

Articles

From *Ekistics*, v.33, no.196, March 1972, p. 218-229: 15 fig.

The Formation of the Human Room

This article is a much shortened version of an address given by C.A.Doxiadis at the close of the 1971 Athens Ekistics Month during which discussions concentrated on: "Our Buildings (Shells) and Human Settlements." The main proceedings of the Month were reported in EKISTICS 191, October 1971.

SYNOPSIS: The room is the smallest unit created by man, which serves all basic purposes and has the widest range of variations. The houses we live in are a biological extension of man. The laws concerning the range of man in space guide him in his building his private space in relation to his needs. The evolution of the human room spans two million years, and the causes of this process are psychological, biological, cultural and structural, all working in combination. The evolution of the room in terms of shape and number can be directly compared to the evolution of cells in nature. The room has evolved due to human needs rather than to chance.

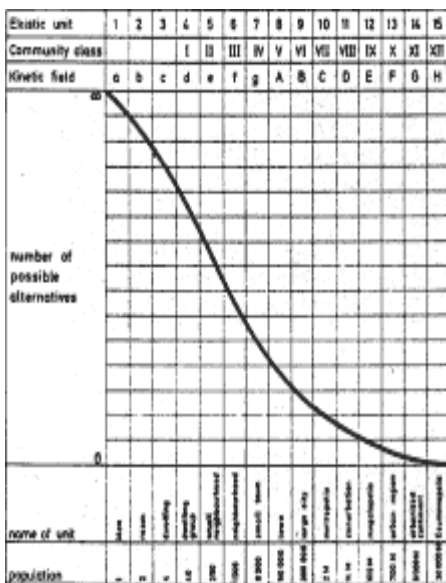


Fig. 1. The alternatives available to Man.

Introduction

My subject is the room, which may seem very naive, especially for architects who know how to build huge housing complexes and large hospitals.

Why the room? There are many reasons. First, the room is the smallest unit created by man - beyond our clothes and our furniture. It is the smallest structure built by man to serve all basic purposes. Second, the room is the smallest unit that can be discussed on a biological basis because it exhibits a wide range of variations. This is a very basic consideration, as was accentuated by Professor Waddington in our summer discussion sessions. If I draw a diagram giving man all alternatives from zero to infinity (Fig. 1) and relate this to the ekistic scale, we can say that man has a decreasing choice of alternatives as the scale increases from the room to the megalopolis and the whole earth. There are few alternatives for the earth apart from blowing it up at one extreme and saving it at the other. But for the metropolis we have several alternatives; for the neighborhood more and for the room there is a wide range. This large number of variants makes it possible for us to investigate them systematically to see if we can draw any general conclusions. This was the basic reason for my choice of the room as the subject of my study.

This paper contains only a part of the study that was presented at the end of the Athens Ekistics Month, 1971. It includes the basic ideas related to the subject, from hypothesis to conclusions, but five specific sections - on the floor, walls, ceiling, form and dimensions - have been omitted. Together with other material, they will appear in my book: *"The Formation of the Room"*, due to be published in 1972.

It is years since I started to study the forces which led to the formation of the human room as given. Today, we take the form of the room as given. We forget how long it took to create it, and at times we try to change it without realizing the forces that shaped it, and without considering whether these forces still operate today. I have therefore been trying to analyze and describe all the forces I have been able to discover that have influenced the formation of the human room.

Before proceeding, I must clarify that I am only speaking of what people usually call a "room": that is, the built-up space (not necessarily covered space) created by man for his normal daily life - as his home, workshop or office. I do not call a factory or other large office space for tens or hundreds of people a "room" in this sense; nor a hotel dining room, or other large spaces. Thus, in my context, the dictionary definition of a room is not appropriate: "a portion of space within a building or other structure, separated by walls or partitions from other parts". This could include a huge factory space containing thousands of workers without walls between them. What I mean by "room" is what the normal man of today understands by the word. In this sense, every type of personal workshop is not necessarily a "room": it may only be used for special purposes - like a photographer's dark room.

It is also necessary to clarify that I am speaking only of the room of an average human being, with a normal development of his body, senses, mind and soul. This means that I am not speaking of rooms made by animals - such as the cells made by the bees - nor of rooms specially designed for blind people. Also, I am not speaking of any special rooms designed for particular individuals to suit their personal requirements at a certain time. I might, myself, like to live in a round tower or a windmill, but this is not the desire of the average Man. This would not mean that I was crazy, but simply that there is a wide spectrum of personal preference. However, I am not speaking here of special cases, but only of the general trend of development. I am concentrating on the average room created by Man with a capital M.

In conclusion, the human room, in the context of this paper, is a space that can satisfy any one of us for a small part of our time - or for a certain period of our life - but usually satisfies most of us for most of our time (a sleeping car that can meet my needs only for a single night is not a "room" in this sense). This means that, although I may cover only some 80% of the spectrum of alternatives, I probably include more than 98% of all actual cases.

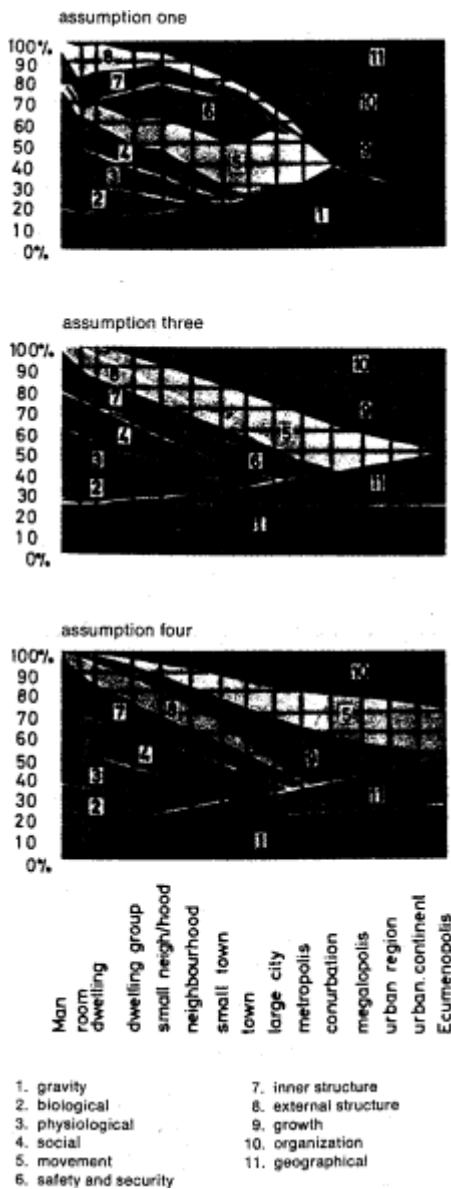


Fig. 2. Probable validity of the forces of Ekistic Synthesis.

Basic hypotheses

Is there really a direct relation between principles, forces and the formation of the human room?

Many years ago I recognized that what Man builds corresponds to his basic needs and his ability to serve them. In this sense Man the builder, consciously or unconsciously, acts as a force continuing the biological processes which led to his own formation. I recognized this, but I could not prove it, because we know so little about "Man the Unknown", as he was called by Alexis Carrel in his famous book that I read some thirty years ago (Ref. 1). Unfortunately, even today many experts, such as Dr. Rene Dubos and others, think this title is still valid. We don't know Man.

I therefore made a hypothesis, and proceeded to try to check whether it was true or false. I could find no scientific proofs, but I checked it with optometricians, ophthalmologists and other experts of the physics of the eye, asking whether my hypothesis was right. All said they had no proof but that they thought I was right. Nothing in my hypothesis contradicted what they knew about man's eye and its relation to space. This encouraged my faith in the hypothesis I am about to present. But, before doing this, I would like to show how another hypothesis I made about the forces leading to a synthesis in space has evolved over the years. I do this in order to make clear the importance of having the courage to make a hypothesis and then, gradually, to ameliorate it. Some years ago, I thought the forces leading to a synthesis in the whole spectrum of ekistic space could be depicted as in the upper diagram - my assumption three - as a result of checking, checking, checking, and also criticizing myself. Last year I moved to another model - my fourth assumption - and I intend to continue this process until each aspect is clarified as far as possible.

Returning to our subject of the room, I believe firmly that the furniture we use and the houses we live in are a successful biological extension of Man. The last assumption of Figure 2 shows a pyramid of forces emanating from Man - the first ekistic unit - that narrows down fairly rapidly. These forces influence the room immensely but become reduced as the scales of the ekistic units increase.

The human room is the ekistic unit that has had the longest evolutionary life - possibly even two million years. It is also, as I have said, the unit that has the widest range of variations.

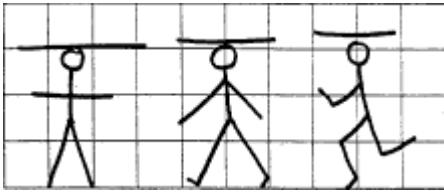


Fig. 3. The moving man changes his height.

Range of Man to space

This relationship is very direct. It is obvious that Man needs a space at least equal to his height in order to stand upright. But this is not enough. He may want to raise his arms, and this needs space above the level of his head. He may want to walk, and this increases his height by 5-10 cm. (Fig. 3). Thus the answer is not so simple.

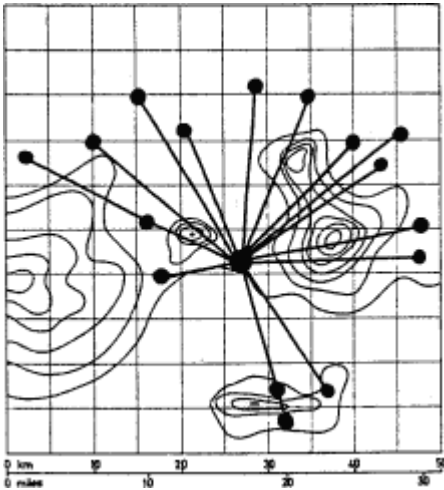


Fig. 4. First Principle: maximization of potential contacts. Given certain conditions in a certain area, man will select the location which permits a maximum of potential contacts.

Let us now take Man's relation to a wall. He does not like to stand close to a wall, looking at it. We only make children do this as a punishment. Man's eyes cannot stand short distances for more than a brief period. It has been shown, for instance, that very few people like their working desks to face the wall. Most prefer to look out into the room. In the middle ages, the low-paid employees worked facing the walls; the others faced outward.

Man is connected with space in different ways. Hearing can be received from all directions, but sight is a straight line, when we are not moving our eyes. We have to consider these things, or else the room becomes a prison.

My experience has shown that there are five basic principles which guide Man's relation to space. I do not insist that there are only these five, but since I first published them in 1969 (Ref. 2). I have found no reason to doubt their validity or add to their number.

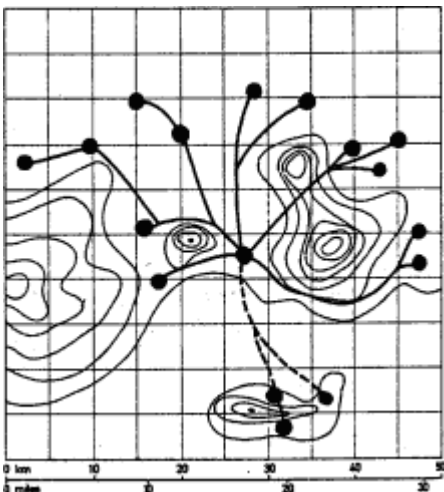


Fig. 5. Second Principle: at a minimum of effort in terms of energy, time and cost. Man selects the most convenient routes.

The first principle is Man's desire to maximize his potential contacts. He therefore looks for a location that maximizes not his actual contacts (he may not want to visit anyone at all) but his potential contacts (Fig. 4).

The second principle is that Man always tries to do with a minimum of effort. When he encounters a physical obstacle, such as a mountain, he does not cross it by the most difficult route (Fig. 5).

The third principle is the optimization of Man's protective space. Man does not like to be squeezed, either as an individual or a group - unless for very short periods and for special purposes. Only in moments of great love or great danger do we willingly squeeze up close to one another (Fig. 6).

The fourth principle is the optimization of Man's relation to the ekistic elements: Nature, Man, Shells, Society, Networks (Fig. 7).

Finally, the fifth principle is the synthesis of all previous ones, which we will be able to see operating in the case of the Room (Fig. 8).

In addition to these five principles, we can instance certain laws, like optimum size of the space, optimum distance

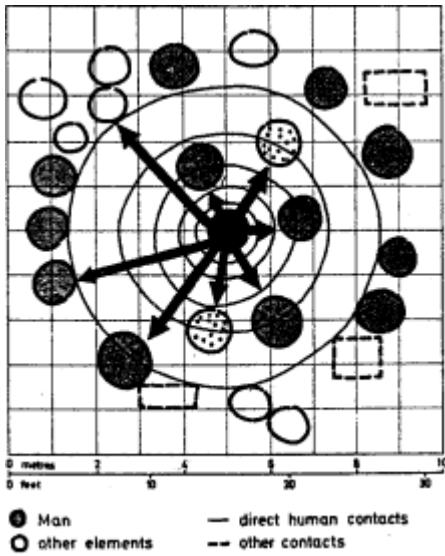


Fig. 6. Third Principle: optimization of man's protective space.

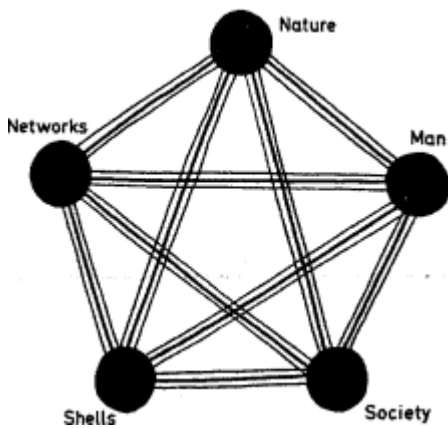
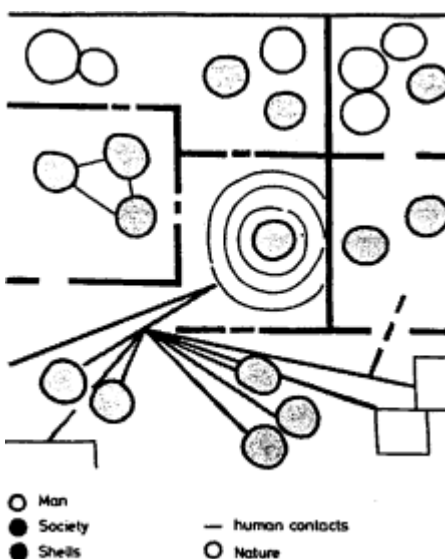


Fig. 7. Fourth Principle: optimization of the quality of man's relations with his environment.



from walls, etc. These are not principles. A principle says: "I do not want to be squeezed, except at certain special moments of love or fear." The law states how much my body can stand to be squeezed, and for how long. These are two different things. Specific aspects of certain principles gradually come to be expressed as laws.

Principles and laws are not created by any single individual. They are biologically conditioned and biologically developed. In creating space, Man is guided by space-formative principles and laws which are related to human satisfaction and human needs. Here we can use the word morphogenesis, since a morphological study of the room can be considered comparable to a biological study of the morphogenesis of bones or wings. And we should not forget that the wings of some birds work, and others do not. Here also we find a spectrum, ranging from the successful wing (or room) to the unsuccessful one.

The central force is Man himself, and we have to keep in mind two aspects of his demands upon space. One, very beautifully presented by Leonardo da Vinci, shows a sphere encircling a standing man with his arms outspread. This was later called the "human bubble" by Edward Hall (Ref. 3), derived from an ancient Greek expression. The second aspect considers Man as the center of a system of spheres representing his body, sense, mind - and soul (Ref. 4). The extent of these spheres will necessarily vary with age, culture, etc, but in this paper we are dealing with the average Man, with a capital M, and not any of his huge variations. I lay great stress on this point because all too often a specific case is studied, and then taken to represent a general law, which is contrary to any scientific procedure.

Fig. 8. Fifth Principle: optimization of the synthesis of the four previous principles.

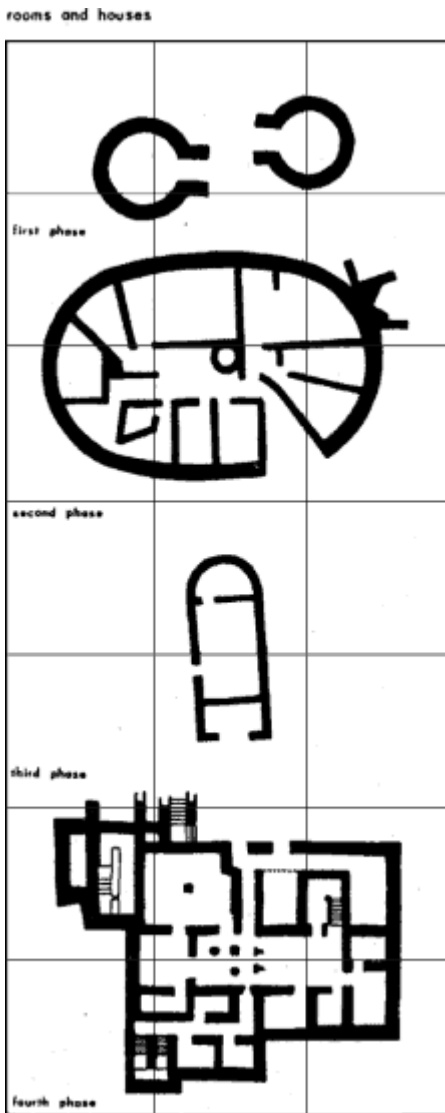


Fig. 9. How the Greek house-type developed.
First phase: Early Minoan (Kumasa, Crete)
Second phase: Middle Helladic (Korakou, Corinthia)
Third phase: Middle Minoan I (Chamoezzi, Crete)
Fourth phase: Late Minoan (Tylissos, Crete).

The beginning of the process

We learnt from Aristotle that we cannot understand any problem completely unless we can understand its origins and its causes. In his *Physics* he said: "Here and elsewhere we shall not obtain the best insight into things unless we actually see them growing from the beginning" (Ref. 5). This is basic for all knowledge. Biology, physics and the other sciences have gained their best insight into things when they have carefully traced their growth from the beginning.

Unfortunately we do not know the beginning of the formation of the room. Some people have thought it originated from round houses, others from orthogonal ones. But the situation changes continuously. We are constantly finding early societies that we did not know of before, and the picture of what preceded what keeps changing. During my own lifetime, the length of man's evolution has moved from 100,000 years to over 2,000,000 and the building of rooms has moved from a few thousand years to nearly two million. In such a situation, we can only attempt to make some reasonable assumptions after carefully checking that these are based on the data that has been discovered up to now.

Studies of gorillas noted that they make their nests in tall grass, in the undergrowth, in clumps of saplings, in the roots of trees, under over-hanging rocks, among the branches of fallen trees and in the forks of trees 30 - 60 feet above the ground (Ref. 6). As these apes are still living in more than 30 different kinds of habitation, it is unreasonable to believe that primitive man only lived in one form of dwelling. The gorillas have some other interesting characteristics. Some of them build a new shelter every night: always for a single individual, never for two. Others live in gangs and all sleep together under the same roof. So, not only the form and location but also the size and use of the basic unit varies greatly.

Many believe that the earliest men lived in caves. I have found over a thousand different caves depicted in various publications. Again it appears that there were numerous different sorts, ranging from deep caverns to overhanging rocks, and that they were used in many different ways. Sometimes, it seems as in a Paleolithic cave at Arcy-sur-Cure in France, where Stuart Piggot is certain that post-holes exist, showing that some kind of structure must have been added by man (Ref. 7).

Round houses and round rooms have been found all round the world, dating from very early times. The Paleolithic round rooms found at Molodova, South Russia, are dated

by Stuart Piggot at around 40,000 BC. These were, at least in part, built of the bones of mammoths. Round houses found at Jericho are dated at around 8,000 BC and others in Sardinia at around 1,500 BC. In Britain several different types of round houses have been dated between the 12th and 1st centuries BC (Ref. 8). These houses show great varieties in their degrees of roundness, and sometimes (as in a Paleolithic settlement in Czechoslovakia) completely round houses are juxtaposed with others of varying shapes. This may indicate man's difficulties in connecting rounded shapes.

We can trace how houses in Greece and the Greek Islands moved gradually from round houses to houses with some straight lines and, finally to be rectilinear houses (Fig. 9). This sequence can be found over a wide range of time and space. Some rectilinear houses in Bulgaria date from before the third millennium BC, and other early examples have been found in various parts of Europe: Germany, Switzerland, England, France. But I am not entitled to state that houses and rooms with straight walls were definitely born later than round houses and rooms, because some years from now we may find - let us say in Indonesia - another much older culture with straight walls. In other words, the only conclusion we can draw at this stage is that we can find all sorts of forms of the room in many different places. We cannot say with certainty which preceded the other on the earth, but for the same place we can sometimes trace an evolution from the first type to the last.

In addition, we find all sorts of sizes - from rooms a few meters long to a length of 100 meters - and all sorts of materials, sizes and forms again remind us that we do not yet know the beginnings of the room. We are still constantly finding earlier and different types. Can we really believe that there was just one beginning? We have the case of the gorillas. How do we know that Man did not start like them? We might assume that, with Man's better developed brain, he could have made many more different beginnings.

The causes of the process

We have to try to understand the causes of the process. Some explanations are based solely on structure: the round house arose from structural requirements. Others are based on biology: the round house was rooted in human biological needs. Others wholly on psychology; others on a combination of biology and psychology. In discussion during the Athens Ekistics Month, 1971, Dr. Erik Erikson said: "Roundness surrounds you more nicely than squareness". But, at the end, Man with a capital M did not agree with Dr. Erikson. He always finally changed from roundness to squareness. On the other hand, Erik Erikson

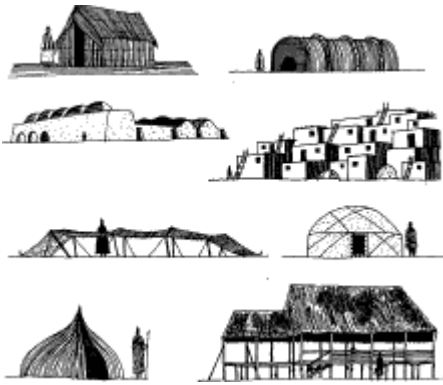


Fig. 10. Materials and house forms (Amos Rapoport, op. cit.)

First row: Dwellings made of one material (reeds). (Left) Uru dwelling, Lake Titicaca, Peru. (Right) Marsh Arab dwelling, Iraq-Iran border.
 Second row: Dwellings made of one material (mud). (Left) Iran. (Right) Pueblos, southwestern United States.
 Third row: Portable tents of stics and felt. (Left) Arab tent. (Right) Mongol Yurt.
 Last row: Two examples from the great range of house forms using thatch and wood as materials. (Left) Masai dwelling, Africa. (Right) Yagua dwelling (Amazon).

The houses in these figures are not drawn to the scale, but their size is indicated by comparison with the human figure.

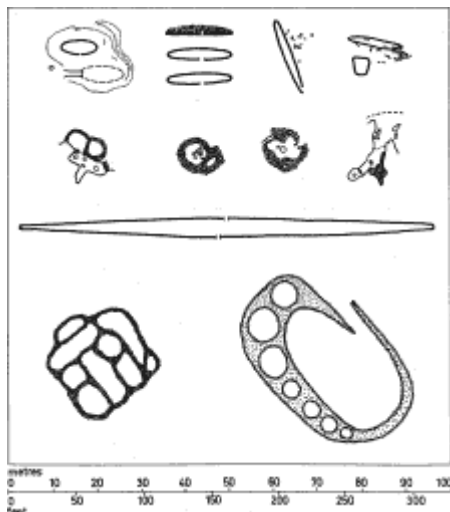


Fig. 11. Easter Island: different types of rooms and houses.

is a great authority on psychology, and there is probably a basic truth in his statement. During the same discussion, a member of the audience reminded us that sheep always form a circle when sleeping together - never a line. This apparently indicates that the animals feel better when clustered in round groups. Darwin also, on his first visit to South America, found some natives who always slept in circles, without any covering "shell". They slept in a compact group, sometimes forming a level and a half. In this case, the explanation was that this enabled them to exchange warmth and to protect one another.

Thus, if indeed the round house did start first, it was probably caused by a combination of the factors of psychology, biology and structural possibilities.

One of the reasons for our uncertainty about the origins of the formation of the room is that people almost always speak of the formation of the house, not of the room. But the beginning of the house is the room - the undivided unit. About this there is no doubt at all. No one has ever found two-room houses preceding the one-room unit. Another reason is that all experts concentrate on the position as seen from their own discipline. Some base everything on the needs of Man himself; some on Society as a system, leading to certain cultures and organization; some concentrate on Networks, basing their theories on communications. When I started to examine the many different theories I became confused. Most discussed the form and location of the house, very few spoke of the dimensions of the room. Almost all were based on a single disciplinary viewpoint; yet, we all now realize that only the combination of many factors can explain the process. Nature, Man, Society and Networks all played their part. Both ecological and cultural forces were at work, for the creators of the first room were simply trying to live as well as they were able.

I will use two examples to show how single factors cannot have been the cause of the form of the room. Figure 10 is taken from Professor Amos Rapoport's book "House Form and Culture" (Ref. 9) and it shows how false it is to believe that the use of a certain material automatically leads to the development of certain forms. His examples make it clear that use of the same material can lead to completely different forms in different cultures - whatever the material used (in this instance - reeds, mud, cloth and thatch). We can cite numerous other examples that show beyond doubt that the structural material did not determine the form of the room.

My second example is related to location. Some believe that the same climate and topography will lead to similar dwelling types. But a Norwegian mission to Easter Island recently published an excellent monograph in two volumes entitled "The Archaeology of Easter Island" (Ref. 10). Easter Island is the most isolated island in the world. It

received the minimum influence from outside it took centuries for new visitors to come to it. Figure 11 shows a number of the examples of house-rooms in Easter Island re-drawn from the Norwegian study to the same scale, so that they can be readily compared one with another. The result shows the very great variations that occurred in this limited area of 117 sq. km (approximately 6x6 miles, or the size of the ideal 18th century township of the USA).

Since the investigation of Easter Island was carried out very thoroughly and by several independent anthropologists, who sometimes represented slightly conflicting views, it provides us with a good case study. It shows that in a period covering a little over a millennium - 400 AD to 1800 AD - there was an enormous variation in the form of the room. Some are only 2 meters in diameter, others are 100 meters long. Some have very thick stone walls compared to the interior spaces - others not. Some used caves, building extensions onto them, and one had steps leading to an underground structure next to the house. There were several very long and narrow rooms - some 10 meters in length - that were probably inhabited by many people. They were still lived in, in 1776. Where in these examples is the unit of expression in size, form or concept?

These two examples may provide sufficient proof that Man did not start out in a single way, but that he tried numerous different things. Even when immigrating to a new land, bringing with him a certain culture he created numerous variations on his former house types. The examples shown in Figures 9 and 10 only represent a few of the typical variations found in each of the two surveys. It seems clear that we cannot accept any simplified theory. What is the cause of these different combinations? Here we need to differentiate between Man's human needs for a better room and his ability to create it. Both these aspects depend upon Nature (materials, climate, etc.), and Man himself (body, senses, mind and transport). Man's human needs can be divided into his biological necessities and his physiological needs (I have sometimes referred to these as his biological necessities and his biological needs). Man needs to breathe fresh air, and if a room has no openings at all, he will not be able to breathe after a time and will die. This illustrates a biological necessity. An example of his physiological need is not to be placed too close to the wall for too long a period. However Louis XIII put some prisoners into very small caves, where they lived for several years, showing that this is not a biological necessity but a physiological (or biological) need. Biological necessities can perhaps be called biological laws, though we are still far from being able to record all the relevant factors so that they could be inserted into a computer and give us an exact law.

However, even when we have fully recorded Man's necessities and needs, he still may not have the ability to

satisfy them. Even when Man has great ability, he may come up with great obstacles: the topography may be fine but the climate terrible. The result can never be a simple combination of the different factors. It is always achieved by the imposition of certain conditions upon the others.

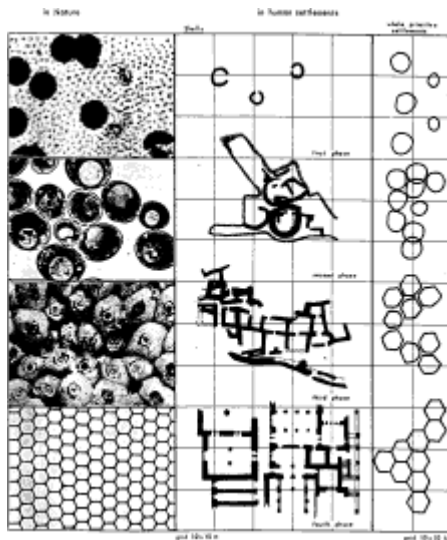


Fig. 12. The evolution of cells and rooms.

First phase: volvox colony; Kumasa, Crete.
Second phase: cells of brewer's yeast; Orchomenos, Boeotia.
Third phase: cells of sunflower seed; Malthi, Messinia.
Fourth phase: honeycomb; Knossos, Crete.

The evolution of the human room

We have now stated that we cannot be certain of the beginnings of the process of the formation of the human room, but that the causes leading to this formation - though many and complex - resulted from the interaction of Man's biological necessities, his needs and his abilities. The constants are the first two of these and we can now ask whether it is possible to trace the evolution of the room by concentrating upon them.

It has already become clear that we cannot speak of the historical evolution of the room since this is constantly being upset by new discoveries. I shall therefore concentrate upon certain general characteristics which seem to have gradually led to the form of the universally acceptable human room. Although a few historical examples are used to demonstrate certain points, they neither present the entire evolution of the room, nor the whole range of types created by Man.

In places where historical sequence has been established upon the same site, it seems highly probable that, even if the earliest rooms were round, there has been a gradual evolution to the orthogonal room. In many countries and civilizations where there were circular rooms at the start, we can trace how these became elliptical, then developed some straight walls (while still retaining some curved ones), and then gradually developed a truly rectangular form, after which it did not change.

We can consider this as similar to the evolution of cells in nature (Fig. 12). These begin as isolated cells, which then come closer together and start to form systems. Rooms also start by being isolated and then become interconnected. This means they start to form straight line connections and come gradually to an orthogonal type of synthesis. In this the structural room is unlike the social community which, as Christaller showed in 1933 (Ref. 11), start off in isolation, gradually come closer together and eventually form hexagonal systems.

The reason the room comes to an orthogonal system and the community to a hexagonal one, when created by the same people is because separate laws govern each ekistic unit of space. Up to a certain point, we can say that the harder the unit the more it leads to hexagonal

connections.

No matter how Man started to create his room, or what types he erected, he improved them as soon as he had the economic or technical ability to do so, and he incorporated aspects from any better rooms that were invented in his area or introduced there. Here we can recognize a process that corresponds to the biological law of evolution.

As long as Man's necessities and needs were not fully satisfied by the rooms he created, he continued to alter them in different ways, until eventually he learnt to form and to build the structure that suited him best. Once Man was fully satisfied with what he had created, he simply repeated the same basic solution with only small variations. In Easter Island, Man tried hundreds of different forms over 14 centuries. Then came the square room, and all other forms were abandoned within a generation. The same is true of other places, except for a few pockets of resistance.

We can trace how Man always changed his room (whenever he happened to learn of a better type from others, or created a better type himself by chance or by reasoning) until he achieved a single final type: the rectangular room with a horizontal floor and ceiling, vertical walls and certain dimensions, a few meters (3 to 8) in length and breadth, and less (2.5 to 4) in height.

The fact that Man has always tended toward the same final solution of the form of his room implies that this is the form that corresponds to his necessities and needs. If the ceiling was too low, he tried to change it. If the floor was uneven, he tried to level it. Man always followed the same path, toward the same type of room. If he made a turn in another direction, it did not prevail. In summary, we can now say:

1. The first creation of the room was probably due to chance and to human needs.
2. Its evolution was due more to human needs than to chance.

Thus we can repeat what Democritus said, and what modern biology accepts as an axiom: Man creates by chance and by necessity (*par le hasard et la necessite*)(Ref. 12).

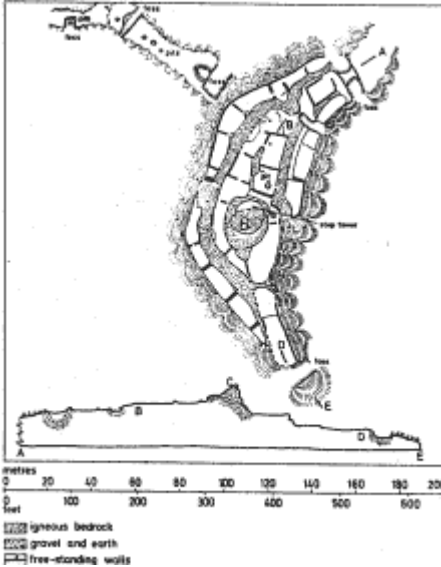


Fig. 13. Easter Island: Rapa-iti, plan and section.



Fig. 14. Traditional village on the national road Damascus to Homs, Syria.

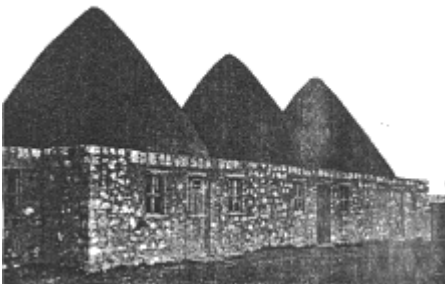


Fig. 15. Modern version of traditional Syrian house type.

Conclusions

Can this general overview permit us to draw any conclusions for action today?

Of course we must always remember that we do not yet know everything about the matter. We do not know all the reasons that led to each type of structure. We do not know what the builders of the different types of rooms had in mind. We can only say that one type is better than another in terms of its economy of operation (movement - uses of energy), or better in its appeal to the eye.

Let us take two examples of a synthesis of rooms from the same general area. Almost all the structures on Easter Island were separated, but sometimes we find a synthesis of rooms (Fig. 11). On another Pacific island - Rapa Iti - we find a settlement with many adjacent units, divided by straight and vertical walls (Fig. 13). Was this an easier or a better way of grouping rooms than was achieved on Easter Island? We can only say that the Rapa Iti solution was more economical in its use of space and the energy expended in its construction and operation. The Easter Island culture may have put preference on other things, or they may not have imagined the solution achieved by another Pacific Island during the same historical period.

Not only do we not know the reasons leading to the erection of the different types of room, we also do not know what functions the room had to perform, or what each person expected of it. We do not know if they were more concerned about a permanent formation of the interior space, or a flexible, changeable interior. A number of psychological issues may also be associated with the size and form of the room. Edward Hall has given many examples of different relations to space in different cultures (Ref. 13). We know that early man had no feelings of individual privacy, as we understand it today, so probably he also had different feelings about isolation and spatial dimensions.

However, even bearing all these provisos in mind, we have been able to trace a process which shows that, despite variations over the world, there is a definite system of selection, proceeding in space and time, that arrives at similar conclusions. It does this by what we can call a free and democratic process of trial and error, regardless of whether the administrative system of the society in question was totally chaotic or rigidly autocratic. But this does not mean that mankind has been moving towards a completely standardized form of room - like the honeycomb of the bees - but that the ranges of its diversity follow a normal spectrum of variations.

What variations do we find? In the size of the room these cover a limited range, due to the forces of Man's biological necessities and physiological needs. In its form and

structure - its general appearance - the variations are far more numerous. This is due to the different influences of Nature, Society (culture) and Networks (communications). There are also the influences of personal desires, and here we come to the differences between Man with a capital M - about whom we have consistently been speaking - and individual man, with a small m.

Let us look at some of the more extreme variations in form and structure. First we should take areas of the survival of the old: usually areas where new forces are still unknown, or where economic or technical limitations are acute. I have been in places where the people wanted to change the form of their roofs, but they could not obtain the materials needed to do this. Such areas are rapidly becoming fewer. However, we can also find certain islands of resistance to the forces we have listed. For example there is a group of villages in Syria - not in the desert but on the most inhabited axis leading to Damascus northward to Aleppo and Turkey - where the houses have not been adjusted at all (Fig. 14). When Western experts saw these villages, they attempted to reproduce their traditional system of construction in other parts of Syria (Fig. 15). But the people did not like to live in them, and they were not repeated. This shows that an attempt to go back in time could not survive. These Syrian villages simply represent small islands of resistance to change. Such instances are very few and can be compared to the survival of certain very specific religious sects.

As an example of quite another type of variation in form and structure we can take the domes developed by Buckminster Fuller. These domes represent very reasonable solutions for a number of purposes - but not as dimensions of the human room. To illustrate this, we can glance at the way civilization has developed its relation to the dome space. It may have started with a small dome created by an ape as a temporary abode for a single night. Early man built domed rooms but then abandoned them in favor of upright walls and a horizontal ceiling. However when he came to build large domes to cover public structures, such as churches and public baths, he found them meaningful. At this scale, his basic resistance to facing a sloping surface disappears: visually the wall at eye level seems vertical. Also, the inconvenience of hitting one's head against a low curved ceiling ceases to exist.

If we place each type of solution on the Ekistic Grid we can sometimes see at which scale they may survive. Solutions that do not make sense at the scale of the human room may make good sense at other scales and for other purposes.

Finally, we should consider the personal variations that are sometimes completely opposed to what we have here determined as the form and dimensions of the human room. We can instance the architect who built a huge

mirror across one end of his room, so that he always sees himself as though he were in an unbelievably long corridor. He built this room for himself, and we have only to ask two questions: is he going to live permanently in this room, and are any of his clients going to request him to build similar rooms for them? We can find many other such individual variations: rooms structurally broken up into small pieces, or the erection of small spherical isolation spaces within a larger room.

As a society we have to be happy that people try experiments; but we have constantly to distinguish between what is basic and common to all, and what is peculiar to a particular individual. We cannot generalize from the latter. One of the ways in which to test the validity of an experiment is to build it and then ask people to buy it. If it cannot be sold, offer it freely to people and see how long they will live in it. Man, with a capital M, will then give his answer.

The conditions for a successful experiment are: first to know the laws and not go against any of them; second, to have a reasonable solution that in some way makes good sense; third, to recognize that we experiment with human beings and we must not make them suffer. Therefore, if someone has a new idea, we have to say: "Alright. Respect Man, learn his laws, try your solution out on yourself, but be aware that, for it to succeed, you must make it so that it is also acceptable to others." If you insist that your ideas are correct but that Society will not accept them, I refuse to believe you. Society, being guided by Man with a capital M, knows much better than smart individuals.

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