Today we're going to begin trying to get at what we mean by Environmental Structure. I said last time that we obviously can't discuss the problems of organic wholeness unless we have a sense of what we mean by environmental structure. So now we have to try and begin to pin that concept down. I'd better say something a little general first about what it means to definite the structure of something. Effectively, when one talks about the structure of something - environmental structure - it means that we want to construct an abstract picture; and that abstract picture somehow manages to capture all the essentials, what ever that means, of the thing in question and leave out all the inessentials. Now there are two different features of this structure concept that we have to get to grips with. We're going to be looking for patterns with features, variables whatever you like to think of them as, in the environment which are to be the building blocks of this structure and these features, these structural features, have got to have two kinds of properties in order to be in some sense essential.

On the one hand they have to be recurrent. That is they have to keep cropping up again and again in similar situations. Obviously a feature which just crops up in some one place is a more or less local accident; is not interesting enough to be part of the structure. It would be very strange indeed if this accidential thing played an essential role in the operation of the environment as a whole. So the features that we are looking for have got to be recurrent.

The second thing, which is much harder, is that the features we pick out as being the structural features, have got to be those which generate the way the thing works. They have got to be those features which go very, very strongly with functional characteristics. They have got to be the ones which are responsible for the nature, for the behavior, of the environment.

Now, before talking about the environment, I'm just going to try and get at those two ideas of recurrency and functionality. A couple of simple examples: To make it clear that when we're looking for structural features we don't necessarily do one of these things first and then do the other; we may do either. For instance, in the case of liquid: Man's known what liquids are for a long, long time. I mean, liquids have been identified as a certain kind of material; has special kinds of properties - you can pour them; they can be solidified as you cool them they become more viscous; they splash; waves will form in them;. So in that case, those functional features were well known for a long time. It was not known until quite recently what the structural feature of a liquid was, which gave it those particular properties, and distinguished it from a solid or a gas. Now this feature has to do with the amount of touching of the particles (I have to distinguish between atoms and molecules for a moment) - in a _____ array - in the simplest kind of cubicle you get that sort of a situation where each particle is touching neighboring particles in all directions, and these other atoms hold the given atom in place. In a gas, these particles are not touching at all - where as in a liquid they are. It's hard to make this clear in two dimensions because it doesn't have quite the same significance. Imagine it in 3-D. There are strings of particles which are - every particle is touching at least two others. But it is not touching particles on all sides of itself; and it's that particular structural feature which is responsible for the functional characteristics that we have long known as being liquid.

So, in that case the functional thing was understood first (I mean was recognized first) and then one was able to pick the structural feature which correlates with it. Now on the other hand if you look at snow crystals, for example, the structural features were abstracted long before anyone had any idea of why those structural features exsisted. In other words, I suppose people must have known for thousands of years that

snow crystals appear in characteristic hexagonal patterns. And, people who noticed this would already have abstracted this kind of heragonal character and recognized that as an important structural characteristic in the crystals. But, it has only been recently again, this time the transition has been made the other way and that people recognize that this six-directional pattern is a consequence of the way that water molecules fit together when the crystal grows.

Now obviously these two features - on the one hand we're looking for structural features which are recurrent; that is which crop up again, and again and again - and on the other hand those which have important properties which are responsible for the functional nature of the object. It's obvious that those two things are going to go hand in hand. Clearly there couldn't be a system which had features which kept recurring and those features, or that feature, kept recurring for no reason at all. So obviously if we notice a feature which is recurrent there is going to be a reason behind it. And, similarly, in converse, if you can find a sort of functional reason that lies behind some structural feature then prosumably if the functional reason is a good one - that feature is going to keep recurring because the functional demand that brought it into being will re-occur.

Now, lets look at what we know of cities. You imagine yourself taking a ride in a train - in an elevated train - looking down on the tops of London or New York or flying out of Los Angeles, or wondering around Paris. Each one of these places has a characteristic feeling to it. You know when your in Paris; you know when your in Los Angeles. The fact that you know where you are - that you can recognize the place your in is obviously evident of a tremendous number of recurrent features. In London you find certain kinds of squares with ter_____ around them. You find a very characteristic pattern where a house has an area basement_____ in front of it, and there is a kind of six-by-eight bridge that goes across that area basement (it may be

solid or it may not be); and may possible be associated with one or two steps.

In London they use traffic rotaries much more than in Paris; in Manhattan or Los

Angeles their hardly used at all. The characteristic kinds of construction are

different in each of these places. In Paris you find a characteristic of a rather

high kind of tenement building, with an open elevator inside it. You don't find

that feature hardly at all in London or New York. In England where there is a

great deal of brick construction, there is a recurrent feature of the cavity wall.

Now, there are cavity walls in the United States, but brick construction isn't very

common. One could literally go on for days and days, and days enumerating the

characteristic, pattern-like, differences that one finds going from place to place

and any place these characteristic patterns are recurrent then they definite the

nature of the situation. Now what we have to do is latch on to all these patterns

and make sure that we get hold of the ones which are functional in the sense that

we not only abstract characteristic patterns, but for each pattern that we abstract

we can name the reason why it occurs in the situation where it does occur.

Now, this point is worth stressing because in the architectural work that has

been done by analyists or theoriests in the last few years there has been a surprising

failure to do this. I think that I will give one example at great length.

Now, this was an effort made by Professor Terrin, who was with the United Nations

and is now the professor of building at the University of London, to classify the

apartment and dwelling types in France and he used what might be thought of as a -

well he describes it as a topological approach - he doesn't quite mean that as it

turns out he is talking about some features which are not topological but much more

geometric - but I'll just draw (I guess you did). One of the things that he is

interested in - he has a number of different bases that he is classifying in this

dwellings - is the following: He uses this scheme (drawing) and he varies the

following features. One is he always picks the corner where the living room, or what

ever corresponds to it, is - he shades that - then he says that the first characteristic

relationship that can vary is the position of the entrance, with respect to that,

and he gives three possibilities. One possibility is an entrance in that relation to it -

one is an entrance in that relation to it - and one is an entrance in that relation

to it. The second thing that he varies is the number of solid (that is unpierced)

walls which surround this thing. And he gives the case where there are no unpierced

walls that would be either a tenement house or a free standing dwelling, the case

where there is one unpierced wall; now obviously the position to the entrance with

relation to that wall begins to create significant variation, apparently. You get

a different pattern on his diagram according to whether the entrance comes through

that unpierced wall - I mean unpierced by the windows - or whether it comes in down

here. Anyway, he plays these variations and he has a little table here consisting

of 15 possible combinations of the way in which - oh sorry, I didn't continue that -

there is one unpierced wall - two unpierced walls like that - two unpierced walls

forming an angle or three unpierced walls. Those are the cases of how many solid

walls there are. So he plays the combinations of that feature against the other

feature of where the entrance is with respect to the major living quarter, and then

he gives quite a large number of examples of actual apartments and dwellings in

Paris and classifies them and puts them into one of these categories. Now this is

apparently the sort of thing that one ought to be doing if looking for the structure

of the environment - if your trying to abstract from the environment and get at the

structure. But in fact what he has done, is quite meaningless because although it is

true that he has picked a particular pattern and chosen to abstract it, it is not

a pattern which varies with function in any obvious or important or significant way.

And he has not in other words the difference - now that statement I just made might

sound puzzelin g. If there are any questions on it I would like to take it up at

the end. Because obviously it could be the case that those two apartments that I've

might feel very different = might behave quite differentially as environment. The

point that I'm making is that that would almost certainly be a consequence of some

other things that were done in relation to the organization pictured here. And the

functional difference would not be a direct consequence of this particular relationship

changing. So there is no point in simply abstracting patterns just because one happens

to be able to abstract them. Now I''ll give another example - because it is rather

an important point. Some work, well actually work that is being done in some form

or another in various being done in Boat Braneck and Newman, by wells and Clark, its

being done in England by Lyn Mosely and by a group now working in Bristol. They are

taking the attitude that in order to organize a building porperly you have to establish

kind of a charcteristic differences between the different spaces in the building.

So what these people dod is to make a chart of all the accommodations - I mean again

we're talking about a dwelling and they would make charts of kitchen, bathroom, living

room, bedroom, dining room, garage, etc., like that.x And then they would make a matrix

and write down an appropriate distance that there ought to be between each two spaces.

Now, my point is not that that could never be significant. I mean there are obvious

some cases where the distances between one space and another plays a crucial role from

some functional standpoint. For instance, the distance bwtqeemxthe between the garage

and the kitchen in a culture which survives largely by supermarket shopping is quite

important. And that distance really has some relevance to the way that the building

is organized. One the other hand, the distance bwtween aets say a bedroom and the

kitchen is large irrelevant. Of course, its true that you could rationalize yourself

into the position of saying - Well xXkk actually I mean its nice to get up in the night

and get a snack. But one can also rationalize anything. I'm sure you can do the same

for that other example I just gave. But the point is that there isn't really any

crucial functional problem at stake and there is no poikxx point therefore for fiddleing

with that particular relationship. Now necessarily what I'm saying here is slightly

because
undefined whichxix just what we're taying to stand by a proper function, a function

which we could accept as opposed byxxthat to that one that I just dismissed as a

rationalization. I haven't made that clear yet, in fact I won't be able to make

it clear for something like two or three weeks. There is a difference. I'd like

you to question it if you don't feel that there is or try and try for your selves to

feel what that difference is. There is one anyway.

So it's not enough to be abstracting features which are just easily abstractable.

Now another thing that we must not do when we try to abstract the environment. We talk

about environmental structure. Is to pick a particular set of parts or functions and

somehow say that those are the critical ones. We're going to discuss the relationship

among those things and regard that as the environmental st5ucture. I'll give you examples.

This is tricky because it is what you do in physical chemistry because there the objects

are so simple. Examples. Mel webber has talked about cities and hopes or has hoped

to display most of its structure in terms of its terms of flows. That is flows of

information, flows of people, flows of goods. Now, I think that the observations, the

communication plays a vital role in modern cities is a very valuable observation. It

may well be that there are certain patterns important to cities and based on those

considerations which would have to appear in any adequate account of the environment.

I'm convinced that that is so. What is not useful is to try and say that's what the

environment is, xx or that's what a city is. We're going to pay attention to those

functions, those features and talk about their structure. We have to be able to be

much, much more embracxxding if we're going to succeed in talking about the unity of

the environment. I mean to take an obvious example, the fact that on an ordinary door

frame you put up a 2by1 to stop the door swinging past the lock. That door stop, I

mean this is a characteristic pattern which recurrs literally millions - if not billions -

of times throughout the world. It's obviuos a pattern whxchxmxxx that would have to

be a part of any adequate account of environmental structure and it can not be described

in terms of flows or communications. Now I mean, the moment I give that example of it,

xou obviously you can at once think of a hundred ax other kinds of examples. I

do want to make the point strongly that we have got to be sufficiently general about

what we're prepared to consider so that we can hope to get hold of everyghing that

matters. Now, it sounds very simple to find features which are both recurrent and

also clearly responsible for some particular aspect of functions. But it isn't particularly

easy. And in fact if x we could do it successfully we could give I think a very

adequate account of the differentes between Paris and London and New York and Los

Angeles which as a matter of fact will be rather hard to give. It might be worth

trying. I mean if any of you feel like trying it and buildin g your critical comments

around that critical effect that might be very worthwhile. I think that you'll see

that although its do-able its quite hard to do. and I would like to talk a little

bit about why. Now I'm not sure if I've given enough examples of functional patterns

first of all, no I might give one or two more before we fly round of with that why.

All the patterns which are to be used as the building blocks of structure are going

to be patterns we've agreed are both recurrent and which have some obvious functional

purpose. Now what is the nature of those patterns to be. Here again I couldn't

prepare a slide in time. I wanted to make clear to you that the variety of possible

spacial relationships which might figure in an important way in these patterns, is

quite tremondous. That was what I was really going back to those examples pure connection

in a topological sense or one or two geometrial sexsexexx kinds of connections are not

sufficiently great. Now I'mx going to read off a few kinds of realtions. A quick

series of examples. One kind of a relation. If the expentaltial rat e of density

decrease going away from the center of an urban area. In other words, if you plot

the density against _____ it looks like that - it doesn't exactly

look like that because you get all sorts of minor senses again. But the important

point is that this curve is an expential curve and the reason for that have to do

with the economic trade off between land value - that is the desire to be central

on the one hadd and the cost of accessibility on the other hand. And that economic

trade off produces that characteristic pattern and that pattern is indeed characteristic

of all metropolitan areas through out the world. Another scale, recreational lakes

Lake Berrisa near here, a man made lake pacifically build for recreation. Has this

kind of shape. In another words a very, very _____edge. The reason when

you build a recreation lake since you know that its the edge of the lake that is

going to be most useful to you you are going to allow the largest nujber of people

to come take picnics and have a reasonably amount of privacy, to do so xx you want

to make that edge as long as possible. Characteristic pattern for recreation lake.

I want to make it quite clear that each of the sorts of relationships that I mention.

That is the property of being in veluted   is the particularly kind of of spatial

relational property is of course not going to be always important. It just happens

to be important in this case because we xxenkxxx understand the functional reason

for it in this case. Similarly that expotential density curve is not going to be

there is no particular reason to look at those kinds of curve or that expotential

equation except in that particular case where it has that economic background.

Windows are rectangular. More complicated were. I'm not quite x I think an analysis

for the reasons for that would you'd end up realizing that its partly tradition.

Partly to do with the fact that at one time windows used to slide and that a shash

xx hung window obviously has to have paralell sides. But there are reasons which

have to do with the material that the window is made from. It's easier certainly

to cut wood that way. Now and it's also easiest to build a rectangular frame in the

surround material. So there is a characteristic pattern. Doors bhe same. Now

the thing that I want - this is the most difficult point to make - and this is why

it's really hard to get at environmental structure in the sense that I mean it. Most

of the relationships that I have been mentioning are so incrediably obvious that we

really tend to pass them by. In other words, the pattern - the fish is the last to

to didcover water. And we live in this environment and take it so much for

granted that the relationships which are in fact recurrent, the shape of rooms

the perample shape of office blocks, the fact that office buildings never go above

100 stories or so, because of the way in which elevators and services begin to eat

up space. The fact that roads have lands somewhere between 10 and 12 feet wide on

them. The fact that roads have sidewalks. The fact that there is such a fhing

as aschool and that its distinct from such a thing as a store. See these global

features are the features of the environmentax which really tie into our lives

and these are the ones that we have to learn to express in a clear way and get a

good look at. Now this is an unfamiliar kind of business. Especially for architect

to be doing. Because architects in a way have often been occupied with a question

of whxthexxklxxuqx uniqueness not with a question of recurrence. Another words,

it's hard to definte that exact, I its' an emotional attitude perhaps. An architect

will often consider the unique qaulities of the building to be particularly important

and take the recorrent features for granted. But if w3 wxaxx want to talk about the

way in which the environment as a whole is structured, we must be able to get a look

at all of these recurrent functional patterns and regard the environmenta as an

interweaving of those patterns. Now I have the feeling that I haven't expressed

myself very clearly on that and I'd like to have some questions if possible and

we might need to go on xh with the discussion next time. Lets try it.

Question:

Reply: At one level, yes. I mean when you look at those recurrent patterns you certainly xexa realize that x its more integrated than you might have thought. I think that we'll be able to make k quite a hard-nosed argument to the fact that its not sufficiently integrated even when we look at it in those terms. If your skeptical about that it would be worth it to pursue it.

Max question:

Reply: No, definitely not - xx I'm glad you brought that up. I should have made clear the fundamental format for any one of these recurrent features. Its really three-fold rather than two-fold. In other words, I was saying theres a recurrent feature and theres a reason for it. Because there are really three things which we'll be calling later CONTEXT, PATTERN, and PROBLEM and these are the two that I've been talking about this morning. And of course, any one of these recurrent functional patterns d only crop up or make sense within a limited context. Now the range of context that makes senseful can vary quite a bit. Like the example of the expotential _____ that I gave happens to hold for all apex urban areas. On the other hand, the cross-section of the English terrace house although mainly in London, I'm not sure about that, does it hold in Scandanvian - don't know. It's very possible associated with not only with matters of construction but also with a particular attitude toward privacy. Some of the features can be recurrent in even much more restricted kinds of contexts. There is always a limited range of situations xhx within which you would expect that pattern to recur. That's really part of what I meant by the word recurrenxxt. I didn't mean universally recurrent.

　　　　t

Question:

Reply: Do you mean - now wait a minute.x The fact of an expotential _____

happens in millions of places. The fact that the density of cities happens to follow

that particular curve when you go from the center outwards, I don't think is for

different reasons. Are you saying that it is?

No.

Would be meaningless no - I - see, one of the things that we'll be doing in the not

too distant future is findingxaxmuchx trying to give a much harder definition of the

idea of a pattern. And it will become obvious that the parts within it and therx their

identification is very crucial, so that in that sense already these two things that
                    expotential curves in them would be different
happen have explanationsxbecausextheyxwouldxbexdifferent. I really do want you to

viewing that as a unitery object - that is the basic building block of akkx every thing

that we will be doing and in that sense two, the two cases that you've just described

will be different because there'll be two different problems associated so you won't

try to look at those as being the same pattern.

Question:

Reply: I'm not at this point, I can't answer that and I'm certainly not suggesting

that there is an answer to it at this point either. So I wasn't saying that there is

a point where you're able to draw the boundary and say not we've got everything. What

I was saying was that - I was saying the opposite in fact. Anybody who tries to draw

such a boundary can almost certainly find a counter example. And I say look theres

another kind of a feature which doesn't fit into his scheme thats actual important.

There is one point to be made out of this - see in a way, when you start talking about

let's say information flows, that's much, much more concrete than what I've been saying

this morning and in that sense more attractive. Because at least it sort of seems that

your getting down to the nity-grity right away. Where as what I've been saying is on

the abstract side. And I think the reason is this. I'm trying to create a kind of

conceptual framework within which anything could possibly be important in the environment can be said and which is not going to be exclude something .

Question:

Reply: No the difference is this. For instance, in this scheme I drew - the remember that pattern as being the two walls and those positions. Now there a topological problem property at stake there, that's to some extent namely there are two walls which are separate and in that there a thing with appatures there andxa thingx between it and a thing with appatures there, that's the topologic al fact. The fact that their parallel is not a topological fact. That's all I mean. That's the kind of distinction - isxthatxwhatxyouxmeanxx that's a geometrical factor.

Question: Geometric   something or other.

Reply: Yes, I quite agree with you. I don't think that one can make a helpful distinction between them really. What - in fact again I was trying to make the argument that some poeple who have made that attempt, I think are in error. In other word, some people have said look - let's classify office buildings, according to their topography. You see what I mean. And other things like that. Now, it might be that in a particular case a topological property was really the only one that mattered. For example, On an automobile road racing circute the only thing that really matters is that it meets up to the beginning again. But, it doesnt matter what shape it has well, except in thesmall, it matters what the curve banking is like but so there are things where purely topological properties are important. I don't think there are very many such cases.

Question

Reply: Yes, I feel this is sort of achaky question. i wanted to mention it and yet I not sure how to say anthing very exact about it. (Question from the floor). The uniqueness part of it. Another wards, architects -- there are two things that I think are true about architects. First of all that when there given a particular job they

an effort to make it unique if possible. Many architects - let's not say all but
many architects do do that, and that's one-half of what I'm saying. The other half
of what I'm saying is that they also have a kind of philosophical position in that
direction. They will to tend to argue that it is the unique things in a situation
whibh makes it beautiful or which makes it important and ignore the universal features.
I think that's perhaps deeper , a deeper xx concern. In other words I can image that
a designer who believed that, and I'm not really ready to challenge that believe at
the moment, but I'm just saying that somebody who did believe that, would be sort of
- just bored xxx by anything that dealt with the recurrent features. And yet the point
that, perhaps I don't know if this was obvious the way I was talking - I mean it is
the case that most of the really interesting things in the universe are characterised
iin a sense by universal features to begin with and then maybe made special by some
unique ones later. I mean in the sense if you wanted to think about all the people
in this room - now we all share certain features and although its ture that now that
we share them, I mean in the sense of all being human beings with certain kinds of
biological and psychological characteristics -- once we share them then we're very
very happy to lay xx emphasis on the uniquenes s of each one of us. But laying
emphasis on that uniqueness is really completely crazy. Unless it is seen on top
of this vast universal patterning which lies between and I do thinks architects are
a bit weak on that - that's what I trying to say.

Question:

Reply: No. I said that the specific example, - you see this is specially the kind
of think that I was trying to warn you against. I said that in this specific case
it is not clear to me that that property - you remember I had those two drawings
there, that there is an important functional distinction between those two plans
I would go further - if you were - that was one and that was the other - now remember
this is the livingroom - right - now what we're talking about it you enter very close
to the living room and in the other case the entry seems rather far away from it. Now

the functional difference, what I'm saying is if you were readyxxtox really to start talking that seriously and to start asking about the - what were the possible where should one enter in relation to the living room - for different varieties of people and context - then I think you would begin to realize that there was a particular sort of relationship between the entrance and the living room which is important and which happens to be very badly charactdrised by either one of these things here or by both of them together. So in that particular case the properties which was chosen - this is not a topological problem as it happens - of it is sort of if you regard those connected - but in that particular case the thing that was abstracted was irrelevant. I definitely did not say the topoligical properties are not important in the environment. In fact, I gave an example of the road racing ring, where it really is cruical and there are such things in buildings also, I mean in a heating system for instance right - in the way the hot water circulates. In these cases - its just that there's not point in tryi g to define some special branch of mathematics and say that the particular features is that it happens to study are the ones that matter in the environmenta. That's stupid. That's all I was saying.

Question:

Reply: Yes, that's interestin g because there are things like that. For instance, you get - what your saying there are some recurrent features which are not as function oriented as what I've been saying and of course if you take the way in which the main members of a Japanese roof cross at the top this is a characteristic feature again it certainlyxxin kinds of roofs but not really a functional one in quite the sense that I've been describing this morning. And there are these special recurrent patterns enbeded in culture, I think that it is possible to regard them as possible solutions to problems - and I'd like to discuss that at some length further. I can't give a good answer to it at the moement. But it is important to be aware of these things. Some of them may be sort of sybmolic percularities of a particular tribe even. How

they fit into the larger pictures we'll have to see. I'd like that to be taken up

again actually.

Question

Reply - no, no xxdx I didn't mean that in a bad way - I mean idosyncracies.

Question:

Reply: Right --- No - now I dont' understanding what your saying - right - I see

It is true that it's often hard to find out exactly what the reasons are behind it.

I - could you connect that up with what he said. - Are you saying that there are

also some which seem to be non-functional or were you saying that another way that

these are actually functional - in a special kind of way. As a matter of fact this

is an exp extremely important topic - xxxxxxxxxxxxx the sense in which patterns are

residual - that is that they were used at one point for xx functional reasons and they

are not loped off the moment they become disfunctional or non-functional is very, very

important. It sounds silly and designers offen have a reason I think to quarrel with

that - like they sort of laugh and say ha-ha look the horseless x I mean the automotible

when it was designed was really like a carrage with out a horse and it wasn't until

30 years later that people began asking how to build cars. Really, because the

way a car works - now this is true, there is actually an important reason for that

In other wrods, culture wanxx wouldn't really work well if that kind of process of

hanging on to past solutions were not going on. I'm going to be discussing that I

think in about two or three lectures.

Question:

Reply: Yes, that's a tricky issue because you can't get completely hog wild when

you start taking that approach. We'll have to pin that down. Your right I think there

is that sort of. - ok lets cut it.