Lecture 20
November 15, 1967

One or two people have said that they need some help in developing their own sub languages of patterns and obviously that would be numbers of you and I can't play a significant part in that so I've suggested that those that want to do it get together in small groups so anybody who wants to arrange something like that should stay behind in the end and we'll see whos here and try and arrange something.

Now, we have reached the following point. Let's assume that your language is relatively complete - in other words I've of course only given examples so far but we have something of the order of many thousands of patterns in the language and what I described in the last two lectures represents a system of connections between the patterns whereby a part of one pattern will be identified with or linked to if you like to put it that way, part of various other patterns. As I pointed out this implies nothing about being able to lift the parts out of the pattern, parts don't make sense lifted out of the pattern. But we do have this system of linkage. Now what we have so far then gives us enough material to be a criterian for a good environment. I'm making the fantastic leap here in assuming the patterns for most of the functional problems of the environment are in the language. And under those conditions we do not have sufficient material so that if we want to look at an existing building or proposed building in drawings or any kind of a proposed scheme, we could in theory check through all the patterns in the language one by one decide whether or not the context that that pattern refers to holds, and therefore whether the pattern applies, and then on to whether the pattern has actually been inserted into the design. And by doing this we could decide for every possible building or situation in the environment or every possible scheme, whether it contains context that would tend to give rise to problems that were not solved, so that in that sense we have a fairly comprehensive scheme all ready. Potentially I realize that we don't have the

material filled out. And the hook-up between the patterns that I described last time plays an essential part in being about to do this because for instance as I described it would be necessary in order to determine whether the correct patterns had all been applied in a given case, Suppose that we had the parallel street pattern implimented somewhere and one one of these driveways there was a house, it's only because of the identification between that driveway and the street in the house sign pattern that we know that house on that driveway constitutes that context there fore requires that sign in that manner. But we can do it. Now given this hook-up that gives us a complete way of looking at the environments and deciding whether its right or not.

The part of the language that we don't have at all yet is the generative part. If there were indeed 10,000 or 100,000 patterns in the language and you had a job of designing let's say a small drug store and you started in sketching, it would be a fairly fantastic job to go through all 100,000 patterns, 99% of which would be relevant to your problem and make use of them. And more over even if you could get rid of the 99% that were relevant and you had only a few hundred that were relevant the very crucial questions would occur in what order shall I make use of these patterns. If I've got 300 patterns that all deal with drug stores, which ones do I look at first. The 300 are to complicated for me to get a sense of them all at once. In other words, as a designer now making use of the language what series of steps must I go through to produce a design from the language.

In order to sharpen this question I'm going to describe this morning the most extreme possible answer to it. This is a very mechanical answer. It is one that will not - I repeat not - work for the language in general. So please don't go out of this lecture thinking that I'm recommending what I'm about to describe. I'm going to describe it so that we can begin to understand its shortcomings, and so we can learn

something about how the language would have function. Now, this extreme form which I'm going to describe I think is best characterized by the word "algorism" or operational sequence if you like that better. It is a series of instructions based on patterns such that someone who applies these instructions rigidly and in the correct order will produce a design which does have the right pattern in it. In order to explain this idea I'm going to make use of a small number of patterns that were developed by one of the members of my seminar last year called Frank Hammer and these concern a university campus and the operational sequence which I'll describe for them being developed for the moment by Bob Gay who was also in that seminar. I don't want to get into a discussion about the functional rightness or wrongness of these patterns for the moment because that's relevant to what we intend to get at, so I'm simply going to sketch out and tell you what these patterns are first of all. Now, I'm going to very very rough and ready about them, I'm not going to give you the full context pattern problem thing. I'm really going to give you the most shorthand version of problem possible. The first one asserts that the most basic unit of organization of a campus is a cell about 110 feet square with about an 80 foot square in the middle of it. This is a student space - student work areas in it - that is the central square and it is ringed around the edge by faculty offices and departmental offices that is the basic unit. I should say that all the patterns I will describe right now refer to the second story of a rather more complex structure so there are a number of things going on above and below it which I will not discuss. This is mainly because Bob Gay's work with the operational sequence involved the use of a cathoray tube on a computer and it's the easiest thing for him to represent with(?) two-dimensional material. So we're just working with the second story. That's the basic unit. that's pattern one. Pattern two says that these cells are to be connected to one another in checkerboard fashion with courts inbetween. Pattern three says that the overall diameter of the checkerboard is to be not more than 2600 feet.

So in other words the further - the two cells which are furtherest apart are less than 2600 feet apart. That's the third thing. The 2600 foot restriction. The fourth pattern states that large class rooms, lecture halls, and other specially equiped facilities are located in a core roughly in the center of the campus. And that there total square footage is about 20% of that of the cells. So that four says that there is this core consisting of special lecture facilities and it's area is about 20% of this area. Pattern five says that at this level, remember that we're on the second level the major pedestrian circulation goes on somewhere on four or five campus paths running regularly outward from the core and about equally spaced. Pattern six says that the first increment of cells immediately around the campus core - of I'm sorry - I'm not saying that very clearly - Pattern six says that the central core is completely ringed around by about 15 to 30 cells and that - remember that these paths are now going outward like that - that beyond that first ring of which is completely densed(?) with cells - the dormitories are sitting in that manner astraddle the paths. So that the cells - the remaining cells than fill out in between those dormitories. The last pattern, now actually necessary for the operational sequence I described, over part of a different series, state that college dormitories should not be more than four stories high - and gross square footage will be computed on the basis of 400 square foot per student. Now, so far these patterns are in the same general format that we have been discussing and now the question is: how do you use them, in what manner can you get a design out of these things. Let me make clear that with those very small number of patterns that is not a real problem. Obviously anybody could simply look at those seven things and given an actual site and some actual conditions could create a design that does have these patterns in it. I'm being very loose about that for the moment deliberately. I don't want to get into a whole lot of details in general you could say the university - obvisouly they would need to be more precise, but that's not part of this exercise.

So when I said that somebody could easily take these things and work with them, I am assuming that, if you have a context to work with _______________, I am only making that assumption.

Now, the thing -- this algorithm that can be derived from this particular set of patterns has the following character: it is a strict series of questions and computations which will actually produce a design in a mechanical manner based on these patterns, and I am going to run through it step by step so that you get a clear sense of just what this means, and I will build up an actual design as we go. The first step of the algorithm is a question and that is what size and shape is the site and where are the access roads on it -- as a matter of fact, the access roads is a gratuitous but we will include it. Now, let's assume that that is being answered; I am going to give answers to each of these questions and computations as I go, and let's suppose in this particular case we are dealing with a site somewhere in the Midwest; it's a flat site, it's a long distance from any city, and it is a one mile square piece of ground, and it has a road along one side of it. And the second question is how many students are there to be in this university. In this
187 case, let's assume that the answer is 8500.

Question:

Reply: The third step of the algarythem is internal and based on -- I am sorry I omited one thing that each of these cells is presumed to cope with 200 students that is part of the pattern I gave you the dimentions but not that fact. I said that this 80 ft. sq. space inside is for students it is for 200 .

Question:

Reply The first step of the computation says with ~~eightyfivestud~~ 8500 students based on 200 students per cell there will need to be43cells in the university. The next computations which is based on the dimention of this thing says -- oh I would like you to make a record of which patterns are being used in this process of ~~comp~~ computation as we go so far we have used pattern one.

Now this thing is about 110 ft sq. there should be limits on that but I am being

ruff and ready on that is 12000 sq ft. based on this pattern we know that each one also is associated with an open area to that same extent so that the total area covered is 24000 ft per cell. So there is the next step in the computation that is a permanent step in the computation it might be regular there is no need to compute it afresh each time. That is making use of patterns one and two.

Question:

REply: Now this is step 4.

Step 5 says based on 43 cells at 24000 sq ft per cell there will be a total cell area of 1,032,000 sq ft that is called a dominion. A million sq ft a cell or of cell area.

Step 6 says the core is 20% of the total cell area that is based on pattern 4. That is 200,000 sq. ft. notice we havent done anything to this actual site yet.

Step 7 says the core plus the cell then are 1, 200,000 sq ft.

Step 8 says the diameter of that core plus cells based on 1,200,000 sq ft. is 620 ft.

Step 9 says check it against in pattern 3 checks 1,240 against 2600 and it is less there is still some discussion is it not the radius. It is the radius so the diameter is 1240. Check s the diameter against 2600 now it is important to note I don't want to bring that in here if it so happens that the student population has been laege enough to drive this diameter above 26 100 it is quite clear that something would have to give pattern in the language dealing with cases where the diameter is greater than this amount. Well in fact that seems to be the most natural way to handle it it probably would require a slightly different pattern involving either a greater concentration of these cells smaller cores higher densities or perhaps just a relaxation of the conditions. For the moment we are within that so we continue.

Now on the basis of that check step 9 might --keeping count of the steps correctly -- I am making them up as I go -- can step 10 says we have a 620 ft radius to deal with thate is now a choice becausethe core could be located anywhere as long as it is 620 ft

from the edge it needs to be -- let me point out a kind of a deficiency here if one takes this pattern seriously it says that the core should be completely surrounded on both sides by these cells and that it should be at the center.

Now the wording of that pattern is infact not perfectly precise so it is not clear from the way it was written how crucial it is in other world might that be a reasonable possiblility or might that something like that be a reasonable possibility it isn't clear from the way this pattern was written so I am goint to assume for the moment that it should be taken literally. This kind of difficiency in the definition of patterns will keep cropping up it really isnt a deficiency in the statement of them it is something enivitable -- conditions will always arise that bring the particular formulation of a pattern into doubt. But taking that literally we now have a choice point - we are on step 10 - which is to locate this core and so here we can do either of 2 things we can step out of the mechanical process and simply let someone make the choice and in view of the fact that there is this road it seems pretty sensible to put it over toward this edge there is no pattern in the particular set that I am presenting to you that says anything about an association between this core and the nearest road so that is an arbitrary choice and maybe the most reasonable one so it is quite alright to make it if one wanted to be perfectly mechanical this decision could be make at random within that zone but that -- I am saying that not because it is valuable that it should be mechanical but I will discuss the whole mechanical nature of this algarythem when I get to the end of it.

Now so we locate the center of the core 620 ft from the edge not the core radius itself -- now the core is 200,000 sq. ft the core radius is 250 sq ft. so I think it is quite clear step 10 locate the point which is the center of the core.

Step 11 computes the radius of the core 250 ft based on 250 sq g ft and locates that core as drawn now here again we have a choice which could be random or it could be done with good judgement now that is the exact shape of this core is not determined by the pattern of course the computation fact in the making will assume that these are

circular nothing in the patterns which says so. So I chose to draw it as a square. At this point now the program asks another question which is what percentage of the students live in dorms? And inview of the kind of location that I have described to you a reasonable answer in this case might be 80% if the location happened to be in a metropolitan area a place like Berkeley or San Francisco State the percentage would be very low, but in a Midwest campus miles from anywhere it would probably be very high so 80% of the students would be assumed to be living in dorms this is now step 12. 80% of 8500 is - sorry I should make it step 13 is to compute 80% of 8500 which is 6800 so 6800students are living in dorms.

Now on the basis of pattern 7 we have to give 400 sq ft for students and the next step there is another choice the pattern says the dorm cannot be more than 4 stories high it does not say that they should be exactly 4 stories so that the choice can be made as to how high they will be. I have made the arbitrary choice that they will be 4 stories high. So that gives us 6800 sq ft of ground coverage for the dorms

14 th step is to compute the totat sq footage of the campus as a whole core plus dorms which is now 1,200,000 plus 68000 which is 1,180,000. sq ft for the campus as a whole or rather for those 3 items. which gives a radius of 800 ft so we sketch that in radius of 800 ft notice that mine are nomially here that in our placing of the original core 620 ft from the age this 800ft radius is not going to accomodate that many sq ft. These are nomilies (sp)when they get really serious they make algarythems impossible -- they are only minor in this case. We now go to step 16 is chose either 4 or 5 campus parts that pattern gives the option of 4 or 5 I chose 4 a choice point again and locate them this is one of those cases where the choice is both in the number and the exact location. Pattern said that they should be about evenly spaced that is not precise but common sense will win out there.

Step 17 since there are 4 campus parts and each part is to be strattled by dorms on the basis of pattern 6 we may compute divide that by 4 and get 177 for the area of the dorms the place on each one of the parts. Now in order to get the exact

shape of those dorms blobs (?) we have to follow first of all this pattern which says that there is an inner ring of cells in other words it says that dorms do not go all the way to the core -- there will be an inner ring of cells somewhere between 15 and 30 now I have choden 15 -- 15 cells have an area of 360,000 sq ft plus the 200,000 of the core = 560,000 so that gives an inner ring the radius of 420 ft I colapsed a few steps there. So that is 420 ft there for the inner ring and that is the whole radius of 800 so there are 380 ft remaining there so that there is 380 ft so each of the dorms its radial dimention is 380 ft. Since each one of them has 170,000 sq ft its mean width is about 450 ft so we place those dorms like that. The Next step says add cells sequentially statting on the basis of a checker board pattern strating at the core and the final step says where there - if you can imagine if you enlarge that slightly where you have drawn that edge the cells are going to come up to it like this and there are a number of different ways of treating this it depends on the exact treatment of the pattern. I will chose the following arbitrarly, Let's put- imagine that that pattern has been written correctly with limits on it and supose this dimention was to have the limit there was 75 to 140 for the size of the cell. Then make the algarythem operate in the following manner -- wherever the cell -- where this line crosses something that is trying to be a cell if any of the cell sides are less than - if any of them are less than 75 ft. push this line back until they become 75 and complete all these cells in what ever shape they come out so long as each side is 75 ft for instance there there would be a cell of that shape so we would push the thing back a bit. That would complete the operation of this algarythem. Tentatively we have placed locations for the dorms and that is at the very edge of the dorms. Obviously there are very many other patterns and this is simply nothing but a sketch but this is the extreme form of how a language might work. Now I want to mention a number of things first of all. One of the crucial aspects of the development of this language is going to be its creativeness a normal language has tremendous creative power. It enables us to say anything we want to say to make

poems to be very very extraordinary in our ability to use the language. What I have just described is just the opposite extreme it puts the designer in a position of doing nothing more than answering one or two final questions and making one or two trivial choices. Now I think that we must face the issue fair and square. It is this if it were possible that the pattern language in the manner which I have just described then it would be shere romanticism and whimsey to try and prevent it. I am sure that there would be great resistance to a language which operated like that but in the long run it would almost prevail where genuinely possible. So rather than trying to get rid of something like I just described on the grounds that it is not nice we must I think try and grapple with what that sort of process will not do.. In what respect is that kind of process functionally weak.

I think we should discuss this a bit at the beginning of next time before I go on into the next state of the discussion. What kind of comments do you have?

Question?

Reply: You are saying that the algarythem could actually be tooned up and made better you could get ride of that quite easily.

Question:

Reply: Yes, indeed if you look at the reasoning behind this pattern you find that the possible range of shapes that it takes can be fairly great.

Question:

Reply: First of all I have for the sake of/introducing simplicity this fast there is no reason-- these things could could vary a good deal the exact levels of variation are not specified in this pattern I dont think it would be too difficult to sketch them out. For instance I expect one might always want to leave it with 4 sides. I expect when you end up with 5 sides some of the angles would get tricky enough so that building problems would become almost insuprible. The important thing to notice that even here this was stated more suttily an algarythem could easily take care of this. The very very rote process which I have described could almost handle

that provided it was clearly stated. It would handle it in the following manner. It would try to put in squares and wherever it failed it would start making something else. The pattern should say this the pattern is quite sketchy.

Question:

REply: Well not that of course is an interesting observation -- I think you are quite right but if these algarythems in general made sense presumably there would always be a way of setting them up afresh from any set of patterns. So that you would now change this set of patterns then your algarythem would become different of course. You mean if this was a variable. No then I don't know what you are saying. You mean that the different contexts of the diameter would be different. What kind of variable are you takling about. That is equally true of the pattern and we know that the patterns are going to be in continual flux because we are going to keep finding mistakes in them and keep proving them and in theory that would be quite possible to do in the algarythem. That is an interesting line of discussion and I don't know if that is the way to cut to the core of the algarythem. We have sketched this algarythem out in a few minutes and he has been working on it for a few weeks. Actually developing the algarythem is no longer a task of developing the patterns. I don't think on that score you can critiicize that method of attact maybe you can I havent through it through all the way. It doesn't look like that is going to show what is wrong with the algarythem here.

Qeestion:

Reply: That is an intersting question too I mean it is obviously a different endity it has a different form of construction it is based on this clearly it brings them in at different points. What is logical with respect to these I think is an open question. When you say is it separate or is it the same what are you asking really.

Question:

REply: Well probably in the sense it is better to think of it as being a task. I think to generalize what I have just sketched out this moreing you ought to bare in mind the

following idea even your 100,000 patterns even for any subset of the patterns you might have picked it would be possible to construct an algarythem that made a design according to those patterns. So in that sense for every possible set of patterns you would have an associated algarythem or you could have one. So that there is a strong association in that case.

Question:

REply: You are saying it vaguely but you are saying a very important thing. You are saying there are more interesting things that you can do with these patterns then that algarythem can do and it is obviously that language has to be able to do those more interesting things and the algarythem doesnt do them. See if you can define what those more interesting things are. That is the question. You are saying that there is something imporatnt that the human mind can do which this type of process cant do and I think you have to define what that type of process is. It is a very important question.