A. Design follows instinct and direct experience

Human beings react either positively (with a healing response) or negatively (with stress and anxiety) to different types of environmental information. This effect has been measured by experiments. Positive feedback comes from physical settings that make us feel secure from threat, and whose components stimulate our brain in a positive sense. Structural elements that elicit a positive response from our environment include:

1. “Safe” spaces.
2. Pieces of nature.
3. Certain structures built from natural materials.
5. Colors that harmonize.
6. Symmetries on all levels of scale.
7. Different scales that are coherent with each other.
8. Anything that shows the same mathematical information as natural structures.

Human beings are subject to a pervasive information field (Salingaros, 2005: Chapter 2). We are surrounded by transmitted environmental information, which is constantly being interpreted by our sensory system. The messages contained in environmental signals trigger our internal senses, generating physiological responses felt deeply within our body. This phenomenon depends upon complex superimposed contributions from all of our senses. Those include — but are not limited to — sight, hearing, smell, touch, radiation (infrared heat exchanged from hot or cold surfaces), and a kinesthetic awareness of our surrounding space.

The information field combines contributions from distinct mechanisms acting on different scales and at different ranges: the effect we experience depends on the distance between the human body and a structure. That is because different forces come into play at different distances, and therefore the field effect’s qualities change with distance. One might think of information as primarily visual, yet it is not limited to that component. Whereas non-visual components are not usually studied by
architects, they are equally important, and become even more so at the shorter distances.

One or two architects did write about the importance of non-visual components in our sensory experience. There is a wonderful little book by Yuhani Pallasmaa, “The Eyes of the Skin” (1996), on the different senses present in the environment. While this book is sometimes assigned as a reading for architecture courses, it does not seem to have much impact either in architecture studio, or in practice. It could be that framing those arguments in terms of philosophy, not science, made them less convincing.

Interacting with changing environmental information elicits attempts from us to shape the information field itself, to increase our sense of wellbeing. We instinctively try to mould the environment because our own responses cannot be consciously controlled. This mechanism works independently of learned aesthetic values and dominant design paradigms. We cannot change the information coming to us from structures and surfaces at some distance, but we traditionally shape and modify structures within our immediate surroundings. People adapt the interiors of their houses using paint; they treat surfaces and introduce ornamentation, decoration, and furnishings. This action is driven by an innate biological need seeking a state of wellbeing.

Christopher Alexander (2001-2005) has summed up his own findings in achieving coherence in a way that can be applied to adaptive design. His work encompasses and goes beyond previous attempts at achieving a practical synthesis. Quite separately, an extensive literature on phenomenology exists, and some architects have tried to bring those insights into design. The results are, however, mixed. The architects of some inhuman buildings claim to be applying phenomenology, which raises serious questions. More important, in my opinion, is more recent scientific research that tries to link phenomenology to cognitive science.

**B. Motion, dynamics, and paths**

Almost all designers have been taught to think of space as fixed and static, whereas human movement generates a dynamic interaction with the enveloping space. Architectural experience couples the user dynamically to surrounding structures, thus engagement with the information field changes continuously. Interactions change their effect on us as we move about, and become static only for those specific instances when people are stationary. Adaptive design has to take human movement and the dynamic versus the static nature of information into account.

One immediate application is in designing paths. Wayfinding in both interior and exterior spaces depends upon information changing as one moves. Markers and signals can either help someone navigate a space, or hinder movement by giving psychologically confusing signals (Lyons Stewart, 2015). Much of the directional and navigational information resides in visual patterns on the ground. Studies in
hospitals show where people unconsciously walk, and how the floor color and pattern can help the circulation. At the same time, many current design practices contradict natural flow. People are always getting lost because the architect or interior designer simply did not apply helpful design rules.

We connect informationally with the floor on which we walk. Floor patterns influence both the way we move, and the direction in which we move through space. And yet, many floors are too plain to help guide circulation and movement. Even worse, we might find flooring patterns that contradict the intended movement, and those confuse the user and create psychological stress. The consequences in hospitals, daycare centers, schools, and housing for the elderly can be severe.

C. Machine versus organism

There is a contradiction between accommodating environments and possibly hostile places being designed today. We are constantly experiencing two entirely distinct types of architecture, driven by opposite design philosophies. An explanation comes from the contrast between “machine” and “organism”. Designing for machines is easy: you just try to figure out what minimal spaces, shapes, and surfaces are sufficient for what you want the machine to do, or what you think the machine should be doing, and you build this without any feedback or testing. This is essentially the industrial modernist approach to design.

Designing for organisms is very different indeed. The process begins from an understanding that the users have their own intrinsic responses, and you — the designer — cannot control them. It’s up to you to try and accommodate all possible user reactions and anticipate both negative and positive responses to what you are going to build. The information field of the structure after it is built will determine whether it feels comfortable and accommodating to the users, or not. Adaptive design therefore considers information and feedback as primary in shaping an environment where human beings are going to live.

This crucial distinction between machines and organisms is clarified by the “Santiago School of Cognition” (Hallowell, 2009). A living system defines a fairly self-contained entity that possesses mechanisms for responding and adapting to its environment. The living system’s behavior is determined by biological forces that keep the organism alive, and those forces couple to continuous responses from environmental factors. An organism decides where to move and where to stay, whereas any external agent simply interferes with the organism’s natural response-driven choices.

Every organism has its own behavior and priority of interaction and response mechanisms. It cannot be controlled as a machine can. Any attempt to control a living organism only results in disturbing its natural repertory of functions and actions. It reacts to our interventions. By changing the environment, our design implementations change the dynamics of the living structures it contains. This, of course, doesn’t stop people from trying to design living spaces for other human beings. Those are successful or not, depending on the sensitivity of the designer.
By contrast, a machine or inanimate entity is entirely subject to control from the outside. It can be molded or changed in many different ways. There are various possibilities to change an inanimate object that doesn’t actually “do” anything, whereas a machine can be controlled and transformed (by us) in a number of ways, as long as those presumably allow it to keep running. Unfortunately, the “human as just another machine” model from the heady days of early industrialization continues to apply to design, and to influence our living and working environments.

D. Feedback drives useful innovation

Practitioners interested in adaptive design should discover the forces I’m talking about from their own direct experience. That ought to be easy to do, once they know what to look for. The information field presents structural information, and our biological nature interprets this information so that it affects us directly. The action, therefore, is akin to a force field that acts between us and our surroundings (even though there is no physical exchange taking place). If we feel a positive attraction to the built environment, at every distinct scale and distance, it is due to sensitive design by the architect.

Many apparently benign design decisions, however, trigger negative physiological responses in the user after they are built. I would encourage individual architects to heighten their own sensitivity to such effects, applying environmental psychology in the interest of promoting an involved approach to design. If we wish to build environments that offer positive (attractive) information, then we need to identify and eliminate the possible sources of negative responses. Many of these techniques are part of conventional design practice.

To help identify what not to do, let me list some points here. Amorphous materials without any organized detail erase information on the smaller scales (the opposite of the high degree of ordered microstructure seen in natural materials). Other techniques for disengaging human responses include glass walls and tabletops, brutalist concrete surfaces on walls and ceilings, and walls having random surface applied patterns (instead of regular patterns as found in 19th century wallpaper, for example). Otherwise, no color, only gray surfaces. Also, no articulation and organized detail on the range of scales 1 mm up to 20 cm; for example, no moldings, cornices, or trim.

Nevertheless, humans love to shape, decorate, and paint the surfaces of their living spaces. This urge for physical intervention is seen among all peoples. Much experimental research shows that we are definitely attracted to certain types of structure in our environment, and those interactions vary with distance. Despite this biological phenomenon, aesthetic norms can override our innate craving for information. Accepted norms discourage people from shaping their immediate environment. Ornament is banned, walls painted other than white or pale gray and very pale color hues are out, as are old-fashioned furnishings made from natural materials having ordered fine structure. At the same time, everyone is strongly
E. Useful analogies from the basic forces in nature

Knowing that different physical forces act at different distances will help an architecture student to develop sensitivity to the information field. It is useful to draw analogies with physics. I will review here the fundamental forces in the physical universe. They are: gravitational, electromagnetic, strong nuclear, and weak nuclear. Five points of analogy listed below illustrate mechanisms acting to influence how we experience architecture through information.

(i) Every object feels a gravitational pull downward (there is no anti-gravity). The architectural analogy is the human experience of a massive structure. But in our times, the major architectural effect is one of disguising mass by means of glass curtain-walls. Yes, the mass is there in buildings that are by far larger than anything dreamt of in past centuries, but they are transparent! Our senses are being tricked, leading to emotional contradiction on a massive scale. A separate trick is to position building mass upwards, off the ground, which contradicts gravity and triggers our alarm mechanism (thus generating anxiety).

(ii) Electromagnetic forces can be attractive or repulsive. Only charged bodies can experience them, not electrically neutral ones. For our purposes, note that a variety of forces act together to define structure in nature, combining mass differently from electrical charge. In the same way, a variety of mechanisms contribute to our experience of the environment. We react to qualities other than mass: for example, to color, texture, contrast, surface design, patterns, etc. All of these must be taken into account, as well as distinguishing which situations are attractive, which are neutral, and which are repulsive to human beings.

(iii) Another point concerns the range of physical forces. Both gravitational and electromagnetic forces are long-range. The strong nuclear force is strictly attractive, however, but acts only at very short distances. The strong nuclear force overcomes the repulsive electric force among protons (being 137 times stronger), locking them into an atomic nucleus. Here is an example of a drastically changing force field, as objects get closer. In architecture, information also changes as one approaches and goes right up to a surface. Different informational mechanisms come into play to shape our experience of space and surface.

(iv) Something curious happens in atomic nuclei: a nucleus cannot be made up of only protons. One needs about the same number of (electrically neutral) neutrons placed with the protons for the strong nuclear force to hold the nucleus together. That follows because neutrons and protons like to change into each other by exchanging a virtual pion. What does this mean for architecture? Well, at the very least we can conclude that uniformity of elements cannot lead to a coherent whole: you need coupled pairs of elements, or some variety of elements, to achieve coherence when putting them together into a larger whole.
(v) If you succeed and separate all the neutrons and protons from a nucleus, then the free neutrons will decay in 15 minutes into protons (through the weak nuclear force). So all you will have left are protons in the end. Furthermore, since those are no longer bound by the strong nuclear force, they repel each other and will disperse. The basic building blocks of matter therefore exist only in the context of tightly-bound complex settings. Isolating them destroys their informational identity. As an analogy for architectural field interactions, this effect reinforces the necessity for coherence at the smallest experienced scale. It tells us that structures are defined by their context, and cannot be transferred or scaled up or down.

Context-specific and scale-specific elements dominate in both nature and in our experience of architecture. Necessary components of design and structure are defined only at their own specific scale. Moreover, they are dependent upon other adjoining elements, and removing them from their geometrically-coherent context destroys their identity. For this reason, the postmodernist design practice of quoting architectural elements out of context leads to incoherence, and is psychologically disturbing at intermediate and large distances. Architectural elements arising within the coherent setting of an older form language become meaningless when removed or juxtaposed.

In conclusion, complex information that includes a variety of interactions changes character drastically with the changing distance between a person and the surrounding physical structure. Different mechanisms act at different distances. The informational field effect triggers our body to respond, and this is what we experience as architecture. This physical effect is stronger than any abstract qualities of the plan or the design. It has to be experienced in person, however, and cannot be guessed from a design. As a result of their training, architects have learned to concentrate on the design more than on their perceptual mechanisms, and this leads many to make exclusively formal judgments. This is one reason why nowadays, architects and common people react in irreconcilably opposite ways to the same buildings.