THE STUDIO CTH-A AND THE SEARCHING PICTURE

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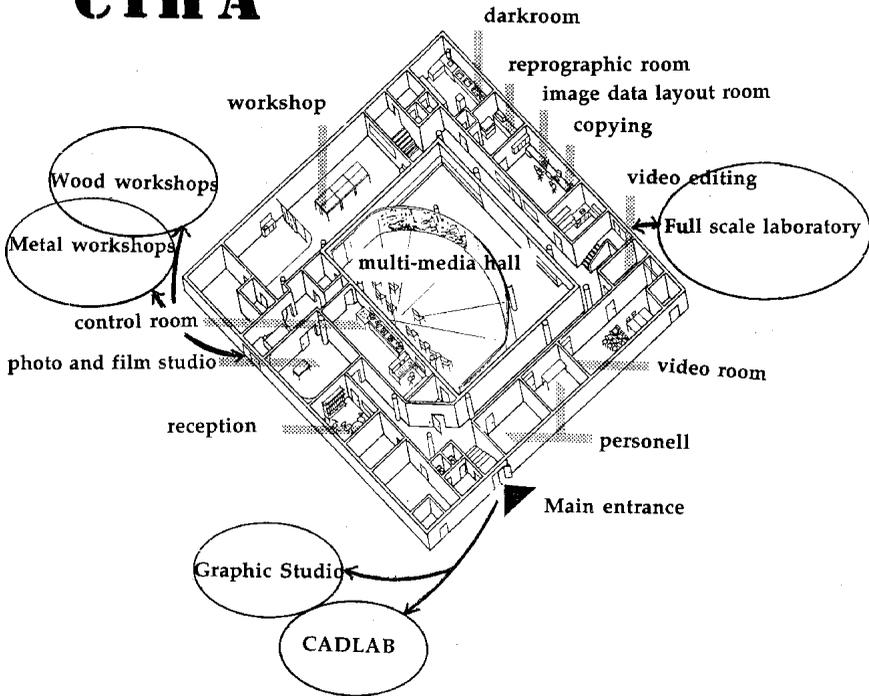Design Methods
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I will both try to present our STUDIO CTH-A and discuss the architect´s searching process, in which endoscopy is one of many tools. The Studio for Visualization and Communications at Chalmers School of Architecture in Göteborg started in 1975. It might be of special interest to you that we are *not* specialists! Our aim from the beginning has been to have equipment ready for students and researchers who want to study and train in as many different media as possible for visualization.

In our studio we have simple as well more complicated. e.g. from a sand box to a 13-projector Datatone controlled multivision facility, projected on a 180 degree canvas. (Our best simulation results has been achieved with this equipment). We dispose of about 600 m^2 area for our different activities, and the Studio is closely connected to The Graphic Studio, the wood and metal workshops, the CADLAB and the 400m^2 fullscale laboratory. We have found that *close to* is very important for creating a congenial environment for teaching and research purposes.

The versitality of our equipment allows us to develop interesting and useful combinations betweeen old and new media. One of the outcomes is the ”Emerging picture”, a tool which makes it possible to combine hand-drawn sketches, OPH diagrams and recorded sound, resulting in Super S video cassettes.

We are planning a visual media laboratory with an image data system linked to the conventional library search system, with will produce many different results. As a result of this conference our endoscopy equipment

STUDION CTH A

darkroom
reprographic room
image data layout room
copying
workshop
Wood workshops
Metal workshops
video editing
Full scale laboratory
multi-media hall
control room
photo and film studio
video room
reception
personell
Main entrance
Graphic Studio
CADLAB

will be modernized! For a long time we have been engaged in notation techniques, which we find most necessery, since many important aspects in space experience not are the visible ones.

Currently we are engaged in a joint research with professor Young Chul Kim from Korea with regard to space perception and ways of visually depicting its contents so as to enchance the architects planning process.

For some time we have studied the architects creativity. To introduce a possible future discussion on the place of endoscopy as a planning tool in comparison with other tools, our latest abstract in this field might be of interest.

THE SEARCHING PICTURE

What happens during an architect's search for the best solution? How does he (or she) begin, which tools are chosen, what happens when he comes to a standstill? The activities – sketching, discussions with other people, making models, taking walks to think, visits to the library, etc? What is an ordinary procedure and what is more specific? Do the tools have an impact on the final solution chosen? What happens during periods of no activity? Are they important? In which fields of activities are signs of the searching process to be found?

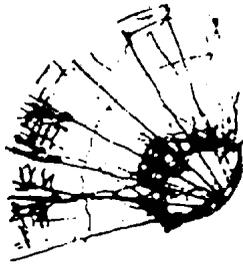In other words — what is the process of creative thinking for architects?

Mikael Hedin and myself at Design Methods, Chalmers University of Technology, have started research into architects' problem-solving. We have finished a pilot study on a very experienced architect working traditionally, without Cad ("The Bo Cederlöf Case")[1].

We have started preliminary discussions with our second "Case", an architect in another situation, who has been working for many years with Cad equipment (Gert Wingårdh). For our next case, we will study a third situation – two or more architects who share the responsibility for the solution and where the searching is a consequence of a dialogue between equal partners. At present, we are preparing a report on theories in and methods for Searching and Creativity.

[1.]*Arne Branzell, Mikael Hedin: Den sökande bilden, "Fallet" Bo Cederlöf, Department of Design Methodology, Göteborg.*

I will give you some results of our work up till now, in the form of ten hypotheses on the searching process. Finally, I would like to present those fields of activity where we have so far found signs of searching.

Our approach, in comparison with earlier investigations into searching (the most respected being Arnheim's study on Picasso's completion of the Guernica) is to collect and observe signs of searching *during* the process, not afterwards. We are, to use a metaphor, following in the footsteps of the hunter, recording the path he chooses, what marks he makes, what tools, implements and equipment he uses.

For practising architects: a better understanding of what is going on and encouragement to try new ways of searching, for architectural students: better preparation and training for problem solving.

It all began while we compared the different objects in our collection of sketches at the Chalmers STUDIO for Visualisation and Communication. (For some years, we have been gathering sketches by Alvar Aalto, JornUtzon, Ralph Erskine, Erik and Tore Ahlsén, Lewerenz, Nyrén, Lindroos, Wingårdh and others in a permanent exhibition). We observed similarities in these sketches which allowed us to frame *ten hypotheses about the searching process.*

Sketches from the collection at the Chalmers STUDIO for Visualisation and Communication; Alvar Aalto, Sigurd Leverenz, Bengt Lindroos and Bo Cederlöf.
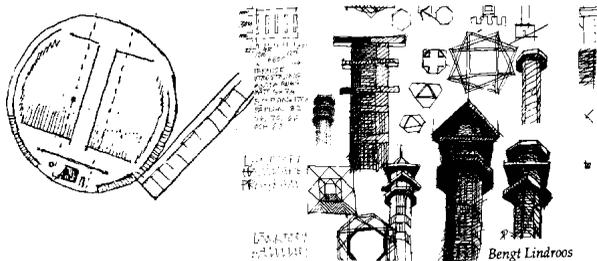
Some of these might seem to be obvious, but one ambition in our research is to gather and coin good names for the most important factors in the problem-solving process. They are *design hypotheses,* points of departure rather than scientific hypotheses in the ordinary sense. These design hypotheses have been the subject of discussion since the beginning of the project, now follows our latest version. The ten hypotheses are:
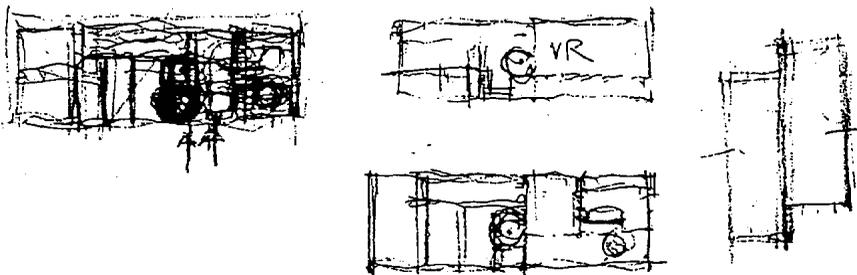
1. On small sizes

When comparing the different sketches in our collection, the following observation was obvious: Aalto, Nyrén, Lindroos made *very small sketches* at the beginning of a project. Leonardo da Vinci, Van Gogh, and Gauguin among painters are also evidence of this.

It is common knowledge that first sketches have often been made on restaurant serviettes, matchboxes, etc. There is even an English expression for this "thumbnail sketches." It was no surprise that Bo Cederlöf's first sketches were very small.

Gert Wingård has been interviewed on this: His answer came promptly – *"small! ... The more I work, the more I work in miniature"*.

Reflection: We think that this has mainly to do with the concentration of the mind, and what Rollo May called: *the courage to create.* (It is less daring to make a small sketch). We think this hypothesis is well-founded.

The next hypothesis is apparently connected with this observation.

2. On all at once

Many different aspects often appear on the same piece of paper. In our collection, this was obvious in the case of Aalto, Lindroos and Nyrén. In Leonardo's sketchbooks this is obvious. We found evidence of this also in Bo Cederlöf's "Case".

Reflection: We think that this has to do with the nature of the architect's problems. To solve a problem, he has to deal with many different aspects simultaneously. They are often presented in his mind at the same time. Small size is thus important to each aspect. He/she must capture every fleeting thought!

It has to do with what Alfred Binet named divergent thinking, which is considered to be a most important part of creative thinking.
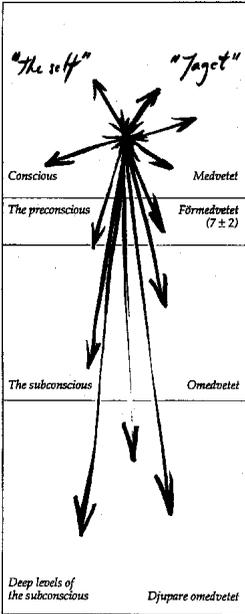
Connection with all levels of consiousness is important.

3. On the importance of the subconscious

This hypothesis must be included. We have had interesting discussions on this with Professor Emeritus Gudmund Smith, Lund University, (the most experienced researcher in Sweden on Creativity). This picture was done after that discussion. Obtaining evidence of the subconscious in our "Cases" is, of course, difficult. Quotations from interviews, however, support our hypothesis:

Bo Cederlöf: *"I have to sleep on it"*. He usually waits before drawing a single sketch until very late. In our case, after he had visited the building-site, he did not do anything with his project for a month. In his own words: *"I cannot draw if the problem has not matured in my mind. It is always like that. If that has been the case, it is later much easier to solve the problem. This is often difficult for the client to understand"*. He broke off at intervals, letting the subconscious work on the problem. Gert Wingårdh: "I *sketch best while I am walking"*

Reflection: Many authors stress the importance of the subconscious. One aspect has been mentioned as being important: The ability to tap the subconscious mind is common among creative persons (Gudmund Smith). Mozart once wrote to his sister: When I make a composition, it is very easy — suddenly all is clear to me, I see everything as a whole and I just have to take out of my *memory bag* what I need.

During the incubation period, an important phase in creativity, the subconscious is an active searcher. The search is in progress, although the searcher is not aware of it.

4. On the importance of tacit knowledge (acquired skills)

This hypothesis was formed after studying Bo Cederlöf's search. (By tacit knowledge we mean in this context acquired skills, "the knowledge of the hand"). Bo Cederlöf uses model-making as an important tool in problem-solving. He has a special skill in making very small models while searching. Asked why, he described the

pleasure he took in his youth in making paper buildings-a magazine called Allers had a supplement with paper buildings in the 1940's which he loved to make.

Reflection: We think this will prove to be an important factor. Training at an early age and acquired skills make the searching exciting, interesting.

(There is also the possibility that tacit knowledge is a way of communicating with the subconscious.)

5. On the need to change ways of approaching the problem

Searching includes trying different methods. In our collection, Carl Nyrén has noted that he regularly changes from free-hand drawing to fair drawing using a T-square. Bo Cederlöf has a special way of searching. He changes from free-hand sketching to modelmaking. In our case, this change was made very early in the process and played a most important role for the final solution. His models are very small (scale 1/400).

Reflection: Changing ways of approaching the problem result in elements being presented in a different way, new aspects of the problem may emerge and a decision can be made. An architectural problem can be studied in many ways. Changing from different mental starting-points is one way of approaching the problem. Changing media is another.

Changing ways of approaching the problem must be considered to be an ordinary procedure during the searching process. As Donald Schön puts it: *"The totality of all possible media constitutes the Design Language."*

6. On the influence of the medium used

In what way does the medium used influence the solution? For Bo Cederlöf, model-making was of the utmost importance when choosing the final solution.

Reflection: We think that the influence of the medium is an important factor that has been overlooked. Each medium has its own possibilities and different aspects of the problem may emerge.

In a discussion with Gert Wingårdh, he mentioned that the Xerox machine had probably helped the deconstructivist movement in architecture. The layer by layer of contrasting elements is easily made visible with the Xerox machine.(He has also mentioned that he thinks that for him the Xerox and the Fax machine are more important tools for problem-solving than his computers.)

New tools can influence the searching process and also future architecture. Media analysis and evaluation, comparing the usefulness and effect of different media should be investigated. (At Design Methodology at Chalmers we have started studies on this subject.)

7. On aesthetic satisfaction

While searching, the pen is often the focal point of the searcher's feelings, which makes for interesting graphic results, sometimes of great aesthetic value. Does this influence the process?

There is also another aspect of aesthetics — Bo Cederlöf: "I *seek simplicity, clarity.* When I have found that, it feels good. The solution in itself is beautiful".(Gert Wingårdh: "*I don't find my sketches interes ting after I have done them . I always throw them away after a while. The important thing is the erected building – that is what counts".)*

Reflection: There are two types of aesthetics, *logical and pure.* Both can make the work exciting. Pure aesthetics may be dangerous, because the sketcher can be seduced by the beauty of his sketch. (The Swedish architect Celsing is said to have taken away soft, good pencils from some of his too skilful employees, replacing them with ball-point pens.)

8. On insight as a consequence of working with the problem

When does insight occur, at once or later after having worked hard on the problem? One of the most interesting phases in the phase-theory formulated by Helmholtz and

Wallas as long ago as in the 1920's is the illumination phase.

In this hypothesis, we stress that in architectural problem-solving, the solutions mostly come as a result of hard working on the problem. The most important decision in our pilot study came after about three months of working on the problem. Bo Cederlöf was asked when the insight usually appears: *"After a while"*.

Gert Wingårdh when asked about this... *"Some insights come early, then nothing happens and then it may happen that each part falls into place. An obvious feeling that it fits together.... I also have a feeling that there is a process going on where different problems, (sometimes old ones) arise. – One has hidden expectations going on which one tries to meet. Then, suddenly, one gets the "a-ha feeling" which makes it much more interesting to go on. I get a similar feeling of excitement when I see other architects finding good solutions!" .... " I have a feeling that what I have done before influences the new project."*

Reflection: Illumination phases appear during the solving process. The insight, the illumination that "it fits" often comes suddenly, and mostly as a consequence of hard work. Insight is also a prime mover that makes the efforts worthwhile.

9. On tools close at hand

In searching, what importance does proximity and access to the different tools have? Bo Cederlöf's best tool is a sharp, thin 2H pencil, which he always has at hand. He also has 1 mm cardboard and a knife for model-making near his working-table.

Gert Wingårdh also uses sharp, thin 6H pencils, which he has placed all over his office. (In both cases they do not use the soft graphite pen, which conventionally is considered to be the sketching pen of choice.) In his case, a simple wordprocessor, Fax and a Xerox machine are also at hand. The model-making is also near him, he has a full-time model-maker in his office.

Reflection: If a tool is not close at hand, it will not be used, and will have little influence on the searching situation. In our future study "The Wingårdh Case ", we will study in what way computers are involved in searching for the best solution.

Possibly, they are not as close at hand as one could wish. An interview with Torbjörn Edgren, one of the most experienced computer users at Wingårdh's office: *"Computers are old-fashioned in a way - the hardware interface has not changed since the 60's . The software has developed immensely but the hardware could be much better".*[2] If a tool is not close at hand, it has little influence on the chosen solution.

[2.] *Parks Scientific Lab in Palo Alto is currently working on these problems.*

The most obvious hypothesis, however, is of course the following:

10. On trial and error

The way of searching by means of repeated attempts, also including making errors, is obvious.

In the architect's case, the transparent sketching paper is a good tool. If the solution is not acceptable, the paper is thrown into the basket; if the result is interesting, improvements can be made on a new layer. In "The Bo Cederlöf Case", model-making was a most effective trial-and-error tool.

In our coming study of Gert Wingårdh, one interesting question concerns the ways in which the computer can be useful as a trial-and-error tool.

Reflection: It is important to find tools that facilitate the trial-and-error method. The choice of solutions is made easier if the tool is fast, cheap, and can be combined with other ways of searching.

A model of behaviour

Where and in what fields of activity can traces of searching be expected? Since needs generate activities, signs can be expected to turn up in four fields of activity. Considering the architect's situation, the architect's most important need is also the name of the first field of activity:
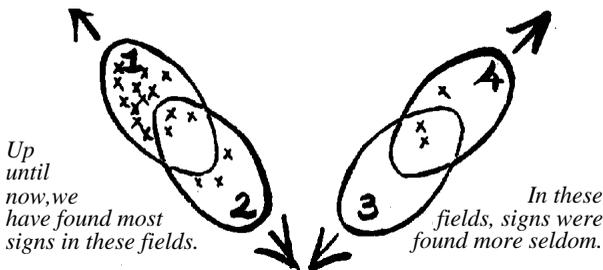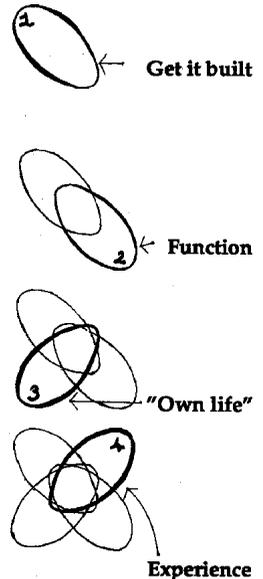
1. Get it built. Signs in this field are the only ones that are absolutely necessary to get a building erected. They may give money and reputation! The physical representations of the product are found here; the "letters" to the builder and to the authorities: plans, sections, fronts. Another expected field is
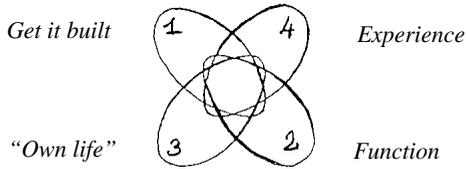
2. Function. The user's physical need of space, transportation flows etc. (Signs in this field have so far been scarce.)

3. "Own life". The architect should foresee how a building will age by itself and without Man's influence. He should be able to describe the influence of climatic factors, ecological aspects, construction consequences, and so forth.

But the result cannot become architecture without considering the consequences on the mind, the psyche of the future user! The fourth field is therefore of utmost importance:

4. Experience. Perspectives, models, notations of space experience, (including notations of time - the fourth dimension) etc., could have been expected here, but were rarely found in our case study.

Get it built

Function

"Own life"

Experience

Up until now, we have found most signs in these fields.

In these fields, signs were found more seldom.

139

Get it built   1   4   Experience

"Own life"   3   2   Function

In this figure, it is possible to place the following overlappings:

*(1+2) (1+3) (1+4); (2+3); (2+4);*

(1+2+3); (1+3+4); (2+3+4); (1+2+3+4);

In the center of this figure (1+2+3+4), the building is formed, studied and then torn down — the completed full-size model should be noted!

In our pilot study, Bo Cederlöf's models and his "zero-scale" (small sketches with no established scale), affected all four fields of required activity.

An architect should be able to describe all the consequences of the erected building. This time Bo Cederlöf, with his 45 years of experience, did not need to describe all the consequences. I think, however, that the architect in his searching should be able to describe all four fields to be sure of a good result. And this he should be able to describe not only to himself but also to the authorities and users involved. "Get it built" is easy to describe. In the case of the other fields, some useful methods of description have yet to become common knowledge. For some fields, for instance the building's "Own life" ,new methods will have to be developed.

If an element is not described, it is in a way "not there". It may be overlooked. I am *critical* of the tendency among architects to rely on their ability to "read" all aspects of architecture on the basis of physical representations.
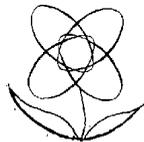
By the way, when you find this flower,
(the four leafed clover)
luck is just around
the corner !