



## Research Paper

# Typology of Pattern Spatial Organization to Finding DNA as Identity in Architecture

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| ARTICLE INFO  | ABSTRACT   |
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| <p><b>Received:</b> 15 June 2022<br/><b>Reviewed:</b> 08 July 2022<br/><b>Revised:</b> 28 July 2022<br/><b>Accepted:</b> 09 August 2022</p> | <p>An understanding of the repetition of patterns was carried out by Linnaeus as a taxonomist in 1700a by classifying the shape of flowers in plants while Durand categorized buildings according to their function. Then, Aldo Rossi suggests a typology approach for focusing on the similarities, on the universal and enduring such as the permanent character of cities and buildings. the theory of typology could aid understanding of architecture and a city within its historical and socio-cultural context. Identity search is one of the important goals for the future for a good environment. DNA was the identity of every organism. DNA research has developed in various sciences including biology, archeology, forensic science, political science, social science, psychology, geography, environmental science, sports science, and culture. This genetic science appeared in various sciences, as well as developed in the field of architecture. This study used a qualitative method to discuss how repetition and classifying to finding DNA as identity in architecture. the identity of architecture has DNA that was always passed down from one generation to another.</p> |
| <p><b>Keywords:</b><br/><i>Typology, DNA, Architecture, Identity.</i></p>   |  |

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## 1. Introduction

The Neo-Rationalist approach received more influence from Aldo Rossi. For the research of type, Rossi suggests focusing on the similarities, on the universal and enduring such as permanent, character of cities through comparative study of urban form, using a typological-morphological approach and suggests the analytical moment of architecture. Rossi promoted traditional building types and emphasized the significance of examining historic cities for architecture. Considering “city itself as an artifact,” using a typological-morphological approach. the theory of typology could aid our understanding of architecture within its historical and socio-cultural context (Güney, 2007). Architecture should achieve formal autonomy, to gain identity, in order to meaningfully relate and to convey meaning. By establishing a unique, separate identity, each form could be read more easily in opposition to another (Rossi, 1982). Identity search is one of the important goals for the future for a good environment. Cities and regions face huge challenges as a consequence of globalization. Contemporary architects is to take old and present culture into consideration, and to find out practical approaches to revive tradition (Ibrahim, 2016) In modern conditions, preservation of individual uniqueness and identity of environmental architecture is a must (Dyda, 2015).

The latest development of the Neo-Rationalist during the late twentieth century, through space syntax methodology borrows the concepts of ‘genotype’ and ‘phenotype’ from the discipline of biology and applies it to social sciences in general and architecture in particular (Hillier & Leaman, 1974). From the theory of genotypes and phenotypes in architecture that have been discovered before. Then an understanding of the connectedness of the theory was used in finding terms of DNA in architecture. The genetic mapping idea and human species roots tracing has become the most significant discovery at the Nobel Prize in the last century (Schwartz, 2017). The use of genetic algorithm themes often appears in international conferences. Now, this theme continues to develop into a tool in design. Moreover, an understanding of the relationship between genes and architecture has emerged when architecture was formed. As Vitruvius and Corbusier have stated before about the proportion of humans to forms in architecture. The use of the term biology in architecture has been used, for example the theory of Darwinian evolution (1859) through natural selection is also often used as a framework in design, both as an analogy of explanation and practice (Steadman, 2008).

The purpose of this research is to understand typology theory Aldo Rossi in expressing permanence and characteristics as identity and using that into analogy of the term DNA as identity to be used in architecture

## 2. Material and Method

- **Typology**

The term “typology” emerges around the mid-nineteenth century. According to De Mauro, the emergence of the term “typology” is influenced by the renewal of interest in abstract models during this time. The term was used to refer to the study of types; the comparative analysis and classification of structural or other characteristics into types (Jo, 2003). Peter Eisenmen defines the idea of type in introduction to architecture of the city (1982): “the new time of architecture is thus that of memory, which replaces history. The individual artifact for the first time is understood within the psychological construct of collective memory. Time as collective memory leads Rossi to his particular transformation of the idea of the time. With the introduction of memory into the object, the object comes to embody both an idea of itself and memory of a former self” (Rossi, 1982).

Typology becomes transcendent of form and allows memory to be carried throughout the history of architectural piece, connected rather to the events of the city. Plato describes the meaning of form between the abstract world of ideas and the sensible world of physical things (Jo, 2003). In architecture type is the product of the history, the spatial composition and the use of Building. Type is seen as an objective, logical principle. Recognizes historical process: type reacts dialectically with technique, function and style. As an

example, he cites the house with a loggia: the basic plan of organization has existed for centuries, but changes in social customs, construction techniques and family hierarchies have caused many variations in its actual design (Rossi, 1982).

In this sense, Rossi's interpretation of building is both a cultural and a historical. Type is the abstraction of memory to which will be referenced and type is an abstract principle concerning basic needs and beauty while specific forms depend on historical circumstances and social context. Rossi used type-forms to make a new kind of classification for interpretation, and to initiate design processes in the Teatro project and Modena cemetery (Belmahdi & Djemili, 2022). Type was operated through memory, individual and or collective, to transport meaning from the original context from which Rossi adopted the forms to the new site and situation. No type can be identified with a particular form, but all architectural forms can be referred to types (Mehrpooya et al., 2015).

Rossi (1982) argues that architecture is constructed with known primary and intelligible elements. Within an urban environment there are some primary elements (monuments) with the collective memory of the urban populace. He interprets monuments as the vehicles of public images, rituals and myths. This capacity of primary elements is contrasted with the general fabric of the city, including residential and commercial building places for everyday life which accommodate variable human activities over an extended period of time. Permanence and architectural forms through history and memory as follow: "When a project or form is not utopian or abstract but evolves from the specific problems of the city, it persists and expresses these problems both through its style and form as well as through its many deformations. These deformations and alterations are of limited importance precisely because architecture, or the fabbrica of the city. Constitutes an essentially collective artifact and derives from this its characteristic features"

One can still experience the form of the past in this monument and the physical form of the past has assumed different functions and has continued functions. The communicative value of type and exploiting tools to create new forms. He believed that a design should stem from the proper understanding of the problem at hand, and that the fact that a designer needs to rely on the type as inherited form, or mental picture of the final design is only a remedy (Colquhoun, 1983). Moreover he recognized that type, like language, fulfills a communicative and social role, linking tradition with present. Rossi believed that type can be transformed, creating a dialogue that can be saturated with meanings and cross references, and hence he thought about the memory of type from personal experience of place rather than the historical formal memory of type. Each typological element is effective in the way that multiple readings of form and function can be made by individual.

- **Identity**

Definition of identity according to the Cambridge Dictionary, identity is who a person is, or the qualities of a person or group that makes them different from others. Identity means dignity, in the Amid Persian dictionary. Identity means the reality of the object or people by bringing basic traits or characters. According to the meaning of the word, identity is character, basic nature, and is related to life (Mehrpooya et al., 2015). Identity is a differentiator between one individual and another so that each individual is unique. Even identity does not only talk about the individual but the relationship of the individual and his society, to find an identity requires sensitivity between the individual, the environment and the people who live in it. And identity is a form of purpose, values and beliefs to be achieved in giving direction, purpose and meaning to life (Heidari & Mirzaii, 2013). Research to find identity in architecture can be establishing formal autonomy in architecture through finding unique characters, separate identities, so that each form can be read more easily in opposition to the others.

- **DNA in various science**

The term DNA was first discovered in biology in 1944 by Avery, Mc Carty and MacLeod who discovered DNA and called it genetic material. Subsequently, in 1953 depictions of DNA structures were discovered by Watson, Crick, Wilkins and Franklin. Then developing in the application of DNA purely from developing biology in archeology, Grahame Clark introduced the term 'Bio-Archeology' in 1972. In archeology, developing biomolecular science studying biology and chemistry, this science is used by archeologists biomolecular, DNA is important in biomolecular archeology because it contains records of individual offspring. In 1986, for the first time DNA was used in Forensic science by Jeffreys et al. (1985). In fact, the findings were further developed by The Human Genome Project, as a result, the project announced a sequence of human genome references in April 2003. Information from the human genome project could benefit medical science as well as testing human identity on forensic science in helping to understand human genetics (Butler, 2005). Furthermore, DNA also has an important role in social science. Individual differences can be based on biological basis that influences social behavior (Eysenck, 1983). In psychology, Rossi (2002) was the first person to publish a proposal for the creation of a new discipline called the psychosocial genome. The psychosocial genome is used to explore how psychological events and social gatherings of everyday life can activate activities that depend on gene expression and neurogenesis in ways that optimize the performance of human health and well-being. DNA is used by the body in biological activities and emotional states (Hill, 2012). In sports science, DNA also has an important role. Magnesium needed in metabolic processes such as ATP synthesis and DNA and magnesium processing affects bone growth which affects athletic performance (Hyde & Gengenbach, 2007). DNA also appear in political science, DNA is a gene that forms beliefs, values, and even voices in opinion. Genes also affect how often someone chooses, this is based on the hormone serotonin or the hormone comfort and calm (Wilson, 2010). In geography, the genes and the environment affect the body's behavior and physical well-being. Adaptation to the environment is a form of cultural practice, in meeting the needs of clothing, food, and shelter. The geographic influences include climate, altitude, UV exposure, chemical toxins and pathogens (viral diseases) (Creanza & Feldman, 2016; Juang et al., 2022). In environmental science, the emergence of epigenetics science, namely the study of changes in gene expression caused by mechanisms other than changes in DNA sequence codes. Environmental changes can have an effect on the genome in the form of changes in phenotype and genetic expression (Royle, 2016).

In the cultural sciences, the term DNA was introduced in cultural DNA through the analogy from biology to culture using the analogy of genes in genetics (Hyun & Lee, 2017). An evolutionary biologist introduces the term meme as a unit that carries cultural information copied from person to person by imitation (Dawkins & Davis, 2017). The term meme has been used in fields such as the theory of evolution, religion or myth and has been explained for concurrency. For example, cultural DNA containing genetic information needed for cultural production in instilling knowledge, beliefs, arts, morals, laws, customs and every other ability and habit that humans obtain as members of society (Hyun & Lee, 2017).

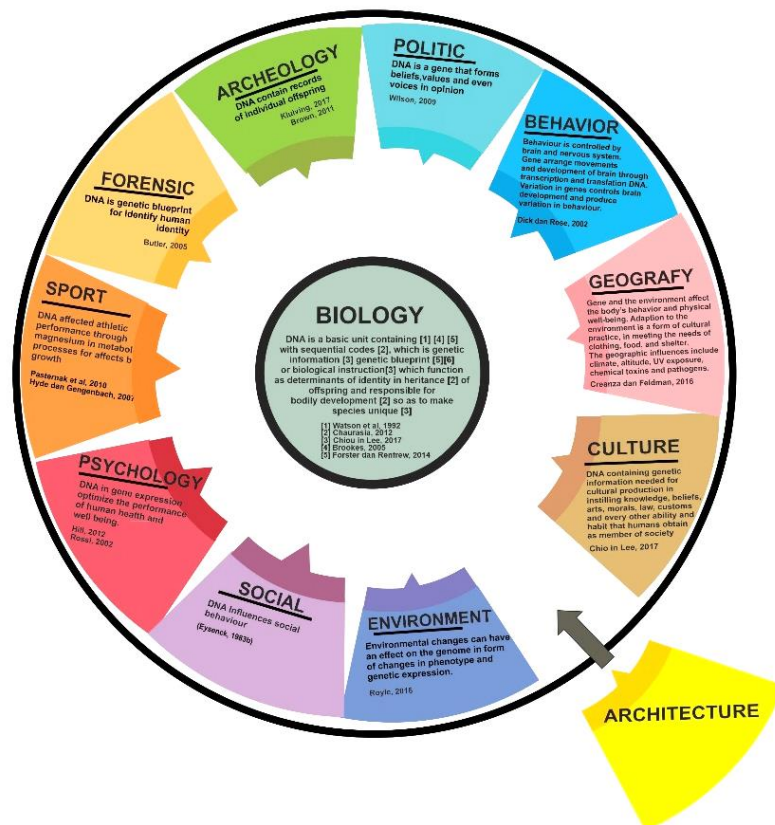


Fig. 1. DNA Research in Various Science

Generally, in various science used the term of DNA to defining an identity. This research used Qualitative study. Qualitative study applied in this study to confirm and further describe how a study of DNA are developed from academic literature and examples in practice for connecting the typology of Rossi and DNA in architecture.

One example of an identity that mentions the term DNA in architecture. Traditional dwellings in Korea has been developed into a modern dwelling in the form of multi-store buildings. It was found that the modern house still maintains the old features through different floor levels. The floor level limits the boundary between the inner and outer environment. The house is more than just a functional object because the house is a means that carries cultural values and beliefs that are transmitted from generation to generation. In that sample of research appear the term DNA of house, and called it “hidden dimension” to reveal the hidden value in the physical occupancy (Seo, 2012). Another research on traditional houses and modern apartments but in a different location, Malaysia, it was revealed that to find genotype elements that survived the old culture can be found through floor plans that can be changed through graphical representation and analyzed to filter out spatial elements that are most common in it. Through this interpretation of similarities, the special nature of culture from the past can be revealed. The term DNA is used to express something that is always passed down from the old generation to the new generation (Seo, 2017). In addition to research on a regional scale. Traditional Chinese private gardens have unique cultural significance for architectural heritage, then a computational approach was taken to uncover the DNA of cultural heritage by applying the spatial characteristics of traditional Chinese private garden through mathematical measurements and parametric designs (Gu et al., 2017).

Then research on a city scale. The DNA term and origin of ideas that have produced urban forms in France today and future planning through morphological analysis of urban forms in France from 1960 to 2020 (Treuttel, 2017). Another example the research was carried out in traditional houses to find DNA or architectural styles of the city by testing the suitability of archetypes in traditional buildings in Ghana (Tengan, 2014). Based on some research reviews in architecture science, it can be summarized research and publications that use the term DNA in various scales both in urban scale, settlement scale and housing scale in architecture science, namely:

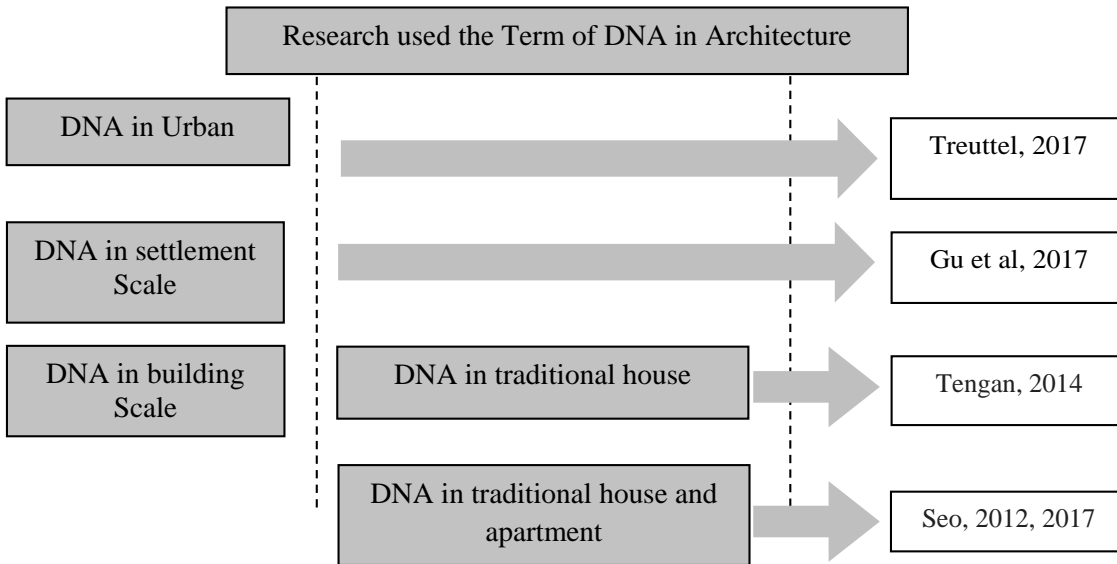


Fig. 2. DNA Research in Architectural Science

### 3. Discussion

- **Type and Memory as an instrument**

In architecture and city, Rossi employed memory as a valuable means, a starting point for creating architectonic structure rich with meaning and rich with potential which exploits thinking, reading and responding. The validity of Rossi today, is about the use of type and memory as an instrument for operating in architecture and city. His ability to modify the context and the system that the built environment reflects, is revealed in his projects and writings and his autonomous architecture, in addition, is expressed in the development of a typology of relationships between architecture and city (Jo, 2003).

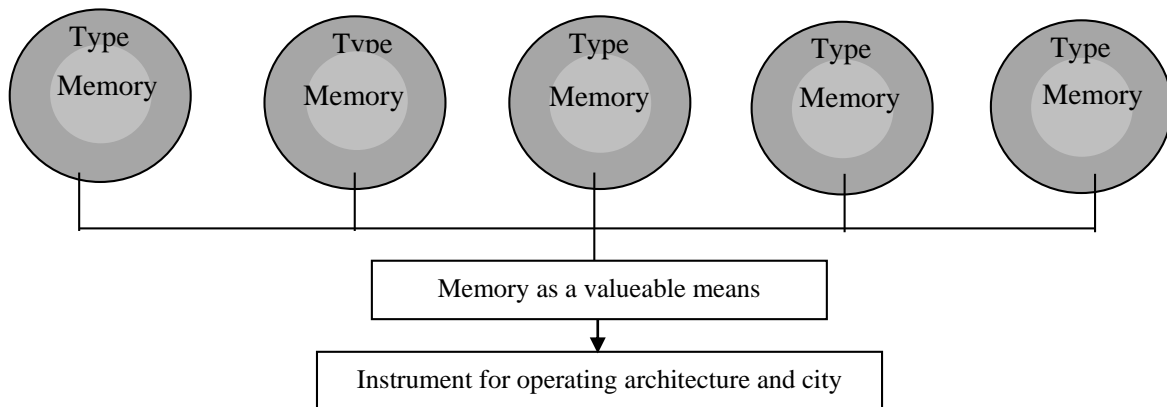


Fig. 3. The meaning of Type by Aldo Rossi

Rossi used term of autonomous architecture to describe identity in every type of architecture or city. an Identity in architecture has memory are consist of cultural and a historical. The Environment consists of a series of interconnected behavioral connections that have some common similarities. The main elements of these elements include index patterns of behavior and physical environment. To define the quality of buildings and cities, a spatial identity must be found that arises from repeating certain patterns of events that occur in that place. Repetition occurs because of similarities (Mehrpoya et al., 2015).

- **Repetitive Pattern as Similarity**

Nearly every culture throughout the world has a variety of repetitive patterns. At present, these patterns seem to be complex or typical regardless of their culture. For certain patterns, people can easily recognize their differences or similarities at first glance. In some other cases, it is difficult to recognize a pattern because of its complex nature. When various symmetries are realized on a global level (Park, 2017).

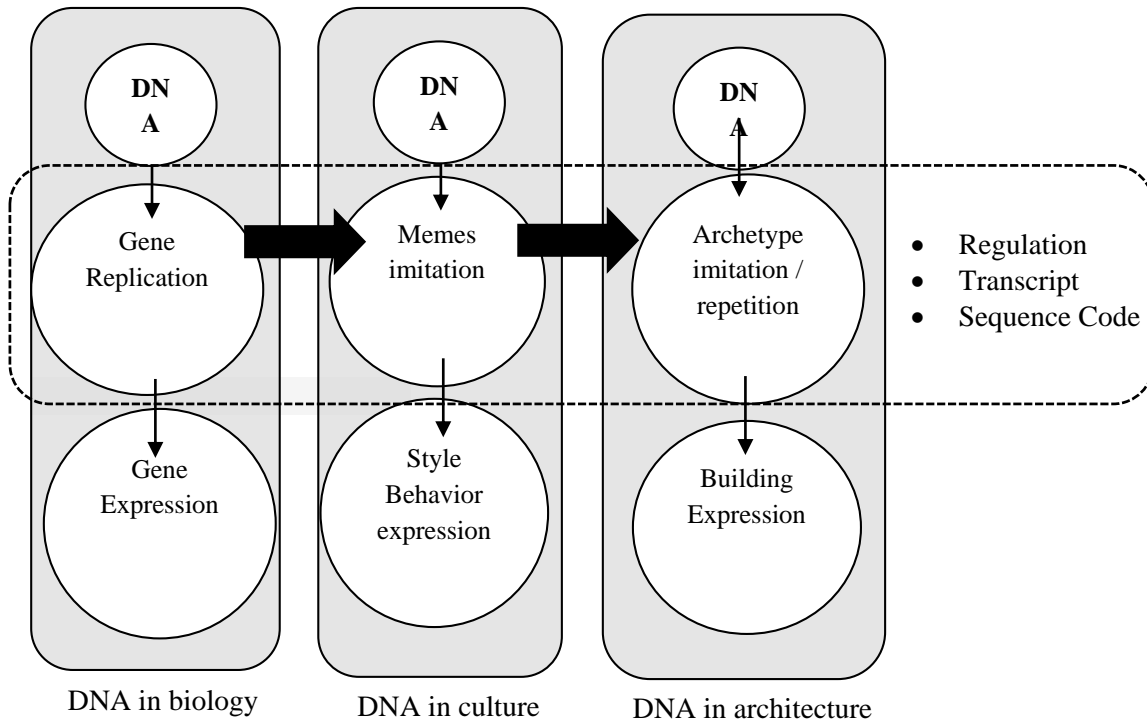
Sometimes every human uses space differently according to his needs and desires so as to bring lots of variations. To simplify the information. It is necessary to understand the identification of functions and forms to find out how humans use space. The function is considered as the point of behavior of the user of space. In examples of building, the form originating from the walls, roof and floor is considered as a limitation of space for the user of space. This is the reason why archetypes in spatial layouts are the initial reference in identifying character of buildings (Hyun & lee, 2017). To understand archetypes (original pattern) within the specific scope of domestic architecture or local architecture, building design was examined through the study of several treatises and typological analysis (Ledent, 2017). Building is an artifact symbol that stores cultural information on human habitation. Buildings are symbols of innate human qualities and symbols of individual and cultural communities. In other words, buildings or architecture can be described as traces of human cultural information which act as language artifacts. To understand the language of artifacts, it is necessary to know the general units or architectural components by tracing spatial patterns.

Hereditary information theory has occurred in humans as an independent process of biological evolution. Basically, humans have the genetic metarepresentational (pattern recognition) ability to represent language. Language has rules or structure of language such as DNA in biology to be replicated. Language is divided into 2 types namely natural language (conversation language) and artifact language (object language). The concept of language artifacts made by humans, the basic idea is that this language helps humans receive and disseminate cultural information so that culture develops. The evolution of the concept was adapted to define cultural DNA. From a very abstract idea in the form of a meme (imitation), it is then defined as cultural information in the form of a copy from one person to another which is realized through the language of artifacts (Distin, 2011). An object or an action becomes real only if it repeats through imitation. Whatever is lacking in repetition, does not have reality. In other words, the repetition done by humans feels real when humans repeat by imitating or imitating the same archetypes. In Biology, DNA is a core that has a pattern or regulation that is always replicated or repeated in similar living organisms. Likewise DNA in culture, humans are always repeat by imitating the behaviour and DNA in architecture, information through memory such as cultural and historical that are always replicated by humans is translated into buildings.

Understanding of cultural information, the shape of the house was determined not only through climate reasons but also because of the availability of materials, construction technology, the character of the location, the need for protection, economic, religious and also socio-cultural reasons. The form of residence not only limited to physical but also with regard to socio-cultural. The term Max Sorre, the genre de vie or mode of life that covers all aspects of culture, spiritual, material and social. Houses and settlements are physical expressions of the genre de vie (way of life) and this is their symbolic nature (Rapoportm 1969).

DNA in biology DNA is genetic information that consists of genes that produce molecules in the form of proteins known as gene products that are responsible for the development and function of all living things.

Genes are the basic unit of heredity in DNA, the heredity in question is the inheritance of character from the parent to the offspring. Genes are related to regulation, transcription and sequencing of other functional areas. Basically, genes contain the sequence code needed to realize expression. Cultural DNA is genetic information that consists of memes or imitations from one person to another in the form of ideas, behavior or style. This imitation helps humans receive and disseminate cultural information so that culture in the form of ideas, behavior or style can develop. Whereas in architecture, humans do repetition of archetypes (basic patterns) contained in buildings, regions and settlements. In these archetypes there are regulations, transcripts and sequential codes which ultimately affect the expression of buildings.



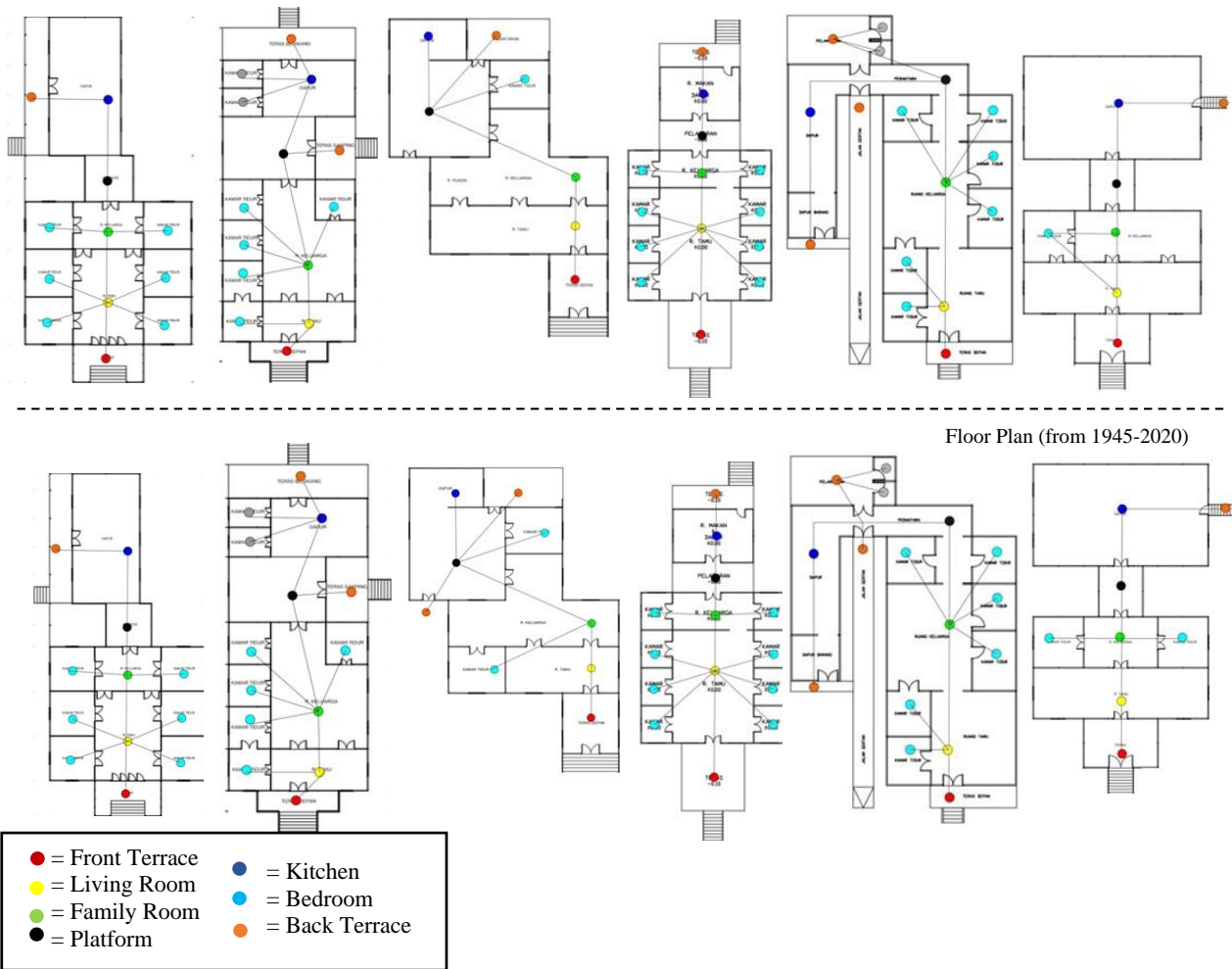
**Fig. 4. Terms Analogy DNA in Biology, Culture, and Architecture**

Cultural structures can be passed down from generation to generation, but produce large variations at an observable level. The stable structure that underlies this is referred to by biologists as genotype compared to phenotype which is a form that can be observed varied. Genotypes are broadly defined as features or phenomena that persist over time (Bafna, 2012). Cloned from generation to generation, and repeatedly stated in several cases. The domestic spatial genotype can be defined as a spatial pattern that commonly appears in some cases (Byun & Choi, 2016). In architecture, resistance to change is firmly rooted in structures called archetypes. Archetypes or archetypes can be considered as zero points in architecture.

Genotypes are abstract relational models that govern the arrangement of space, and the principle of organizing space and phenotypes is the real realization of genotypes in physical environment, namely architectural artifacts. In space syntax theory proposes that genotype is a reflection that is not only about spatial organization but also the nature of social and cultural patterns. Through identification of similarities and differences in the internal configuration of buildings it is possible to identify spatial genotypes. In analyzing genotypes, one of the most common ways to be observed is where culture is built into residential space patterns. The recurring pattern is for example the position of the kitchen which is located in the deepest room of the building. Then the spatial configuration shows the cultural genotype that results from encoding social meaning in architecture.



The understanding of genotype dan phenotype are suitable with Rossi's interpretation of type. Type is the abstraction of memory to which will be referenced and type is an abstract principle concerning basic needs and beauty while specific forms depend on historical circumstances and social context. This research used six sample with 2 times divisions in past (1700-1944) and a present (1945 until 2020) traditional malay house in West Kalimantan, Indonesia.



**Fig. 5. Justified Graph Six Sample Floor Plan and Traditional Malay House West Kalimantan**

In the syntactic analysis through Justified graph analysis of Malay house in West Kalimantan, consistency was found in repetition of patterns in six sample houses. The pattern is in the form of a room consisting of a terrace, front (porch), living room, family room with rooms (cubicles), platform, and kitchen which is equipped with a side terrace or back terrace. The repetitive pattern being genotype and always maintained or passed down from generation to generation. Malay people in West Kalimantan is Moslem, thus the meaning of house was influenced by its culture and religion. Genotype in the house was according to socio-cultural pattern in the house. This can be seen from the spatial organization formed. In traditional Malay houses, socio-cultural patterns looked in type of house. It could be seen from the spaces in the house. Traditional Malay houses in had the concept of "umamah" or brotherhood in Muslims as it was reflected by the house, they were the hospitality in religious events in the house. Organizing events or meetings in families and neighbors was important in establishing friendship. Sequence in the middle of house are consist of a terrace, front (porch), living room, family room, platform and kitchen became a communal space to accommodate many people in the house when it was a big events. Repetitive pattern in spatial organization at traditional

malay house revealed that this type of house has a memory are consist of cultural and a historical in malay people.

## 4. Conclusion

The term DNA in architecture can be used to describe an identity that is always repeated in spatial organisation of building and a city. This identity can be found in type of building and a city through the classification of archetype in typologies. Buildings are determined not only through climatic conditions but also because of the availability of materials, construction technology, the character of the location, the need for protection, economic, religious and also socio-cultural reasons. The whole factor will be the determinant of the formation of the basic pattern which becomes the reference of DNA as an identity in architecture.

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