



# UNLOCKING THE BRAIN

FOR BETTER ARCHITECTURE AND DESIGN

BY DANA DUBBS

**A unique collaboration between neuroscientists and architects aims for evidence-based design.**

Do specific colors support patient recovery in hospitals? Can certain acoustic conditions support learning in classrooms? Do windows support productivity in offices?

The intuitive answer to all of these questions is a resounding yes. The Academy of Neuroscience for Architecture (ANFA), a unique research venture between architects and neuroscientists, wants proof.

Launched as the legacy project of the 2003 AIA National Convention in San Diego, Calif., ANFA is devoted to building intellectual bridges between

impacts the cognitive ability of children, for example, architects could design enriched learning environments. By understanding how some people are able to find their way more easily than others, architects could create more easily used navigation systems in complex buildings.

ANFA, headquartered in San Diego, is a venture whose time has come. Cross-disciplinary

research planning for the AIA. ANFA received funding for its first two years in the form of a \$100,000 Latrobe Fellowship.

“Architecture stands on the threshold of a new era,” says Eberhard. “The enormous body of knowledge being created by neuroscientists is about to dramatically change what it means to be a professional designer. Architects will benefit from the new knowledge base made possible by neuroscience, but the real beneficiaries are future generations of school children, hospital patients, and office workers who will have their environments more carefully tuned to their needs and desires.”

## SEEING INSIDE THE BRAIN

neuroscientists and architects that will lead to studies about how and why the human brain perceives and responds to architectural cues. What neuroscientists learn from these studies can one day be applied to make evidence-based design possible to a new level of precision. By understanding how an architectural setting

studies involving neuroscience and architecture are being made possible by new knowledge and technologies.

John Eberhard, FAIA, has been a driving force behind ANFA since its inception. He is ANFA's executive director, a Latrobe Fellow of the College of Fellows of the AIA, and director of

## THE POWER OF PLACE



Dr. Jonas Salk, one of the greatest minds of the 20th century, credits architecture for the breakthrough in his thinking that led to his development of the polio vaccine. At one point during his research on the vaccine, Dr. Salk became so frustrated and deadlocked in his efforts that he took a retreat to the 13th century village of Assisi, Italy. The spirituality

of the architecture there proved enormously inspiring to him, and it was under that influence that he returned to his laboratories in Pittsburgh, Pa., and was able to design the research that led to his world-changing polio vaccine.

Dr. Salk intuited that architecture has a power to elevate and enrich

the human experience. And indeed, the world-renowned and architecturally acclaimed Salk Institute for Biological Studies that he built in La Jolla, Calif., is infused with the same sense of spirituality that Dr. Salk felt in Assisi. Fittingly, the Salk Institute is one of ANFA's scientific partners.

In his paper “Architecture and the Mind,” Eberhard writes, “The research results emerging from neuroscience provide knowledge of the basic biology of the brain, of how our minds use the brain to process experiences, and of why the human brain has evolved in this way.”

Among the recent discoveries, for example, is a finding by Fred Gage, Ph.D., president of ANFA, that enrichment and exercise can lead to a re-tooling of the adult brain. Gage is a professor at the Salk Institute’s Laboratory of Genetics.

Tools that didn’t exist as recently as 10 years ago are available now to study brain function. Scientists can employ imaging techniques to see what’s happening inside the brain, including which areas of a person’s brain are in use or being stimulated. New brain scanning devices can trace mental processes as a person moves, sees, hears, meditates or experiences emotions.

Eberhard spent six months developing a white paper encompassing what he’s learned during his two years as a Latrobe Fellow. In that paper, which he presented during the AIA National Convention in Las Vegas

last May, Eberhard states, “Observations of how humans interact with their environment are based on informed suppositions and usually careful methodology. The limit of these methods is that we know a good deal about what happens during environmental interactions, but we don’t know why humans respond the way that they do. As a result of studies of the brain and the mind by neuroscientists with modern scanning equipment, it is possible to know much more about how humans

## TRACE MENTAL PROCESSES AS A PERSON MOVES, SEES, HEARS, MEDITATES, OR EXPERIENCES EMOTION.

experience their environment, about why they have such experiences, and about what might be done by designers to influence experience.”

Steelcase has been a founding patron of ANFA since 2004 and an advocate for ANFA’s focus on neuroscience, one of the fastest evolving scientific fields today, as a new means for understanding the human experience of interior spaces and workplace effectiveness.

“The Academy’s work, including how the mind processes experiences, has many implications for the creation of effective work environments — offices, healthcare facilities, colleges and universities, research laboratories, etc. We recognized early on the importance of ANFA’s pioneering work and are pleased to be the exclusive participant from within the office furniture industry,” says Joyce Bromberg, Steelcase’s director of Workplace Futures-Explorations. “By partnering in

this venture, we anticipate gaining a wealth of new knowledge to apply to our ongoing research and development efforts.”

Esther Sternberg, M.D., is a member of ANFA’s board of directors and director of the molecular, cellular and behavioral integrative neuroscience program at National Institute of Mental Health (NIMH) in Bethesda, Md. Dr. Sternberg noted the enor-

mous potential of evidence-based design during a neuroscience and healthcare facilities workshop attended by neuroscientists and architects in 2002. If you have a biological read-out of the brain, Strenberg notes, “you can tell your clients that people who have a high cortisol level feel stressed under certain environmental conditions, and you want to avoid designing spaces that produce these conditions,” she said. “Everything you can know about the physical environment and its impact on patients is providing you with more ammunition that will help design a space optimally.”

It is still too early for any big breakthrough discoveries but give ANFA time. Eberhard has met one-on-one with more than two dozen neuroscientists who live and work in the San Diego area. He has collected a wealth of information that will help determine research projects for teams of neuroscientists and architects to undertake. He has also identified studies that are either currently underway or planned that could be potential research bridges.

ANFA has hosted three workshops over the past two years with the purpose of linking the emerging base of neuroscience with design criteria for effective facilities.

The workshops were attended by a cross-sections of professionals from both neuroscience and architecture. The events yielded 60 hypotheses and ideas for research projects considered important by architects who design healthcare facilities, K-6 classrooms and spiritual places. More workshops are planned. In 2006, Steelcase will sponsor a workshop focusing on the design of neuroscience facilities and how neuroscientists’ brains respond to the environments where they work.

ANFA’s Pioneer Program is further promoting dialog and understanding between neuroscientists and architects. Under this program, people work in architectural firms or neuroscience laboratories for at least one year to gain knowledge of whichever field is new to them, and then share what they learn with others in their profession.

Eve Edelstein, Ph.D., is an ANFA research associate who is involved in the Pioneer Program. Dr. Edelstein is a neuroscientist who is serving as a liaison/interpreter for the AIA Academy of Architecture for Health and for the Interfaith Forum on Religion, Art, and Architecture. In 2003, she and Eberhard designed and began

teaching the first in a series of undergraduate courses titled “Neuroscience for Architects” at the NewSchool of Architecture and Design in San Diego.



John Eberhard

Dr. Edelstein also currently teaches graduate courses and seminars at the NewSchool.

Another Pioneer, Margaret Tarampi, Associate AIA, is currently working as a laboratory aide in the Vision Center Laboratory at the Salk Institute. She is also an adjunct professor at the NewSchool where she, too, is teaching the “Neuroscience for Architects” course to undergraduates

.Eberhard notes that architecture education in universities has not changed much in over 100 years and that most architects are not aware of neuroscience research or its potential to increase the

knowledge base for architecture. One of his goals as a Latrobe Fellow was to stimulate the development of interdisciplinary doctoral programs at universities around the country. His efforts met with limited success, he says,

“The potential is absolutely tremendous, and in 10 or 20 years’ time we’re going to be able to look back and realize how far we, as architects, have come in learning what it is in the human brain that is affected by the

## “CREATE SPACES THAT ALLOW PEOPLE TO REACH THEIR FULL POTENTIAL”

though some universities such as University of Michigan, Texas A&M and Rice have indicated an interest in developing these kinds of programs if funding can be found.

environment and how we respond to the environment,” she says.

“Therefore, we’ll be able to realize that we have the ability to create spaces that allow people to reach their full potential, whatever the kind of use of space we’re talking about.”

Alison Whitelaw, AIA, is CEO of ANFA and principal of Platt/Whitelaw Architects in San Diego. In the ANFA-produced film “Beyond Intuition,” she noted that neuroscience is in its infancy and that the discourse between neuroscience and architecture is just opening.

The human brain’s cortex is folded in a manner which gives the brain the appearance of a cauliflower. This cortex, if it was unfolded, would be about 30 inches square and have 10 billion neurons encased in its six layers of wrinkled tissue.

These neurons, the key building blocks of the brain, are organized into collections called “neuronal groups” as the result of a random and highly variable process. There is no master program of instructions (as there is in a computer), it just happens.

## KNOW YOUR BRAIN

Some of the components of the brain are:

- The corpus callosum - the bridge between the right and left hemispheres of the brain. This tissue, filled with nerves, is constantly sending information back and forth.
- The cerebellum (little brain) was once the main brain of our ancient ancestors. Each hemisphere is split into four lobes:
- The occipital lobe manages visual processes;
- The temporal lobe deals with sound, speech comprehension, and some aspects of memory;
- The parietal lobe deals with movement, orientation, calculations and some forms of recognition;
- The frontal lobe integrates thinking, conceptualizing and planning — and the conscious appreciation of emotions.

from John Eberhard’s website  
architecture-mind.com