

Neuroscience and Health Care Facilities Workshop:

Summary



The National Academy of Sciences / Woods Hole MA / August 13-15 2002 Sponsored by the American Institute of Architects and the Vinyl Institute

Meeting on Neuroscience and Health Care Facilities Design

Woods Hole, Massachusetts August 13-15 2002

PREFACE:

This report has been prepared from notes and audio tapes made at a workshop held at the elegant conference facilities of the National Academy of Sciences in Woods Hole, Massachusetts. The version provided here contains the highlights from the first day, including the recommendations of the five groups who explored potential research projects intended to link neuroscience research to architectural concerns with healthcare facilities.

A second version will be available some time in October, with a more in depth treatment of the discussions of each group, and especially of the discussion held on Friday morning during the closing sessions. The Friday morning sessions include a number of explanations by neuroscientists of their methodology. Anyone interested in obtaining a copy of this more detailed report should send an e-mail message or letter to Margaret Tarampi at the AIA. Her contact information is:

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In addition to these written reports, a video tape record of the presentations and a number of extended interviews with individuals were created during the workshop. A videotape version of the workshop will also be available later in the year. Some of the visual material will also be incorporated in material to be displayed on AIA research web pages towards the end of this year.

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Tuesday, August 13, 2002

Reception and dinner at Main House

Introductions and Welcome at the Carriage House Gordon Chong, welcome on behalf of AIA Self-introductions by all participants (see attachment A)

Wednesday, August 14, 2002

Opening session at Carriage House

John Eberhard described the plan for the day's proceedings

Tom Regan set the tone by using the term "Evidence-based design". There would seem to be strong arguments that knowledge obtained from neuroscience research will eventually make true "evidence-based" design possible.



Esther Sternberg made a power point presentation on the immune system and the brain, providing an introduction to the many layers of the brain that underlie our experiences. She defined stress as the nonspecific response of the body to any demand. Sometimes the stress response is needed to achieve peak performance (e.g. the top-gun pilot), but it can also become a negative force on the immune system. Demand and control are some of the determinants of stress, and this varies for each individual. Too little hormonal stress response can cause reverse actions from the immune system resulting in arthritis or asthma. Only 35% of complex traits like these diseases and possibly our stress response is determined by genetics and thus 65% is determined by environment. One potential environmental variable is previous experience. Belief systems can also impact the healing process – whether such belief systems are cultural, social, or based on expectations. The effect of belief on healing is called the placebo effect.



Terry Sejnowski began by posing the question: How do we know something is correct or true? In science there is a procedure for submitting an idea (a supposition or hypothesis) to experimental process. We are often surprised by the answers. It is now possible, using brain imaging techniques, to watch what is happening in the human brain when we think and behave. This will revolutionize our understanding of human brain functions such as language and social cognition. Computational Neuroscience is a way to organize knowledge of the brain at many levels of organization through the use of computers (such as simulations). He then showed a computer-based film on the synaptic processes (using animation derived from electron microscope images). This video provides ideas for scientists working on problems such as the synaptic basis of learning and memory. The model in this film provides a tool to help visualize and understand function – much like using a model of a building to understand what the real building will be like. He also provided examples of areas where advances in neuroscience can help inform the design of hospitals:

- The hippocampus is important in long-term memory. We now know that neurogenesis occurs in the hippocampus, but the survival of the cells depends on sensory stimulation and motor activity. This suggests that patients who are recovering should be active and the environment a stimulating one.
- The brain has a dozen neuromodulatory systems that are important for regulating arousal, mood, attention, memory, reward and exploration. For example, low levels of serotonin are associated with depression and risk-taking behavior, and high levels of serotonin are found in primates with high social status (Prozac increases the level of serotonin activity). Serotonin levels are increased by motor activity like walking. Hospitals should be organized to encourage patients to walk every day if they are able.
- The circadian rhythms in the body and brain are entrained by light. Hospital rooms should be brightly lit and kept on a 24-hour light/dark cycle.
- The treatment of patients for recovery from stroke is rapidly changing from requiring long bed rest to a recovery process based on exercise – walking and talking as soon as possible. This suggests that hospitals should make it easier for stroke patients to get physical therapy.
- Overall, these findings suggest that the hospital setting should be an environment that actively engages patients rather than the passive setting or experience that is now the norm.



Ron Skaggs described the Guidelines for Design and Construction of Hospital and Health Care Facilities developed by a multidisciplinary Health Revisions Guidelines Committee under the auspices of the Facilities Guidelines Institute and The Academy of Architecture for Health of the AIA. He indicated that this committee would be open to any additional input from neuroscience evidence.

The following are examples from these Guidelines (bolded phrases are of interest to workshop participants):

Guidelines Appendix A7.2.D.7 :

"Windows should be provided so that each patient may be **cognizant** of the outdoor environment. Windowsill height should not exceed 3 feet above the floor and should be above grade. All windows in the unit should be fixed and sealed to eliminate infiltration."

Guidelines 7.6 Psychiatric Nursing Unit:

"When part of a general hospital, these units shall be designed for the care of inpatients. The environment of the unit should be characterized

by a feeling of openness with emphasis on natural light and exterior views. Various functions should be accessible from common areas while not compromising desirable levels of patient privacy. Interior finishes, lighting, and furnishings should suggest a residential rather than an institutional setting."



Frank Pitts described the Academy of Architecture and Health. How it came into existence, the fact that there were now 3750 members, and asked David Allison to talk about the Committee on Health Environmental Research (CHER). David indicated this interdisciplinary committee undertook applied research through contracts with others. They have recently explored subjects such as "color in healthcare environments" and "rate of change in hospital laboratories".

Bob Horsburgh presented some alternative approaches to problem solving:

- Inductive reasoning
- · Deductive reasoning
- · Clinical trials with comparative hypotheses



He proposed that a designer should analyze very carefully what needs to be done and then after the design has been completed to go back and determine whether or not the original intentions were met, and if the original design hypothesis was indeed correct. If the hypothesis is found to be correct (the space is serving the intended purpose) and there were no unintended consequences, then something is known and should be recorded in order to be used again in the next design. Thus an iterative process is established for determining what is right.

Roger Ulrich talked about state-of-the-art research on healthcare facilities that he has been conducting in the U.S. and Sweden.



Psychological and social needs are largely disregarded in the design of healthcare facilities - and often marginalized in creating visitor and staff spaces. In spite of traumatizing hospital experiences and major stress from illness, little priority has been given to creating surroundings that calm patients, or help to strengthen coping resources and healthful processes. Rather, the functional emphasis often produced environments now considered starkly institutional, stressful, and detrimental to care quality

There is a growing awareness internationally among healthcare administrators and medical professionals of the need to create functional environments that also have patient-centered or supportive characteristics to help patients cope with the stress that accompanies illness. The key factor motivating awareness of facility design has been mounting scientific evidence that environmental characteristics influence patient health outcomes. Many studies have shown that well-designed environments can, for instance, reduce anxiety, lower blood pressure, and lessen pain. Conversely, research has linked poor design - or psychosocially unsupportive surroundings to negative effects such as higher occurrence of delirium, elevated depression, greater need for pain drugs, and in certain situations longer hospital stays.

Further, staff as well as patients benefit from good design. Supportive design of staff spaces can help employees cope better with workplace stress, reduce absenteeism, may lower turnover, and in several ways support employees in providing quality care. Well-designed staff environments are a positive factor in attracting and retaining qualified employees.

Research suggests that healthcare environments will support coping with stress and thereby promote improved outcomes if the design is oriented to fostering:

- · Sense of control and access to privacy
- Social support
- Access to nature and other positive distractions

After lunch the participants were subdivided into five working groups See attached list of group participants (Attachment B)

CALMING ENVIRONMENTS within healthcare facilities (reported by group leader Joan Saba).



figure 1. Stress Response

They decided that calm environments should be defined as being the opposite of stressful environments as per Esther Sternberg's presentation (fig. 1). Building design is only one aspect of how to provide a calm environment. Being in control of one's environment is an important aspect of being "calm". A calming environment may be different for medical staff versus patients. The points they proposed for research were:

- a. A good definition of calming and non-stressful environments is needed.
- b. Consider individual difference factors/parametric studies focus on where the differences occur and get a "range" of acceptable sensory perception.
- c. Calming Environment
 - Visibility of what's going on (have control)
 - Opportunity for privacy
 - Need for predictability
 - Employee satisfaction
- d. Different people will respond differently and for some it is not clear that a calm environment is desirable, i.e. an environment that provides some stimulation may be desirable for a recovering neurological patient.
- e. Shannon Kraus provided a diagram of the interaction between patients and staff within separate spheres of influence (fig. 2).
- f. Patrick Russell proposed exploring the influence of different variables. To quote him "The advantage of applying neuroimaging techniques to understanding calm is that it gives us an environment in which to explore a more physiologically rigorous definition of 'calmness.' It would let us use new clinical populations. If we had to study only clinically populations confined to a hospital and submit them to other stressful testing, we would have a limited population to study. Neuroimaging and other techniques would give us access to a much larger control population of healthy individuals in which to explore the impact of environment on mental state. Here the techniques of neuroscience let us go 'offline,' if you will, from the clinical environment and do tests on normal populations. Finally, as it pertains to the architectural community, we could study most of the variables that will probably be identified as relevant to stress in an architectural setting.

This includes questions of which variables are most robust across populations so that you could actually build them into an architectural space. (If certain environmental variables have a profound impact but one that varies too greatly across individuals, it could well prove futile to seek a optimal value for such variables to be incorporated into a stable environment.) It may also be possible to rank these variables in order of efficacy and hence of cost effectiveness."

- g. Julian Thayer indicated that recordings of HRV monitors could be used to measure "calmness" once a theory of data needed was determined. He explained that we have the statistical means to work with a number of scenarios and subject types at the same time.
- h. Investigate use of virtual reality to "enable" calmness in the environment



figure 2. Spheres of Influence on a Patient

WAYFINDING in architectural settings (reported by Mardelle Shepley group leader).

This group felt comfortable with the concept of wayfinding as it does not need to be redefined. They showed floor plans that indicated examples of difficult paths. Indicated that difficult paths are a special problem for patients with Alzheimer's. Spatial orientation is a fundamental skill. It plays a more significant role in memory than color or symbols. For example, if you are looking for your car in a lot, color clues are not as helpful as spatial configuration or landmarks. Many cognitive psychologists believe that general information is stored in memory in parallel to the way spatial information is processed. They suggested the following research topics:

- a. Understanding what is seen and what is not seen when one is stressed and trying to find one's way;
- b. What are the biomarkers measuring stress associated with attempting to find one's way;
- c. Studies on people who are good at wayfinding; what are their neurobiological characteristics.
- d. How does being lost manifest itself physiologically.
- e. A summary of research that has been done on navigation.
- f. Perhaps an analysis of the movement patterns of dancers (choreography) would be useful in identifying a non-visual method for wayfinding.

Terry Sejnowski suggested: "There's a lot known about navigation in both animal literature and in human literature. The way it falls out is that it looks as if there are two different ways of solving the problem. Different people have different strengths. One is your ability to know your location in space and to head off in the right direction. And the other is to simply use landmarks and directions. Let's say you go one hundred yards in that direction and when you get to the barn, you turn right and go off a number of blocks. Different people are more comfortable with location ability and others with using landmarks. Usually gifted people like the second method because they can remember lots of different landmarks.

Although infrequently recognized as such, there is neuropsychological evidence for the existence of yet another specialized area within the extra striate cortex. This evidence is in the form of a subset of patients who suffer from 'topographical disorientation'. These patients, most typically following dextral lesions of the medial occipital lobe, seem to have particular difficulty using salient environmental features for way-finding. The limited neuropsychological testing that has been performed upon these patients suggest that they are primarily impaired in the perception and recognition of street scenes, landscapes, monuments, and most notably, buildings. ... Commonly, these patients report relying upon less salient environmental features (i.e., distinctive door knobs, mailboxes, park benches) to learn and follow a path."

WINDOWS and their impact on patients (Introduction excerpted from Roger Ulrich's talk).

Research on intensive or critical care units strongly suggests that a lack of windows can detrimentally affect patients. Lack of windows in ICUs is associated with higher rates of anxiety, depression, and delirium compared to rates for units with windows. Questionnaire evidence indicates that patients in acute care consider windows to be very important, and assign especially high value to nature views.

Regarding staff, many studies across a variety of workplaces (healthcare, office buildings) have found that employees, like patients, attach high importance to having windows, and nature views are most preferred. Further, employees with nature window views are less stressed, report better health and higher levels of job satisfaction than comparable groups who lack nature views or have no windows.

The finding that viewing sunshine apparently alleviates depression may explain the results of the second study - that mortality of myocardial infarction patients was lower for patients assigned to sunny, south-facing critical care rooms rather than to north-facing generally sunless rooms. Regarding staff, questionnaire studies indicate that employees also prefer window views of spaces illuminated by sunlight rather than cloudy conditions.

Windows and their role in healthcare (results of group discussion were presented by Esther Sternberg via a power point set of slides she had made based on their discussion). The group began by stating that the quality of the view was less important than the information available from looking out the window. This raised a set of research questions:

- a. Is there a relationship between visual stimulation and healing?
- b. If yes, then what are the elements of visual stimulation that promote healing i.e. light, movement, etc.
- c. Are the effects of the environmental elements additive or synergistic? (that is, is there something about lots of these stimuli seen at the same time that is better to promote

healing.)

- d. Do these elements promote healing by blocking bad sensations?
- e. Does stimulation (the relief of boredom) come from visual environment?
- f. Is passive visual stimulation enough?
- g. Does the effect of the visual stimulus that windows provide depend upon the stages on a patients illness?
- h. Is there a requirement for active engagement? (i.e. visualization or closing your eyes, seeing a place and pretending you are out there.)
- i. What are the neural pathways activated by positive views? (and do these include the emotional centers that are involved in positive or negative emotions?)
- j. What are the hormonal responses to this activation, and how do they impact the immune mediated diseases, and/or outcome measures of health?
- k. Is memory involved in the beneficial effects of windows? (memory is certainly an important element of stress, so it would seem that it would be an important element in healing)
- I. Views of nature have a larger positive population response than views of abstract art. Why is this so?

PRIVACY for patients and for physicians.

This group found the definition of privacy to be perceptual and hence one that will vary from person to person. [Dictionary says: "freedom from the intrusion of others in one's private life"].

Bob Horsburgh: We felt like privacy was not a very easily defined concept. We spent a fair bit of time talking about it. First of all, we determined that privacy is not just a concept that relates to a physical space. You can have privacy violated by smells and sounds so that it's not just limited to physical space. In addition, it's a perceptual quality in the sense that something might seem like it threatens your privacy. If you have control over it, it might not threaten your privacy-it's more the potential than the reality. You can be worried about the privacy of your medical records. The definition we finally came up with is: Privacy is a state of mind describing a more or less acceptable state of social interaction. Thus focusing on the concept of interactions with other people. We also decided to spend most of our time talking about individual privacy as contrasted to group privacy.

There were a couple of research questions that we thought would be important to look at:

- 1. Are there cultural predictors of perceptions of privacy?
- 2. Does it vary with your socioeconomic status?
- 3. Did it vary with your racial or ethnic background if you were from a foreign country?
- 4. Does your sense of privacy relate to what is acceptable or not acceptable? Keeping in mind that it can be both ways. You may want to be in a group of nice people. You may not want to be in a group of people who threaten you. You may want to be alone.
- 5. Does your perception of privacy change when you are sick versus when you're well? So you could compare people who are sick and then after they got better and recovered. Didthey have a different sense of privacy?
- 6. We thought of trying to find some sort of a privacy meter (see below).
- 7. One might even consider simulating certain situations in having people undergo invasions of privacy and see how they respond to them
- 8. And then we thought, once we had sort of a good definition of what we thought privacy

meant to people, it would be very important to then move on to the kind of neuroimaging study phase. One in which you would look to see when people have had their privacy violated or restored, what part of the brain is activated in response to that kind of challenge.

The group's notes regarding a privacy meter or "privameter" reflected a number of ideas:

- 1. User survey
 - 2. Measure stress factors
 - Serotonin
 - Testosterone
 - Corticoids
 - 3. What is the range to calibrate privacy perception?
 - 4. Measure what is happening
 - a. Vary scenario
 - b. Vary subject
 - c. Interview prior to experience then record outcome with subject
 - d. Threshold conditions: transitions between interactions comfortable or not
 - e. Isolation of jogging or swimming
 - f. Passive disruption of sense of privacy
 - g. TV viewing is learned behavior = crutch for social interaction not present in hospital environment
 - h. Food preparation and meals stimulates interaction

Additional Research questions: (from this group)

- a. Are there cultural differences in expected levels of privacy?
- b. What part of the brain is activated when privacy is violated?
- c. Would ability to control privacy be measurable on brain scans?
- d. Is there a culturally dependent bubble of personal space?
- e. Can privacy be a hindrance to healing as in physical therapy or intensive care units where privacy cannot be provided?

INTERIOR ENVIRONMENTS.

- Ron Skaggs: Our assignment was actually interior architectural experiences. We somewhat redefined that into interior environments. What we tried to do was stay on the assignment, trying to define a research question that would be at the basic level. And since I kept wanting to return to applications, it would probably be better if someone talks more from the research side. Jack Snell will go through our groups discussion and conclusions:
- Jack Snell: This morning, we were exposed to the very, very complex system of systems that we are exploring here, the human in the built environment. What our group tried to do is understand how all of this works. We have assumed that there is a system of systems and that they're interconnected. So if our task here is to try to understand the influence of the architectural experience on human health or the outcome in a hospital, then we need a system model of the environment, the occupants in it, and the stuff in it.

We needed to try to define the system that we're talking about. And that led to this diagram (fig. 3). It's a first-order system representation. On the left is the "physical environment"

which includes the care provider, other patients or visitors or what have you, the physical interior environment of the hospital, the external environment, etc. These are all the kinds of interactions of things that need to be accounted for in trying to understand the influence of the architectural experience on wellness. Next is the patient's equipment for collecting "Sensory Inputs." The third block, the one on the right represents what goes on within the patient, the things Esther and Terry discussed which influence thinking and wellness or health. Outside of these blocks we have indicated the general domains of various disciplines we bring to the problem.



figure 3. Model of system of systems

In terms of research, then, of how this experience - that is that set of influences captured as an experience - affects a patient's physiological or mental outcome we came back to the notions of control for comfort or well-being. The top level research question is whether or how to operationalize a model like the one represented by our diagram. As to other research questions, there's a need for some very significant epidemiological work to just sort out what are the major influences. The ASHRAE guide approach to measuring comfort is at best first-order as it relates to issues we're trying to address here. There are some very significant measurement issues with respect to all of these sensory inputs. We need a scientific knowledge base to explain, measure, and predict outcomes. To do this as a better underpinning for architectural practice, we need to be able to develop and test modelselements of these systems and put them together.

Some Research Questions identified by the group:

- 1. How does the environment contribute to causing disease? Define an environment that does not make things worse.
- 2. What can the physical built environment do?
 - · To minimize discomfort
 - \cdot Do no harm but rather be a positive modifier
- 3. Should the environment be static or dynamic?
 - · Changes in care
 - · Different syndromes
- 4. Which way do you go?
 - · Universal
 - · Multiplicity of spaces

· The dilemma is how do you adapt

- 5. Can we prove that comfort and control (choice) are important?
 - · If so what are the determinants of control and comfort?
- 6. Is the specific disease/ailment a major determinant of what the interior space should be?
- 7. How do you identify and quantify those influences on the diagram and what do they depend upon?
- 8. What is the impact of corridors as opposed to individual rooms or groups of rooms?
- 9. What interior environments are the most important to study? > Those with the greatest impact.

The Group felt that consideration was needed for the most cost-effective research approach (i.e. epidemiology, molecular biology, physiology).

- Giovanni Cizza: If I may, there is a reason why this research is difficult to determine. We have a lot of disciplines that are represented, and there were a lot of presentations that ranged from electro-physiology to endocrinology. I think that at the stage in which the field is at the moment we should ask ourselves the question which approach you do first, not to convince ourselves but to convince people outside of the community that this is the real effect. We need to show with some convincing biological studies that there is an effect that is clearly significant. It can be done with so-called prospective-retrospective studies where you can identify two or three facilities in the country with good records. Maybe one of the facilities has windows and the other without windows. And then you show that there is a difference. Something as straight forward as this. I think that there should be an effort to prioritize and to convince people outside of this room that this is a very important thing. And then you can go in any direction.
- Terry Sejnowski: One of the things that we're trying to identify is what are the things that we ought to be varying. Which are the things most likely to give us a big outcome, right?
- Bob Horsburgh: I'm not going to argue against an epidemiological approach, obviously. The real issue is what are the testable hypotheses. I know, in our group, we couldn't come up with a testable hypothesis. We couldn't get a definition of what privacy was. So you couldn't do an epidemiological study. But you have to first of all have a hypothesis. And, you know, privacy is not a yes/no thing. It's not like these people have it, and these people don't, and you can see if there's a difference. It's a continuum, and maybe too much privacy is bad and too little is bad and somewhere in the middle is best.

Giovanni: That's a good point.

Attachment A - Participants

FROM THE ARCHITECTURE COMMUNITY:

- > Janet Baum, Ph.D., Principal, Health, Education + Research Associates, St. Louis
- > Gordon Chong, AIA, President of the AIA
- > Norman Koonce, FAIA, Executive Vice-President and CEO of AIA
- > Shannon B. Kraus, MBA, RTKL, Dallas
- > Frederick M. Marks, AIA, Earl Walls Associates, San Diego, CA
- > Thompson Penney, FAIA, First Vice President of the AIA
- > Frank Pitts, AIA, Past President of the Academy of Architecture for Health
- > Joan L. Saba, AIA, President of the Academy of Architecture for Health
- > Ronald Skaggs, FAIA, Chairman and CEO of HKS, Dallas

FROM THE UNIVERSITY COMMUNITY:

- > David Allison, AIA, Director Graduate Studies in Architecture + Health, Clemson University
- > Robert Horsburgh, M.D., Chairman of the Department of Epidemiology & Biostatistics, Boston University, School of Public Health
- > Tom Regan, Dean of the Department of Architecture, Texas A&M University
- > Mardelle Shepley, D.Arch., Associate Director of the Center for Health Systems & Design, Texas A&M University
- > Roger Ulrich, Ph.D., Director of the Center for Health Systems & Design, Texas A&M University

FROM THE NEUROSCIENCE RESEARCH COMMUNITY:

- > Giovanni Cizza, M.D., Ph.D., Senior Clinical Researcher, National Institute of Mental Health
- > Farideh Eskandari, M.D., Senior Clinical Researcher, National Institute of Mental Health
- > Terence Phillips, Ph.D., D.Sc., Chief of the Ultramicro Analytical Immunochemistry Resource, Bioengineering and Physical Sciences Program, Office of Research Services, Office of the Director, National Institutes of Health
- > Patrick Russell, Ph.D., former staff member of the Neurosciences Institute
- > Terry Sejnowski, Ph.D., Professor, Computational Neurobiology, Salk Institute
- > Esther Sternberg, M.D., Director of the Integrative Neural-ImmuneProgram, National Institute of Mental Health
- > Julian Thayer, Ph.D., Investigator, National Institute of Aging

FROM FEDERAL AGENCIES:

- > Lloyd H. Siegel, FAIA, Director of Facilities Strategic Management, Department of Veterans Affairs
- > Jack Snell, Ph.D., Director of the Building and Fire Research Laboratory, National Institute for Standards and Technology

FROM THE AIA RESEARCH PROGRAM:

- > John Eberhard, FAIA, Director of Research Planning, The American Institute of Architects
- > Ed Jackson, D.Arch., AIA, Research Consultant, The American Institute of Architects
- > Margaret Tarampi, Assoc. AIA, Research Assistant, The American Institute of Architects
- > Michael Sheridan, Producer of Media Materials
- > David Weiner, Producer of Media Materials
- > Allen Blakey, Director of Public Affairs, The Vinyl Institute

Attachment B - Working Groups

CALMING ENVIRONMENTS within healthcare facilities

- > Norman Koonce, FAIA, Executive Vice-President and CEO of AIA
- > Shannon B. Kraus, MBA, RTKL, Dallas
- > Patrick Russell, Ph.D., former staff member of the Neurosciences Institute
- > Joan L. Saba, AIA, President of the Academy of Architecture for Health
- > Lloyd H. Siegel, FAIA, Director of Facilities Strategic Management, US Departmet of Veterans Affairs
- > Julian Thayer, Ph.D., Investigator, National Institute of Aging

WAYFINDING in architectural settings

- > Farideh Eskandari, M.D., Senior Clinical Researcher, National Institute of Mental Health
- > Terence Phillips, Ph.D., D.Sc., Chief of the Ultramicro Analytical Immunochemistry Resource, Bioengineering and Physical Sciences Program, Office of Research Services, Office of the Director, National Institutes of Health
- > Tom Regan, Dean of the Department of Architecture, Texas A&M University
- > Mardelle Shepley, D.Arch., Associate Director of the Center for Health Systems & Design, Texas A&M University

WINDOWS and their impact on patients

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- > Terry Sejnowski, Ph.D., Professor, Computational Neurobiology, Salk Institute

INTERIOR ENVIRONMENTS.

- > David Allison, AIA, Director Graduate Studies in Architecture + Health, Clemson University
- > Allen Blakey, Director of Public Affairs, The Vinyl Institute
- > Giovanni Cizza, M.D., Ph.D., Senior Clinical Researcher, National Institute of Mental Health
- > Ronald Skaggs, FAIA, Chairman and CEO of HKS, Dallas
- > Jack Snell, Ph.D., Director of the Building and Fire Research Laboratory, National Institute for Standards and Technology

FREE AGENTS to roam between groups.

- > John Eberhard, FAIA, Director of Research Planning, The American Institute of Architects
- > Michael Sheridan, Producer of Media Materials
- > Margaret Tarampi, Assoc. AIA, Research Assistant, The American Institute of Architects
- > David Weiner, Producer of Media Materials