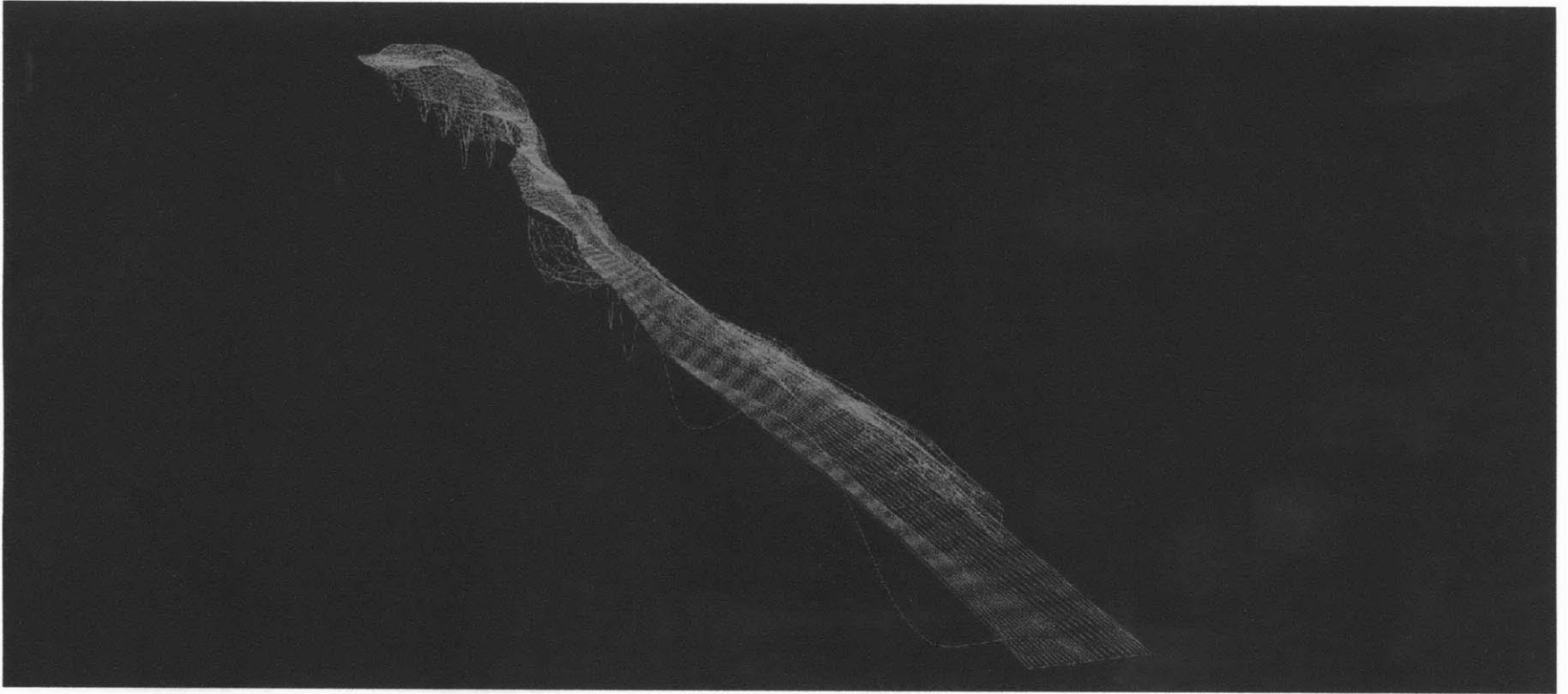


Fig. 65. **Material cells**

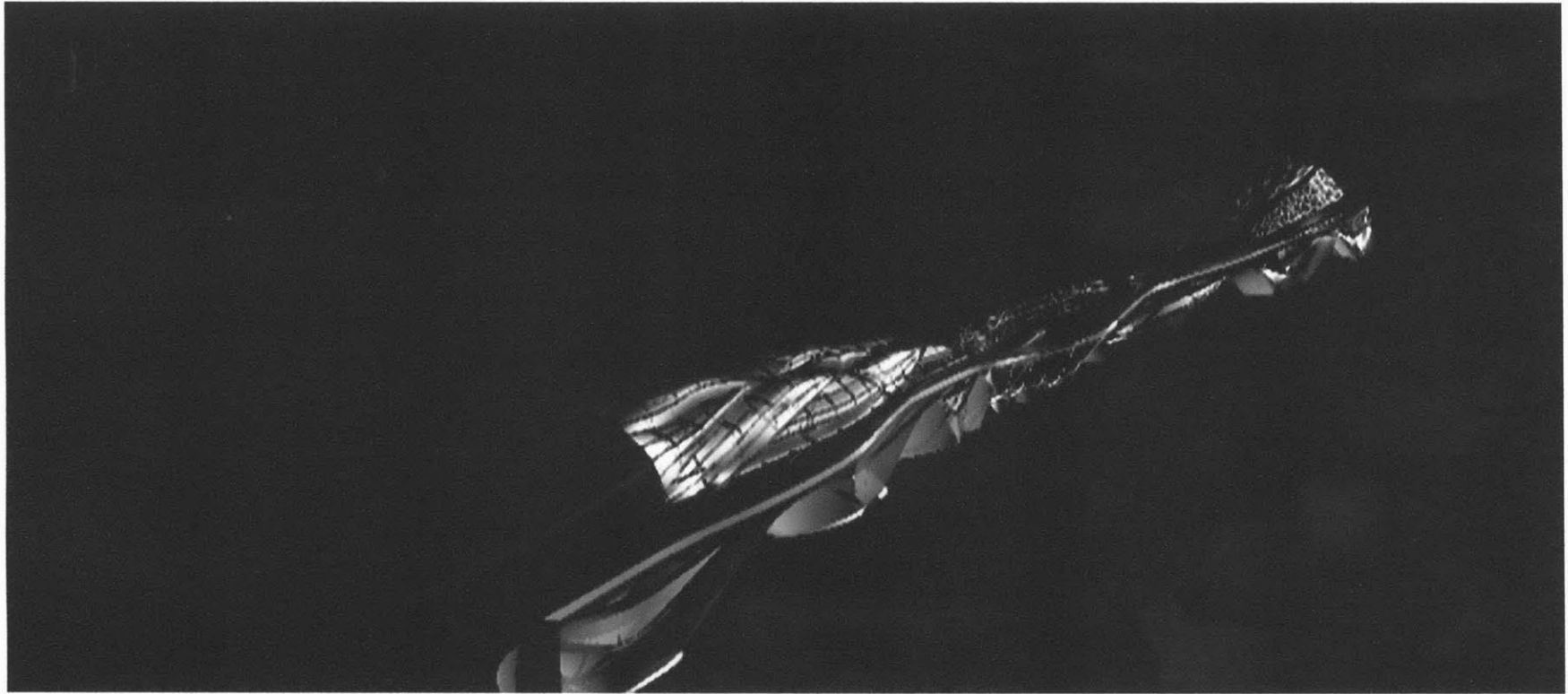
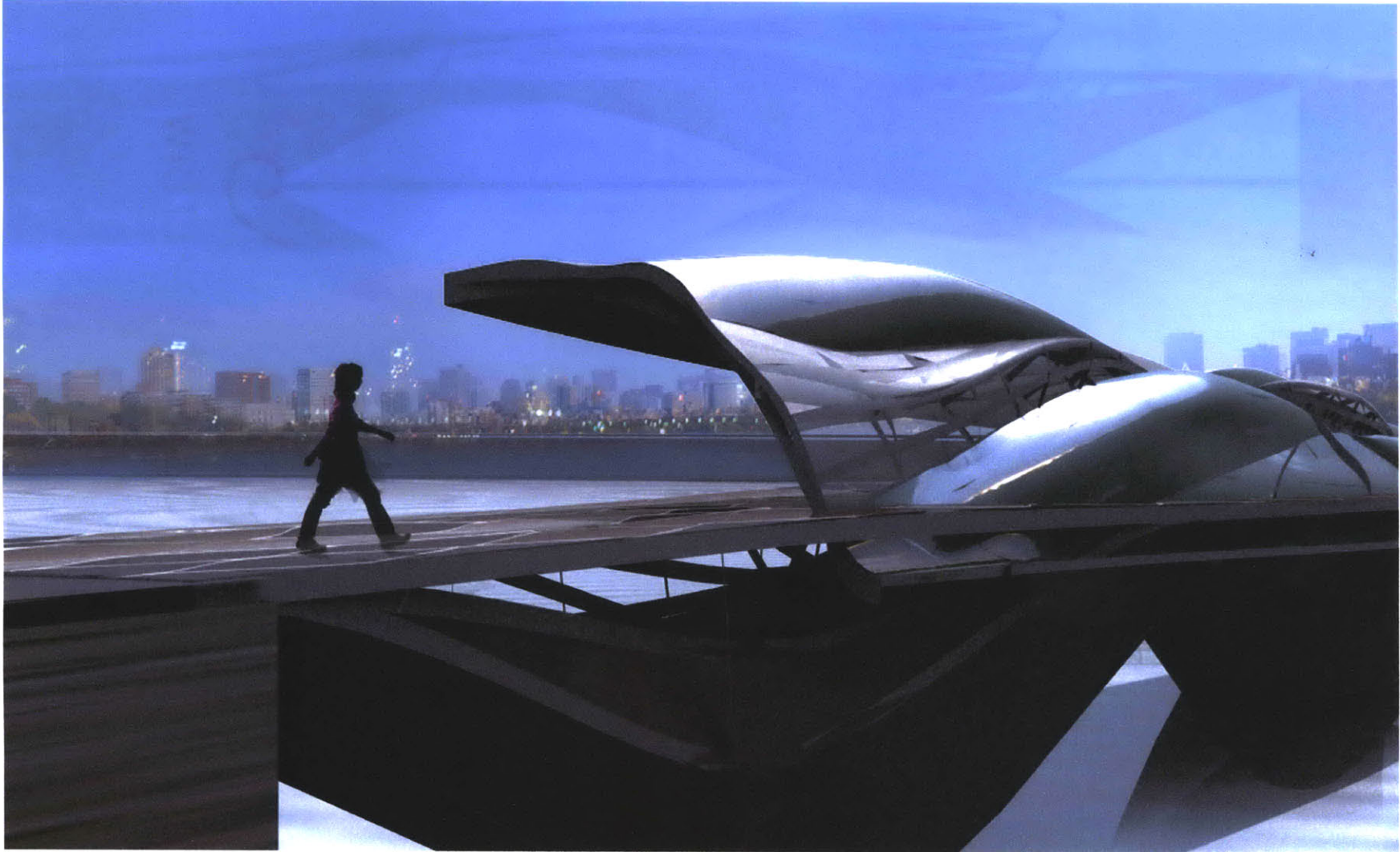


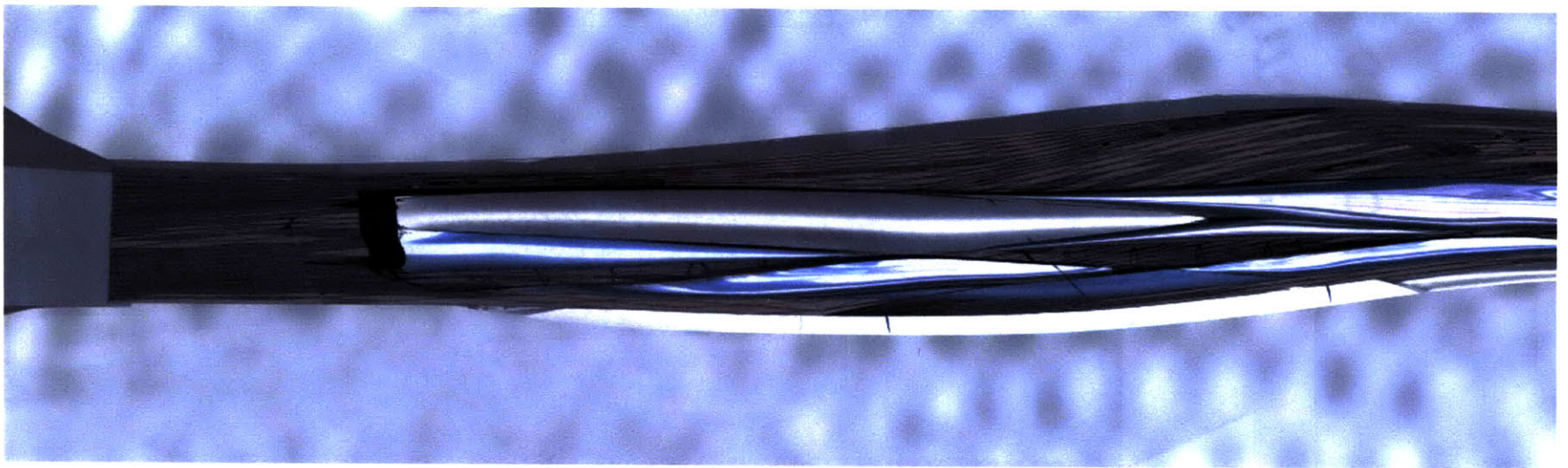
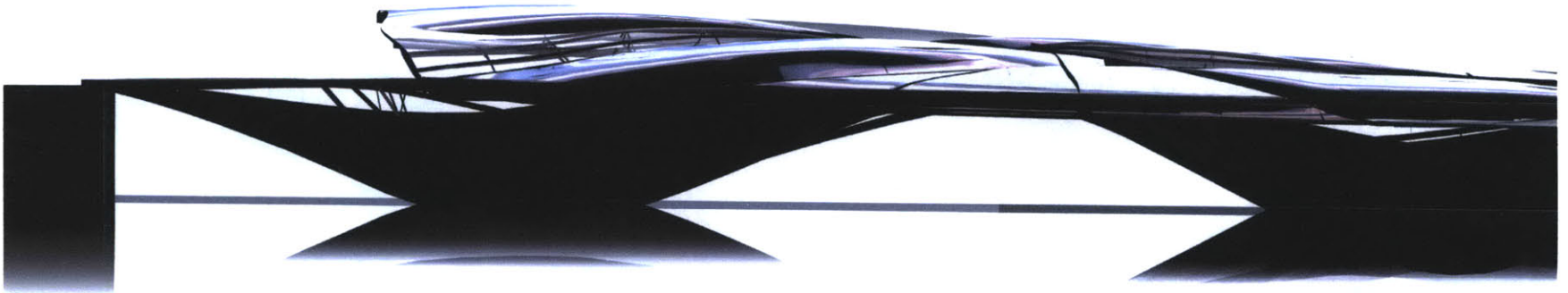
Fig. 66. **Bridge**

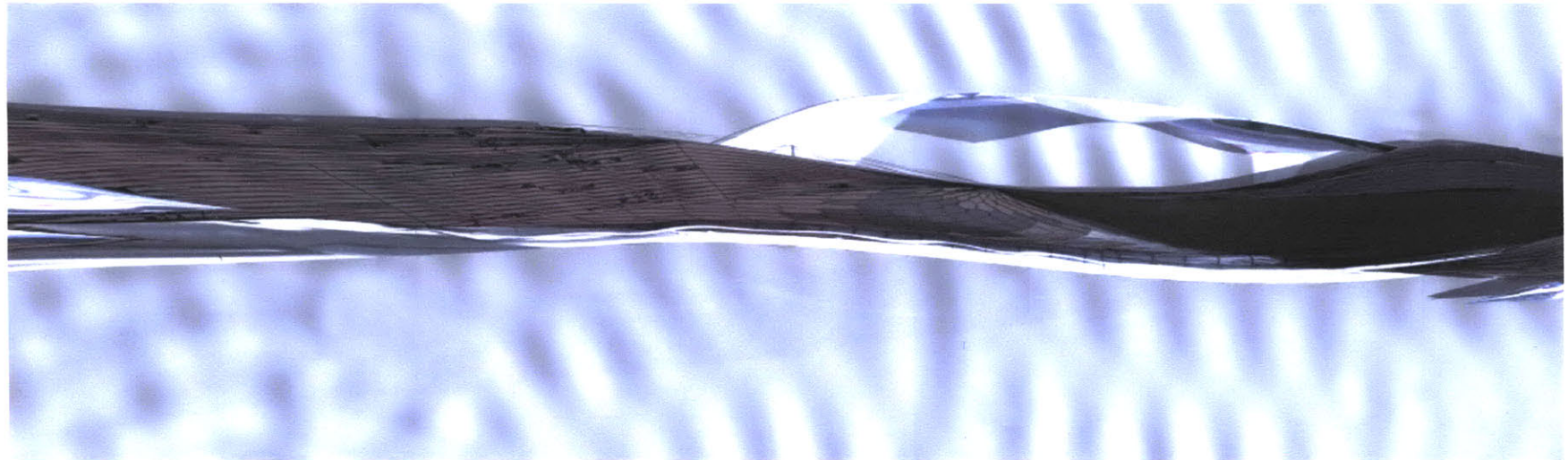
Therefore I created an instance of my concept.....

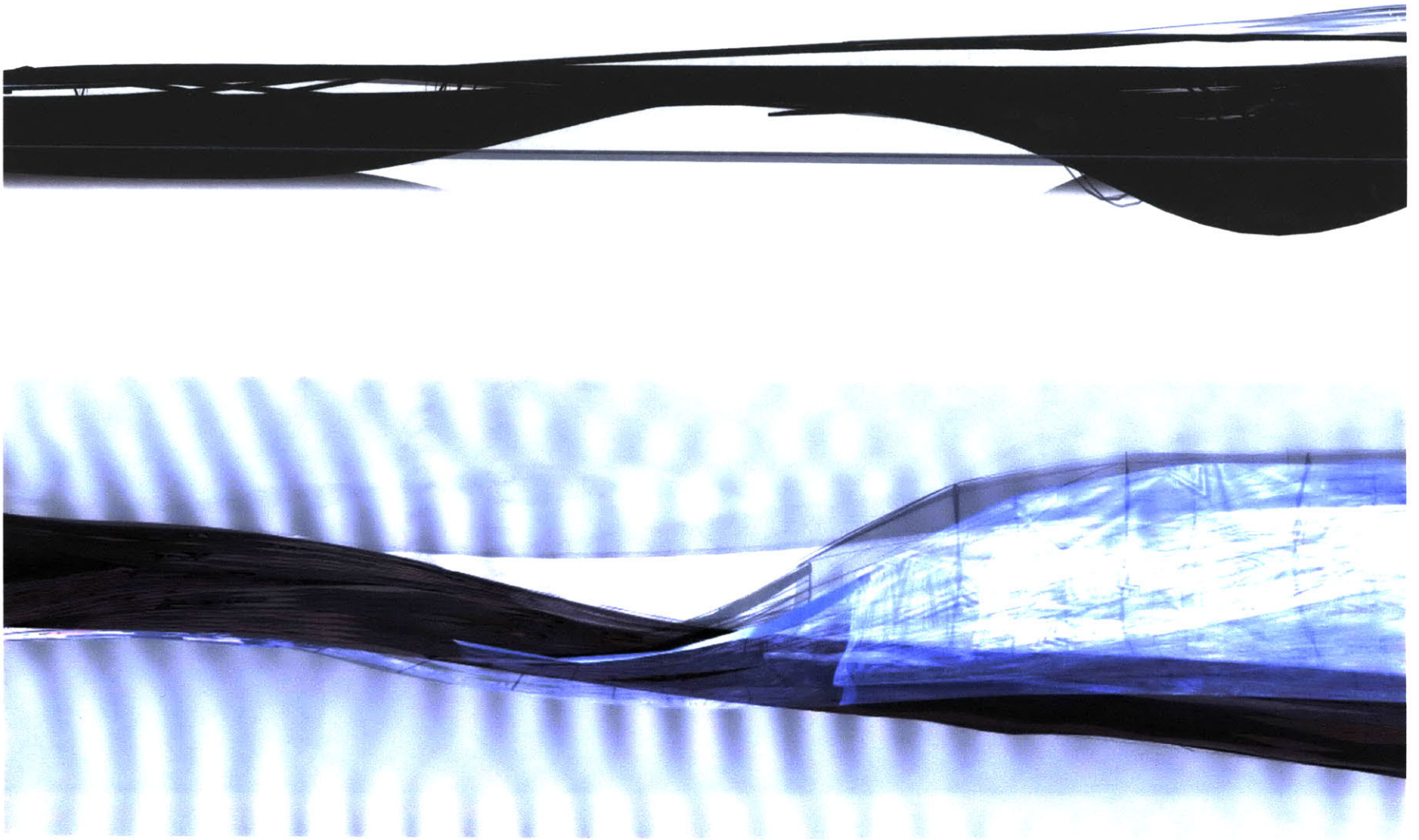
## Bridge



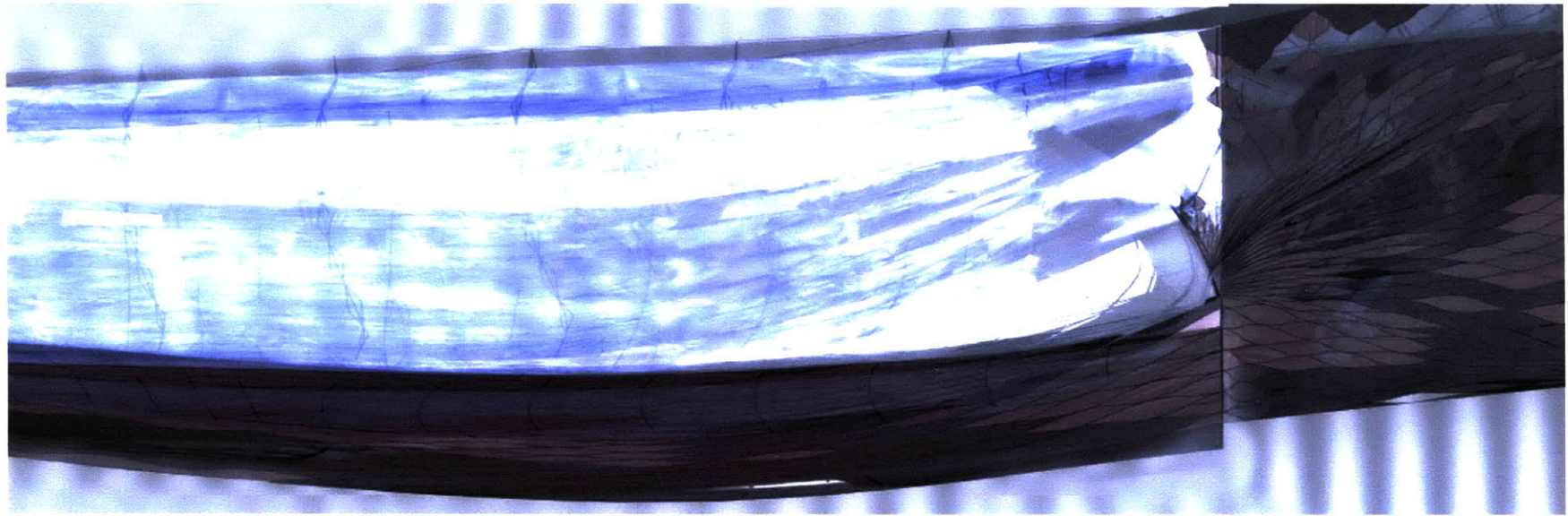
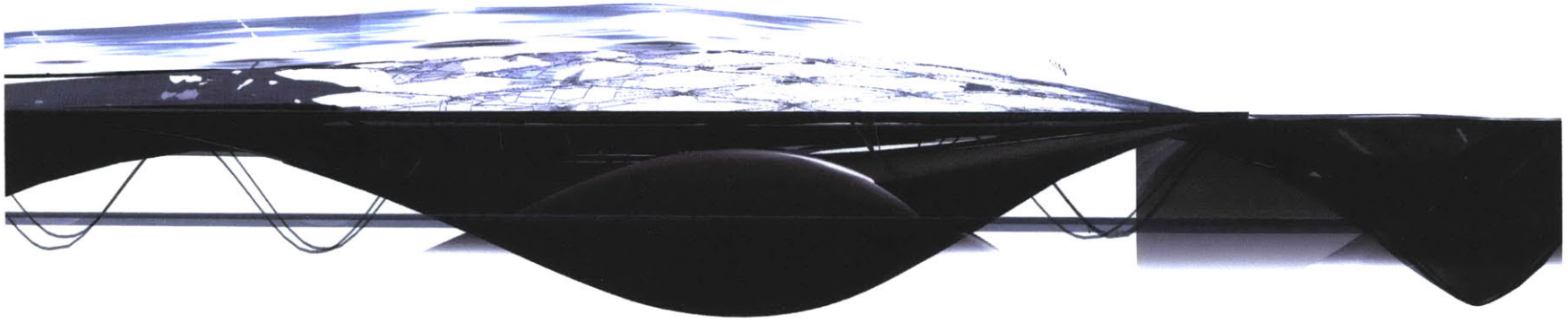












## **Conclusion**

I created monsters on my own and feared them throughout this thesis. Yet, at the end, I feel that many of them were defeated in my mind. I clearly see this media as a tool for design being nothing more or nothing less than the traditional ones, just different as all the other media are to each other.

We fear monstrous metaphors because we think they will cause us to degenerate, to lose the solid boundaries of selfhood, to take the place of the admired object, and finally, cause us to become monstrous ourselves. But really this is a false fear. The same false dichotomy has been played out, over and over again, in Homer's siren story, in Plato's rejection of the Sophists and poets, in the seventeenth-century debate over good and bad wonder, and in today's polemics over mass-media and video-game influence on impressionable minds. The truth is, we need to believe in the danger of monstrosity in order to not allow ourselves to be distracted from our straight path. [Hanafi, 2000]

My concept as well as the concept of incorporating this media into architectural design is still under development.

It is still a new tool in architecture, which needs to be investigated. At the very beginning of the incorporation of any new media, the skills of handling the media or accessibility to them tends to become a direct power for design. However, design is not only about the skills of using the tool but it is about the philosophy, esthetics, creativity, sensitivity and much more. I believe, the most important thing is to incorporate the non-skill part of the design in using this media. If this is achieved, the rejection of this media in the field will be gone. I really appreciate those classes in MIT which allowed me to investigate the "digital realm" in a very free and experimental manner. I hope that in the academic field, the developing phase of this media is accepted and appreciated more widely.

I am not trying to say that computers are the only future media for design. I simply feel that as a tool it can expand the limits of our imagination with a greater cultural impact in the architectural production. As an investigation, it allows for one to re-think the origin of the design process in its most fundamental origins.



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