

COMPUTER IN IDEA SEARCHING КОМПЬЮТЕР ПРИ ПОИСКЕ ИДЕИ

Aleksander Asanowicz

Bialystok Technical University

What is design?

Designing is creative process of finding, fixing and developing an abstract idea of real spatial forms, not a "process of problem solving" as scientific research is. How the processes of design flow? In what way the design idea arises? **Conscious activities or serendipity is the main principles of designing.**

Stanislaw Lem has claimed that the **serendipity** is an early, especially turning point of the great process of evolution. **Serendipity** is the effect by which one accidentally discovers something fortunate, especially while looking for something else entirely. Lawrence Block described serendipity as follow - "Serendipity. - Look for something, find something else, and realize that what you've found is more suited to your needs than what you thought you were looking for."

The basic conditions of creation are intuition, that is the ability to foresee without trying to understand, and imagination, that is the ability to create certain images in our mind. Therefore, the core of creation is based on creating an idea in our thoughts, which had never before been brought to life by anybody, as well as images, which are not associated with any past experiences. (Maslow 1962) A. Koestler in his book "The act of Creation" emphasized a concomitant presence of inspiration, cognitive leaps, or intuitive insight as a part of creative thought and action. (Koestler, 1964)

Traditional way of form searching – sketching

However, in what way we search the idea in architectural design? Most of us agree that the sketch is the main medium in architectural creation process. I would like to present three methods of form searching by sketching.

First method – from scrawl to form. The Le Corbusier sketches of the Ronchamp Chappell are illustrating this method. The form has developed from landscape sketch. Each sketch was more and more detailed. The sloppiness of the drawing is natural however, as it reflects the author's real idea of the form at that particular stage of his research. The presented sketching method is characteristic for the process of searching in which the subconsciousness plays a main role.

Another method of using sketches is observed when the author, from the very beginning, consciously chooses a particular direction of his search. Knowing what he wants to find, he pursues an aim, analysing critically each consecutive stage of sketching. The good example is the sketches of the Brasilia city, made by De Costa. The two intersecting lines transform into a drawing of a dragonfly, being the essence of the assumed directions of composition.

In the third case Niemeyer could not come up with any ideas, so he drew a circle on a piece of paper. The circle transformed into a sun, surrounded by an aureole of rays, what suggested the central plan of the building and pylons open to the top as if sunflower leaves (Fig. 1).

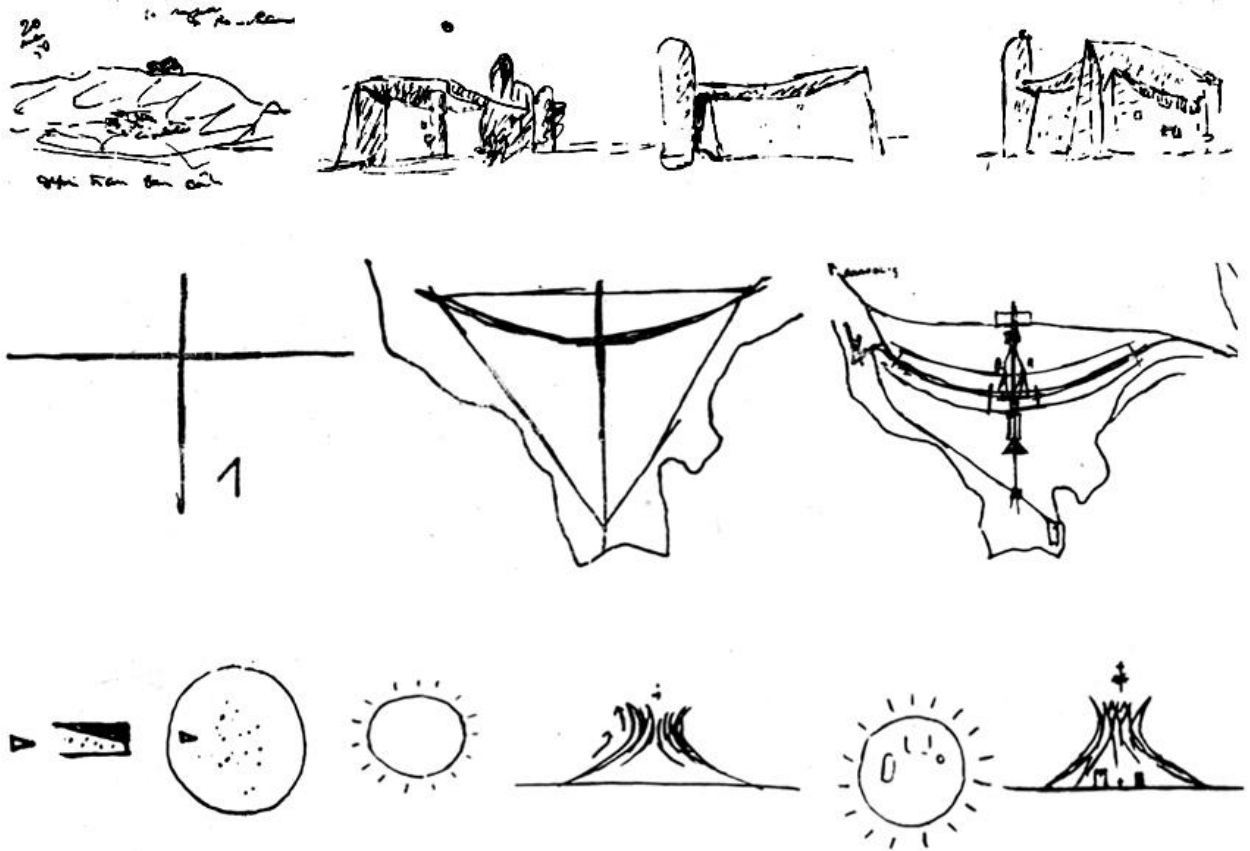


Figure 1. Traditional sketching

Theories of creativity

Presented three ways of designing has showed that metaphors play important role in the searching process. Confirmation of this thesis we may find in many psychological theories of creativity.

Incubation in which the main stage of creative activities is illumination is an active process of sketching and discussion. This increases and accelerates the emotional experience, which is the basis of illumination. (Wallas, 1926)

In Synectics a source of creative possibilities is connection of different elements, which do not have anything in common. On their base arise sometimes weird associations. For effective process of searching designer's mind should achieve emotional instability. Designer needs new perspective to synthesis of a new solution. For this purpose, he uses procedures including analogy and metaphors. Thanks to metaphors, we may see ordinary in extraordinary and rare in common. (Gordon, 1961)

In Visual Synectics a designer generate useful ideas by looking at a number of pictures. The process of generation includes three stages:

The designer look at a picture or small set of pictures. The picture(s) can be drawn from anything: e.g. art, environment, recreational or sport activities.

The designer write the comparison between the picture and the topic, using a stem such as “_____ is like _____ because ...” or “_____ is like _____, as well as not like _____ because ...” and sketch what he/she saw at this picture. It is phase of illumination.

He/she tries to relate sketch to design starting from total impression to more and more detailed analysis.

We may described this process as follow - In the normal intuitive process the idea evolves when individual is confronted with an object which is quite distant from the problem area. The idea, which emerges, is a product of intuitive confrontation. (Geschka, 1980)

In Geneptore model creativity takes place in two phases: a generative phase, where an individual constructs mental representations called preinventive structures, which are ambiguous and fuzzy, and an exploratory phase where those structures are used to come up with creative ideas. The successful ending of creation depends from ability to see metaphoric meaning of concrete structure. (Finke, 1992)

According theory of **Bisociation** new ideas arise on the basis of the intersection of two quite different frames of reference. The creative process is based at metaphoric thinking. Koestler invented this term to distinguish the type of analogical thinking that have place in creativity from the logical thinking, with which we are familiar in our everyday lives. (Koestler, 1990)

In **Conceptual Blending**, elements and vital relations from diverse scenarios are "blended" in a subconscious process, which is assumed to be ubiquitous to everyday thought and language. Insights obtained from these blends constitute the products of creative thinking. (Turner, Fauconnier, 2002)

All presented theories emphasize the role of unpredictable associations and metaphors in creativity. Lakoff and Johnson (1980) write that, the essence of metaphor is understanding and experiencing one kind of thing in terms of another. Metaphors help designers to understand unfamiliar design problems by juxtaposing them with known situations. Retrieving concepts from metaphors demands creative thinking. Metaphors affect the way we perceive the world and organize our thoughts. These devices have a fundamental role, because they enhance innovative thinking. They allow the designer to think unconventionally. (Casakin, 2007)

Application of metaphors in designing is one of more interesting ways of form creation, as metaphors can be used for the description of the projected form with symbolical values. Designing is considered as process of a combination of the ideas borrowed from different areas. In this process visual image, metaphors and analogies expands area of search of alternatives. Especially interesting are a visual metaphor that defines the new semantic space of searching. Efficiency of metaphorical process of form creation is determined by a graphic operating mode as architects think graphically. Visual, graphic metaphors allow making transformations with the minimum loss of conceptual value. The mechanism of appearing of visual metaphors is based on the purely visual principles. Calatrava asserted that palms inspired the columns at the Orient station in Lisbon. Arup claim, that the form of Sydney Operas' reflects yachts sails in the Sydney harbour. An interesting example of metaphor is the Moebius's tape. Eisenman used it, projecting Max Reinhardt House. Ben van Berkel in Moebius House Het Gooi used the idea of a tape also.

Methods of exploration of design metaphors

The concept of “metaphorisation” is based on intensifying hidden meanings. On the basis of association of images, impressions and concepts, an additional aesthetic quality – a metaphor – is created. When designers sketch and search for architectural forms they consciously or subconsciously think metaphorically. Computer “metaphorisation” methods presented in this paper are based at presented above theories of creativity. In all methods pictures are treated as idea triggers. Designer generate the ideas of the form by use the pictures as triggers for free association or for metaphorisation (Fig. 2).

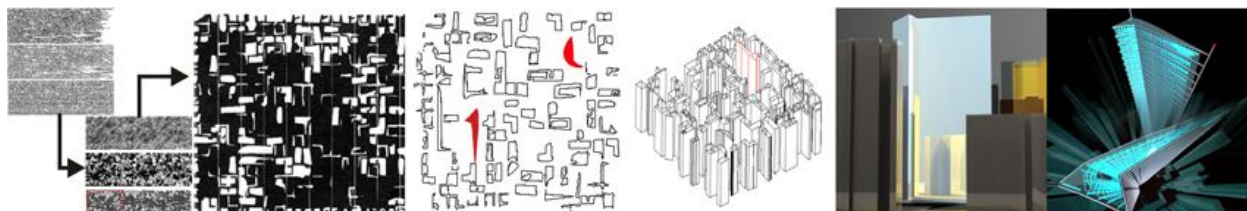


Figure 2. Metaphorisation

There are two methods of working. In first, designer uses existing pictures. He/she can use any pictures as photograph, art painting or pictures, which was the result of printer crash. In the second case designer create own picture using such methods as diagrams, scanning, collage or visual sampling.

Next step in both cases is the transformation of these pictures into graphic one. For preparation of the “sketch” of the architectural form, the different methods of graphical transformation are applied (“speeding drawing” or “photoshopping”). In this process the existing graphical software as Gimp, Photoshop, and Corel Trace is used.

"Go wrong"

Each architect who applies the computer in his work, meets set of problems resulted from incomplete mastering of computer programs, or which aroused due to the crash of the computer software or hardware. As a result, the unexpected pictures came into existence. The author has the interesting collection of graphic files and the printer listings which occurrence is impossible to explain in no way. In this set are the renderings in which the program itself has changed colour of forms, pictures received by opening of graphic files in text programs, texts from Microsoft Word in which the program has changed a font size and simultaneously an interval. The separate group is the pictures, which have resulted of the printer crash during printing. Some of these artefacts are unusually beautiful, some are not clear, but all can become a source of inspiration in the course of search of the new form (Fig. 3).



Figure 3. Examples of “wrong” pictures

Diagrams

Diagrams are the representations created for visualisation of a problem. Designers apply diagrams to creation of spatial metaphors in the decision process. Diagram’s helps to combine the information with spatial forms and support process of perceptual conclusions. (Larkin,

Simon, 1987). Diagram's can be consider as record system, the artefacts created for "replacement", for creation of metaphors and by that a tool for problem "catching". Integration of relations between different forms and different spatial values opens new possibilities of search of idea and allows using models of analytical factors as design metaphors (Fig. 4).

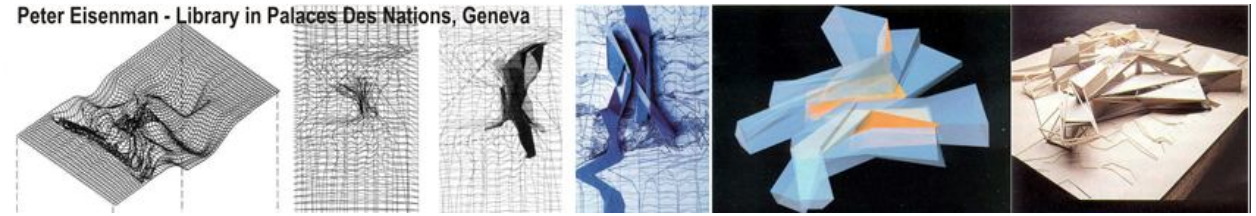


Figure 4. Examples of diagrams

2D scanning

2D scanning - is based on computer processing of the scanned elements. In this method for input of the initial information 2D scanner was used. Scanning different subjects, for example small pieces of a colour paper, leaves, a scattered beads, the designer receives various pictures. They arise casually, but not without intervention of the author which makes the decision on quantity and quality of the applied elements. Pictures which most full correspond to author's idea, become a basis for the further graphic computer transformations in which result there are computer sketches of the form (*scansketches*) (Fig. 5).



Figure 5. Scansketches

3D scanning

3D scanning - may be used to transcribe the formal surface qualities of handmade models directly to the computer. The transposition of the digital spaces of spatial forms makes their later transformation possible. It is possible to scan not only the handmade models but also other forms, which then become an inspiration for creating an architectural form.

Designing starts from preparing working model of the form in traditional way as cardboard model. After a scanning the form is modified by using CAD software. Author in experimental designing as starting form used the deformed manually cube. The cube was scanned and modified in CAD software. It is possible to scan any spatial forms, for example leaves, flowers, stones that also can become "inspiration" for creation of the architectural form. Thanks to CAD software, 3D forms may be moulded or carved. The availability of 3D scanning enabled a connection between real and digital modelling environments.

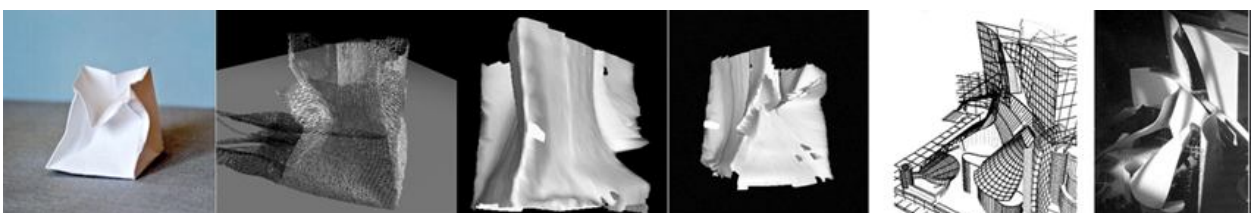


Figure 6. 3D scan of the cube and its transformation

Collage or visual sampling

The collage is association of two realities association of which would seem impossible. The elements taken from the real live created unexpected associations, raising subjective sensations at spectators. The computer collage may be named – “visual sampling”. Similarly musical sampling in which diverse sounds are used for music creation, in “visual sampling” an equivalent of sounds are images. These images are used for creation of new forms, structures and diagram’s. In visual sampling, the designer, applying digital process of scanning, transforms images to colour raster. It allows performing such numerical operations as a fragmentation, association, distortion, or duplication. The images can be transformed by means of a wide set of various editing methods (colorizing, mixing, punching, rotation, greasing, etc.). In the computer collage designer can use different layers, which illustrate different aspects of a form – spatial, functional, constructive, formal, chronological or biological. Spatial form may be percept as a collage vertical and horizontal surfaces, empties and volumes, colour and light, transparent and non-transparent, mirror and frosted. Because searching process of the form already includes many similar associations, computer collage is a very effective method supporting this process (Fig. 7).



Figure 7. Examples of visual sampling

Morphing

Separate method is – “Morphing” - dynamic, smooth transformation of one image to another by means of geometrical operations. This method based on the process of interpolation (morphing) in which Parent “A” is mapped to Parent “B” and between steps is calculated. Geometrical coordinates both form are changed and in result we have some kind of morphogenetic process of creation. The morphed child shares characteristics of its parents yet has its own identity. Designer may define percentage balance of starting forms. (Terzidis, 1999) The user can change and operate the transformation process and repeat it many times, changing some or all of transformation parameters. The result of the morphing is the genealogical tree of all possible mutations, which are the basis for further exploration. Each object, being continuation of “parents”, is simultaneously unique (Fig. 8).

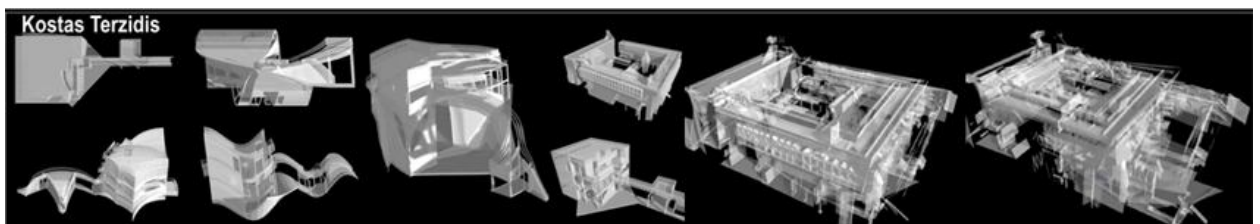


Figure 8. Morphing elaborated by Kostas Terzidis

Experimental work - Visual Synectics - Art Galery – 3rd year course work

In our experiment we used the Russian constructivist painting but newspapers and magazines are an obvious source; advertisements often have eye-catching and stimulating material. We decided to give them Rodtchenko's and Kandinsky pictures as an inspiration for a design. The problem statement is put on view and discussed until clearly understood. Then each student chose one of the pictures and on the basis of this picture created an abstract 2D composition. The sketch of the composition could be done by hand or use Photoshop filter as Bas Relief, Glowing Edges or Photocopy. Some of students use the Corel Trace software to obtain more linear drawing. In the next step they transformed sketches into plan of a gallery. The idea was discussed and evaluated. At the basis of this sketch students create the space form of gallery. From one picture different students created very different sketches, and in a consequence different unpredicted, even for them, 3D forms.

The choice of relevant picture criteria is important. Our experience shows that the more useful is the abstract patterns. Pictures should be unrelated to the problem; it can help if the picture is open to a variety of interpretations (Fig. 8).

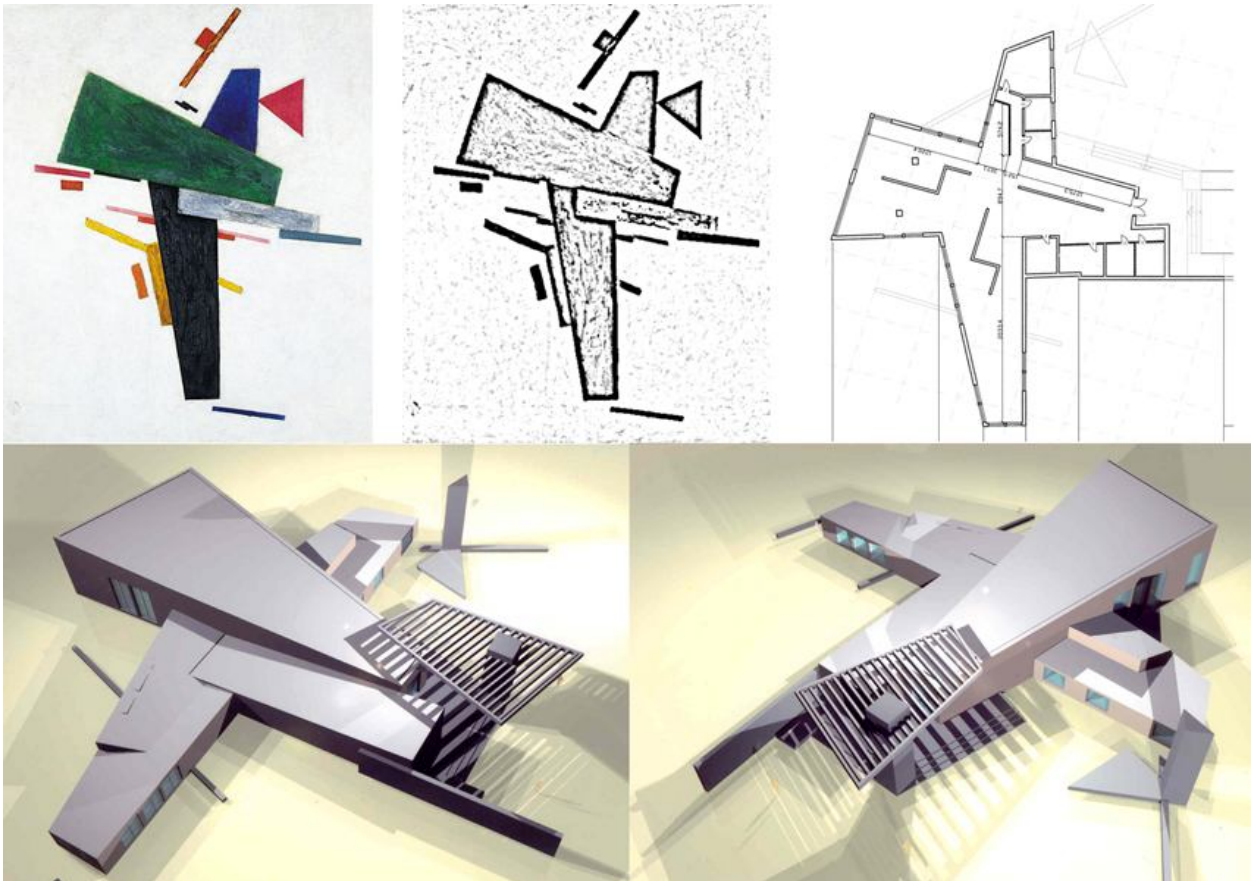


Figure 8. Examples of students work

Conclusion

Creativity depends on ability to dream. Creative processes are based on extraction of new associations from the subconscious. These processes are close to mythical and simultaneously poetic understanding of the world. The designer reminds the primitive men who for expression of richness, variety and complexity of the word used compressed and reduced symbols (symbolical analogy), capable to replace the direct and detailed description of the perceived phenomena. They have used symbols as their language. For designing, however, other aspect of a problem is important: that the symbol reflects what is known and what is not known to the same extent. The designer can use symbols as a link between the description of the meanings

and its representations. For this purpose he applies a language of metaphors that conducts to considerable discrepancy of results, but that is paradoxical - simultaneously raises efficiency of creative process.

The metaphorical design thinking is based on a «divergent thinking», which comprises withdrawal from stereotypes, human's ability of finding unexpected alternatives and possible logic ruptures. Results of all these methods' work are characterized by high level of abstraction and include a different sort of association and means of expression (drawing, sound, and colour). Computers start to play the role of intermediary, the arbitrator between the designer and idea.

References

Casakin, H.P.: 2007, Metaphors in Design Problem Solving: Implications for Creativity, *International Journal of Design*, 1(2), <http://www.ijdesign.org/ojs/index.php/IJDesign/article/view/53/27>

Finke, R., Ward, T.B., Smith, S.M.: (1992), *Creative cognition: Theory, research, and applications*. MIT Press.

Geschka, H.: 1980, Methods and organization of idea generation, in S. Gyskiewicz, (ed.), *Creativity development week II*, Greensbro, NC: Center for Creative Leadership, pp. 49-61.

Gitter, D.L., Gordon, W.J.J., Prince, G.M.: 1964, *Operational mechanism of Synectics*, Synectics Inc., Cambridge, MA.

Gordon, W.J.: 1961, *Synectics, the development of creative capacity*, Harpercollins College Div., N.Y.

Koestler, A.: 1990 *The Act of Creation*, Penguin.

Lakoff G., Johnson M. *Metaphors We Live By*. University of Chicago Press, 1980

Larkin, J.H., Simon, H.A.: 1987, Why a Diagram is (sometimes) Worth Ten Thousand Worlds, *Cognitive Science Journal*, 11, pp. 65-99.

Maslow, A.H.: 1962, *Towards a psychology of being*, London.

Turner, M., Fauconnier, G.: 2002, *The Way We Think. Conceptual Blending and the Mind's Hidden Complexities*, Basic Books, New York.

Wallas, G.: 1926, *The art of thought*, J. Cape, London.

This paper is supported by the grant W/WA/1/05