Neuro Ergonomics of Design

"A fundamental issue in design is to find creative and body friendly solutions, which could be somatically functional and sustainable, and not only visually catchy for the eyes"

Neuro-ergonomics studies how our nervous system reacts to different spatial patterns, organizing the body responses in different, but specific, ways.

Our spatial environment can change radically in only a few hours, but our nervous system is practically still the same it was millions of years ago. Changes in DNA are quite slow and happen only when it is really worth it. For this reason 99% of our genome is the same as those of other primates and when for example we find ourselves in a canyon, we react to that space as any mammal would, namely with a more or less intense 'fight or flight' response that urges us to get out of there as soon as possible.

The evolution of the nervous system through the ages has selected proper responses to specific properties of spaces. By now this is naturally built-in to our organism and activated by default. In the example of the canyon, the nervous system doesn't let us sit and think or indulge in our feelings, but rather activates an automatic motor response that makes us head toward the exit at a faster pace.

As demonstrated by the theory and experiments of the psychologist James J. Gibson (Cornell University), people, as well animals, don't view their environments in terms of "objectively defined shapes and volumes, but in terms of their behavioral potential". In other words, "you immediately apprehend what you see in terms of how you think you can interact with what you see. You see affordances" (S. & .M. Blakeslee)

Understanding the relationship between design and our nervous system provides designers the possibility to 'read' and evaluate spaces at a different level of perception, cognition and experiential knowledge. It helps to design neuro-sustainable spaces that, instead of distressing our nervous systems and ourselves by creating meaningless conflict with our built-in human software, merge naturally and functionally with it.

Main neuro-sustainability issues: spatial affinities with different neurological patterns.

1) Right brain - left brain affinities

Different spatial features call for different brain-hemisphere responses.
The workshop allows participants to experience and understand the substantial physiological and psychological differences between right and left brain functions and the specific spatial patterns provoking them.

2) Cortical - subcortical affinities.

When designers are brought to experience extreme cortical conditions – e.g. through abstract mathematical thinking - or on the other hand more low brain conditions - like here and now perception - they design very different environments, which in their turn sustain or inhibit the same brain areas.
Our brain, in fact, can react to the qualities of space by default either with an active cortical thinking response or with a natural subcortical response. The first makes a space more interesting and stimulating, the second more relaxing and familiar. The ease or difficulty in orientation plays a major role in determining this response.

3) Neuro-developmental phases affinities.

The nervous system did't develop all at once but through different basic stages. Following stages integrate and complete the previous ones, instead of substituting them. Different spatial patterns talk specifically to each of these built-in phases and help to evoke their specific strength, like feeling, thinking or action. Thus inherent qualities of space can either support the integration of different psychological qualities, or specifically support only one of them.

4) Sympathetic - parasympathetic affinities

These two aspects of the nervous system basically relate to our response to the stress-pleasure axis. Designs made after experiences of distress and insecurity show a completely different family of patterns then those made after experiences of pleasure and comfort. Vice versa it is easy to understand how the use of different spatial patterns can stimulate corresponding responses in the nervous system.

5) Vision pattern affinities

We usually think about vision as a mechanical gathering of information, but in fact it isn't, because there are many brain operating options involved in the process. For example in an experiment done with people looking at an aquarium, westerners turned out to look at single fishes, while easterners looked at the whole picture.

The way we look activates a completely different bodily organization and causes very different design styles. The workshop explores how these styles effect vision and vice versa.
All color issues are mainly addressed in this lesson.

Teaching methodology

Each issue is usually approached though:

a) A practical experience that allows students to embody the difference among different neuro-physical conditions (e.g. sympathetic vs parasympathetic, cortical vs subcortical, right brain vs left brain, different neuro-developmental patterns, etc.)

b) Drawings before and after the physical experience that allow students to realize how neuro-physiological differences express themselves through differences in design

c) Class work to recognize specific design patterns related to each condition

d) Short power-point presentation showing the anatomical and neurological backgrounds and specific drawings highlighting single patterns

e) Slide show showing examples from the real world

f) Small group work exploring the implications for design of the relationships explored

g) Final discussion confronting the different group findings and the social and cultural implication of specific design choices