

İSTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

**DIAGRAM AS A TOOL FOR CREATIVE PROCESS
IN ARCHITECTURAL DESIGN**

**M.Sc. Thesis by
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Programme : Architectural Design

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**MİMARİ TASARIMDA YARATICI SÜREÇ İÇİN BİR ARAÇ OLARAK
DİYAGRAM**

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FOREWORD

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I dedicate this work to the good and honest people, all those who have struggle in life and those who have not had the chance to have education...

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DIAGRAM AS A TOOL FOR CREATIVE PROCESS IN ARCHITECTURAL DESIGN

SUMMARY

In this research, 'Diagram' is scrutinized referring to deeper notions of its theoretical background and its role as a tool for creative process in architectural design. The notions that are taken into consideration are mainly based on the idea that diagram is slightly different than a simple schema or a sketch, and that is more than only a representation. Diagram is considered as a dynamic tool for expressivity, abstraction and creativity for design; this involves a holistic approach that associates different perspectives, aiming to reveal a network of various thoughts that are in relation with each other, and points out a distinctive way to look at diagrams. One of the most important perspectives that are scrutinized on this research is Deleuzean perspective to diagram, which mostly refers to modern paintings. According to this notion, diagram operates as an intermediary tool that provides abstract data that are ready to be transformed into figure; in this way, it functions as an abstract machine that makes creative process open to new formations at all times. This notion that had been put forward by Deleuze is considerably different from the common approach to diagram, and has an impact on diagrammatic methods which belong to creative process in architectural design. Considering the complexity of the notions that take place in this research, it has been decided to take the issue of diagram in three steps: In the first step, the definition of diagram as a visual tool and as a design tool are issued. The second step, which is the third chapter, consists of the approach to diagram as a dynamic tool for creative process. In the third step, which is the forth chapter - for 'diagram as a tool for creative process in architectural design' is the main issue of this research - the potentialities of diagram for architectural design are taken in consideration by referring to the definitions of diagram as a visual tool and as a design tool, and diagram as a dynamic tool for creative process.

MİMARİ TASARIMDA YARATICI SÜREÇ İÇİN BİR TASARIM ARACI OLARAK DİYAGRAM

ÖZET

Bu araştırmada, ‘Diyagram’ın mimari tasarımdaki yaratıcı süreç için rolü, teorik altyapısı derin anlamda irdelenerek incelenmiştir. Bu çalışmada ele alınan kavramlar, diyagramın eskiz ve şemadan farklı, ve basit bir temsil aracının daha ötesinde olması fikrine dayanmaktadır. Diyagram, tasarım sürecinde dışavurumcu, soyutlayıcı ve yaratıcı bir araç olarak ele alınmaktadır. Bu ele alış, farklı bakış açılarını bir düşünce ağı içinde bir arada değerlendiren ve diyagrama yeni bir gözle bakılmasını sağlayacak bütünselci bir yaklaşımı da beraberinde getirir. Ele alınan bakış açılarının en önemlisi Deleuze’ünkidir. Bu bakış açısına göre diyagram, bir ‘soyut makine’ edasında, yaratıcı sürecin üretkenliğini sürekli ‘yeni’ ye açık hale getirerek pekiştiren bir araçtır. Bu değerlendirme, diyagramın genel bakış açısı ile değerlendirilmesinden oldukça farklıdır ve diyagrama dayalı mimari tasarım kavramına yeni bir soluk getirmiş, büyük katkı sağlamıştır. Buna bağlı olarak diyagramın, tezdeki yaklaşım bağlamında ele alındığında, mimari tasarım süreci için ne gibi potansiyeller barındırdığı da düşünülmelidir. Tez, kavramların daha rahat anlaşılmasını sağlamak amacı ile üç kısma ayrılmıştır: Birinci kısımda diyagramın tanımlar bazında değerlendirilmesi söz konusudur, burada diyagram, bir görsel araç ve bir tasarım aracı olması çerçevesinde ele alınmıştır. İkinci kısımda diyagram, tezdeki temel bütünsel yaklaşım bağlamında, bir geçiş aracı, soyut makine ve yaratıcı süreç için dinamik bir araç değerlendirilmiştir. Üçüncü kısımda ise diyagramın, tezde yer alan yaklaşım bağlamında, mimari tasarım süreci için hangi potansiyelleri taşıdığı tartışılmaktadır.

1. INTRODUCTION

1.1. Aim and Content of the Thesis

Diagram is a notion that can be taken in consideration through its basic meanings and use; but it can also be issued considering notions that are more extensive, by referring to a wider historical and philosophical background of design theory. In the beginning of the research, it has been seen that there are only a few studies in Turkey that are based on diagrams in the context of architectural design, and a few of these studies take the notion of diagram in an extensive manner. It has also been seen that the theoretical background of the notion of diagram has not been known in common, but only by a few people that are interested in modern philosophy and design theory. According to the lack of research and knowledge, it has been decided to contribute to fill this gap by writing a thesis on diagrams, by referring to deeper notions of its theoretical background and scrutinizing its role as a tool for creative process in architectural design.

In this thesis the approach to the notion of diagram is mainly based on the idea that diagram is slightly different from a simple schema or a sketch, and that it is more than a mere representation. In this approach, diagram is considered as a dynamic tool for expressivity, abstraction and creativity for design. This is a holistic approach that associates different perspectives, aiming to reveal a network of various thoughts that are in relation with each other, and that points out a distinctive way to look at diagrams.

In the beginning of the research, it has been encountered a distinctive notion of diagram that Gilles Deleuze had pointed out. Deleuzean perspective to diagram mostly refers to modern paintings, in which diagram operates as a tool that provides abstract data that are ready to be transformed into figurative data. Diagram in this sense is defined as an intermediary tool for creative process for it functions as a medium transferring the expressive data to form an authorial subject and stimulates the production of sensation. In this context, diagram functions as an abstract machine

that makes creative process open to new formations at all times. This notion that had been put forward by Deleuze is considerably different from the common approach to diagram, and has an impact on diagrammatic methods which belong to creative process in architectural design.

Consequent to the research of the notion of diagram as an abstract machine that Gilles Deleuze had pointed out, the notions of creative process were further questioned. Creative process through Deleuzean perspective can be taken in the context of post-structuralism; for it points out a system, whose members are formed dynamically interconnecting in a network, affecting each other. The approach to creative process, in this sense, also points out a 'self-accord' system and new perspectives to the notion of diagram. After a period of investigation of these notions of creative process, a series of conceptual dynamics forming a self organized system which is highly able to create new formations by itself, were realized. Some of these conceptual dynamics which are involved in self-organized creative process can be named as, topological transformations, singularity, multiplicity, affordance, becoming and assemblage. Accordingly, it has also been realized that the dynamics in question have existed in nature in the role of a trigger for evolution. Consequently, the relationship of the creative process in nature, and diagrammatic process which involved in the creative activities in arts and architecture were questioned. Through this inquiry, it has been achieved that, the creative process in nature, and the creative process involved in arts and design, in the context of diagrams, have many similarities; furthermore, the creative process in nature and its elements have been imitated by designers and inspired them for various design activities that involve diagrammatic methods involving self generation techniques.

While researching diagram as a dynamic tool for creative process, it has been thought that, the notion of diagram as a visual tool and as a design tool are also in need of explanation. In this manner, the definitions of diagram involving the dictionary meanings, meanings of common use and also the etymological roots have been researched. During this research, the questions of, "How visual tools have emerged?", and "How diagrams have emerged and evolved out of visual tools?" were asked. Seeking answers to these questions, it has been discovered that, the first visual tools were formed through expressive activities of first the human beings. Thus, visual tools and concurrently diagrams have emerged through prehistoric

artistic activities. Accordingly, the development of diagram throughout the history as a visual tool and the relationship of diagram with other visual tools were investigated.

1.2 Methods of the Research and Forming the Structure of the Thesis.

As it can be understood from the aim and content of the thesis, the research refers to wide range notions of various disciplines, not only involving arts and architecture, but also mathematics, philosophy and natural sciences. For this reason, as the method of this research, a technique has been used to obtain multi-layered information on various subjects consisting of different perspectives. This method involves cross-readings to scrutinize the notion of diagram in a deeper sense, which brings out a high level of brainstorm of ideas and concurrently the chance to discover and associate different perspectives.

Considering the complexity of the notions that are planned to take place in this research, it has been decided to take the issue of diagram in three steps:

1. In the first step, the definition of diagram as a visual tool and as a design tool, which will contain information on common use and meanings of diagram, starting from dictionary definitions and etymological roots, the inquiry of diagram as a descriptive and generative tool, its relation to other visual tools like sketch, schema, transcript, pictogram, map and plan, the notion of diagram in metaphorical manner and also a small information on the development of diagram through the history will be issued.
2. The second step, which is the third chapter, will consist of the approach to diagram as a dynamic tool for creative process. Firstly, diagram as an intermediary tool for creative process that functions as a medium for the transfer of the expressivity and as a tool for the production of sensation will be issued. Consequently, the approach to diagram as an abstract machine that supplies a creative process which is highly productive and open to new formations will be scrutinized. Lastly, the notions of self organized creative process in the context of the search of a relationship between creative process in nature and design activities involving diagrammatic process, and diagrams that have been used as intermediary tools in the role of productive medium

integrated to the experimental studies that involve properties of a machining productivity and self generation will be investigated.

3. In the third step, which is the forth chapter - for 'diagram as a tool for creative process in architectural design' is the main issue of this research - the potential of diagram for architectural design will be taken in consideration by referring to the definitions of diagram as a visual tool and as a design tool, and diagram as a dynamic tool for creative process.

2. DEFINITION OF DIAGRAM AS A VISUAL TOOL AND AS A DESIGN TOOL

The word diagram refers to a very extensive concept, not only related to design process, but also to philosophy, science and arts. For it may be difficult to comprehend such an extensive notion, it is indispensable firstly to define diagram and its basics by going through the meanings of its common use and referring to dictionary definitions, by following a traditional method for the beginning of the research.

Cambridge International Dictionary of English defines diagram as:

“A simple plan which is drawn to represent a machine, system or an idea, etc. whose purpose is often to explain how what is being represented works (Cambridge, 1995).”

This definition, as a systematic approach to diagram, mostly refers to a notion of diagram as an explanatory tool that shows the relationships of the elements of rather a physical object or a conceptual one as a representation of the structure of a thought (Figures 2.1 and 2.2). To translate from the Dictionary of Turkish Language Association (Türk Dil Kurumu), diagram is defined as:

“1- A graphic that shows change in an event in a certain interval. 2. *Botany*; a draft that shows all the details of a flower (TDK, 1992).”

Differently from the definitions in Cambridge Dictionary, the idea of diagram as an indicator of change in a certain interval is denoted in TDK Dictionary (Figure 2.3); in addition, a figurative notion of diagram is denoted referring to botany (Figure 2.4). An important notion that takes place on this definition is the notion of ‘certain interval’; pointing out that diagram naturally involves the conception of time.

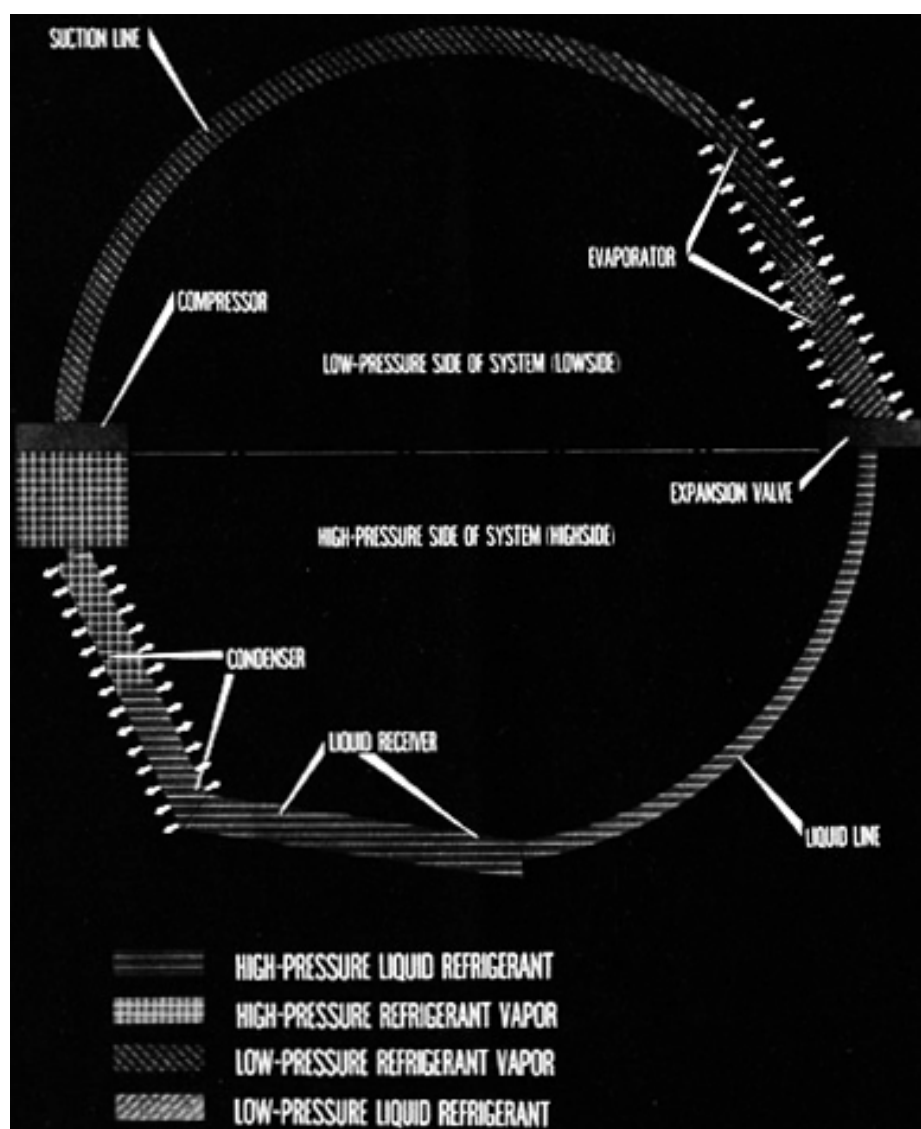


Figure 2.1: Graphic Diagram of Mechanical Refrigeration Cycle (Maritime Park Association, 2004)

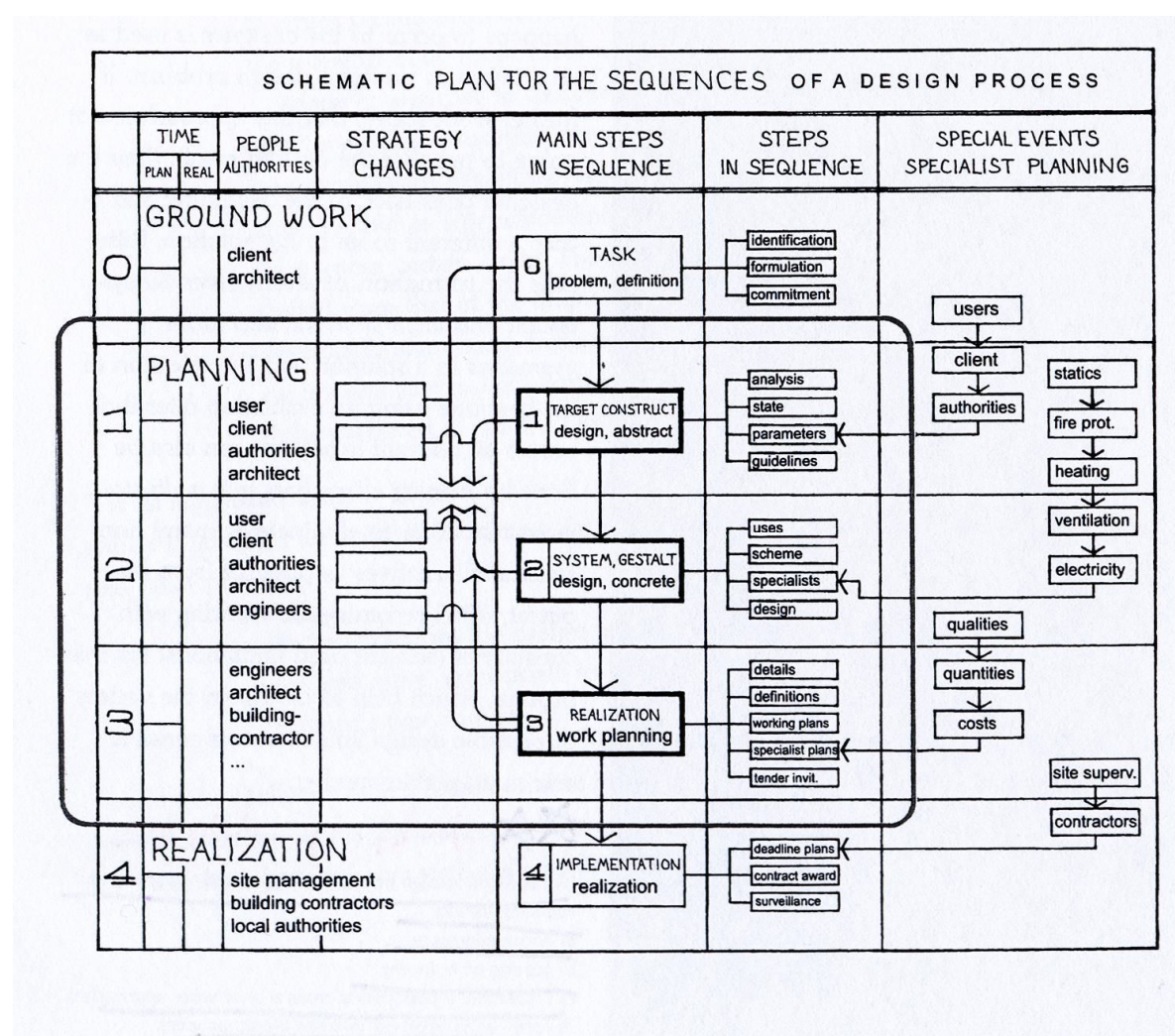


Figure 2.2: Structure of a traditional design Process by Heino Engel, 2003 (Ganshirt 2007)

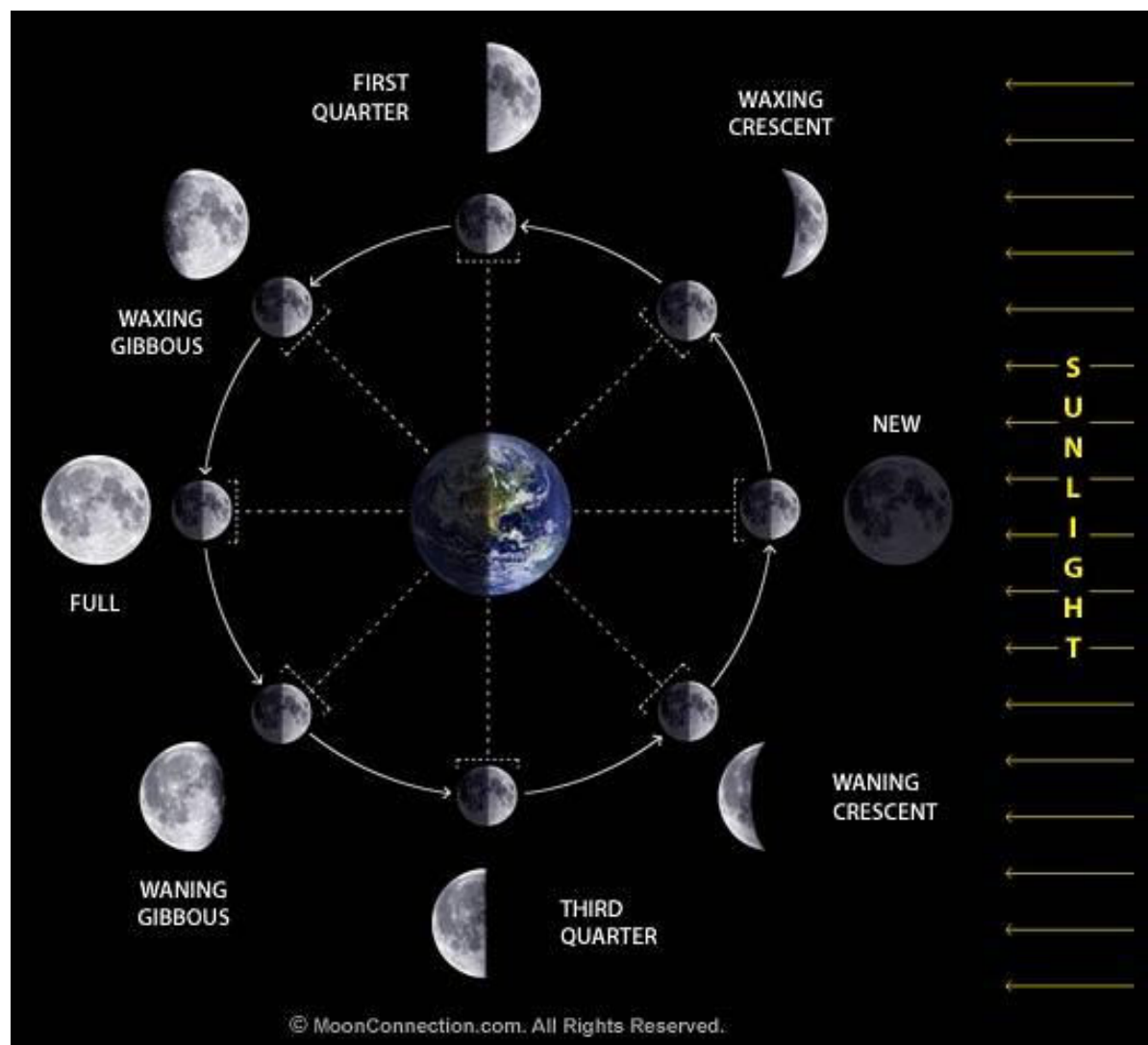


Figure 2.3: Moon phases diagram (Moon Connection)

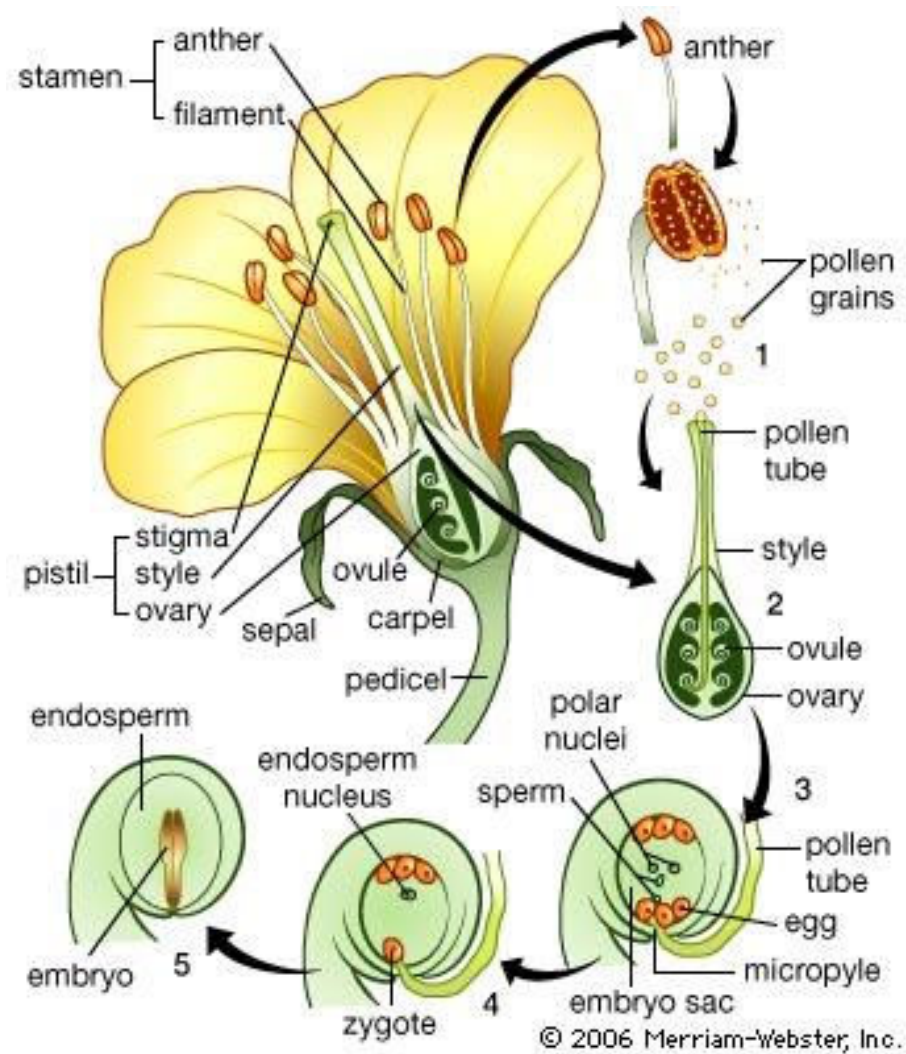


Figure 2.4: The life cycle of a flowering plant (Merriam-Webster Inc., 2006)

As understood from the definitions that take place in dictionaries, the common use of diagram usually refers to a scheme that is an indicator. The ‘indicator’ reflects informational data, and these ‘data’ inform and/or direct the observer. Concerning the modern approach to the notion of diagram, especially its place in design process, it is obvious that this common meaning of diagram would be a narrow perspective to define it. Diagram is not only an indicator, but also a tool for creativity, especially for architectural design process.

To understand the deeper meaning of diagram, the etymological roots of the diagram need to be explained. The ‘word’ diagram, as many conceptual issues do, lies to a both Greek and Latin word: ‘Diagramma’, meaning; ‘figure worked out by lines or plan’. It is a composition of two words: *Dia* and *Gramma*. The first one ‘Dia’ is used as a prefix; meaning through or across, as in *diameter* or *diagnosis*. The second word ‘Gramma’ refers to an attachment indicating measurement; like ‘gram’, which comes from Greek origin word, ‘graphein’ meaning to scratch, to draw or to write (The American Heritage® Dictionary of the English Language, 2000). The use of ‘gram’ in the word diagram, is similar to its place in the word ‘kilogram’, in which gram is indicator of measurement in the scale of ‘kilo’, or similar to its place in the word ‘seismogram’, in which gram is an indicator of measurement of seismic activities. In relation to that diagram is an indicator of a schematic origin of data consisting of scaled measurement and values.

According to the etymological roots of diagram, it can be said that its deeper meanings also contain the notion of figuration; which points out more than the common meaning of it as a graph or a scheme: It is not merely an analytical representation of a mathematical equation, or a schematic chart in order to inform the observer functioning as an indicative tool, but it is also a tool for expressivity, abstraction and creativity in design process. The notion of diagram that refers to its function both as a tool containing abstract data of measurement and figurative data concurrently, can be thought as a positive value added to its nature of being a visual tool of indication (Figures 2.5 and 2.6).

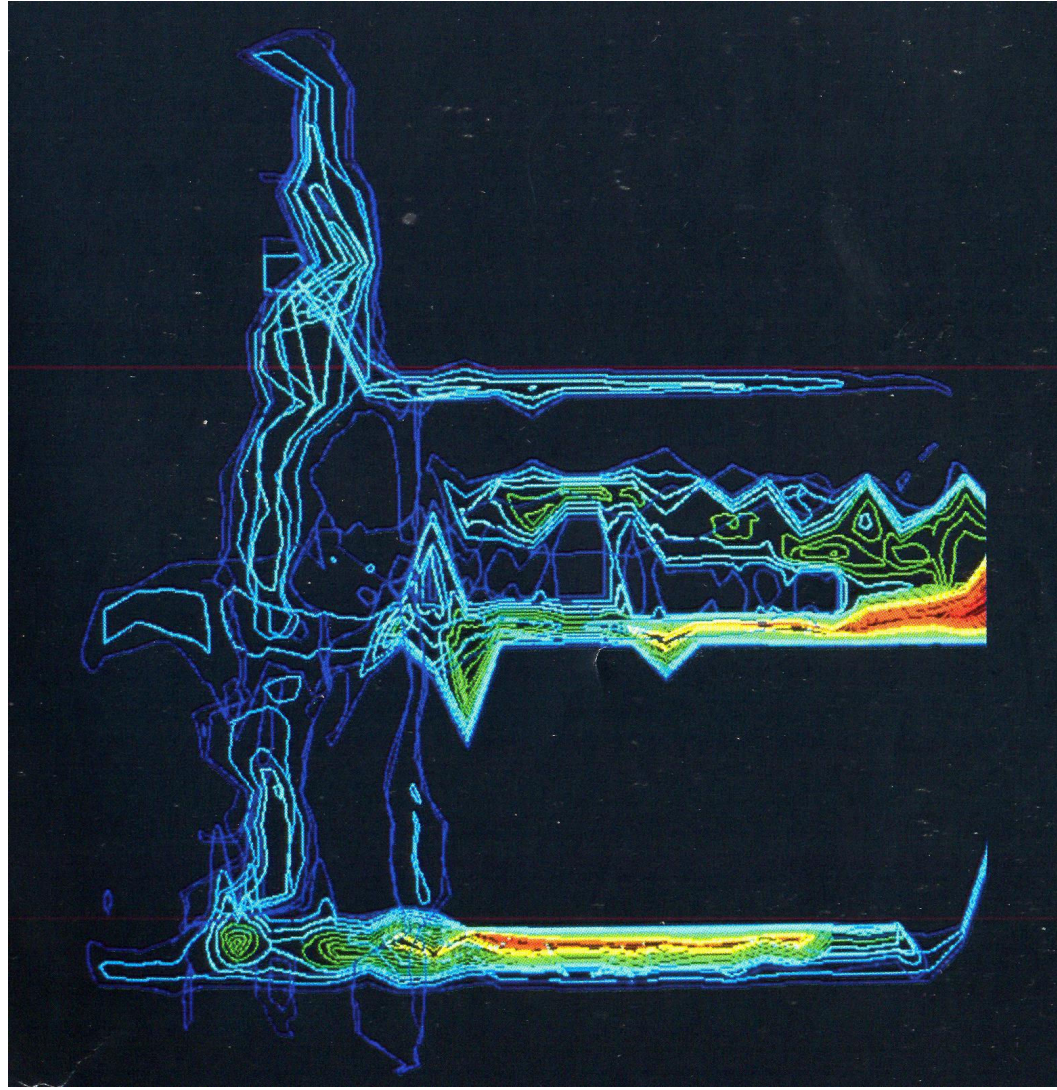


Figure 2.5: Flow diagram including movements, (Berkel, 1999)

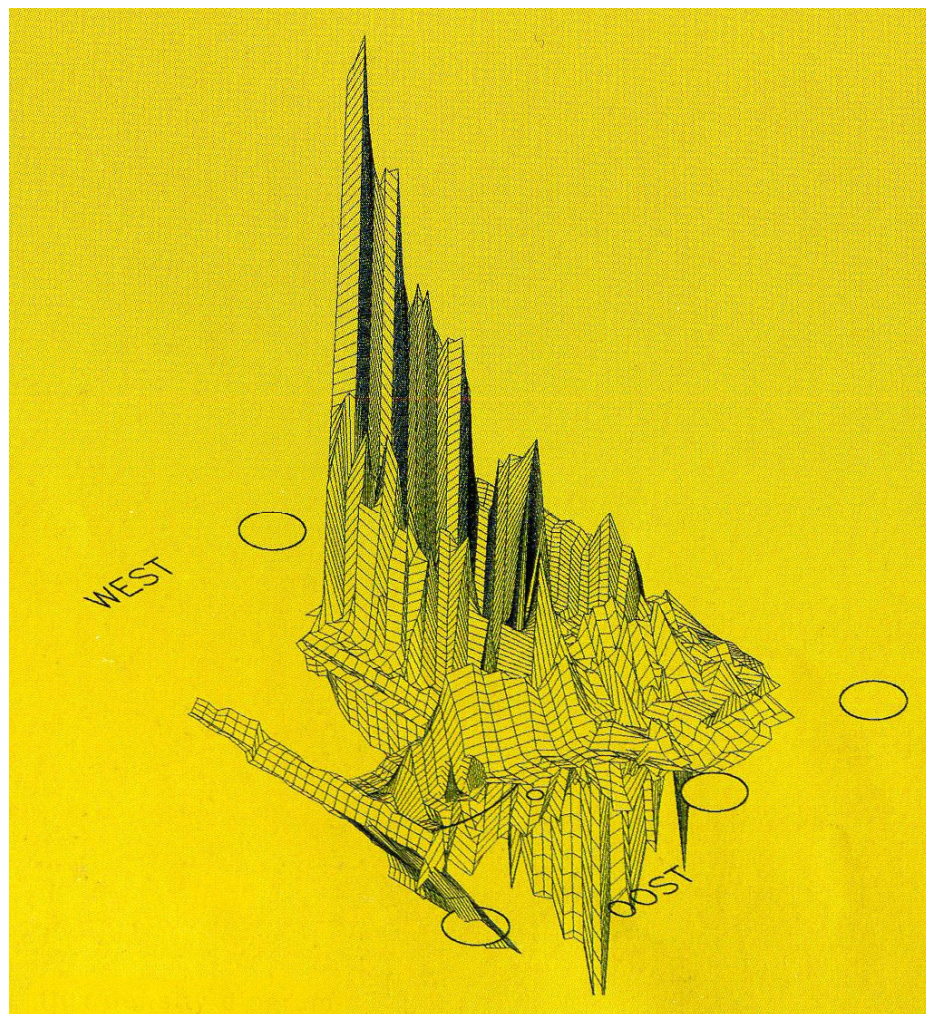


Figure 2.6: a Flux Density Diagram, (Berkel, 1999)

In the last few years, diagram is introduced as a part of a technique that functions as a base study, a generating and instrumentalizing approach to design (Berkel, 1999). In addition to that, especially in architectural design process, diagram has become a tool for design, in such a way it has provided data that are ready to be transformed into psychical design that is neither an arid sketch nor a simple schema. These data, which are provided by diagrams, give rise to a highly productive creative process for architectural design.

Diagram contains intensive visual data of information- both figurative and non-figurative. It can be said that diagram is a type of ‘Graphic portrayal of quantitative information’ (Friendly, 2008) and additionally qualitative information. The quantitative information is in for an informative role in design process, containing data visualized by diagrams directing and orienting creative process, thus providing the indications of measurable and geometrical data. The qualitative information however is in for a both dynamic and abstractive informative role in design process providing the creative data that is morphologically pregnant to new formations containing the traces of information on the potentialities of the creative process.

In relation to the notion of diagram as a visual tool of information, it would be appropriate to explain a two-fold approach regarding the definition of diagram. According to the points made in B. Yardımcı’s thesis; there are two classifications of diagram regarding the architectural design process and the use of diagram throughout the history: Descriptive diagram and generative diagram. In design process, descriptive diagram is in the role of a tool of analysis that contains quantitative information, where generative diagram functions as a tool that virtualizes the invisible data of thoughts. According to this approach, the descriptive diagram has reductive properties, but the generative diagram has qualifying properties that solidify the spatial relations; lacking in the descriptive diagram (Yardımcı, 2007). However it should also be considered that diagrams can be both descriptive and generative. The fact that diagram potentially involves both various data of layered information and generative data that contains qualitative properties, should be taken into consideration in addition to its ability of being a visual tool. This potential of diagram maybe thought as the reason for which it is a popular tool today, for it helps to visualize the invisible data of information such as culture, politics and some other abstract entities in descriptive and/or generative manner.

The notion of diagram as a descriptive tool and a generative tool has been pointed out in deeper sense by B. Sevaldson, indicating that diagram normally operates on a descriptive level, in a way it describes and helps to analyze existing entities and situations, by containing quantitative data mostly. However, qualitative items referring to spatial relations of elements and accordingly holistic composition of space can also be described through descriptive diagrams (Sevaldson 2001). For example through a technical method of visual observation that was done in an experimental design studio at the Oslo School of Architecture, led by B. Sevaldson between years 2000-2002, the movements of a human model jumping off a stool were analyzed diagrammatically (Figure 2.7) by Etienne-Jules Marey. Marey had used white cursor points to make the analysis possible, using a diagrammatic method, by preparing the stage of a dark background and a model dressed in black, by visually removing elements that are of less interest, and highlighting the white points as elements of interest. After the photo shots Marey analyzed the movement through diagrammatic drawings that relate the highlighted dots as cursor points by connecting them with lines. The diagrammatic method that Marey have come up with, is an example that suggests a descriptive tool remarking the qualitative properties of an action event through establishing spatial relations visually. In contrast to the previous example, another example is of a descriptive diagrammatic analysis of quantitative values (Figure 2.8). In Figure 2.8, on the left side, diagram of waiting time superimposed with the photograph of the site is shown, and on the right side the amount of pedestrians, according to the colors of their jackets, passing through that area in certain time intervals is shown. In this example all kinds of data were captured with no regard to potential use (Sevaldson, 2004). For there are no spatial relations that could be established by looking through these analysis scheme and table, it can be said that they are examples of descriptive diagrams showing merely quantitative properties. Keeping in mind the definition that point out diagram as an indicator of changes in an interval, the notion of time being intrinsic to diagram's character can also be understood better by looking to these examples.

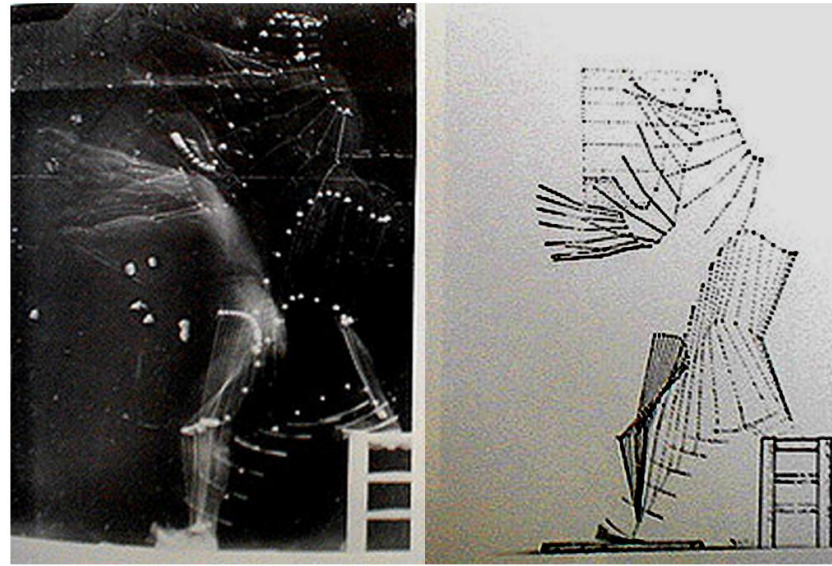


Figure 2.7: Marey's Diagram as a Descriptive Tool Pointing out Qualitative Properties of an Action Event (Sevaldson, 2004)

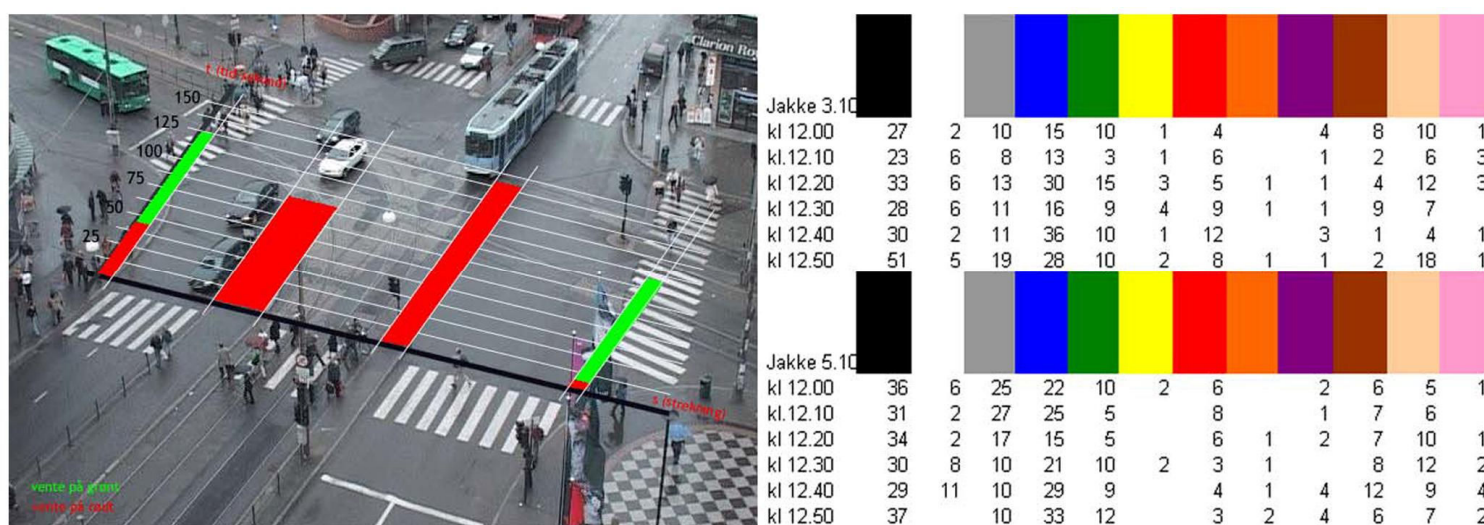


Figure 2.8: Descriptive Diagrams Showing Only Quantitative Properties (Sevaldson, 2004)

While diagram as a descriptive tool describes existing entities and phenomena, generative diagrams are used to generate structural spaces as a tool in architectural design. In a similar way diagram could be defined as an abstraction that both emphasizes structural organization, patterns and relations of architectural elements; thus directing and orienting the creative process (Sevaldson, 2001)

Regarding the definition of diagram as a descriptive tool and as a generative tool, within the diagrammatic process the informational data are converted to measurable data useful for the 'synthesis' in architectural design process; in relation to the connection of theory and practice - for it takes its place between idea and form creating a semantic link between them (Zavoleas, 2008). Through diagrams, measurable data are visualized in a line of figuration, acquiring a different character from a code, a table or an equation; becoming completely readable and convertible data, which supply a base for design process (Figure 2.9). Accordingly, diagram operates as an expressive tool in design process in generative means, by showing the

dynamic relationships among different elements having spatial significance. In this way abstract information of analysis is qualitatively transposed into architectural design by using codes of spatial definition (Zvoleas, 2008).

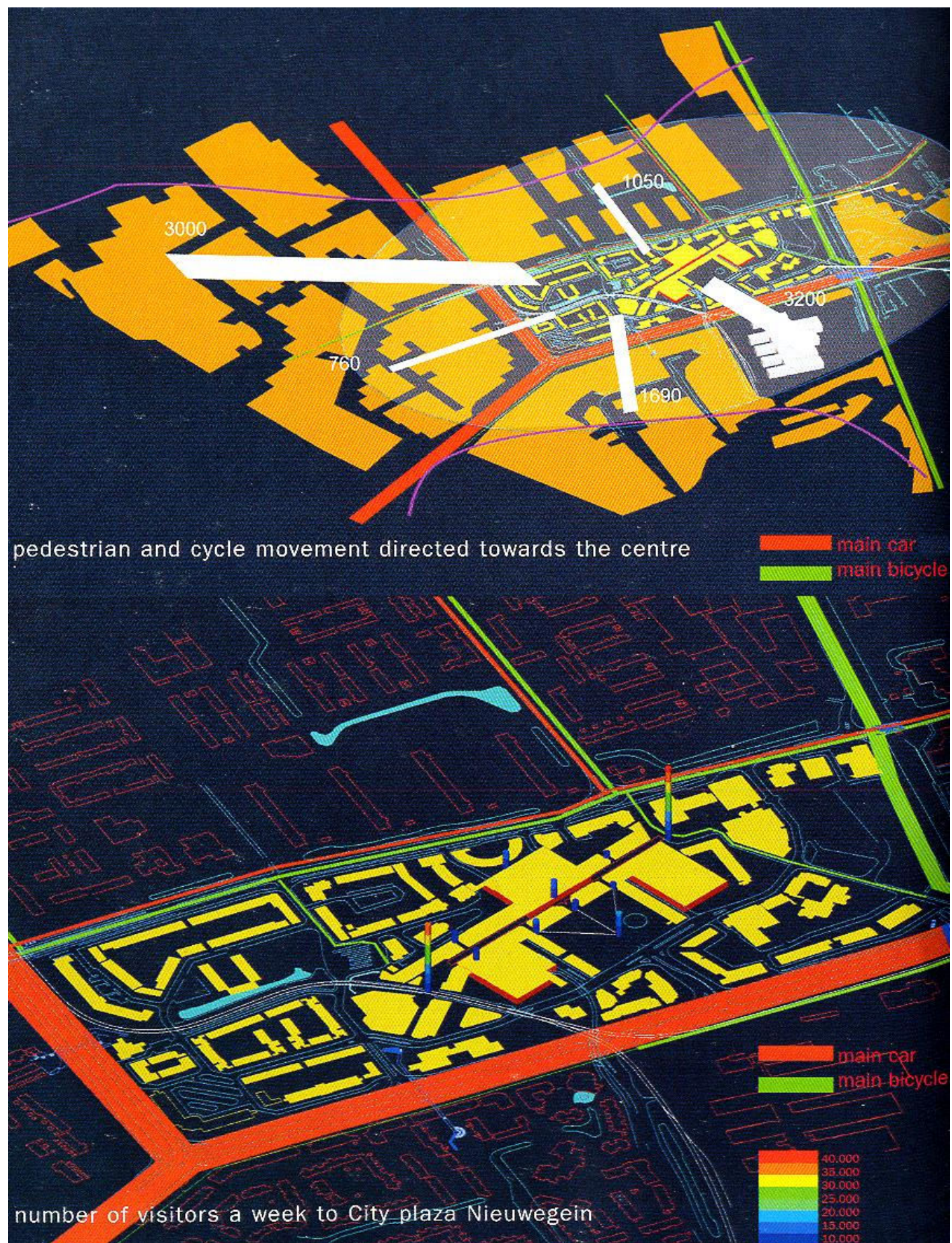


Figure 2.9: Diagrams of Measurable Data That is Virtualized As Qualitative Abstract Information of Analysis That can be Transposed Into Architectural Design (Berkel, 1999)

In relation to the definition of diagram as a graphic portrayal of quantitative and qualitative information, it can also be said that diagrams are visual representations of information that is both figurative and abstract. According to N. H. Narayanan, not all the representations are visual. For instance, one can not say written or spoken

language is a visual representation; where maps, line graphs, bar charts, engineering blueprints, and architect's sketches are visual representations, therefore diagrams in some way (Narayanan, 1995). However, as it may be understood from the issues explained previously; diagram is a form of a visual representation that is slightly different from a formal sketch, an organization scheme, a graphical equation or a map for architectural design process. However this does not mean that different types of graphical tools can not be thought of as diagrammatic mediums, as not always and not all of visual representations are diagrams; nevertheless sometimes and some of them may be diagrammatic - according to the concept of design, the nature of creative process, and of course to the nature of diagram itself as a dynamic of the design process.

There are various types and ways of forming informational and generative data, especially in architectural design; as some of them are scarcely and some of them are intensively diagrammatic visual representations. For example, a sketch is often used as a tool in architecture as a first step towards the materialization of the idea. A sketch can be both descriptive as in describing a phenomenon, or generative as it can be a tool representing something new. Sometimes, however, a sketch can be entirely meaningless to outsiders because of being largely indeterminate. In addition to its properties as a tool for all the phases of the design process, it can also be made during meetings and discussions with the client, at site visits- as a response to designs that have already been worked out more precisely- or in dialogue with engineers and builders (Narayanan, 1995).

Due to the emergence of new drawing materials and drawing techniques achieved in Renaissance, sketches have been developed as an indispensable design tool in architecture (Ganshirt, 2007). In Figure 2.10, design sketches by Michelangelo c. 1525, for Casa Buonarroti can be seen. This example of sketch has diagrammatic properties for it involves multiple layers of traces of the potential design of architectural elements, as it also contains various ideas of different alternatives simultaneously. The schematic sketch of the silhouette of Evora with a few notes, by Alvaro Siza for the design of Quinta da Malagueira seen in Figure 2.11 may be an example of a sketch of lesser diagrammatic properties, mostly because the minor possibility of chance of reading the descriptions for the outsider, or the characteristics of its less visible data in means of generative dynamics. It has to be

noted that the level and intensity of a sketch being diagrammatic has no impact on its own artistic or creative value. However it should be kept in mind that sketch should not be evaluated directly as a diagrammatic tool, especially in the context of the approach in this thesis. The properties of diagram, that distinguish it from a sketch as a preparatory work, will be scrutinized in a deeper sense on the following chapters.

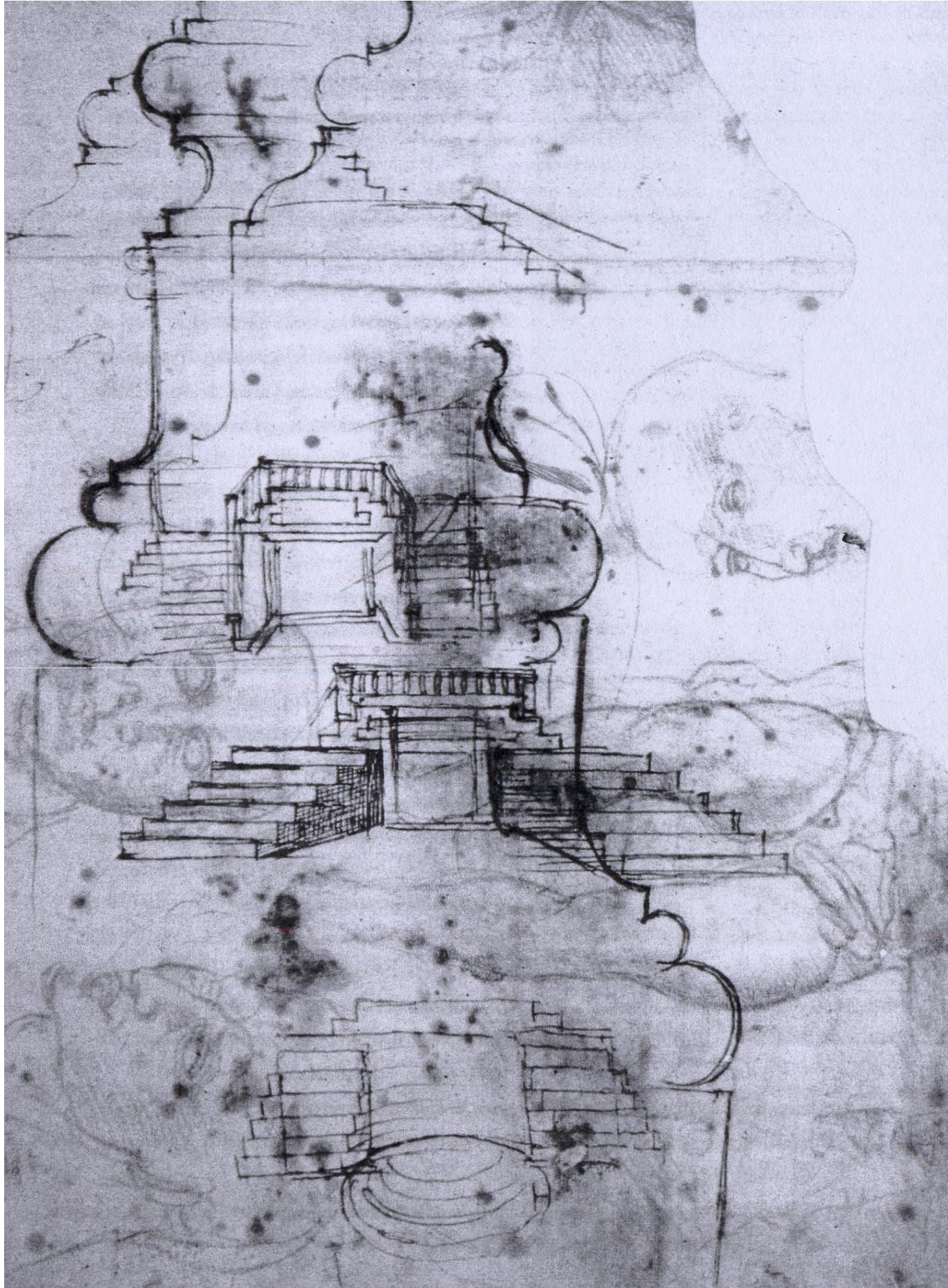


Figure 2.10: Design Sketches by Michelangelo, 1525 Florence, Casa Buonarroti, (Ganshirt 2007)

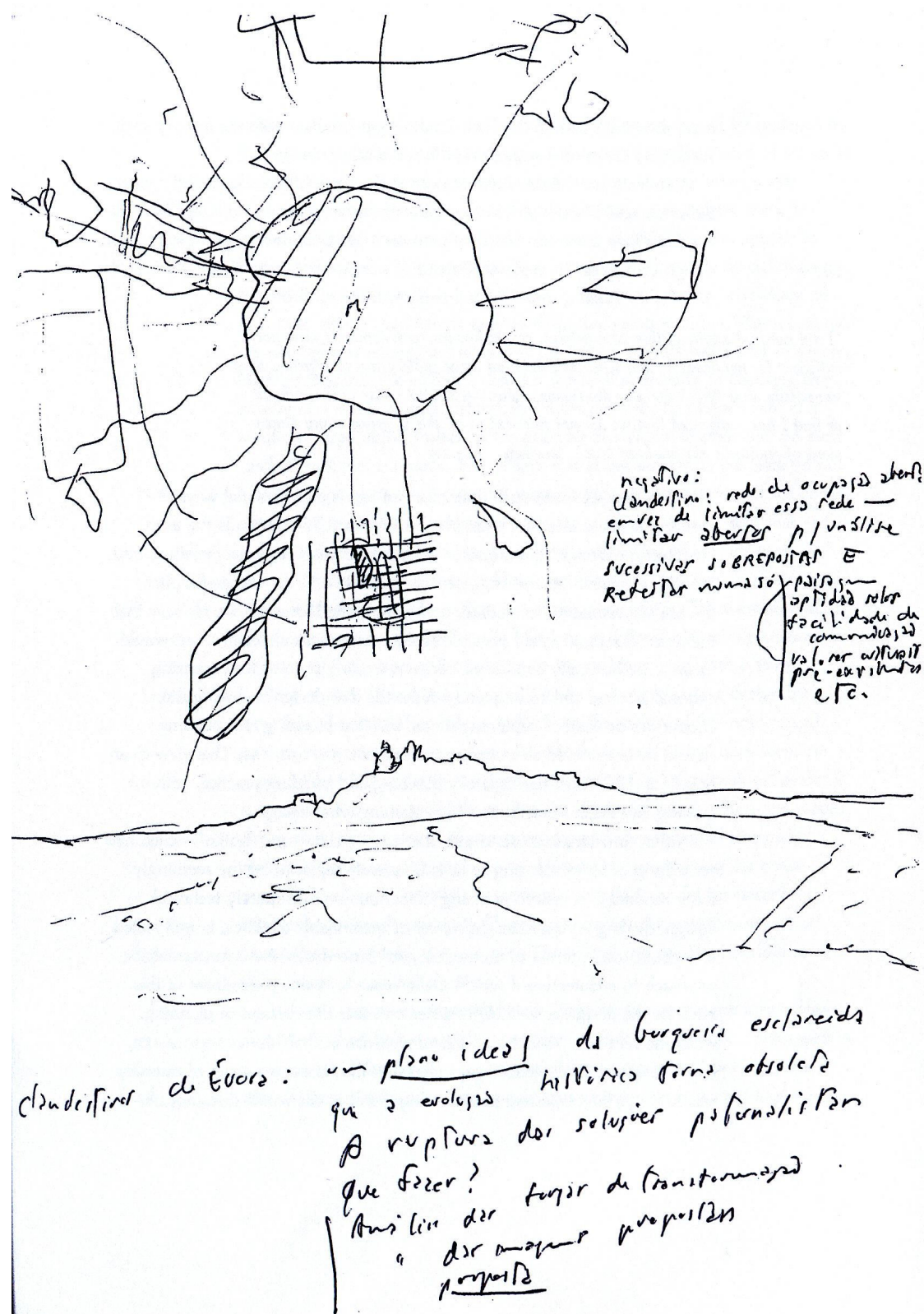


Figure 2.11: Sketch of the Silhouette of Evora by Alvaro Siza, for the Design of Quinta da Malagureira, (Ganshirt 2007)

The second example to the formation of visual data may be transcripts, as they are intensively prescriptive and diagrammatic. The most convenient example to that visual tool would be B. Tschumi's Manhattan Transcripts (Figure 2.12, 2.13, 2.14). They are different from most of the common architectural drawings as they involve neither pure reality nor mere fantasies (Tschumi, 1999); accordingly, the property of transcripts being in between abstract and figure (concrete in architectural means) makes them diagrammatic tools. Tschumi defines their purpose as transcribing things normally removed from conventional architectural representation as it functions as a mediator between the set and the script; objects and events; and the type and the program (Tschumi, 1994), in the same sense of a diagram as a tool establishing connection of theory and practice; thus working as a mediator between the idea and

the form. Transcripts offer a different reading of architecture in a way conventional components of architecture are broken down and rebuilt along different axes (Tschumi, 1994). Yet they may be confused with pictograms - another visual tool that has diagrammatic significance. Because pictograms have lesser potential of being capable of generating newer formations, they are rather codes and have linguistic features that differ from transcripts. But this does not mean that pictograms have not got any diagrammatic character, for they are intensively descriptive through visualizing written or spoken language in an abstractive way, and for they are slightly prescriptive, they have much significance in diagrammatic approach. In Figure 2.15, “Genesis”, a series of pictograms that Juli Gudehus designed in 1992 can be seen. Looking at this example a similarity could be established with hieroglyphs, which were a major step of humanity for the development of both a visual representational tool and language as an expressive tool.

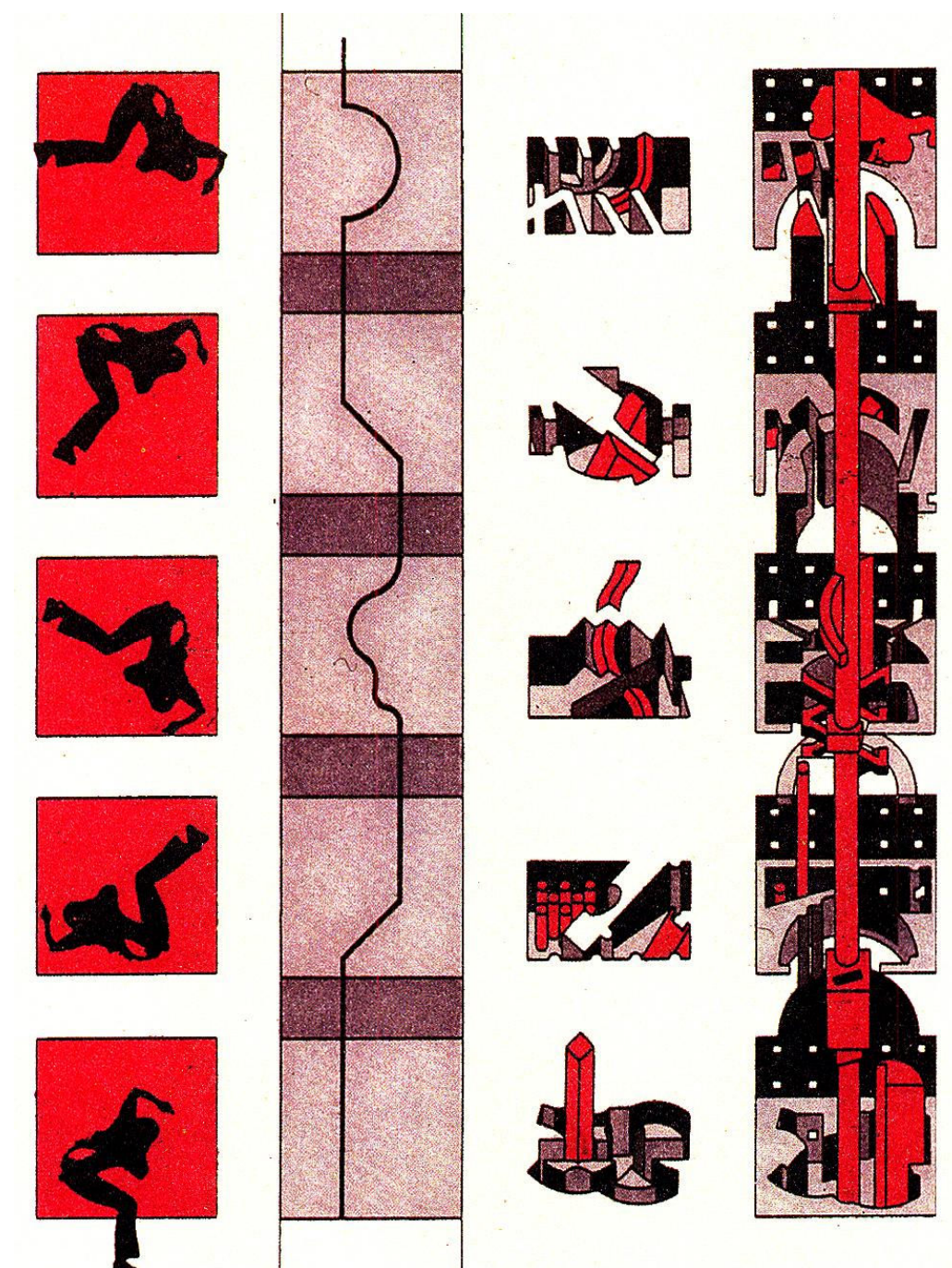


Figure 2.12: Extract from Manhattan Transcripts Part 3 ‘The Tower (The Fall)’, (Tschumi, 1994)

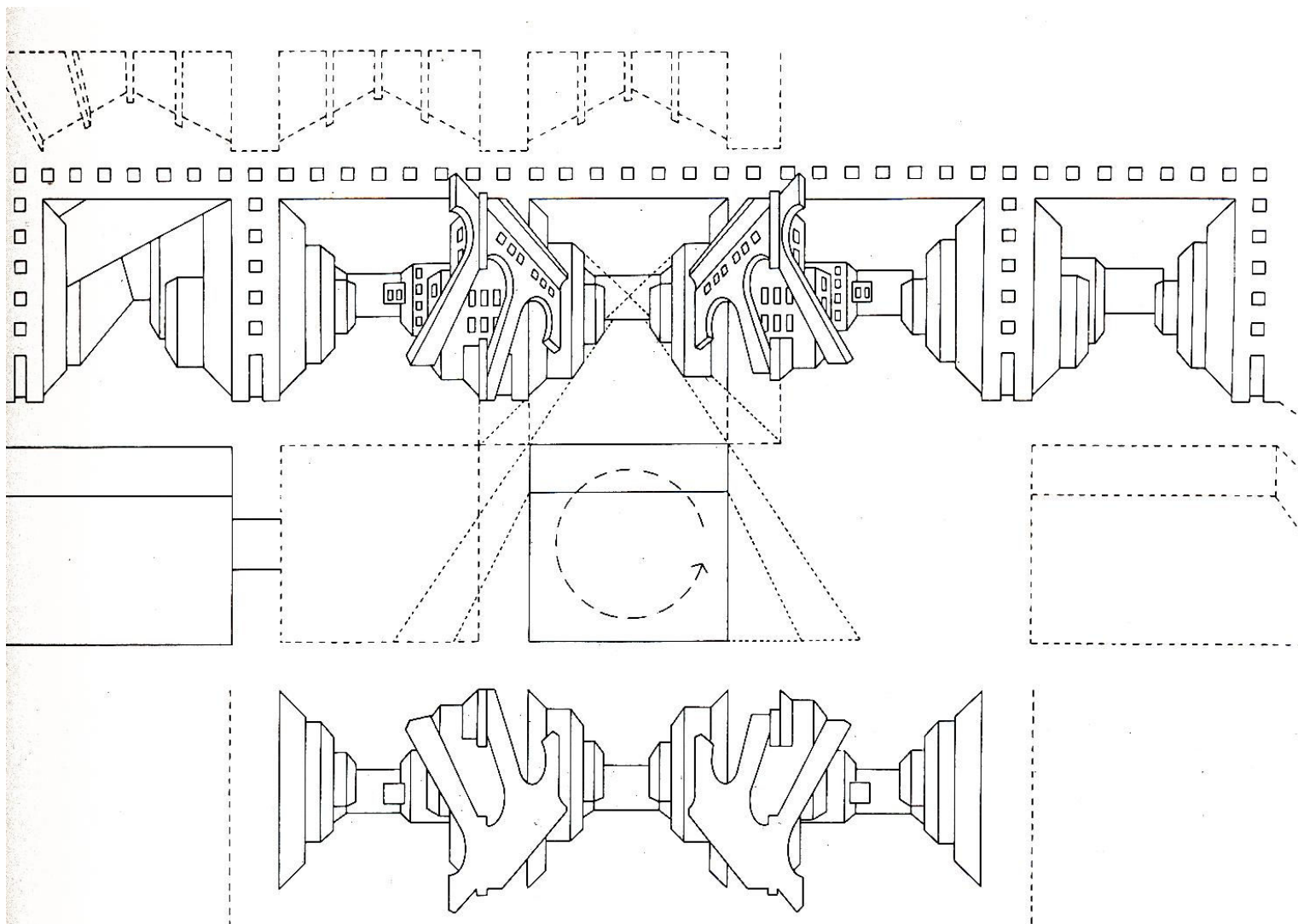


Figure 2.13: Manhattan Transcripts Part 4 'The Block', (Tschumi, 1994)

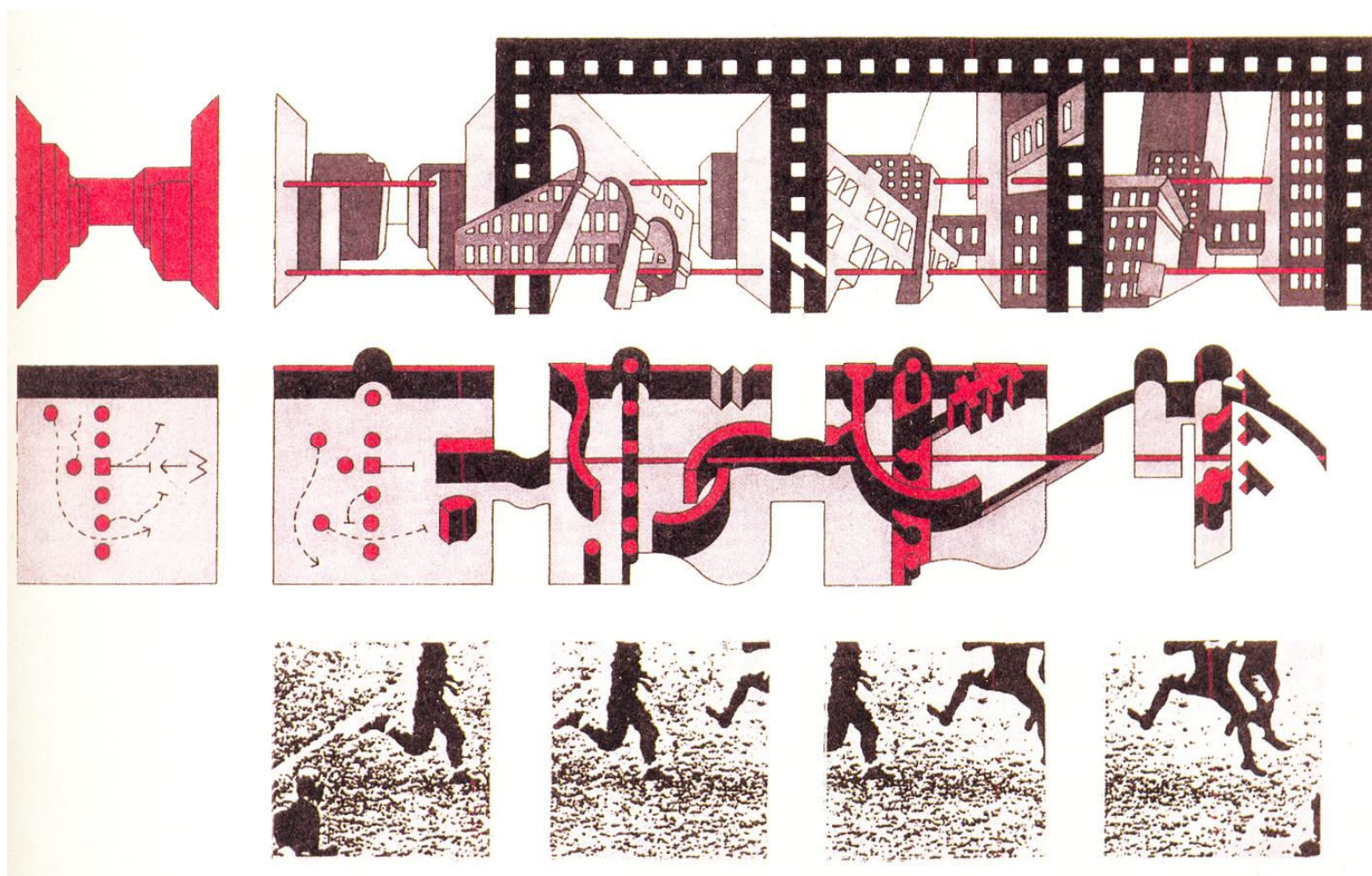


Figure 2.14: Extract from Manhattan Transcripts Part 4 'The Block', (Tschumi, 1994)



Figure 2.15: “Genesis” a Series of Pictograms by Juli Gudehus (Ganshirt 2007)

Another example to a different form of visual data may be schema. Bubble diagrams are mostly evaluated in the same context with schemas which refer to a common idea of diagram. The word ‘schema’ comes from the Greek word "σχῆμα" (skhēma), which means shape, or more generally, plan. The primary meaning of schema is a

diagrammatic representation; an outline or a model; where the secondary meaning is utilized in psychology as a pattern imposed on complex reality or experience to assist in explaining it, mediate perception, or guide response (The American Heritage® Dictionary of the English Language, 2000). It would be appropriate to say that the definition of schema as a tool in psychology also matches the schema defined as a representational tool for design process. Figure 2.16 shows a two dimensional diagram that is an organization scheme brought by P. Eisenman within the design process of Banyoles Olympic Hotel in Spain, 1989. As most of the schemas do, the properties of diagram in the context of the definitions on this research may not exist in schemas for the reasons they usually indicate certainty as they are mostly descriptive tools not functioning on a high level of generative process. Figure 2.17 shows a three dimensional example of an organization scheme, referring to a relatively open ended situation, and more diagrammatic in generative means for it overlaps in a layered mode with spatial and structural aspects of a possible design.

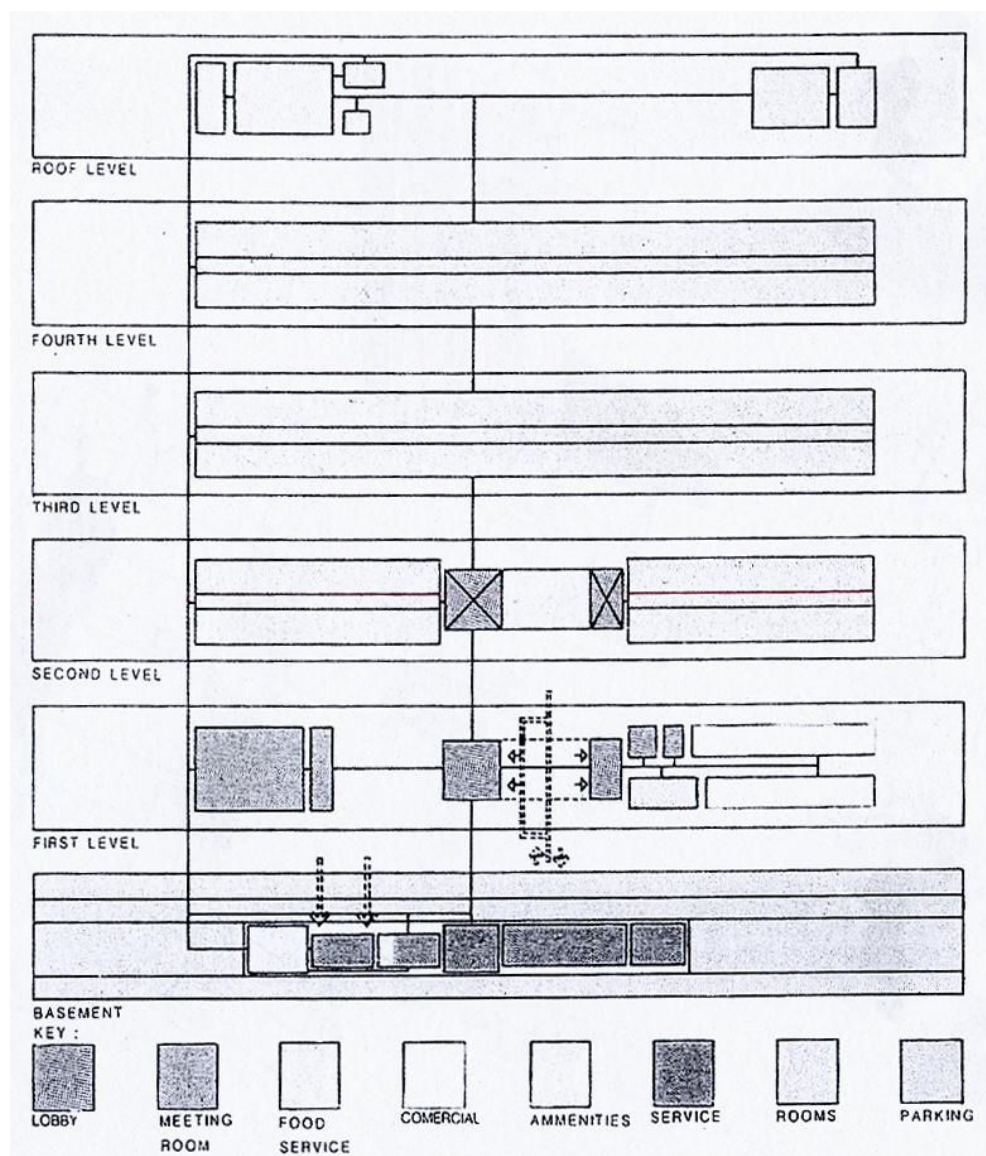


Figure 2.16: Diagram for Banyoles Olympic Hotel, 1989, (Eisenman, 1999)

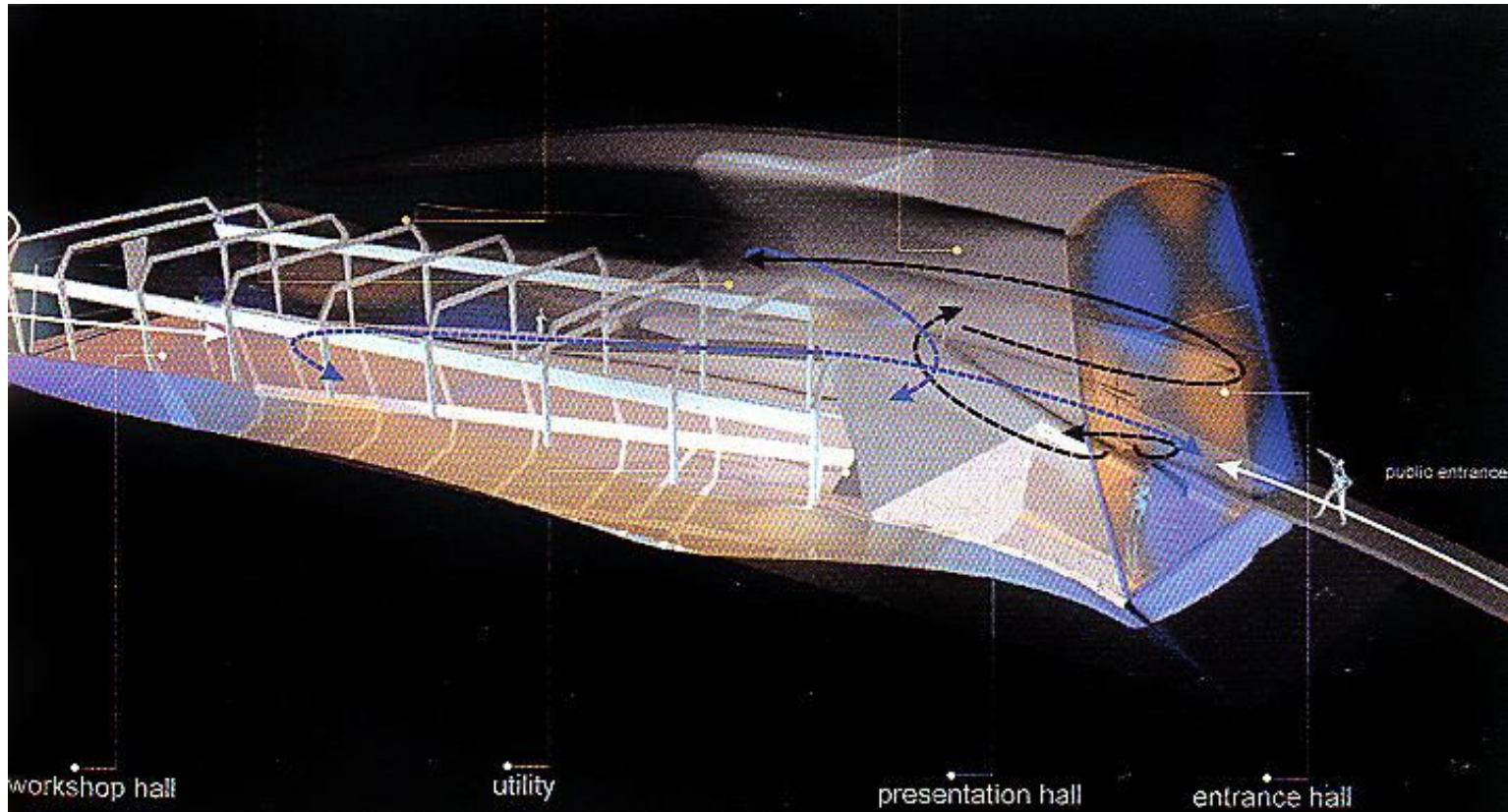


Figure 2.17: Diagram Investigating Inclusive, Infrastructural, Programmatic and Constructive Connectivity, (Berkel, 1999)

The notion of diagram, as a tool for design process holding properties of similarities with tools like sketches, transcripts or schemas, has been considered through different perspectives. Differently from the ambiguous approach to the definition of diagram in the context of architectural design; in which not all of the forms of tools are always diagrammatic, and sometimes some kinds of tools like sketches, transcripts or schemas, moreover maps, even architectural plans or sections can be in form of diagrams; there are approaches that involve a sharper view of definition of architectural diagram emphasizing that it is different from a sketch, a map or a plan. The sketch had been the major tool for architectural design since renaissance up until the modern era where in 1950's, bubble diagram was developed. Bubble diagrams have stiffened the corrective and universalistic modernist approach in design process. These issues were further expanded by the efforts of Christopher Alexander in his early attempts to develop a design method relying on the opportunities of cybernetic logic. Diagram in the same sense, has become a tool, in which certain relations were mapped precisely, with lesser qualitative information (Vidler, 1999). Some examples to those visual tools involving schematic and mapping relations between spatial entities are layouts of tree-based structure and lattice based layout structure (Figures 2.18, 2.19).

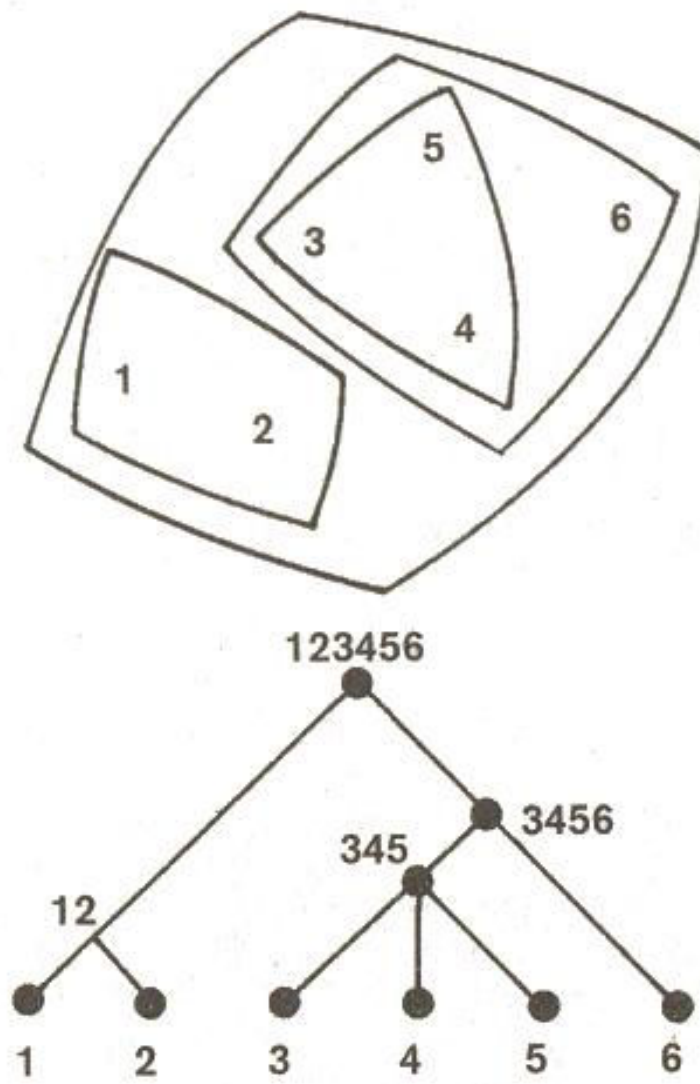


Figure 2.18: Tree Based Structure, C. Alexander

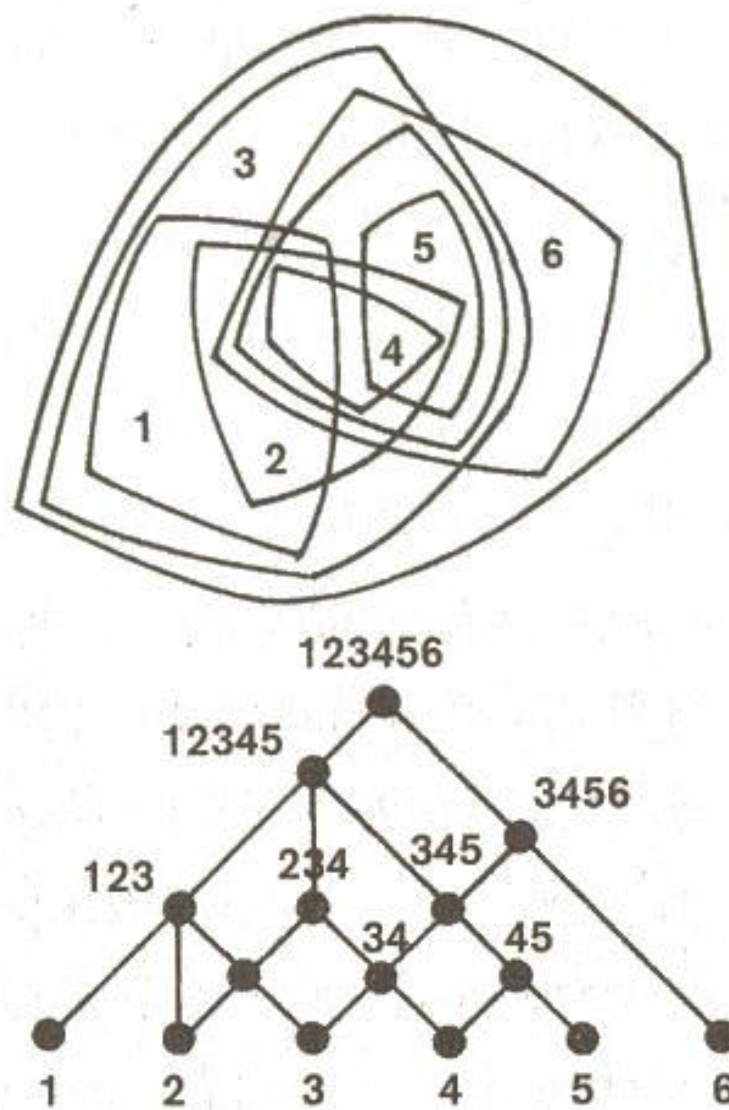


Figure 2.19: Lattice Based Structure, C. Alexander

In his essay 'City is not a Tree', C. Alexander mentions the difference between a tree based structure and lattice structure. To understand the difference between lattice based and tree based relationship Alexander refers to examples from the world of existence that can be quoted:

“For example, in Berkeley at the corner of Hearst and Euclid, there is a drugstore, and outside the drugstore a traffic light. In the entrance to the drugstore there is a news rack where the day's papers are displayed. When the light is red, people who are waiting to cross the street stand idly by the light; and since they have nothing to do, they look at the papers displayed on the news rack which they can see from where they stand. Some of them just read the headlines, others actually buy a paper while they wait.” (Alexander, 1965)

Let, corner, traffic lights, drugstore and news rack be sub elements of the city, given numbers from 1 to 4 in order, associating with Figures 2.18 and 2.19, it can be understood that relationships between spatial entities in question are not tree based, but lattice based, crossing with each other, both being independent and both enclosed, not in a simple hierarchy being an assembly of a system of linear relations (Karatani, 2006); hence the relations between entities in question were visualized through a diagrammatic process.

Following the approach to the notion of diagram as a tool functioning as a representation of relationships like in a schema or map, it was also introduced as an icon that incorporates practices of graphic abstractions. This approach points out a diagrammatic process that forms the object in geometric means; not only for the establishment of the functions like in a bubble diagram, organization schema or a map. In relation to that it also points out the Deleuzian approach to diagram as an abstract machine; in other words, a spatiotemporal abstraction as a kind of map/machine - that will be widely issued on following chapters. These issues have become a backbone of the notion of diagram as a tool for contemporary architectural design process, which has become an active interest after 1990's from Japanese architects to Netherlandish School and Peter Eisenman (Vidler, 1999)

Creative process, in the context of diagrammatic approach, aiming to form the object in geometric means, involves figuration in a way that diagram reorganizes information in order to readdress meaning directed to form. Diagram represents the relationships being transferred to spatial structure and order; as this passageway from diagram to form can be described as a transposition where the connection between

the idea and form is metaphorical. For example, J. Bentham's Panopticon (Figure 2.20), is an abstraction of a function reduced to its ideal form as a pure architectural and optical system that involves metaphorical approach to visual representation (Zvoleas, 2008). The Panopticon is a type of prison building designed by Bentham in 1785. The concept of the design is to allow an observer to observe (-opticon) all (pan-) prisoners without the prisoners being able to tell whether they are being watched. M. Foucault describes Panopticon as the diagram of a disciplinary mechanism that was extensively applied since 19th Century by authorities exercising individual control. In Vidler's words:

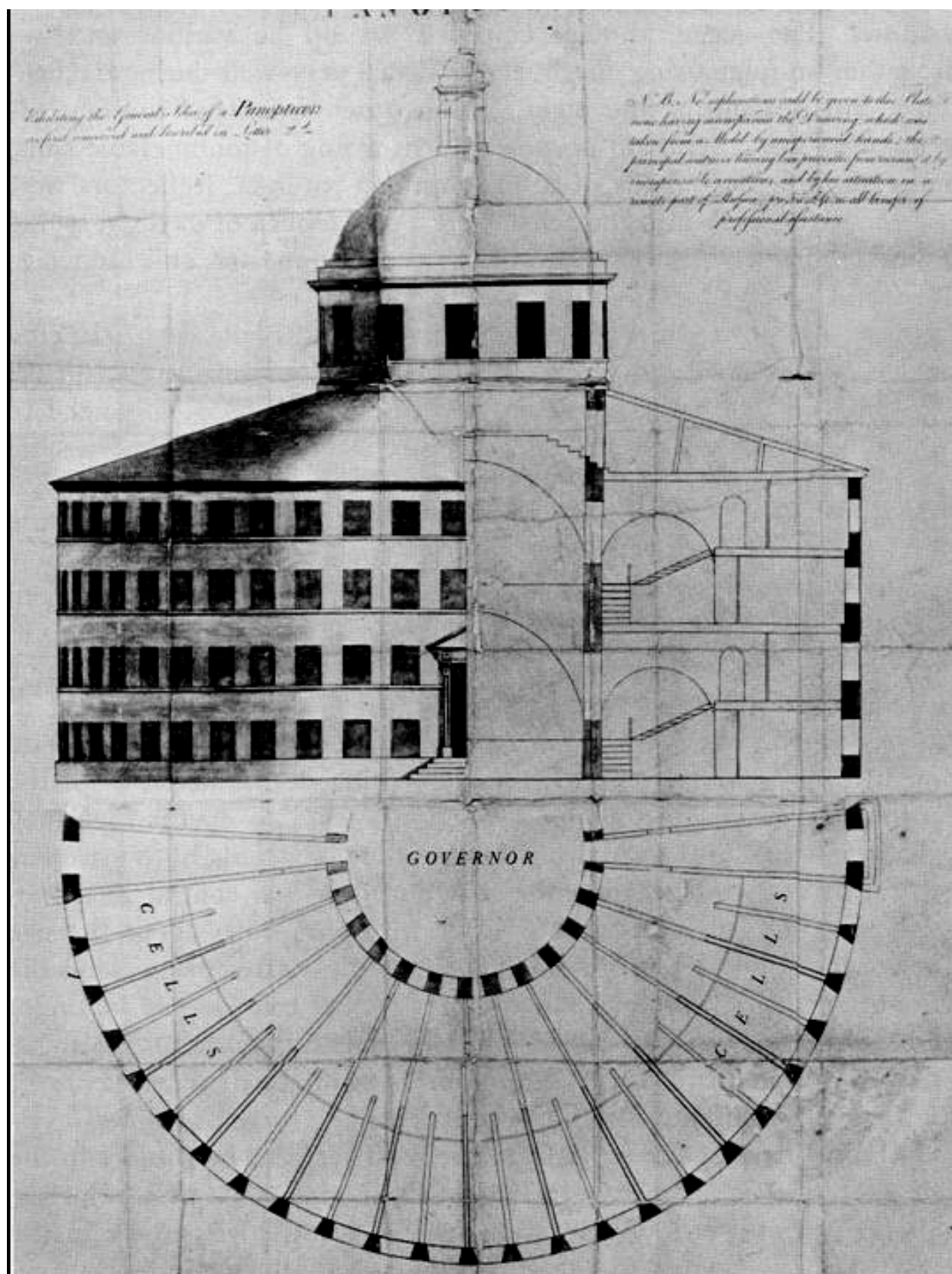


Figure 2.20: Design for the Panopticon by Jeremy Bentham, 1787, (UCL Library, 2008)

“Panopticon is a representation at once a “thing” with specific content (the prisoner) and of a ‘function’ with generalized scope over society as a whole. The diagram, then, is both specific, in that it precisely maps the space of individual confinement, and universal, in that it (imprecisely) refers to an entire social regime. It is as if the diagram of the feudal estate, castle at the center, cultivated strips and peasant huts around the periphery, had been mapped on the organizing system of feudalism as a whole.” (Vidler, 1999)

As it can be understood, the concept of Panopticon holds a great potential for architecture as a diagram that any spatial architectural drawing applications like sketches or architectural plans or sections alone. A plan, as an architectural drawing, may have a potential of being a diagram, as it may be viewed as a kind of diagrammatic schema articulating space by carrying information of analysis of potentials and dynamics, and moreover metaphorical information of abstractive data (Zvoleas, 2008).

Besides the definitions of the diagram according to dictionaries, etymological roots and the accordingly the very basic idea of the notion of diagram as a graphic portrayal of quantitative and/or qualitative information functioning as a descriptive and generative tool, or as a tool for metaphorical thinking and/or as a tool of abstraction; it is also important to shortly mention how diagram as a visual information tool has been developed through the history and how it has been used in various disciplines, especially in architecture.

Information visualization is a very broad term that not only involves diagrams, but also tables, graphs, maps and even text. For diagram is a type of visual information tool, it grounds on the earliest scratches of forms on rocks and the development of pictorial signs and picture, to the developments in the history of science and mathematics. The roots of data visualization reach to first geometric diagrams in the tables of positions of stars, and making maps to aid in navigation and exploration. For example the first known attempt to show changing values graphically, is a diagram that defines the positions of the sun, moon, and planets throughout the year, that dates back to 10th century as it can be seen in Figure 2.21 (Friendly, 2008). It can be understood that the curiosity of human and the will to explore and understand the nature has a major effect on the emergence of diagrams looking at Leonardo Da Vinci’s Vitruvian Man (Figure 2.22) dating back to 15th century, which may be the first diagram to understand the spatial relations of parts of human body in means of ratio; it may be related to Le Corbusier’s Le Modulor first published in 1948

(Figure 2.23), which has been developed consequent to the previous attempts of Vitruvius, Da Vinci and Alberti to discover mathematical proportions of human body and/or proportions of architectural elements which could be useful to improve both the appearance and function of architecture.

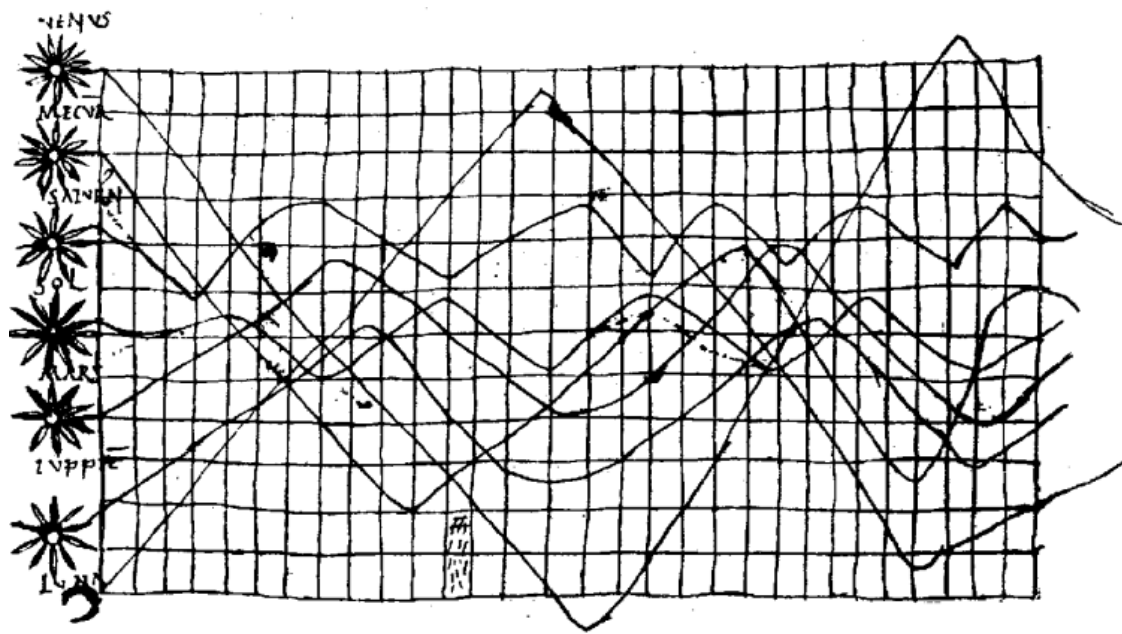


Figure 2.21: The Planetary Diagram, 10th Century (Friendly, 2008)

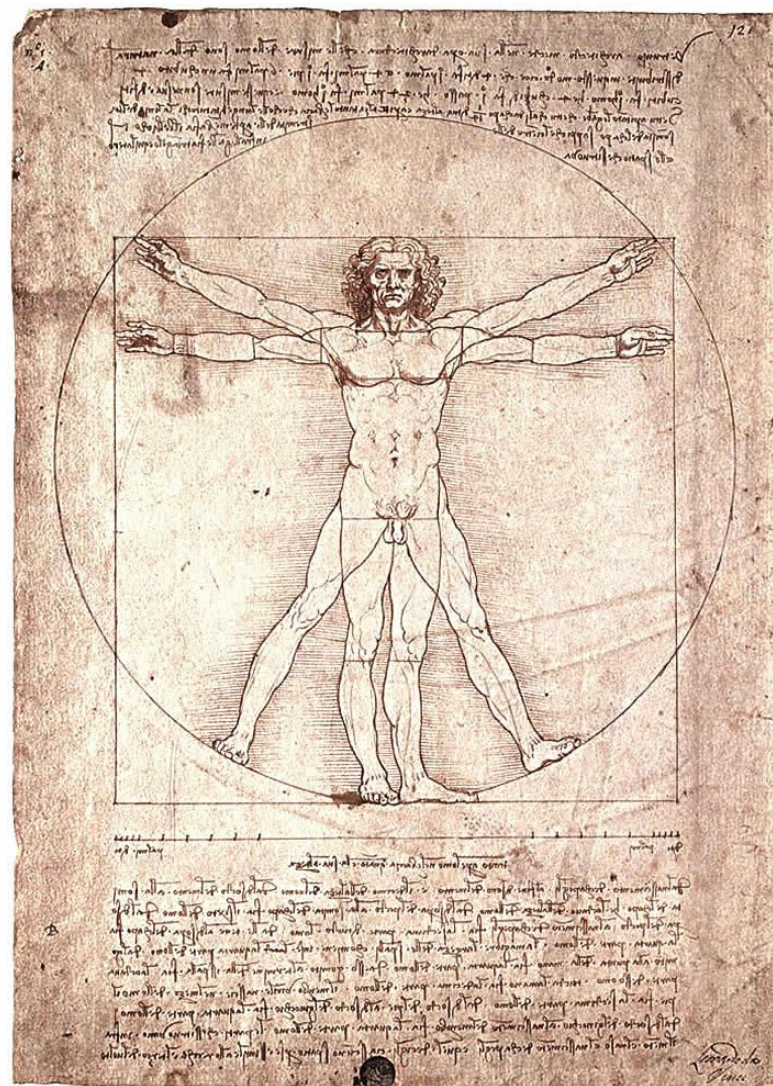


Figure 2.22: Vitruvian Man, Leonardo Da Vinci, 15th Century

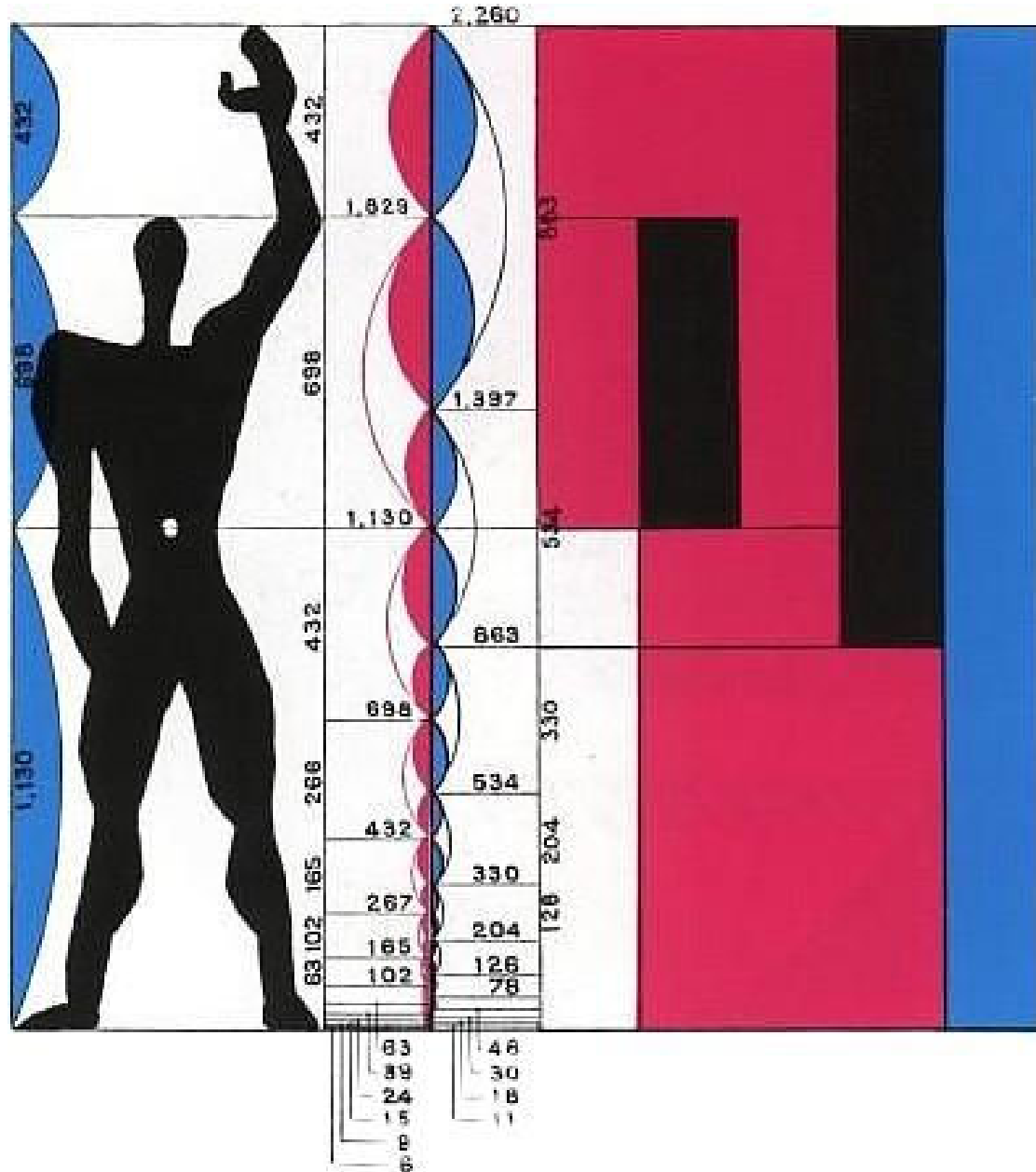


Figure 2.23: Le Modulor, Le Corbusier, 1948

Due to the advancements of techniques and instruments in 16th century, more precise observations and measurement of physical quantities were developed in the context of visualization. In 17th century, there was significant growth of theory and practice like the rise of the analytic geometry, theories of errors and measurement, the birth of probability theory, and the beginnings of demographic statistics, followed by the developments in 18th and 19th century which involved in the birth of statistical thinking accompanied by a rise in visual thinking; thus diagrams. Initially visual tools like diagrams were not very easy to produce, which were hand drawn, piece by piece, and were later etched on copper plate and manually colored, followed by techniques of lithography and photo-etching. It was always a struggle with the limitations of available technology. The effect of advances in computer technologies to the formation of diagrams is so significant that it was unthinkable a century ago; especially advances in human computer interaction have created a new paradigm of forming graphical information, for practical means, in a dynamic way. (Friendly, 2008)

In the same sense, for architectural design process, regarding the definition of diagram as a generative tool, the advantages of the generative power of computers are used as tools to apply generative material in the creative process (Sevaldson, 2001). The developments in philosophical thinking in the second half of the 20th century, following the era of the modernist approach – especially the emergence of post-structuralism, and accordingly de-constructivism that have evolved diagram as an instrument of abstract thinking and a dynamic tool for creativity, has been in correlation with the developments in virtual technologies. The emergence of the notion of diagram as a dynamic tool for creative process in architectural design that has become an active interest after in late 20th century, is due to the possibilities of computer technologies and the application of abstract thinking- involving especially the notions of diagram that Gilles Deleuze had pointed out- which later has become the backbone of diagrammatic methods of creative process in contemporary architectural design.

3. THE APPROACH TO DIAGRAM AS A DYNAMIC TOOL FOR CREATIVE PROCESS

Creative process through Deleuzean perspective can be taken in the context of post-structuralism; for it points out a system, whose members are formed dynamically interconnecting in a network, affecting each other. The formations are called ‘becomings’, which are formed through transformative processes. The world of ‘becomings’ supplies a productive medium, which is able to create newer formations at all times. The approach to creative process, in this sense, also points out a ‘self-accord’ system (a creative process which is self organized) and new perspectives to the notion of diagram.

In the context of this paradigm, diagram is defined as an intermediary tool for creative process for it functions as a medium transferring the expressive data to form an authorial subject and stimulates the production of sensation. Accordingly, diagram is defined as an abstract machine for creative process, like in a metaphor of a productive tool providing abstractions; for it supplies a situation, which is pregnant to new formations at all times by having the potentialities of being ready to transform data. Furthermore, in the context of being machines that supply and sustain a productive state, diagrams, have been used as mediums for structural design processes that involve dynamics of self-generation.

These notions of creative process that define diagram as a dynamic tool, have been interest of design theory for a long time and it has been thought that they have potentials to bring out distinctive perspectives to architectural design process. The notion of diagram, as an intermediary tool and accordingly an abstract machine for creative process in a dynamic role, will be taken in hand in the context of architectural design, on this chapter.

3.1. Diagram Acting as an Intermediary

Gilles Deleuze had come up with a distinctive approach to diagram; the interpretations that he had made on diagrams, considering the work of modern picture, involve a distinctive way to describe diagram and creative process, which were put forward in his essay, 'Nomad Philosophy of Art'. The definition of diagram that he points out involves a proposal that it is a preparatory work, which is not a schema, not a code and that is slightly different from a sketch - but rather an intensive form of dynamic transformative tool that is intrinsic to the creative process; in which it transfers the 'expressivity' and stimulates the production of 'sensation' acting in-between the 'actual' and the 'virtual'. These properties put diagram in the role of an intermediary for creative process.

In Spinoza's philosophy, the notion of expressivity is defined as an interplay between internal thought and external bodies, and how ideas are expressed involving this situation of being in-between outside and inside- which is grounded to the intrinsic power of thought. The notion of expressivity in the context of the expression of an idea, may be viewed as the power of the understanding to express oneself; however it is more than the ability to express one's thought, for it also involves an act of a being or an entity to express its self-state in order to express its essential property, which Spinoza calls the 'substance'. Deleuze supplies that, only ideas adequate to be expressive, give us knowledge through causes or through a thing's essence. This situation can be exemplified through a metaphor: In a state of illness; the symptoms are involved in an expressive state from which the situation would be understood in order to start a treatment. (Lambert, 2005)

Art, Architecture, Literature are the most common tools for the expressivity of mankind. However, it is to be noted that, not only humans are capable of expressing themselves, but also the other members of the Nature, animals, plants and even the "non-living" have their ways of expressivity. Expressivity is an act that belongs, also, to nature to express its states. Expressivity in Nature is a dynamic that results in signals that are to be received by its members. This dynamic provides nature to be 'self-accorded' through affecting all its elements' relationships in the role of an intrinsic communication tool. In the context of the notion 'affordance', it stimulates

evolutional processes; in other words it functions as a tool for creative process in Nature. (Delanda 2007)

Manuel Delanda points out that, ‘Geology’ is the beginning of non-human expressivity referring to the conception of Gilles Deleuze, ‘Geology of Morals’:

“An old mountain is smooth, where the rocky, bald and the tougher one would cry out that “I am young”, a volcanic mountain would signalize that it is dangerous by the look of it, guiding the animal not to build a nest near the opening. The form of the clouds is three dimensional expressivity, as the colors of the materials and components are the signals of the characters of their materials - as different forms of expressivity, telling about the hardness of them or the lightness of them ...” (Delanda 2007).

As it can be understood, expressivity even exists among non living in a manner that affects the behaviors of the living; like the ‘boiling water’– in which the property of being extremely hot is visualized as ‘bubbling’ through expressivity of the molecules forming it. The molecules are filled with vibrating energy that may be harmful for a living organism if swallowed; leading to the consequence of understanding that one should not touch it, and wait until the heat drops.

For the living on the other hand, the simplest form of expressivity is territoriality. For example, a dog marks his territory with urine, a signature like the words: “This is my territory”. In more complex forms of these expressive behaviours, due to genetic variations, some animals are capable of changing colors. For example a changing color of the skin of an animal signals that it is ready to mate or whether it is poisonous or not. More interestingly there is another type of expressivity in animals that is called ‘chosen expressivity’: Bower birds, for example, are able to decorate their nests to seduce the female. There are three types of bower birds: One of them has a very bright blue colored skin, easily attracts the female, and builds a simple nest. The skin of the bird is its internal expressivity that is due to genes and hormones. The second type of Bower bird has only a few of its feathers blue, that it builds a much more complicated nest compared to the first one, begins to express itself externally, due to the lack of internal expressivity. The last type of bower bird that has lost all its blue feathers builds a magnificent nest, even seeks some blue ribbons, blue bottle caps around to bring them to decorate its nest to impress the female. These actions are not only due to instincts that are genetically determined, but results of the conscious expressive behavior, or in other words chosen

expressivity, in which a bird becomes an artist- a simple one, but an artist. (Delanda, 2007)

The forms of expressivity of humankind however, are much more complex than of the other members of the nature. As it is mentioned before, Art, Architecture, and Literature are the most common tools for expressivity of humankind. In relation to the notion of chosen expressivity that belongs to simpler life forms than humans, like bower birds that has been mentioned above, Delanda strongly underlines that, maybe, when the first human beings were painting the caves they were already surrounded by this environment of conscious expressivity (Delanda 2007). Accordingly it can be said that, beside of the situation that the emergence of the preliminary visual tools and maybe the audible tools are due to the expressive motives of mankind itself, it is also possible that nature, in which the expressivity already exists, has an affect on forming these tools. The prehistoric people may have been involved in imitative and mimetic actions inspired by the nature to form their own expressive tools.

The most commonly known visual tools for the first human beings were cave wall paintings, in other words, 'Rock-art'. These may be considered as the first complex visual tools that have been made consciously by prehistoric people, and as a form of art that has both expressive and descriptive properties. Some of the most outstanding examples of rock-art are achieved by prehistoric people of Europe, which can be seen in Spanish Levant. The majority of the works in Spanish Levant are paintings of which nearly all are monochrome; there are very rare examples of engravings and colored paintings, in which the range of colors is very limited. As a technique of forming figurative paintings, the contours are drawn first and filled with paint later. An unfinished representation of a human figure (Figure 3.1), can be an evidence to this discovery (Bandi, 1961). By the way, it is to be noted that etymological roots of diagram matches the properties of these prehistoric drawings. Remembering the definition of diagram from the second chapter that refers to its etymological roots of Greek and Latin word 'Diagramma'- meaning figure worked out by lines- it can be seen that the formation of the figures of pre-historic art are collinear.

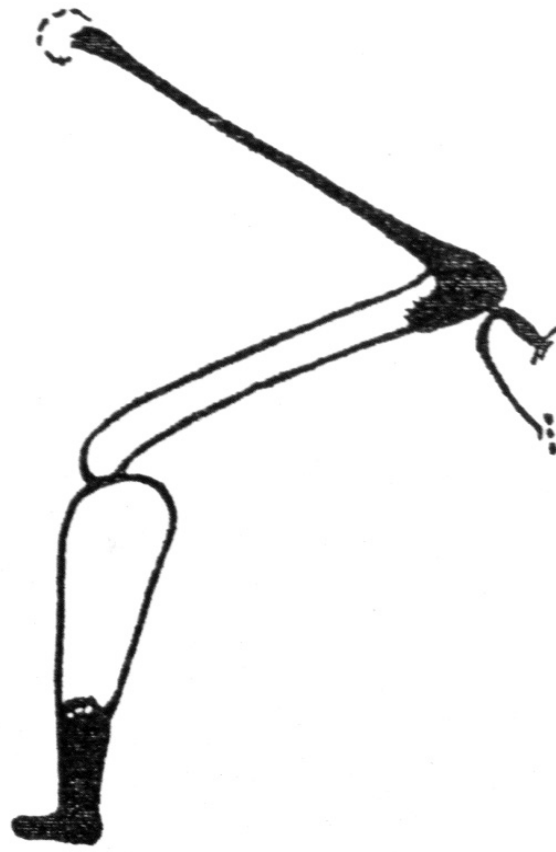


Figure 3.1: Unfinished Human figure. Painting in dark red. Barranco de Valtorda, Castellon prov. After H. Obermaier. Scale approx, 1:3 (Bandi, 1961)

In addition to their properties of being figures formed by worked out lines, Spanish Levant art is a preliminary type of visual tool that has the property of being abstractive. In such way, according to P. Wernert, the examples of Spanish Levant prehistoric art can be distinguished into groups according to their characteristics. For example, 'Alphera' type, identified by its accurate proportions of figures, closer to nature (Figure 3.2); another one, which is 'Cestosomatic' type, involves figures of exaggeratedly long body, round head, broad, almost triangular chest, narrow hips and long, fairly thick legs (Figure 3.3) (Bandi, 1961). These characters of these figures make the pre-historic visual tools a form of art. The figures are not drawn as exactly they are, but in an abstractive way. It is to be noted that, especially the properties of the 'Cestosomatic' type makes it a form of a visual tool that functions generatively intensifying qualifying properties and solidifying the spatial relations, and an abstraction emphasizing structural organizations and patterns in means of relationship of figural elements.

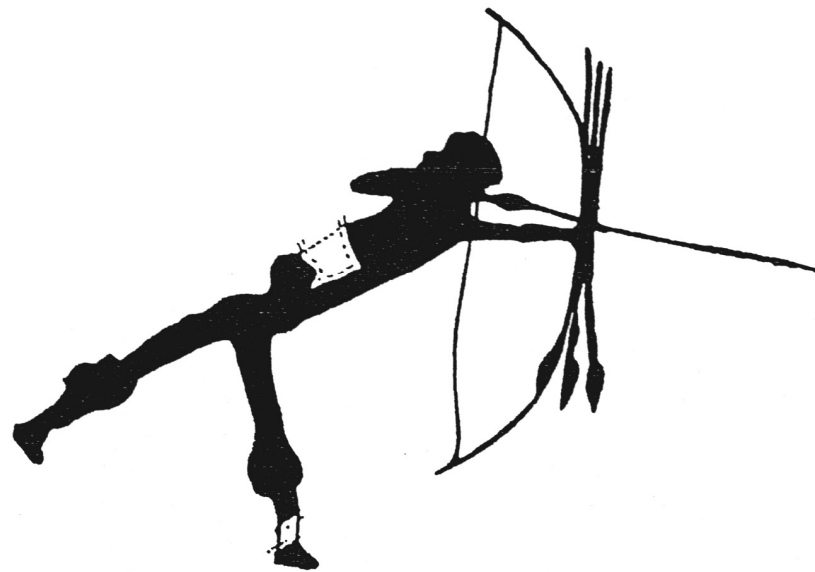


Figure 3.2: Archer, ‘Alphera type’. Painting in dark red. Cueva Saltadora, Barranco de Valtorda, Castellon prov. After H. Obermaier. Scale approx, 1:2.5 (Bandi, 1961)



Figure 3.3: Archer, ‘Cestosomatic type’. Painting in black. Cueva Saltadora, Barranco de Valtorda, Castellon prov. After H. Obermaier. Scale approx, 1:4(Bandi, 1961)

These forms of figures that have abstractive qualities are visual tools of art that have generative potentials for they are formed through dynamics of an expressive act. To quote the words of Hans-Georg Bandi:

“This reduction or enlargement of the body, or parts of the body, in the manner of “ombres chinoises”, is frequently called Expressionism, and it is believed that the artist who employed this method wished to suggest certain ideas of movement or force.” (Bandi, 1961)

To explain Bandi’s words, with the reduction or enlargement of the body, he refers to signs of abstraction; and with the manner that he refers to its frequent calling as expressionism, it is the ‘expressive behavior’ that stimulates abstraction, which gives their artistic character to these pre-historic paintings. What is more, is that he

suggests that these ancient people have formed this art in a conscious way, that he refers to the fact that these people had employed a method suggesting certain ideas of movement -meaning creativity; or force. What is more important than what they refer to as creator, is their actions that involve a creative process due to their expressive motives that result in a form of art. Accordingly it can be said that expressivity has a potential of transformation into a product, in the context of creative process- even in its earliest forms.

In the context of the potentiality of transformation of expressivity, an important notion, which is sensation, has to be taken in hand. One of the most important aims of an expressive act is to make the others perceive what has been expressed. This is most effectively achieved by ‘sensation’. Sensation may be considered as an issue of perception; however it is more than a simple perception event. Sensation is a very complex act of way of perceiving what has been expressed, which is not only up to the observer, but also to the properties of the object. The properties of the object, which accord the quality and intensity of sensation, are determined by the nature of the transformation process of an expressive idea to a product: This is called, ‘The production of Sensation’ (Deleuze, 1993).

The first human beings have begun to have sensations when they have become self-conscious about perception - in consequence of their pictorial attitude toward the environment. They have begun to notice the colors of the light as it distinguishes the objects from each other; in accordance they have noticed the patchwork of the visual field and perspective (Gibson, 1966).

It is easier to have sensation on real environment. But to paint sensation is another problem. In Gibson’s words:

“A man, if he tries can almost see the world as it would project on a glass plate in front of his face – the inverse of his retinal projection, or a so-called retinal ‘image’. He can never quite to do so, for there is always some compromise with natural perception. If it were easy to detect pure sensations, we could be representational painters without training” (Gibson 1966)

To paint sensation is quite different from reflecting the perceivable environment on a surface as it is exactly. The problem of painting sensation has occurred on prehistoric men - who were having sensations already and were good observers of the environment by the way. In figure 3.4, a cave painting of a mammoth can be seen. Understanding from this image, the distinctive features of a young mammoth have

been carefully observed and rendered, yet it can be implicated that the sensation is missing in this form of art (Gibson, 1966). The difficulties of painting sensation have been a problem of transformation of expressivity -which involves the transfer of the actual data to a virtual world- from prehistoric times to renaissance, even up until the modern era.

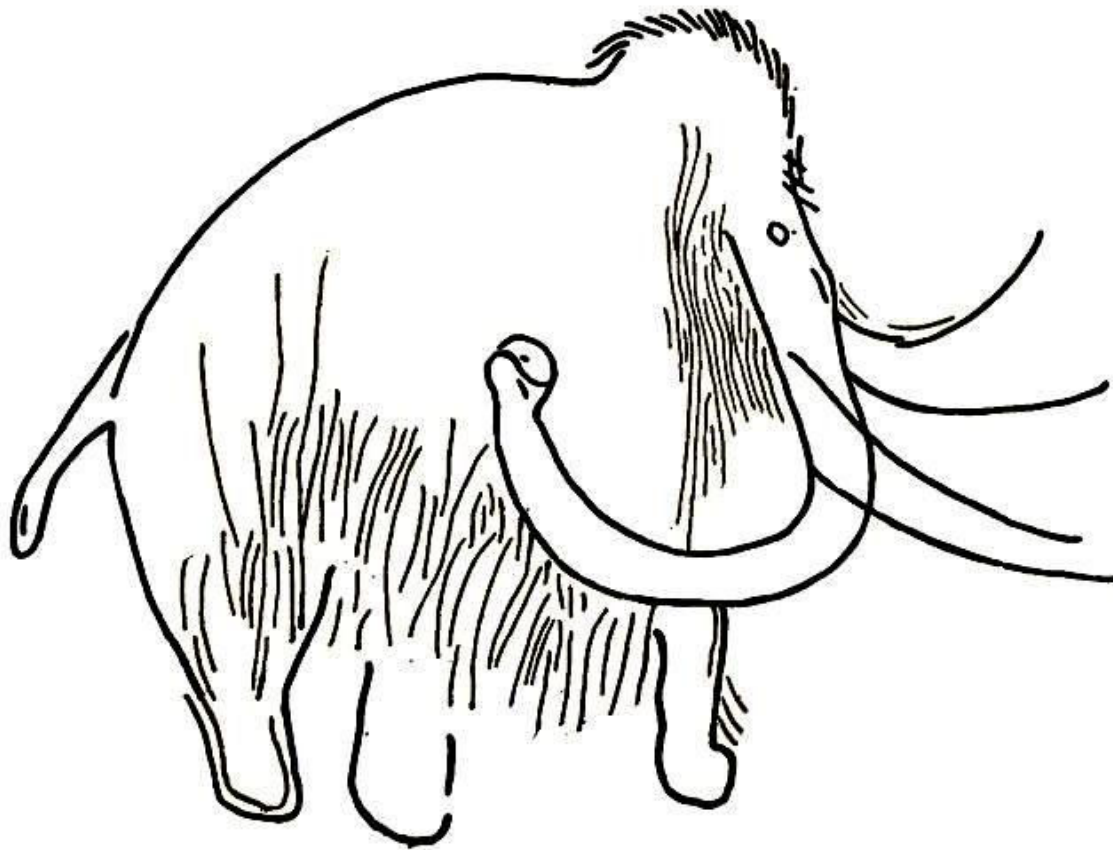


Figure 3.4: The Cave painting of a mammoth, Bettman Archive (Gibson, 1966)

In his essay ‘Nomad Philosophy of Art’, Gilles Deleuze scrutinizes notions of sensation referring to a wide collection of examples of works of modern paintings, especially Bacon’s. The most important notion that is taken in hand on that essay, in this context, that ‘diagram’ is the key to achieve sensation. Prior to define diagram in Deleuzean terms, it is important, as a first step to scrutinize what Deleuze refers to as sensation.

As it has been mentioned before, one of the aims of the expressivity is to establish a perceptual connection with the other beings in terms of senses. Moreover, in the context of artistic and design activities, there may be senses that the artist or the designer wants to be sensed by the observer or the user, which may involve visions, voices, tactile senses or tastes. The user or the observer perceives the product, using one of his five senses, or some of his senses, or all of his senses simultaneously: He observes it, touches, tastes, smells it, and listens to it. This simultaneous activity that is done with multiple senses can be explained with the notion ‘sensation’.

One of the leading artists of Post-Impressionism, Cézanne, had achieved the things that he wanted to reflect in his canvas to the observer by painting sensation (Deleuze, 1993). This can be considered in the context of an highly expressive state of art, for Cézanne had brought the concept of sensation a further step than the impressionists or the expressionists; in his post-impressionist style of painting, sensation should not be considered as only the senses that are imposed by the light and color on the canvas, but also the act to make the observer perceive the picture holistically, by making him become a part of that scene. To achieve this, a harmony of senses is established by stimulating various senses of the observer (Rajchman, 1998). Sensation involves everything needed to make the observer to live the moment of that scene on canvas and become a part of the picture. If the work of Cézanne, for example series of paintings of Mount Sainte Victorie (Figures 3.5, 3.6, 3.7, 3.8) are examined, it can be understood that there may be no need of direct figuration to achieve sensation. Instead, considering the things that the artist wanted to reflect in his painting, some distortions and abstractions are made. If these paintings are examined chronologically, it can be seen that the abstractive character of these figurative paintings gets more intense. These characteristics of Cezanne's paintings, links his work to Bacon's – in the context of sensation.



Figure 3.5: Cézanne, Mount Sainte-Victoire, 1882-85



Figure 3.6: Cézanne, Mount Sainte-Victoire, 1885-95



Figure 3.7: Cézanne, Mount Sainte-Victoire. 1904-1906

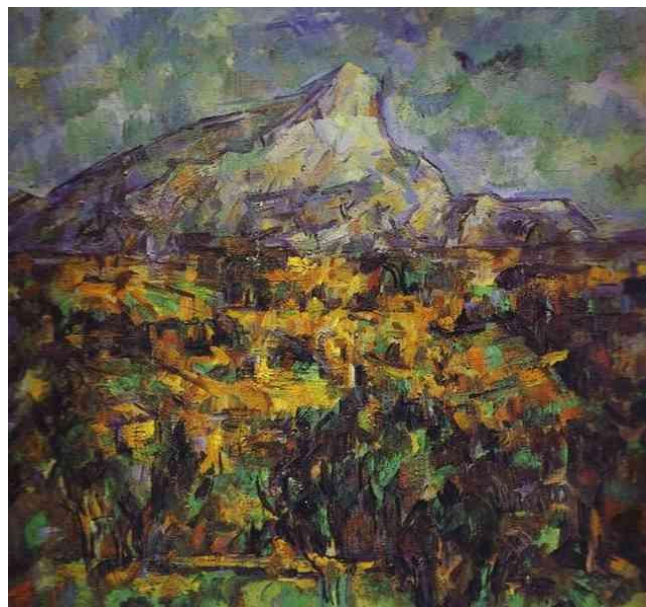


Figure 3.8: Cézanne, Landscape at Aix, mount Sainte-Victoire, 1905

Francis Bacon, points out levels of sensation as sensible domains and moving sequences in his interviews. These concepts are interpreted by Deleuze as, in each picture there may be one or several sensible domains each stimulating a sense/senses. If various pictures are in consideration, assuming that these pictures are framed in a sequence about the same story, the observer would achieve a different level of

sensation in each frame that he examines: Different senses are stimulated in distinct doses so that a rhythm is established, that can be called as the rhythm of senses. The ‘Nomad’ that Deleuze refers to, is this sequential, non stop movement and replacements that take place in the act of sensation of the observer when he observes the work of art; as a way to achieve an intense level of sensation. When a triptych (a type of picture formed of three frames, usually to tell a story) Bacon had painted is observed, the issues that are discussed above can be understood easier. For example in the triptych ‘May-June 1973’ (Figure 3.9), the death of Bacon’s boyfriend in a hotel room where they were staying together is painted. Looking to these frames, the observer lives all the emphatic feelings for the event, disgust, pity, torture, helplessness. The painting is dynamic like a movie sequence, despite the fact that it’s a sequence that is formed of only three frames, it is so intense that it describes the whole moment successfully. The nomadic eye movement of the observer and the non-stop replacement of attention on the frames, establish the harmony and rhythm of senses. The processes forming senses of distinct types and of different doses through different frames are the factors that result in sensation of an intense level that is described above. (Deleuze, 1981)

It should be noted that this nomadic action can also be established in a single painting that does not involve multiple frames, as in various works of art of Bacon; he almost vomits his entire emotional world and his psychological state at a time to the canvas, especially the events around him that had affected his life –just like in the triptych that is illustrated previously. The expressivity of these senses in the canvas is so successful in Bacon’s picture that it is almost possible to sense the smell of meat in his infamous ‘Painting 1946’ (Figure 3.10). In the same sense, hatred is felt looking to ‘Man in a Cap, 1943’ (Figure 3.11), it is possible to feel scared looking to the ‘Head’ series (Figure 3.12), and become anxious and disturbed observing ‘The study After Velázquez: Pope Innocent X’ (Figure 3.13). The secret of this success is the fluent transformation process of the non-figurative data that is filled with senses, to figure. There is a secret formation of virtuality behind the canvas, which is the stimulator of sensation in Bacon’s picture, for which Deleuze points to ‘diagram’ as a tool for sensation. (Deleuze, 1993)



Figure 3.9: Francis Bacon, Triptych: May-June 1973



Figure 3.10: Francis Bacon, 'Painting 1946'

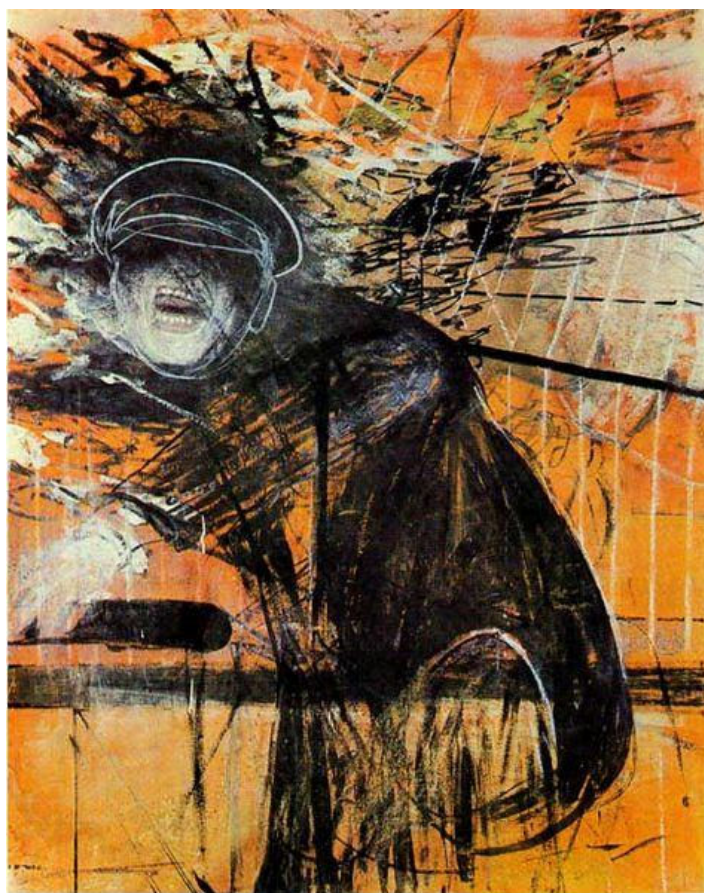


Figure 3.11: Francis Bacon, 'Man in a Cap, 1943'



Figure 3.12: Francis Bacon, 'Head'

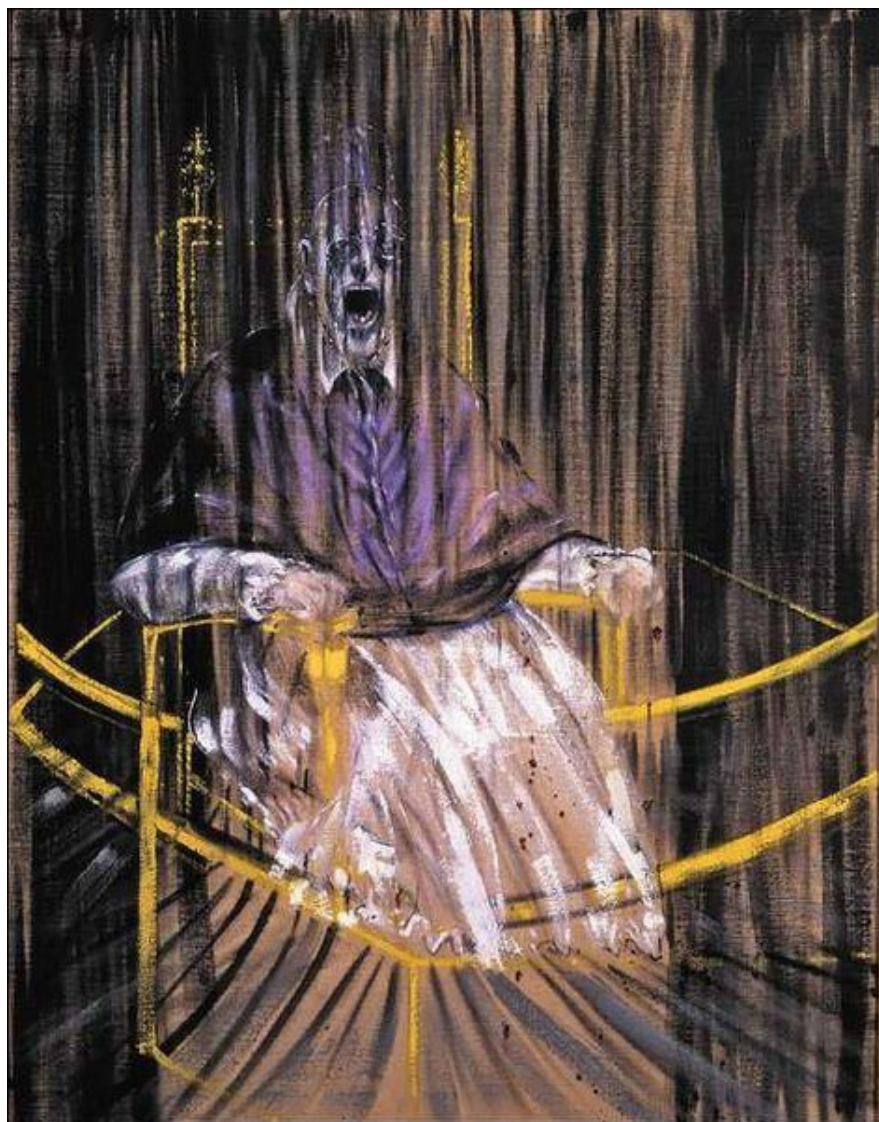


Figure 3.13: Francis Bacon, 'The study After Velázquez: Pope Innocent X'

The non-figurative data is the ‘actual’ sensation that is filled with absolute expressivity; it is like a raw material that needs to be processed. When transferred on the canvas, this raw material becomes ‘virtual’ data. Through figurative processes, this virtual data becomes figural, while it has been breaking away from being abstract and transformed into figure. This transformation involves in a highly creative process, which is due to diagram, especially in Bacon’s paintings. Diagram is in the role of a medium for a transformation process from actual to virtual. Through diagrammatic process, expressivity is visualized and the actual sensation is transferred to canvas being virtualized; just like in Spinoza’s perspective that has been mentioned before, interplay between internal thought and external bodies. This puts diagram in the role of a dynamic tool that functions between the actual and the virtual, in which the conception of time is intrinsic to it.

It is important to scrutinize how diagram accomplishes this dynamic role. Diagram can be thought as preparatory work that is prior to the figuration process of the painting. This foremost work is not exactly formed of sketches, rather it involves random brushstrokes, cleaning and sweeping moves, throwing paint at the canvas randomly and so on. This is a transferring process of expressivity, which involves vomiting of all thoughts in the mind of the artist. The expressive data are transferred into the canvas, and are to be converted to figure in a transformation process. These transformative data, which are in between figure and abstract, form the diagram. Yet diagram shall not be thought as the frozen state of this transformation process, but sustains intrinsically, through the whole process. Diagram is an intensive process of creativity as a progressive act of painting, which can be described as: “Making marks at random (brushstrokes-lines); cleaning, sweeping, or wiping places or area, throwing paint at varied angles and speeds.” This act that involves the transformation of the figurative data is followed by processes as Bacon supplies: “... we lengthen a mouth, we make it go from one side to the other; we clean part of a head with a brush, or a rag”. Referring to Bacon, Deleuze affirms that he calls his act of painting: ‘diagram’. Through diagrammatic process expressivity is transferred and sustained progressively, producing sensation (Deleuze, 1993).

The function of the diagram is to suggest possibilities of facts. With many different choices, intense data of various possibilities are to be transformed into figure, like a raw material to be processed. Diagram transfers the outcome of sudden thoughts of

mind, like a trajectory and expectant of newer formations in a line of representation of possible realities; which does not represent “what will be exactly” but carries information for “what are the possibilities of what will be”.

Diagram as a tool for creative process, is not always seen as clear as a preparatory sketch, because it is an intrinsic process. The characteristics of the pictorial data formed through diagrammatic process vary in different works of different artists. For instance Deleuze points out to Van Gogh’s work as: “...a set of straight and curved cross-hatchings that raises and lowers the ground, twists the trees” he adds that there is always a moment in which the painter confronts the diagram more directly (Figure 3.14). The diagram may be a seed of order and a rhythm but sometimes it can be a chaos and a catastrophe like in Pollock’s picture. Jackson Pollock has painted using various methods of throwing paint at different angles, just like in Bacon’s definitions of preparatory work, he has almost vomited all the things in his mind at a moment to the canvas in his irrational, random, free and maybe accidental way. Because Pollock’s picture is non-figurative and totally abstract, the canvas itself becomes the diagram, metaphorically as the exposure of the machine itself (Figure 3.15). In Mondrian’s picture for example, some squares formed by lines of different thickness or painted squares between those lines can be seen (Figure 3.16), so that the observer would seek a balance between these forms; this is an abstract painting though, and not a figurative narration. At the first sight, Mondrian’s picture may be taken as ‘diagram-picture’ as Pollock’s; however Deleuze points out that, they involve codes rather being diagrammatic, which are digital. Digits have become units that come together in canvas virtually, so that a situation, which ‘the fingers that count’, rather than senses operating, is in question. (Deleuze, 1993)

In the context of this approach, diagram is a dynamic tool functioning as a transformative medium between the ‘actual’ and the ‘virtual’, helping to visualize expressivity and providing the production of sensation. Diagram is not a frozen state of creative process and is intrinsic to transformation process, for this reason it may not be seen barely; rather it sustains through the whole creative process, in which the ‘time’ is intrinsic to it. These are the main reasons that distinguish diagram that is pointed out in Deleuzian perspective from the conventional approach to it in the context of a preparatory work; as a code, a schema or a sketch.



Figure 3.14: Vincent van Gogh, 'The Olive Trees', 1889-06



Figure 3.15: Jackson Pollock in Action Painting

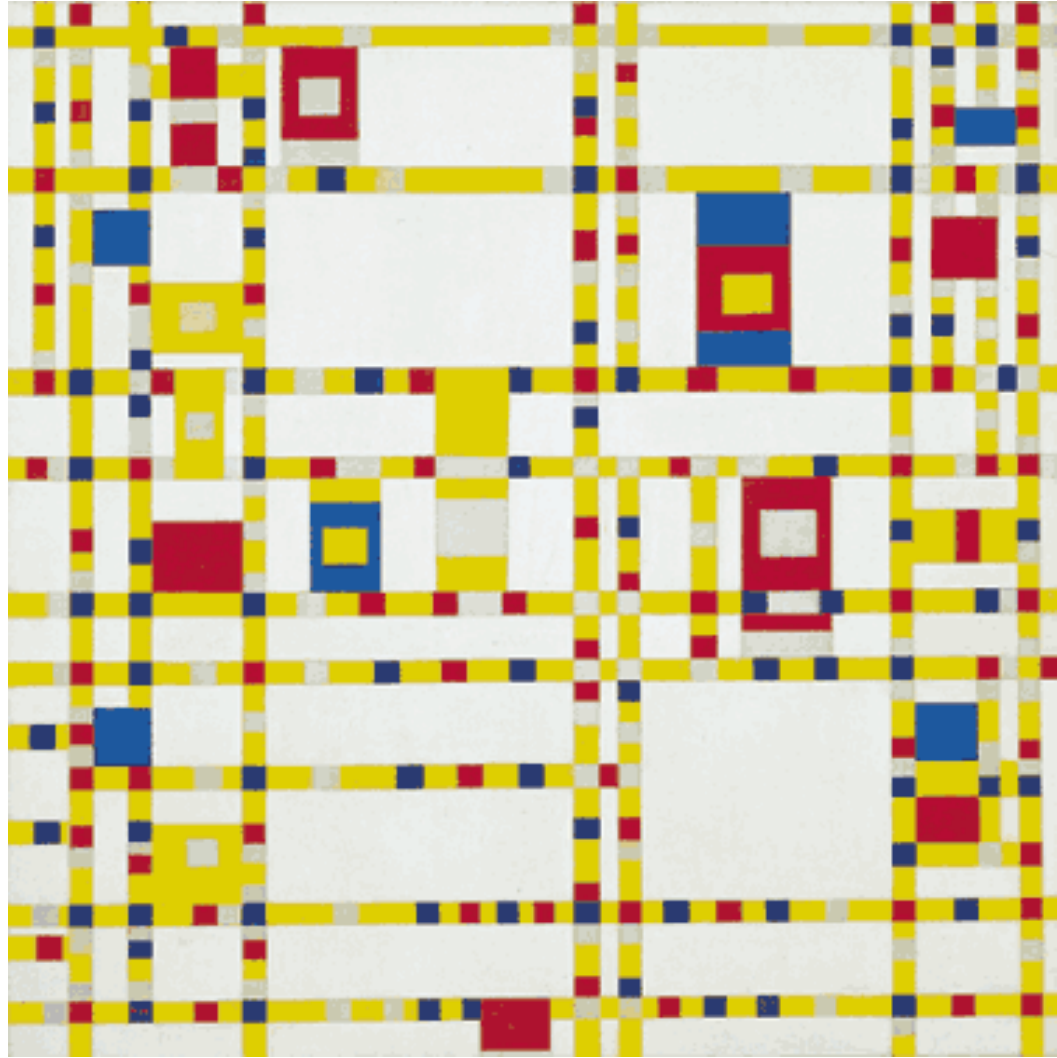


Figure 3.16: Mondrian, 'Broadway Boogie – Woogie', 1942-43

3.2. Diagram as an Abstract Machine

In the context of being a dynamic tool for creative process that is different from a sketch, a code or a schema; diagram functions as an abstract machine for creative process by providing intensive creativity and endless possibilities. Diagram, like a machine, provides abstractions that maintain the situation of being pregnant to newer formations at all times.

The term 'abstract' in modern picture refers to a definition of a line with variable direction which traces no contour, and delimits no form. In 1980's, at the time when Deleuze had written 'A Thousand Plateaus' with Guattari, he asked directly the question; what should one call abstract in modern art? This issue is consequent to the long re-thinking of the idea of modern and abstract, which Deleuze had put forward in 1960's; which involved the term 'abstract machine' that refers to 'almost automatic' series that one sees emerging in pop and in minimalism at that time in New York, around the same time of abstract expressionism, which carried out the questions if the painting was coming to an end. (Rajchman, 1998)

In accordance to the approach to diagram at issue and besides the notion of expressivity that is important to Deleuze's point of view of 'abstract'; he pointed out a situation in which 'the canvas is never empty', in other words the page is never blank (Rajchman, 1998). Due to the endless possibilities of creativity through an abstractive process, it can be implicated that diagram operates not only to visualize the invisible thoughts making them easier to understand functioning as a descriptive tool, but also to visualize the expressivity by functioning as an abstractive tool that provides sensation in the painting- establishing a bond between the painter and the observer.

According to Deleuze, diagram has been no longer an auditory or visual device; rather it functions as a map, a cartography that is coextensive with the whole social field as an abstract machine. This abstract machine is defined by its functioning in unformed matter, as series of processes that are neither mechanical nor organic. The diagram is both the 'form' and the 'matter'; the visible and the articulable (Eisenman, 1999). The definition of diagram as an abstractive tool like in the

metaphor of abstract machine, remarks the characteristics of diagram functioning as a medium in between the actual and the virtual, which supplies open ended situations for creativity. In the same context, diagram specifies the relations between formed/organized matter and unformalized/unfinalized functions; as a mediator that joins the two significant regimes: space (the visible) and the language (the invisible). In this manner diagram operates as a map/machine – a spatiotemporal abstraction (Vidler, 1999).

Regarding the fact that, the act of painting in diagrammatic manner involves an intensive form of the creative process, it should also be considered that the architectural design process is another form of an intensive creative process involving diagrams. Diagram acts as an agency which focuses the relationships between an authorial subject, an architectural object, and a receiving subject: it is the strata that exist between them (Eisenman, 1999). Just like it has been strongly underlined previously that diagram is a mediator between the actual and the virtual-visualizing expressivity and providing sensation; it functions similarly for architectural design process. Diagrammatic process has helped architects to visualize their invisible thoughts for design differently from sketches, schemas or various other tools of visual representations of information, functioning not only as a descriptive tool for the receiving subject, but also a generative tool for creative process involving authorial subject.

In order to better comprehend the issue of what is the place of diagram as an abstractive tool- in the same manner involved in modern painting- in architectural design process, it would be appropriate to have a look at the architectural design processes of the early works of Zaha Hadid. If the drawings Hadid had come up with in the early phases of her design are examined, it can be seen that these drawings are in between virtual and actual. They are neither the exact provisions of future, nor purely abstract suggestions that have architectural connection with place. They are neither just sketches, nor organization schemes. These drawings carry information both on possible tectonic relationships of spatial units, suggestions of new possible lifestyles, and the juxtaposition with the new and the existing (Figures 3.17, 3.18). They are diagrams of architectural design process, as they are the preparatory works and the expectants of newer formations, ready to transform into architectonics; in the same way with the preparatory works on canvas - which is the process of flow of

data in artist's mind as representations of the possible realities – that are ready to transform into figure (Celant, 2003).

Diagrams in the architectural design process are transformed into the concrete world, keeping their fluidity, intensity and identity- which are the agenda of Hadid's design approach. Looking at a single diagram, multiple propositions of façade, juxtaposed with the images of the interior, even the rear façade instantly, moreover, various life style suggestions can be seen; in one single frame complexities as a representation of a possible reality can be observed and sensed (Figure 3.19). Diagrams - in this point of view- have much more potential than a single organizational scheme, a perspective drawing or a sketch. For example in aerial perspective and layering drawing for Reina Sofia Museum, both the possible spatial relation of volumes which forms the structure, and the relationship of the structure with the environment can be seen, in semi-exposed and exploded way, and in one single frame (Figure 3.20).

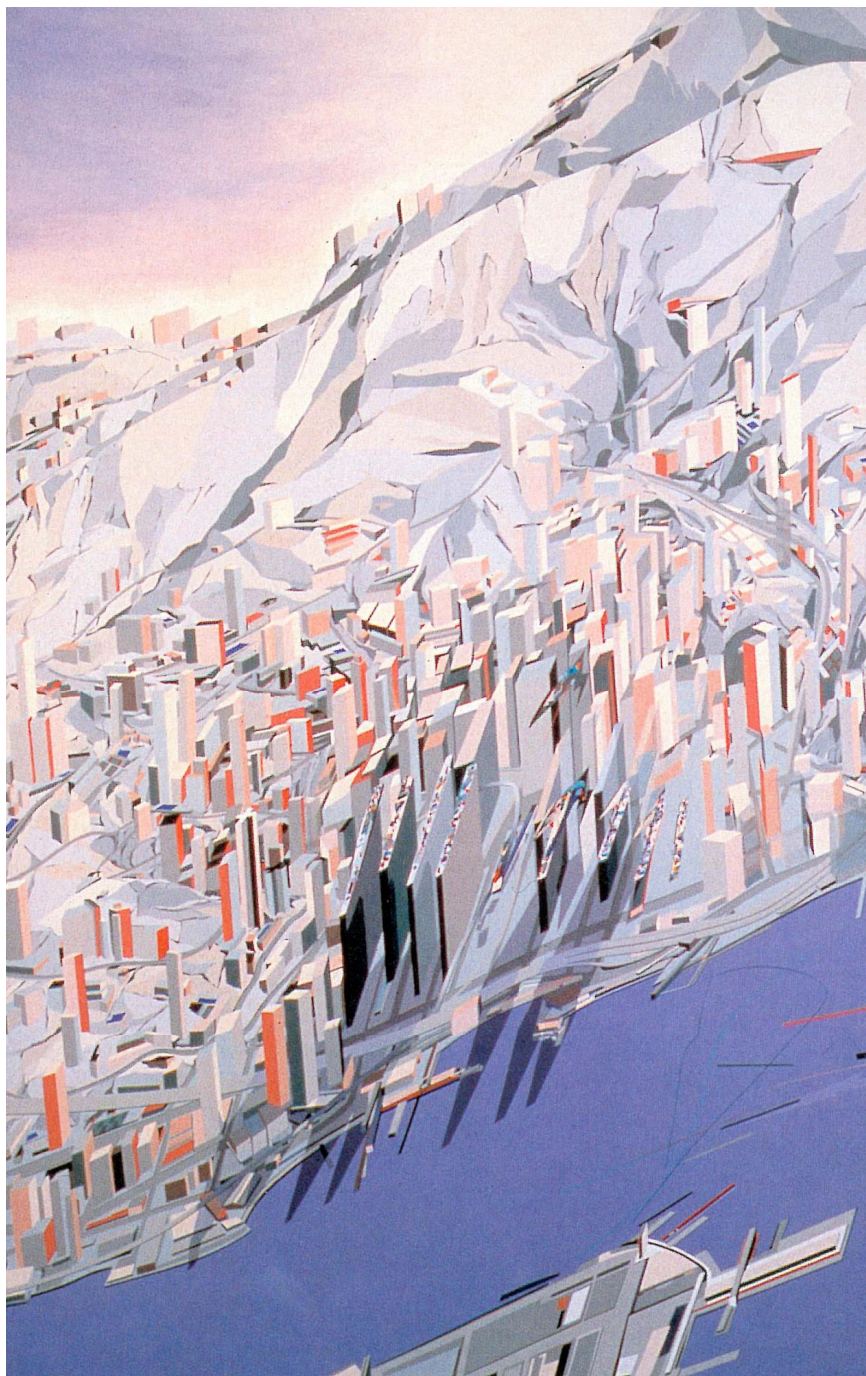


Figure 3.17: Painting, The Peak, Blue Slabs, Hong Kong, Zaha Hadid, 1982-83

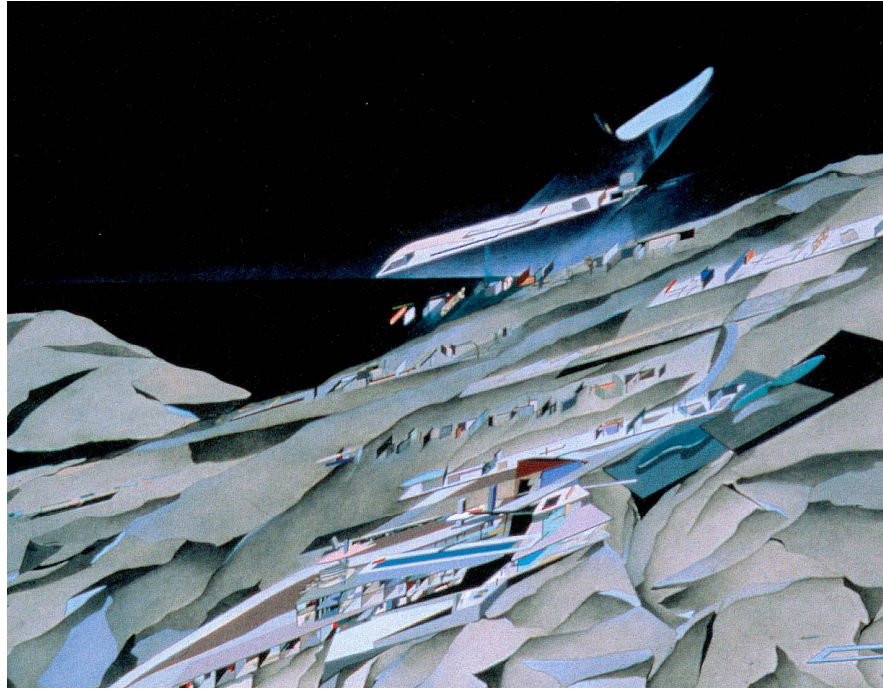


Figure 3.18: Painting, The Peak, Exploded Isometric, Hong Kong, Zaha Hadid, 1982-83

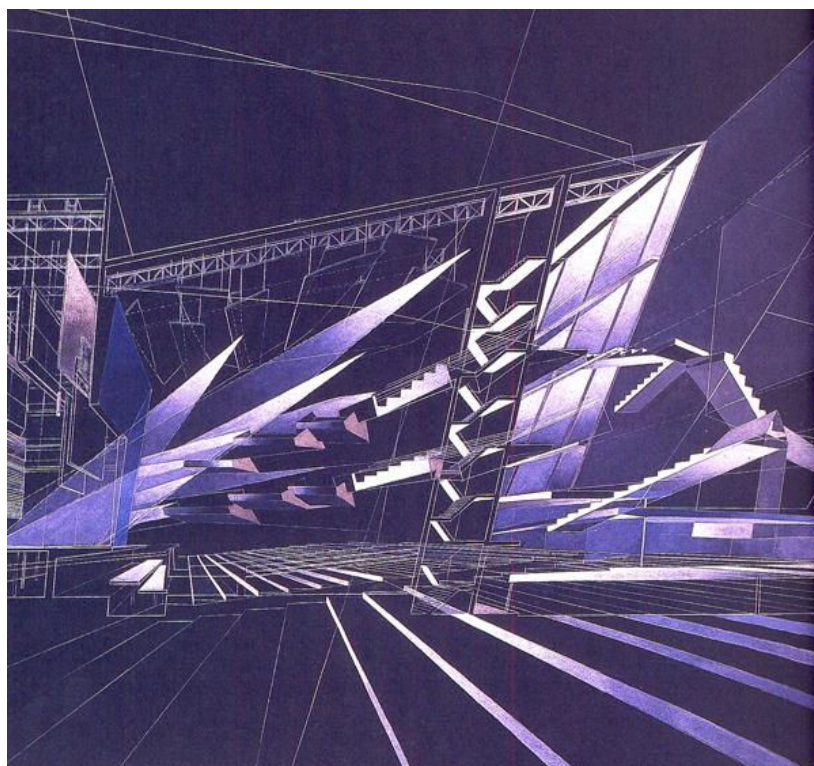


Figure 3.19: Painting, Cardiff Opera House, Zaha Hadid, 1994



Figure 3.20: Painting, Reina Sofia Museum, Aerial perspective and layering, Zaha Hadid, 1999

As it was scrutinized before, there is a transformation process of the abstract data to figure through diagrammatic process in picture. In the same way, the diagrammatic paintings of Zaha Hadid involve the ‘data’ that are ready to transform, which is in between abstract and figural, and that are expectants of newer formations (Mertins, 2003). Just like a raw material, they are processed, and transformed into concrete, keeping their fluidity, intensity and identity through diagrammatic creative process (Schumacher, 2002). That is why Zaha Hadid’s preparatory works are diagrammatic in the same way Deleuze have pointed out. As an outcome, the creator of such diagrams holds so many options of possibilities, ability to represent the thoughts in her mind in an expressive state that makes the observer or the potential user to complete the unrevealed parts of that dream. The Hadid’s diagram has distortions in the same way Bacon had in his paintings, the same continuity, the same fluidity and intensity of a diagram in canvas, making promises in the same way of Bacon’s diagram hidden on canvas (Giovannini, 2003). For Hadid’s paintings as abstract diagrams are tools to create new expectations such as, “what –possibly- it will be like in future” for the observer and stimulate various senses in the same nomadic way Deleuze had described, they are indeed outcomes of the act of expressivity and tools for sensation.

These characteristics of preparatory works of Hadid make them perfect diagrammatic tools. They form the abstract machines for the creative process sustaining the rich possibilities of formations, providing the ideal potentiality for an architectural design. Diagram in this sense becomes a dynamic transformative tool, just like in the situation of modern paintings- not a frozen state of design thinking as in a sketch or a schema. As there are various examples of diagrammatic processes in architectural design that can be taken in hand in the context of the notions in question; a significant one is of New Babylon Project, which was a series of utopian cities designed in 1959-74 by artist-architect Constant Nieuwenhuys. The design process of this utopia, which includes: collages of the new proposals with the existing, paintings of involving provisions of future and that are in between abstract and figural, that are filled with sensations (Figures 3.21, 3.22, 3.23, 3.24, 3.25, 3.26, 3.27), has a significant potential of being abstract machines and are to be named as ‘Diagrams of Utopia’ (Vidler, 1999).

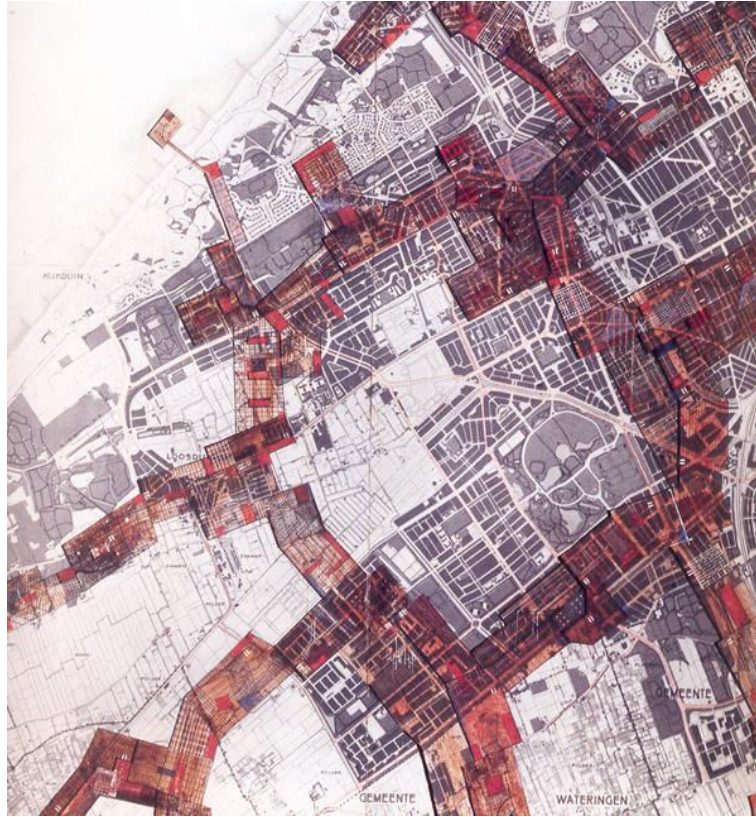


Figure 3.21: Map - Collage, New Babylon Project, Activist Drawing, 1999

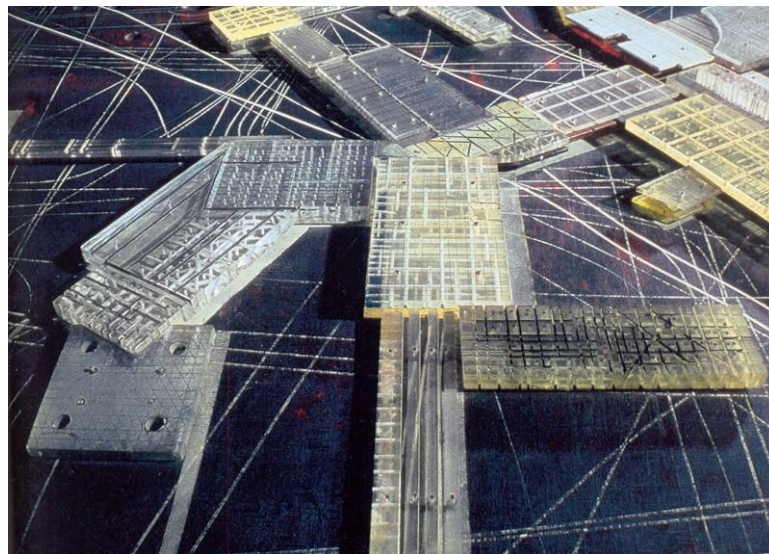


Figure 3.22: Model, New Babylon Project, Activist Drawing, 1999



Figure 3.23: Collage of the built model with realistic environment, New Babylon Project, Activist Drawing, 1999

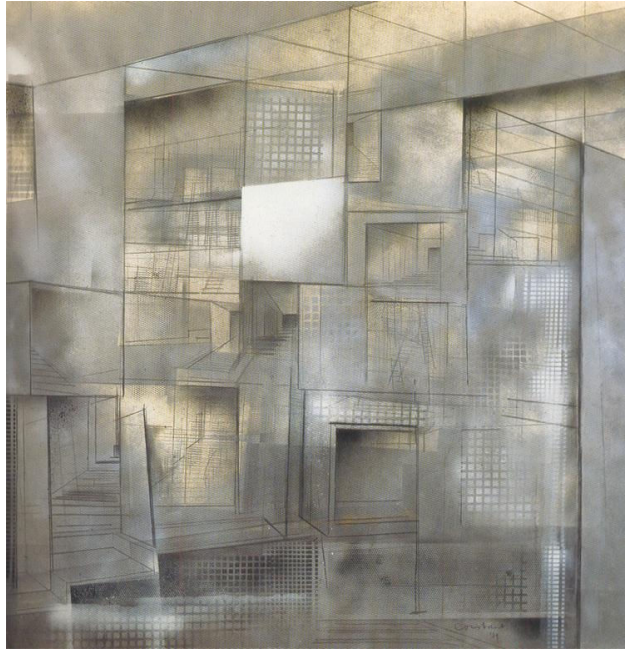


Figure 3.24: Painting by Nieuwenhuys, New Babylon Project, Activist Drawing, 1999



Figure 3.25: Homo Ludens, 1965-1966, Pencil on paper, 133x133 cm, Gemeentemuseum, The Hague (McDonough, 1999)

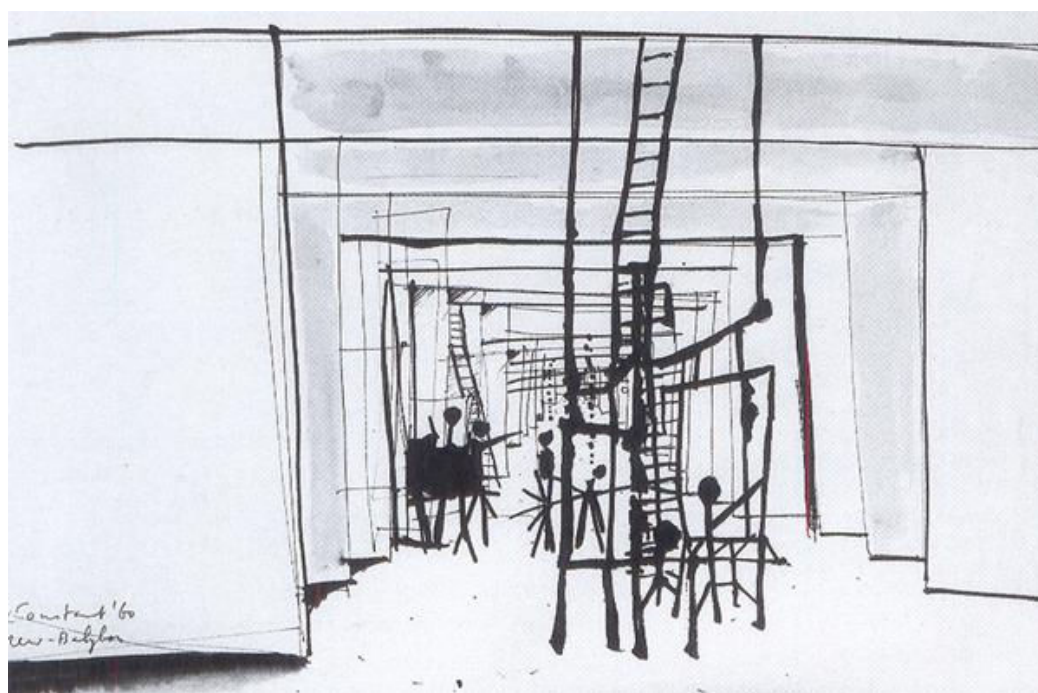


Figure 3.26: New Babylon Interior, 1960, Ink on paper, 32x46 cm, private collection (McDonough, 1999)

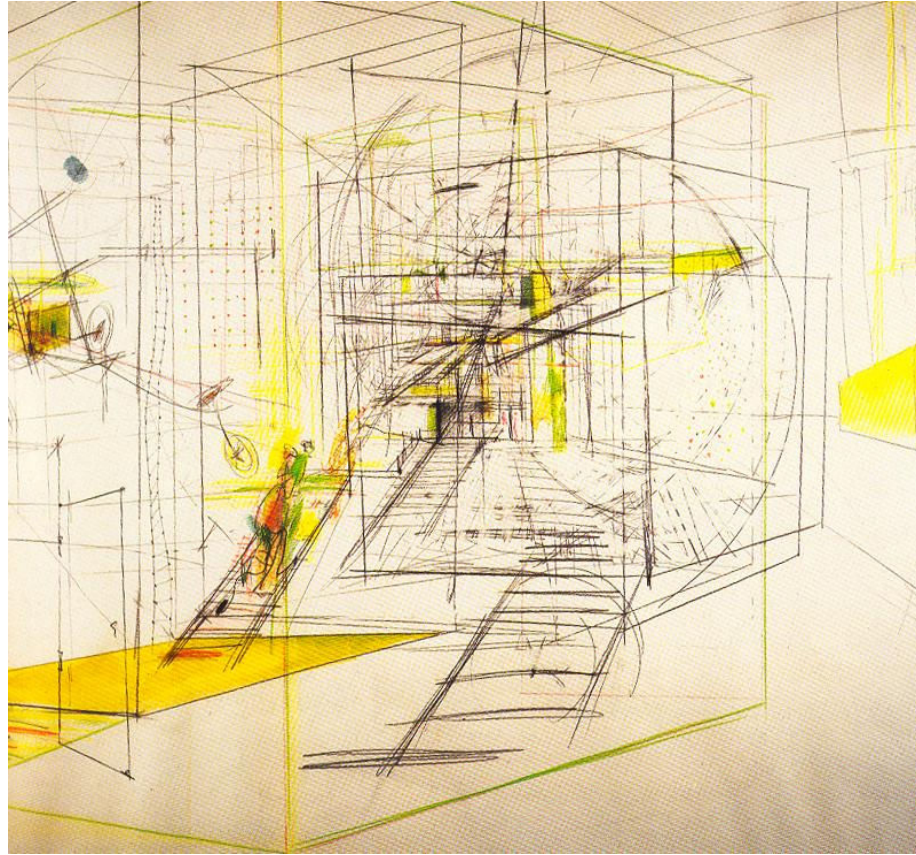


Figure 3.27: Sketch by Nieuwenhuys, New Babylon Project, Activist Drawing, 1999

As a technique of drawing, Nieuwenhuys encounters the nature of the project itself for what he is trying to represent is this very character. For this reason the drawings of New Babylon slide from being ‘mechanical’ to being ‘expressive’ (Wigley, 1999). The power of convincing (it may be thought that it is necessary for an utopian) comes from this representation effect that is intrinsic in these drawings, as they are filled with sensations. Nieuwenhuys’ representations provide the sense of the limitless possibilities inherent in the New Babylon. These representations involve drawings that ‘look like’ architectural plans, sections, models; they are neither exactly perspectives, nor sketches or massing models: They are rather ‘diagrams’. They are depictions, whether drawn or modeled, that look precise and at the same time imprecise, that look like tectonics but harbor no tectonics (Vidler, 1999).

Just like in Hadid’s work, they include the data that are ready to transform, which is in between abstract and figural. Diagrams that are involved in creative process of New Babylon project are in the role of abstract machines, which provide situations morphologically pregnant to newer formations, by providing the convincing effect, of the potentialities of what may happen in future. Nieuwenhuys’ work can be defined as diagrams of utopia; not only for they involve the representation effect that may be evaluated as data that are in-between the ‘actual’ and the ‘virtual’, but also for they are the outcome of an act of expressivity and tools providing sensations.

3.3. Diagram and Nature in the Context of Creative Process

As explained previously, the productive character of diagram as an intermediary tool and in a metaphoric role of a machine results in a process that is always open to new formations and state of possibilities. These properties of diagram, involving the term ‘abstract machine’, refers to almost ‘automatic’ series, which can be taken in matter in the context of Deleuzean post-structural approach to creative process. According to the approach to creative process at issue - which points out a system, whose members are called ‘becomings’ that are formed by themselves through transformative processes, dynamically interconnecting in a network, affecting each other - the idea of diagram as an ‘automated machining tool’ in the context of creative process that is self organized, should also be taken in matter.

Self organized creative process can be explained as a potential situation, in which creativity is intrinsically supplied and sustained being self-accorded with a little or no outside intervention. A system which is self accorded brings out a situation of balance through affordance relationships between its members and supplies formations – or ‘becomings’ in Deleuzean terms - that involves topological transformations; which can be explained as seamless re-integrations and metamorphosis that produces new structures. A creative process that harbors such properties would be at a highly productive state of endless possibilities.

There are experimental studies in which, diagrams, in the context of being a machine that supplies and sustains a productive state, have been used as intermediary mediums for structural design processes which involve imitations of self-organized creative processes. Similarly to their role in modern paintings, diagrams - in which they had been a preparatory work that is intrinsic to the creative process of an authorial subject - have also been used as intermediary tools and in the role of productive medium integrated to the experimental studies of architectural design that involve properties of a machining productivity and notions of self generation. Besides having an active role on design process, they have been formed through the self generative dynamics of these periods. Accordingly it can be said that diagrams,

as products of the self-generation process itself, have also been active tools affecting and orienting it (Spuybroek, 2004a).

In order to concretize the conceptual notions of creativity, which involve self organization and machining processes, it is believed that an evaluation, made by referring to relationships of creative processes that involve notions of diagram and nature, would be helpful. Since, 'Nature' may be one of the clearest examples of a system that involves creative process that is capable of self generation; in which only basically new structures have emerged, but also new orders of structures are always emerging (Bohm, 2004). The notions that involve relations between diagram and Nature in the context of creative process can be taken into consideration in a twofold approach:

1. Through the examples of visual tools that are used as diagrams to describe things that inspired Nature and referred to naturally formed elements of it, aiming to form both descriptive and generative mediums. It is to be noted that, these references only involve diagrams that are formed aridly in formalist and metaphorical manners.
2. Through an evaluation of diagrammatic process and Nature in context of the comparative relationships. On the contrary to the first fold of approach, this takes the notion of diagram in hand in a deeper sense by referring to the conceptual dynamics of creative process in Nature. These references will also be concretized through examples of architectural design processes that aim to form new structures, which involve artificially created environments of self-organized creative processes through the use of diagram as an intermediary tool.

Diagrams, in the context of involvement of elements of Nature, were widely used by architects as visual tools in a descriptive way, especially by urban designers. They were used to describe urban phenomena and design proposals in the form of metaphorical schemas. For example, Constantinos Apostolou Doxiadis, Greek architect and town planner of world wide influence and significance, had used diagrams of his own drawings referring to Natural elements metaphorically (Figures 3.28, 3.29 and 3.30). In his drawings he has described Entopia that should be provided for small human communities with large cities preventing the isolation of them, with diagrams referring to dynamic city with static cells; and compared the latter, to these human communities, which can be taken as a metaphor of a

machining process, with natural formation of free and ready to transform cells which are in correlation with each other formed properly into shells fitting human needs. This can be taken as a metaphor of a skin of Earth- referring to a naturally formed layer, which is formed of organic cells (Doxiadis, 1966).

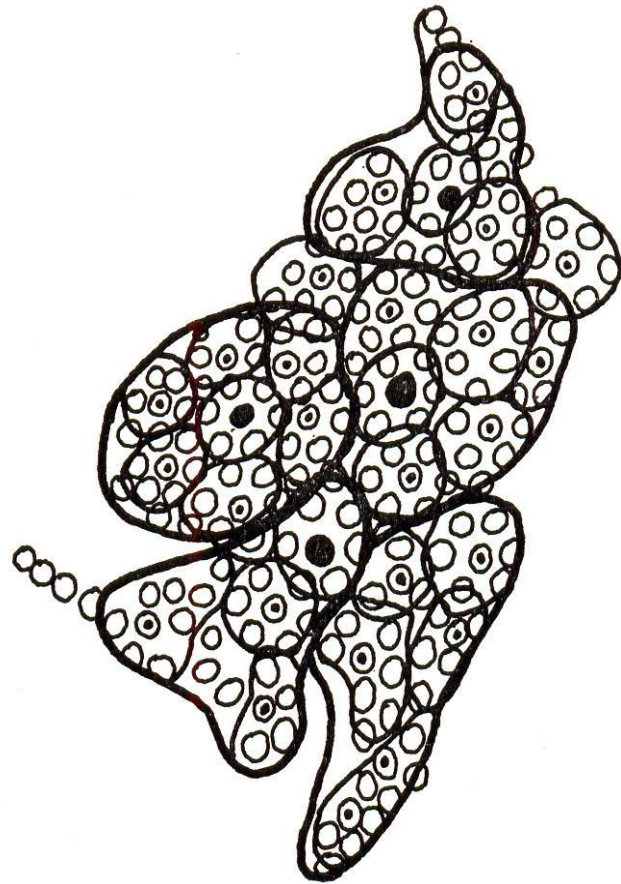


Figure 3.28: Dynamic city with static cells, hand drawing, Constantinos A. Doxiadis (Doxiadis, 1966)

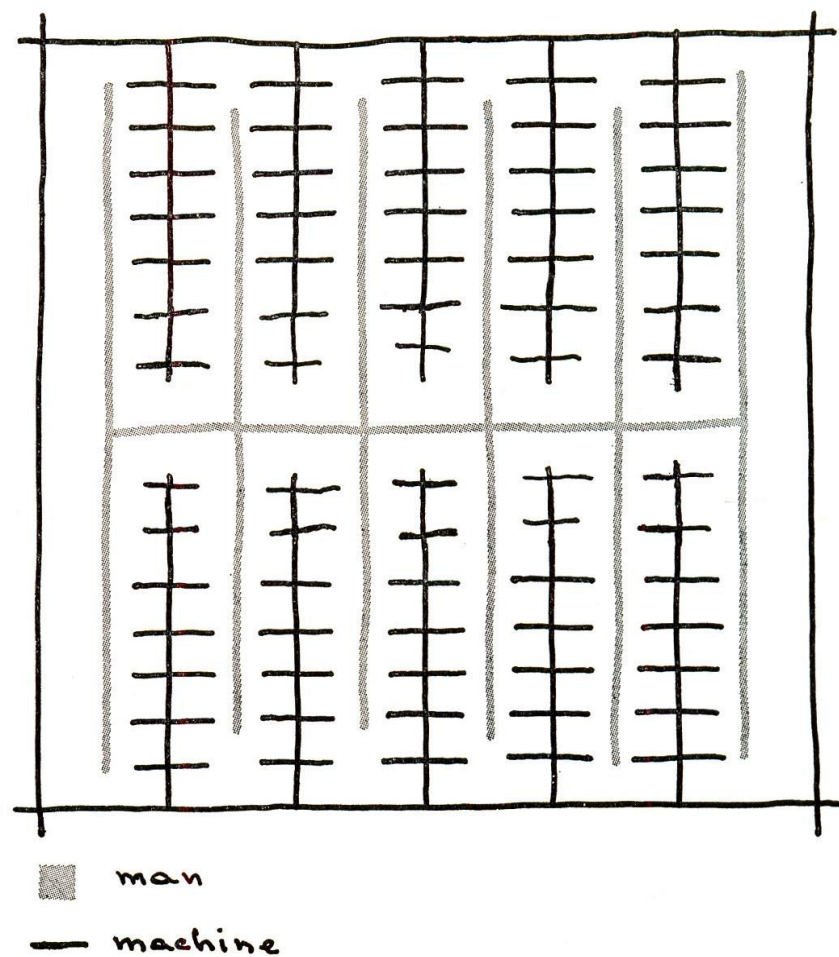


Figure 3.29: Human community and machine, hand drawing, Constantinos A. Doxiadis (Doxiadis, 1966)

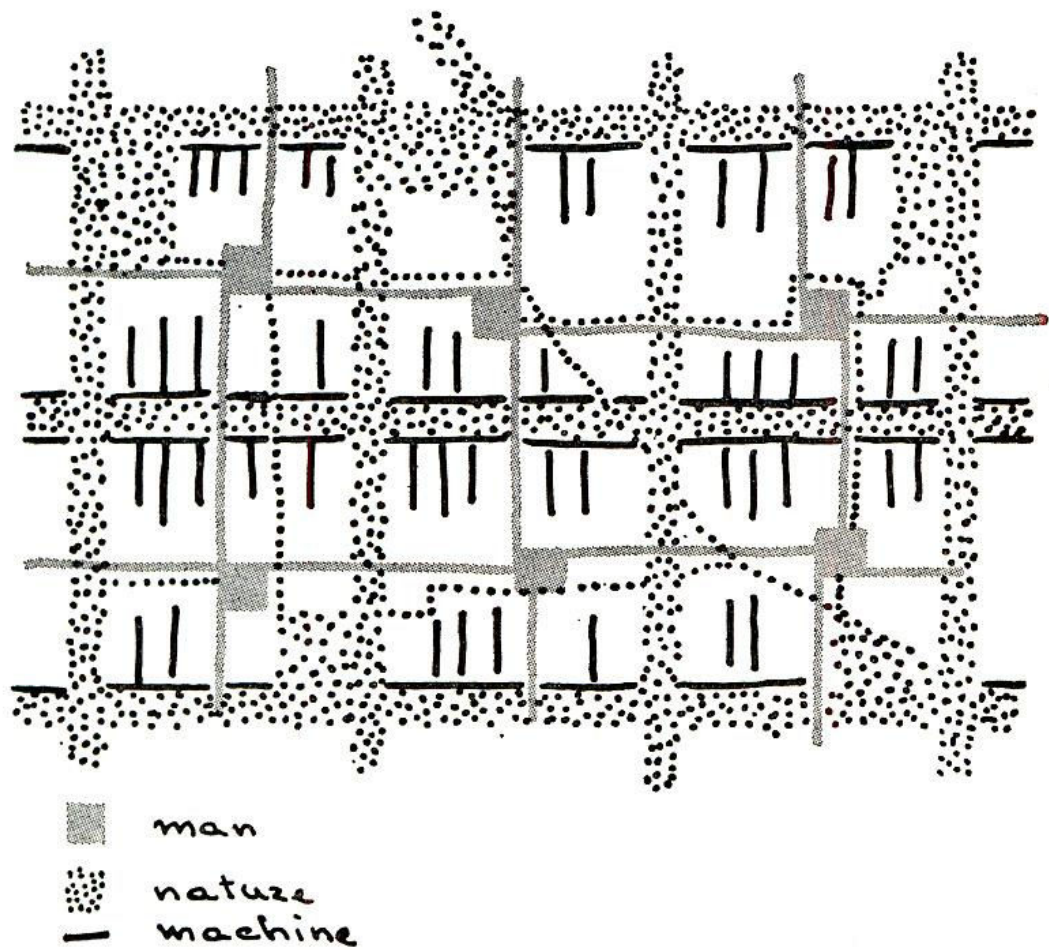


Figure 3.30: Skin of the Earth, hand drawing, Constantinos A. Doxiadis (Doxiadis, 1966)

A form that totally belongs to Nature, a bee hive for example, was used as a primary idea and diagram by Moshe Safdie to form his Habitat Projects; as his first studies included the idea of a multi-cellular structure referring to the form of the bee hive which later in the project were transformed to its latest form when the Canadian version was built, where this polygonal shape remained metaphorical. The latest ideas of the formation of hybrid structures involve imitations of living organisms - for example the cladding of a building that can be thought as skin and its structure which is in organic form thought as skeleton generically- involves inspiration of Nature's elements. More importantly, there are examples in which these notions of hybridization of buildings and seamless re-integration and re-formation of structural and architectural elements are described metaphorically by diagrams, in conceptual studies of architects. These notions are visualized diagrammatically, by referring to transformations in Nature that show evolutionary processes of human beings, which involve assimilation and hybridization of races (Figures 3.31 and 3.32) (Berkel, 1999).



Figure 3.31: Hybridization of races table, UN Studio (Berkel, 1999)

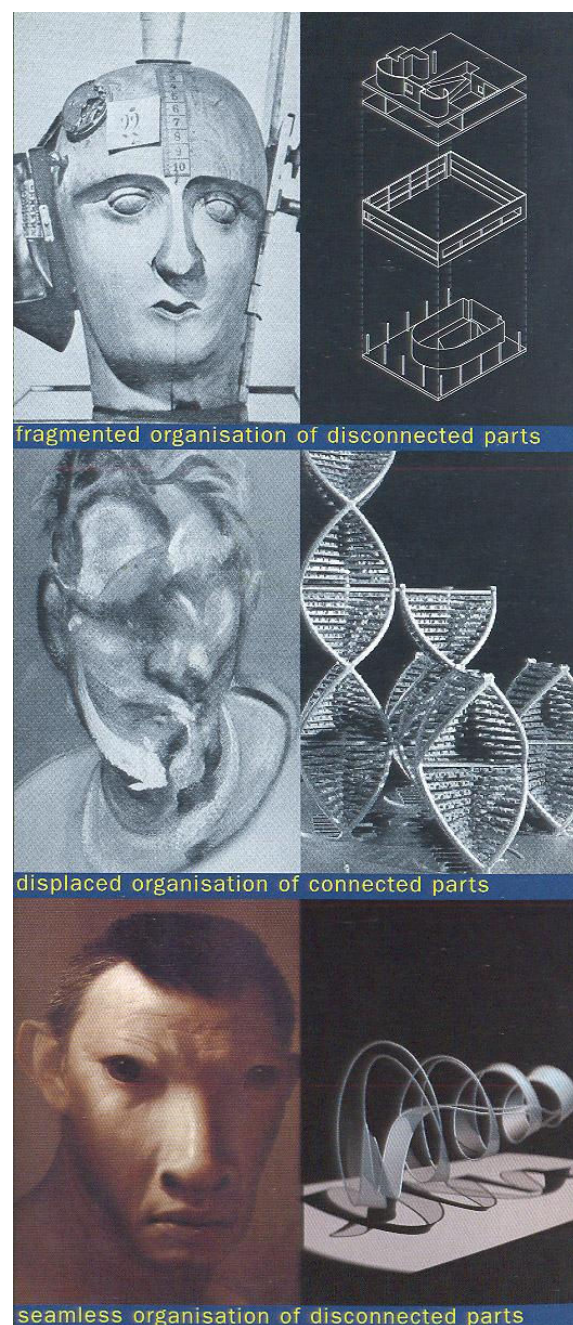


Figure 3.32: Comparison of architectural organizations of different characters, of different eras, through diagrammatic representations. 'Manimal' (imaginary hybridizing of man and lion) on the bottom, UN Studio (Berkel, 1999)

Referring to Nature in order to form diagram - only in a formalist and metaphorical manner - would bring out a narrow perspective to approach to design in the context of creative process. However, taking diagram in hand through deeper notions by referring to the dynamics of creative process in Nature would be a more accurate and profound way to approach to the matter in question. The creative process in Nature withholds formations of many possibilities in an open ended manner because of its character that is due to its structure formed of multiplicities. Just like in the design process that is due to diagrams- which provides the designer with a rich data of multiple choices and endless possibilities functioning as an abstract machine- Nature has its own way of machining process that is due to abstract dynamics (Benjamin, 2004). Through the generative character of these dynamics, everything becomes optimized and efficient in nature that involves a self organization; just like diagram being an abstract machine for creative process. The role of diagram provides an abstract data ready to transform stimulating creativity can be thought in correlation with the issues of the creative process in nature that involves transformations that take a long time; and can be explained with notions of evolution like morphogenetic process, and with dynamics of nature as an assemblage that is formed of singularities and multiplicities that provide a great deal of possibilities of becoming (Spuybroek, 2004a). In order to understand these notions in a deeper sense, some conceptual dynamics are to be scrutinized. The conceptual issues that involve potentials and dynamics of Nature, which trigger and shift the creative process, are singularities, multiplicities and accordingly the idea of Nature as an assemblage.

Singularity that means 'being single' is not the only meaning that the word refers to; the meaning of the notion in question is also related to the situation of being 'singular' as in being non-ordinary, remarkable, and unique. Singularity is the most basic and hardcore element of the creative process in Nature referring to a 'dynamic' that holds the potential of shaping and organizing the space around its extension. Singularity in mathematics can be explained with trajectories that are attracted and curved through the point of attraction. A variable that is adapted to the equation changes the closure of the curvature to the point that this variable refers to (De Landa, 2002). The variable works like a differential, representing a point or points in three dimensional worlds, encloses the curve which is formed by the equation to itself, re-forming the curve. The potential of singularities to shape and organize the

space around them can be understood through examples of mathematics. Claude-Paul Bruter from University of Paris, Department of Mathematics gives an example by making an analogy through geographic world that can be a guideline to understand mathematical notions in question:

“Mathematical examples of basic singularities arise from hydrodynamic and geographic analogies : rivers are analogous to trajectories, and singular trajectories which are reduced to points, are called sources, sinks, and saddle points. The meaning of the terms source and sink is clear : from a source, rivers or trajectories goes out, while they end their lives at a sink. A saddle point has both the properties of a source and the properties of a sink: the river or trajectory may be first directed to that point which acts as a sink, but then, approaching the saddle-point which acts now as a source, it is repelled towards another direction” (Bruter, C.-P., 2008)

The system works like a manifold, it is not as simple as those singularities getting together to form multiplicities; but, within a space of multiple points of attractions with multiple trajectories multiplicity is formed. These points of attractions are often called as topological singularities, where singularities are called ‘two dimensional manifolds’. The n dimensional curved surfaces that are formed by multiple trajectories and multiple points of attractions are called manifolds or multiplicities. Manuel De Landa supplies that:

“...the structure of this n dimensional space of possibilities is the universal singularities, and all the multiplicities and singularities form the virtual, plane of immanent, this is a conception of spiritual, a spiritual world that is impersonal” (De Landa, 2007)

Singularity can also mean a singular state of high stability. Its character can be sensed through the extraordinary values of its parameters that insure fixity (Bruter, C.-P., 2008). As it was scrutinized before, singularity has the dynamic that holds the potential of shaping and organizing the space around its extension- this is through this intrinsic self accord situation of being stable and keeping. For example a leader of a tribe is selected, or has become a leader ‘by force’ - through the dynamics of being tougher, wiser or being descendent of a royal blood. These dynamics are his intrinsic potentials of becoming that work like a point of attraction, where his destiny would be a curve that is attracted through this point which would be a path to leadership, giving him a higher, stronger and stable (stability is a dependent to time situation that is valid only at a certain time- that through time that may be lost) position and the power to rule -as this position ‘is a situation of a singularity’ for

him- both for being singular as in meaning single, and for being unique, non-ordinary, remarkable and being in a state of higher (relatively) stability. This example can be applied to any 'becoming' in Nature; animals living together also have their leaders which have come through similar processes that can be examples to the intrinsic potentials and dynamics of creative process.

The leadership example is only one of the nearly infinite creative processes -or becoming in Deleuzian terms- in Nature; every formation in it goes through similar processes. All the transformations, forms, mutations and evolution depend on the dynamics that are related to the processes in question. Delanda supplies with an example of a naturally formed shape of a soap bubble that may help to comprehend the notions better with a different perspective of singularity as an element of creative process in Nature: Like many physical structures, soap bubble forms its component to meet certain energy requirements. For the soap bubble it is indispensable that it has to keep its surface tension to minimum to keep its existence by taking the best form as a 'sphere' to keep the tension equal through its surface, and adjusting the size of the diameter to keep its surface tension minimum a singularity is achieved (Delanda, 2002). The point of attraction is the center of the bubble where the tension is zero; the trajectory is its liquid density, they are the main affecters making it take its form at certain size under certain circumstances. It is singularity that defines multiplicity through the genesis of a physical form.

Even a soap bubble has its own potential of becoming, for singularity is its main engine referring to a machining process of self organizing and formation, though it may be a smallest example to the formations within nature, which can be called as an assemblage of infinite singularities 'co-existing' and 'affecting' each other to form multiplicities. Deleuze had mentioned the term singularity and the notion of repetition in his several works; in his terms, if the universe is composed of singularities, then production, or in this case creativity, can only take the form of repetition. In production or creative process, each singularity can only express its own difference, its distance or proximity from everything else. Production, on this Deleuzian view, is the repetition of difference of each singularity from everything else (Surin, 2005). The creative process, or again in Deleuzian terms, 'the process of becoming', refers to a transformation from one identity representing a singularity to another and attends instead to what Deleuze and Guattari call 'multiplicities' which

are composed of heterogeneous singularities in dynamic compositions (Sotirin, 2005). This definition refers to the notion called 'assemblage'.

Assemblage is a term that was put forward by Deleuze and Guattari which deals with structure, organization and change. The term in French is 'agencement' which can be translated as 'putting together', 'arrangement', 'laying out', 'layout' or 'fitting'. It is important that this term does not refer to a static meaning; which is not simply as in arranging or organizing but the process of arranging, organizing and fitting together. It is to be noted that assemblage is not a set of predetermined parts that are to be put together in a predetermined phase, or not a simple collection of things (Wise, 2005). At this point the term assemblage has to be defined through a comparison to a close meaning word 'montage': Montage is to add numerous things together straightly; assemblage however is slightly different that it is things getting together in the line of adaptation and formation. For example if a wooden shelf is connected to the wall with a screwdriver, that is simply montage. If the relationships are thought in the same way, but more complex, to wear a hat is also a montage, but the hair that comes out of one's head through his skin is an adaptation as a part of a morphogenetic process that is a new formation, therefore is an assemblage. As it can be understood, nature is an assemblage, in which every element is in such an affection with each other intensifying the creative process, causing the emergence of new materials, life and new species, and igniting mutations, variations and modifications that are the hardcore elements of the evolution.

The creative process in Nature is an outcome of a self accord and organized state that is due to the dynamics that are explained above. Singularities coming together and forming a heterogonous assemblage, which can be explained with multiplicities, providing a creative process supplies a world of 'becomings' of endless possibilities, maintaining an open ended situation for creativity which refers to a machining process of topological transformations in order of 'finding form'. Thus these properties of the creative process in Nature link it with diagrammatic process in design; for the reasons of similarities of its character with diagrammatic process being generative and pregnant to new formations. Artists, designers and especially architects have always been inspired by Nature and its creative process in search for new design methods involving diagrams.

As it was mentioned earlier, there are experimental studies in which, diagrams, in the context of being a machine that supplies and sustains a productive state, have been used as intermediary mediums for structural design processes which involve imitations of self-organized creative processes. It has to be noted that, diagrams, prior to having been a tool for design in this manner, have also been a product of the self-generation procedures themselves, through the creative process. Diagrammatic methods of finding form in architectural design process referring to elements and dynamics of Nature that was studied by Frei Otto and his team in the early 1990's at the Institute of Lightweight Structures is called 'Optimized Path Systems'. It is a research which involves experiments of materials to form structures. Formations of diagrams through the processes of experiments on various materials involve numerous interactions of materials in a certain time span that refer to self-generating processes, which Otto calls, 'finds (a) form' (Figure 3.33). Instead of a digital computing technique, these experiments involve in an analogue computing process. Although it is an analogue process, it has a slight difference from the classical analogue process movement contained in gears pistons, slots or liquids contained in rigid containers. In Otto's machinery process there is a wide range of mixture of liquids and solids that are in interaction with each other inside a container, forming new liquid or solid materials that stimulate the process of the formation of new geometries. The formation of those geometries are through the interactions which are based on complex material behavior of elasticity and variability which involves sand, balloons, paper, soap film (which was involved in the design process of minimal surfaces of Munich Olympia Stadium), soap bubbles, glue, varnish and wool threads. (Spuybroek, 2004b) Through various interactions these materials generate ideal forms by themselves, in a self accorded state. This model may be viewed as a small imitation of creative process in nature. The different photo captures taken in different times throughout the development of transformation period form the preparatory work that would be a base for design process. Like in the manner of forming diagrams in modern picture as a preparatory work, the self generating process produces the diagrams of ideal forms, as intermediary tools for design and a base study. Diagrams formed through self generating technique later become tools for transformation process of this abstract data to concretized structural design.

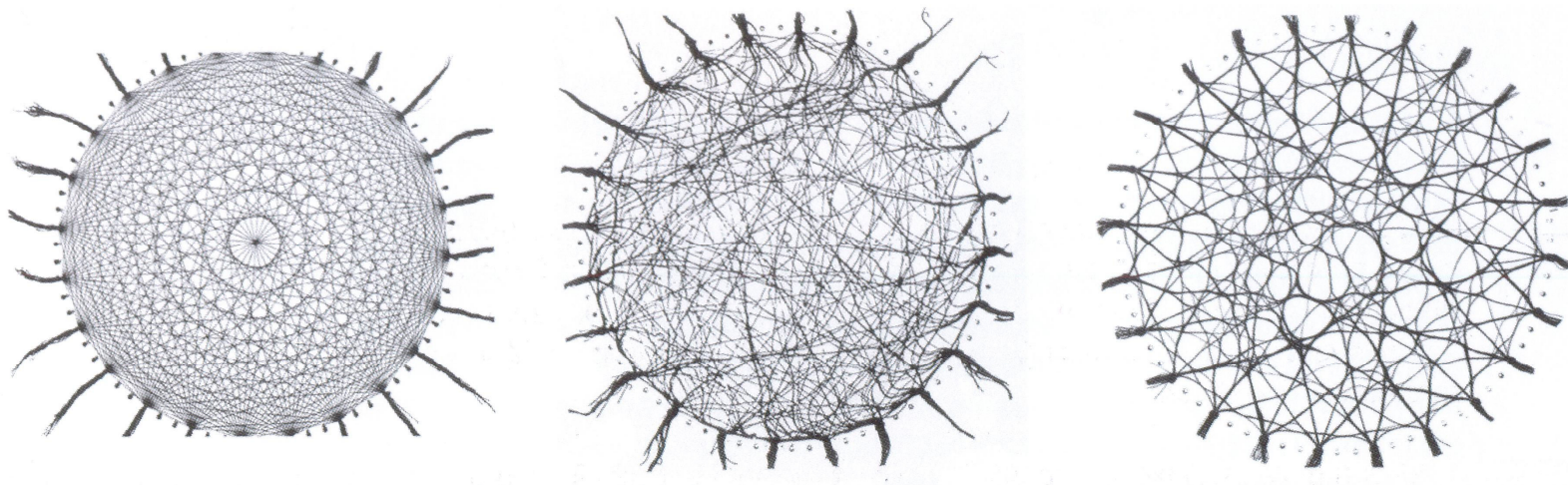


Figure 3.33: Diagrams of ‘Finding Form’, Frei Otto and Bodo Rasch, 1995
(Spuybroek, 2004b)

Lars Spuybroek and his team have brought Otto’s experiments a further step. The diagrams that were developed through transformative processes of materials involved in Otto’s experiments were constrained to two dimensions only and could not provide enough information of spatial renders, therefore Spuybroek and his team mixed the porosity on the plan level with the vertical elevation remaking Otto’s experiments in their office in order to form a three dimensional system and worked with thin rubber tubes and wet lacquer (Figures 3.34 and 3.35). The diagrammatic methods in question are not intended to produce a final design but they are more a structural and formal expression of a ‘meta-programme’ which has the necessity ratio of open spaces and spongy spaces, a scale and organization of the sub-spaces; but Spuybroek especially points out that diagrams always need to have potential and room for development within a clear sense of direction, which point out the properties of diagrammatic process which is open to newer formations of rich possibilities. Thus they have digitalized these analog models carefully filling them with deformable volumes that finalize the nesting process (Figure 3.36), in the end extremities of the models are rearranged to fit typologies that are more generic (Figure 3.37). It is to be noted that reworking with a diagram similar to this case is never direct (even a digitalized model has abstract qualities). Finally, through a plan that was formed in the end of this generative process, that can be thought as more than an X-ray, of which the spatial continuity as in a topological transformation process of generic spaces at both ends of design, can be obtained. (Spuybroek, 2004a)

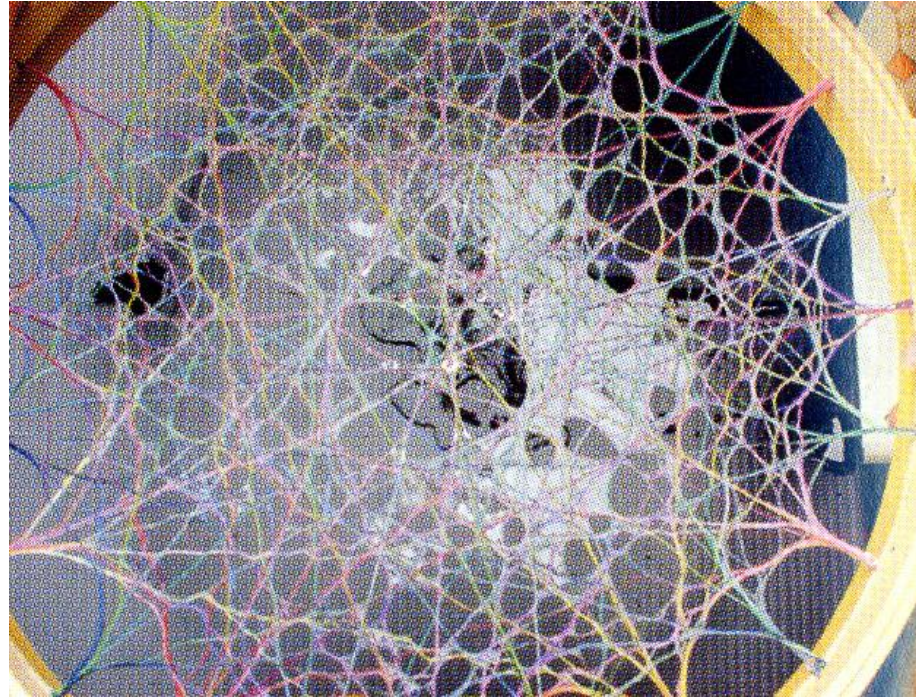


Figure 3.34: Spuybroek and his team's experiments on finding form (Spuybroek, 2004a)



Figure 3.35: Spuybroek and his team's experiments on finding form (Spuybroek, 2004a)

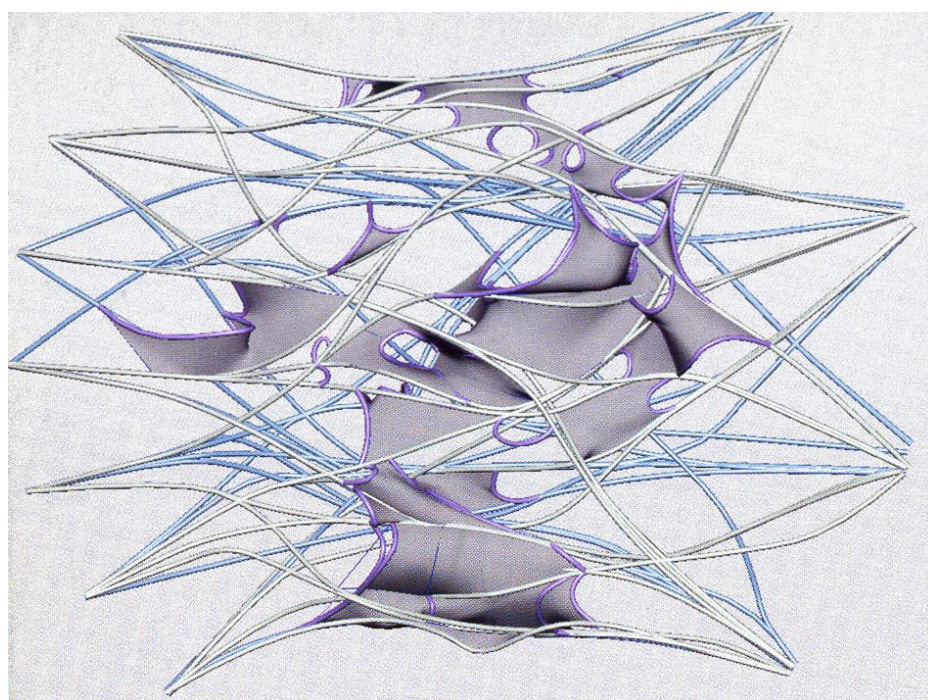


Figure 3.36: Digitalization of analog models, filling with deformable volumes to finalize the nesting process (Spuybroek, 2004a)

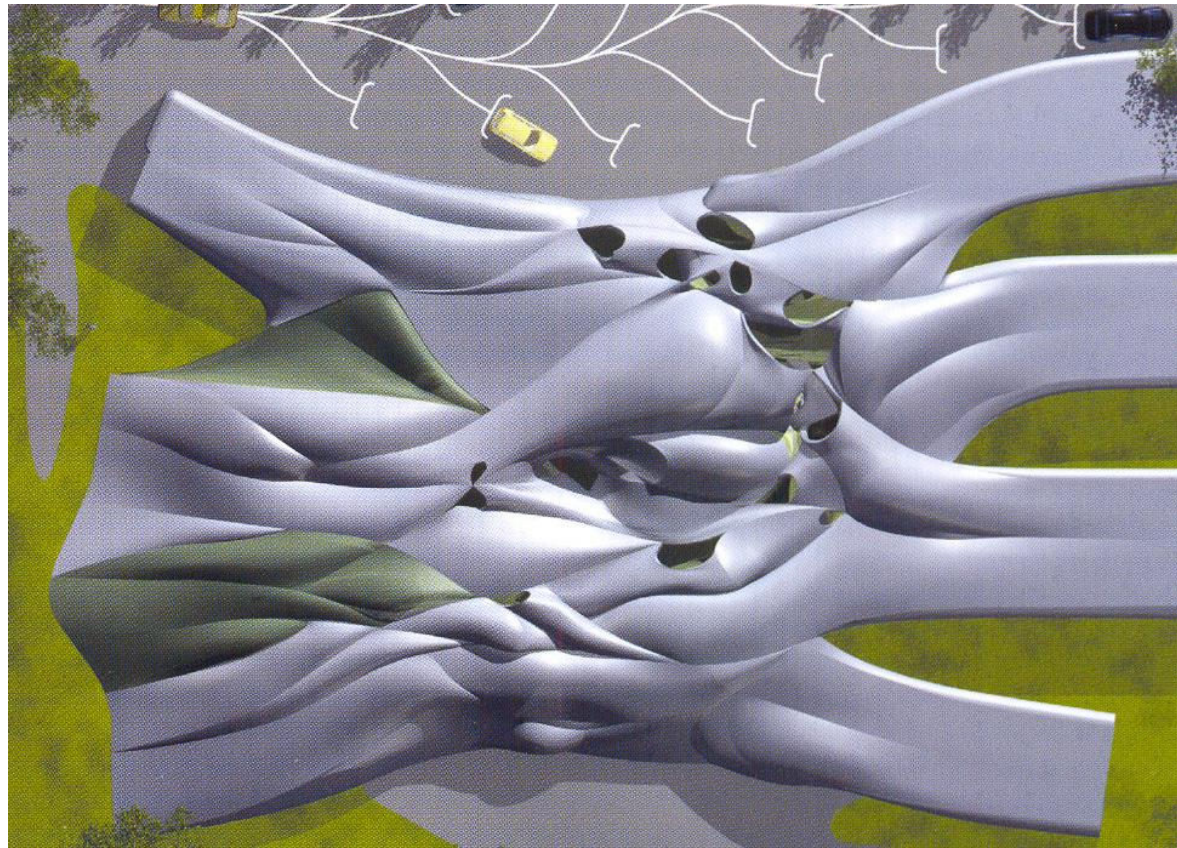


Figure 3.37: Rearranging the models extremities to fit typologies that are more generic (Spuybroek, 2004a)

When Spuybroek have met Otto in 1998, he was surprised by his approach to the design of light structures correlating with his own interest in the generation of complex and dynamic curvatures. This interesting encounter between two designers points attention to the time before 1960's which is the date of the early formations of the Deleuzean ontology and thoughts on creative process (Mertins 2004). In Mertins' words:

"The recent re-engagement of architecture with generative models form nature, science and technology is itself part of a longer history of architects engineers and theorists pursuing autopoiesis, or self-generation. While its procedures and forms have varied, self-generation has been a consistent goal in architecture for over a century, set against the perpetuation of predetermined forms and norms" (Mertins, 2004)

Accordingly, it can be understood that, self generation techniques in design in order to find form through experiments involving productive techniques that supply and use generative diagrams, may be related to creative processes in Nature and diagrammatic process as a machining tool. It is also to be noted that the dynamics of the design processes in issue, which involve self organization and topological transformations, are in correlation with the dynamics of creative process in Nature which consists of the notions of assemblage formed of singularities interacting with each other, maintaining an environment that stimulates new formations at all times.

4. CONCLUSION: THE POTENTIALITIES OF DIAGRAM FOR ARCHITECTURAL DESIGN PROCESS

In this thesis, the notion of diagram has been taken in hand by referring to definitions involving diagram as a visual tool and as a design tool. Furthermore, the notion in matter has been scrutinized in a deeper sense, in the context of the approach to creative process, which involves diagram as a dynamic tool. In this chapter, as it is the conclusion part, the potential of diagram for architectural design will be taken in hand, in relation to the definitions and the approach that has been issued previously.

Architectural design consists of a very complex process, for which the designer has to have the ability to assemble multi-layered information and be able to carry on multiple ‘projections’ simultaneously in a line of a sophisticated structure of conception and creativity. While involving in such an action, the architect, also has to create a product that has to be both functional and aesthetical; thus he has to manage both the technical aspects and the artistic features of the design in a holistic manner.

Despite the fact that, the architect is not alone in this procedure; taking place in such a complex process in a leading role, is not an easy task to carry on. Especially, as the technology advances, it gets more difficult to cope with design process; because, the emergence of new techniques to build and new ways to form structures cause new professions to emerge and the involvement of people in larger numbers of different expertises in the design process. Through that, both the quantity and the quality of design input rises. Thus, the architect has to direct the design process in a manner of a conductor of an orchestra, keeping the accord of the process in harmony.

In the context of the approach to creative process taken in matter in this thesis, architectural design process can be thought as a period, whose members are dynamically interconnected in a network affecting each other. The members that are involved in architectural design form a productive ‘assemblage’ of creative process.

The role of the architect is to direct and orient this process; as he accomplishes this role with the help of various tools. The tools that the architect uses involve both physical instruments and abstract mediums. Just like a musical composer and a conductor of an orchestra, where his piano, his hands and the stick would be the physical instruments, and the musical notes are the abstract mediums; the architect, uses both the physical instruments consisting of technological equipments, and the abstract mediums consisting of visual and generative tools.

The abstract mediums that the architect uses are not only for orientating and interacting with other people of different professions that take place in design process, but also for the interaction of his own professional colleagues, and most importantly for the communication of the architect with himself. As the sketch, schema and technical drawings are some of the examples of these abstract mediums, 'diagrams' may be one of the most important tools that have a very high potentiality for architectural design process.

The most basic potential of diagram for architectural design comes from its property of being a visual tool of information. As it was taken in hand in the second chapter, diagram is a visual tool of both quantitative and qualitative information. Informational data, especially those involve qualitative aspects, are very important for architectural design process. The potentiality of carrying such information makes diagram an indispensable tool for creative process in architectural design; because, the qualitative information is in for a both dynamic and abstractive informative role in design providing the creative data that is morphologically pregnant to new formations containing the traces of information on the potentialities of the creative process. Diagram as a visual tool, successfully transfers these data of information in a line of communication with both the architect himself and with other people. Accordingly, diagram becomes a tool that has potentials for architectural design, by providing data that can be applied into psychical design. These data, which are provided by diagrams, give rise to a highly productive creative process for architectural design.

Diagram as a visual tool of information, comes from the properties of being descriptive. However, diagram can also be generative. As it was scrutinized in the second chapter, in design process, descriptive diagram is in the role of a tool of analysis that contains information, where generative diagram functions as a tool that

virtualizes the invisible data of thoughts. Remembering the definitions from the second chapter; diagrams as descriptive tools describe existing entities and phenomena, where generative diagrams are used to generate structural spaces as a tool in architectural design. In a similar way diagram could be defined as an abstraction that emphasizes structural organization, patterns and relations of architectural elements; thus directing and orienting the creative process.

In relation to that, the potential of diagram that can be both descriptive and generative should be remembered from previous chapters. This potential of diagram may be thought as the reason for which it is a popular tool today, for it helps to visualize the invisible data of information such as culture, politics and some other abstract entities in descriptive and/or generative manner. Within the diagrammatic process, the informational data are converted to the measurable data that are useful for the 'synthesis' in architectural design process - in relation to the connection of theory and practice. Through diagrams, measurable data are visualized in a line of figuration, acquiring a different character from a code, a table or an equation; becoming completely readable and convertible, which supply a base for design process. By this way, diagram becomes not only a visual tool, but also an active and effective design tool for architecture.

According to the notions that have been taken in matter in the third chapter, it can be said that diagram is not merely a visual tool or a design tool basically; but it is also an intermediary tool that can not be seen barely as a preparatory sketch or a schema. As it has been scrutinized largely on the third chapter, diagram is in the key role of a transferor. In creative process, diagram, transfers the expressive data to the authorial subject and supplies the production of sensation through the virtualization of the actual data. The actual data takes in place in authorial subject's mind, thus needs to be transferred to the artistic object, where this data would become virtual data; through this process, the receiving subject would perceive the artistic object through sensation. Similarly in architectural design process, the architect's mind is full of ideas of that needs to be transferred into the virtual world, prior to being concretized. Diagram functions as an intermediary tool for this process; both in a line of generative interaction with the architect himself – by supplying the data that is ready to be transformed and the multiple possibilities of design – and with outsiders, by putting them actively in design process. This brings on an assemblage of creative

process which is highly transformative, open to new formations and highly creative. Through these properties, diagram becomes a dynamic tool for creative process, providing a high potential of productivity and creativity in architectural design.

Consequently, diagrams take a machining role in creative process. As it has been taken in hand in the third chapter, diagram functions as an abstract machine for creative process by providing intensive creativity and endless possibilities. Diagram, like a machine, provides abstractions that maintain the situation of being pregnant to newer formations at all times. Remembering the examples from the third chapter, diagrams that have been used as an abstract machine for creative process in architectural design bring out a high potential for creativity. As a potentiality, the architect, as the creator of such diagrams, withholds so many options of possibilities and the ability to represent the thoughts in his mind in an expressive state; he both intensifies and sustains the creativity through the whole process and even makes the observer or the potential user to complete the unrevealed parts of that dream.

As an extension of the notions of machining creative process, diagrams, can also be taken in matter in the context of self generation. Diagrams have been used by architects not only as a tool of inspiration from Nature in context of the self generation - to concretize abstract notions of dynamics of creativity- but also have been used as intermediary mediums for structural design processes that involve small models of imitations of self-organized creative processes. Accordingly, diagrams withhold the potential, by going one step further from being abstract machines that supply and sustain a productive state in design, as being mediums for the production of naturally forming structures- in the context of an idealist approach in architecture that aims to achieve nearly a perfect design; in which - in Kant's view- that can only be found in Nature.

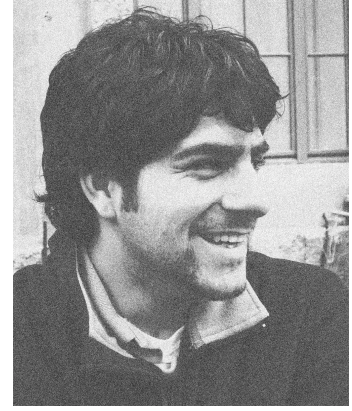
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