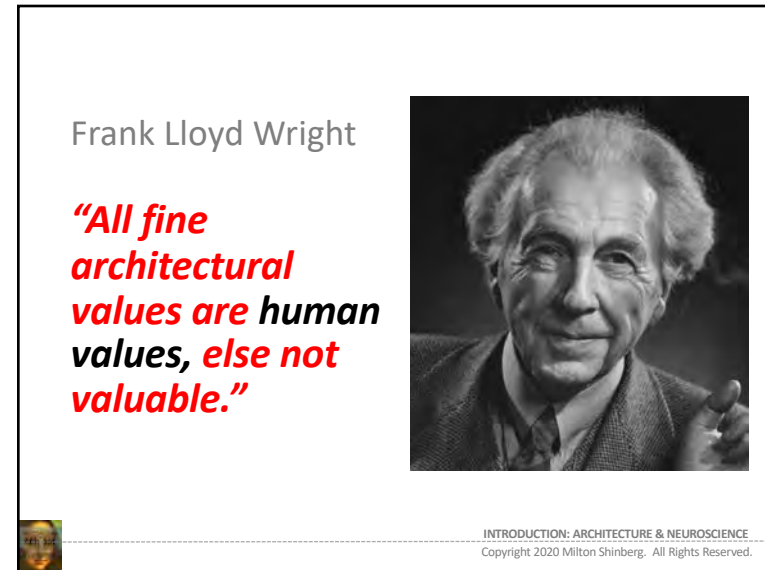


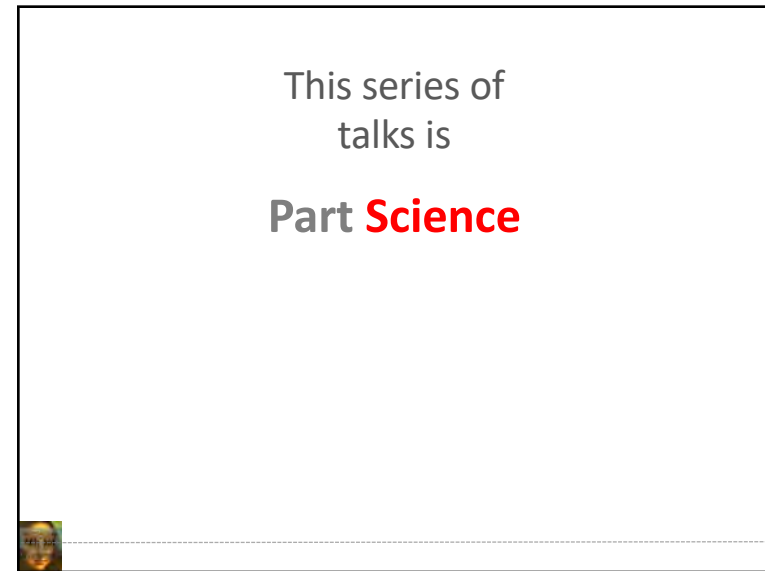
1



2



3



4

This series of talks is

Part Science
Part Anthology
Part Speculation



5

This series of talks is

Part Science
Part Anthology
Part Speculation




6

This series of talks is

Part Science
Part Anthology
Part Speculation

All arising from curiosity.



7

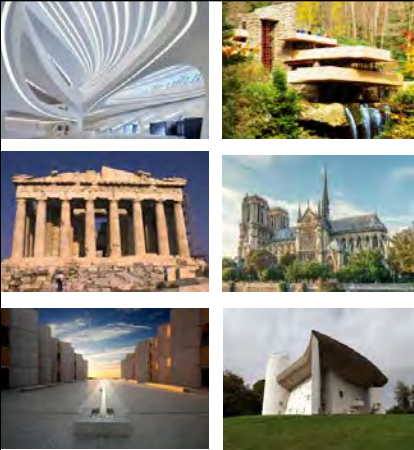


Beauty?

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We'll investigate **aesthetics**, in architecture and art.

Beauty?

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We'll consider whether **seemingly unique**, individual aesthetic responses, have **underlying patterns**.

Beauty?

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Brains

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Brains

We'll explore **how the brain understands** architecture and the environment,




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Brains

A few amazing facts:




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Your Brain

about **100 billion neurons**




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Your Brain

about **100 billion neurons and several trillion connections**




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Your Brain

about **100 billion neurons and several trillion connections**

MANY engaged in understanding what's "out there."



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The Milky Way



300 BILLION STARS

Your Brain




100 BILLION NEURONS

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To learn about architecture through this course, you'll need to know

some basics of Beauty




The Karate Kid, "WAX ON – WAX OFF"

18

To learn about architecture through this course, you'll need to know


some basics of Brains



The Karate Kid, "WAX ON – WAX OFF"

19

to understand how architecture can be seen and designed more wisely.



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An Accidental Encounter with Unexpected Consequences



Peter Blake, Chair
Department of Architecture & Planning
Catholic University of America

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Beginning this Exploration **Learning from Teaching The 1st Year Studio**



Peter Blake, Chair
Department of Architecture & Planning
Catholic University of America

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Beginning this Exploration **Learning from Teaching The 1st Year Studio**

Incorporate Basic Design Exercises?

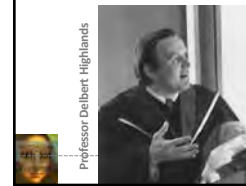


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CARNEGIE-MELLON UNIVERSITY COLLEGE OF FINE ARTS



Professor Delbert Highlands

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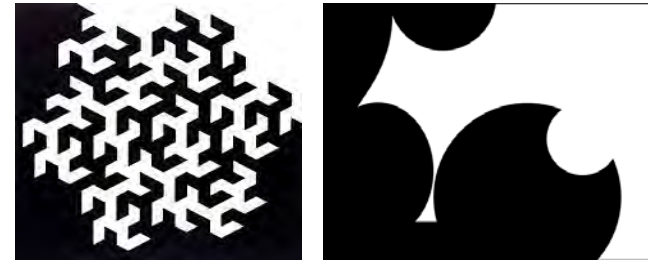
Exercises for Creating Equal Areas of Black and **White**



“Figure/Ground” Exercises INTRODUCTION: ARCHITECTURE & NEUROSCIENCE
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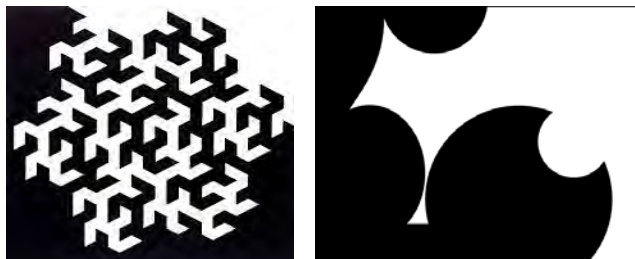
Exercises for Creating Equal Areas of Black and **White**



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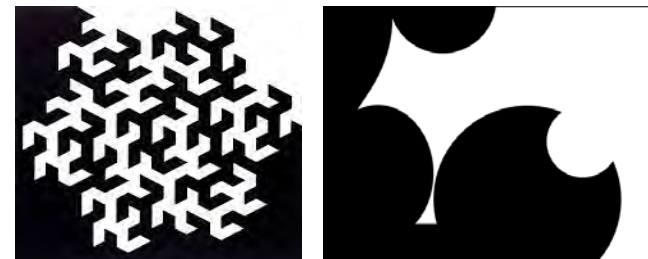
Exercises for Creating Areas of Black and **White** with **Equal Weight**



“Figure/Ground” Exercises INTRODUCTION: ARCHITECTURE & NEUROSCIENCE
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2-dimensional exercises for understanding **3-dimensional reality?**



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Leaders of the Bauhaus



They believed a 2-Dimensional “**Basic Design**” course would be the best starting point for all the visual arts, *both 2-D and 3-D*, from *graphics to architecture*.

The Bauhaus

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Leaders of the Bauhaus



They believed a 2-Dimensional “**Basic Design**” course would be the best starting point for all the visual arts.

We learned later that the brain agrees.

The Bauhaus

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Leaders of the Bauhaus

- Walter Gropius, **Architect**
(later founded **Harvard Graduate School of Design**)
- Paul Klee, **Abstract Painter**
- Joseph Albers, **Painter and Color Theorist**
- Mies van der Rohe, **Architect**
- Wassily Kandinsky, **Painter**
- Laszlo Moholy-Nage, **Photographer**
- Marcel Breuer, **Architect**
- Oskar Schlemmer, **Design & Theater**

The Bauhaus

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Leaders of the Bauhaus

- Walter Gropius, **Architect**
(later founded **Harvard Graduate School of Design**)
- Paul Klee, **Abstract Painter**
- Joseph Albers, **Painter and Color Theorist**
- Mies van der Rohe, **Architect**
- Wassily Kandinsky, **Painter**
- Laszlo Moholy-Nage, **Photographer**
- Marcel Breuer, **Architect**
- Oskar Schlemmer, **Design & Theater**

Friederike Dicker, Everything
There were more women students than men,
until Gropius “balanced” the numbers.

The Bauhaus

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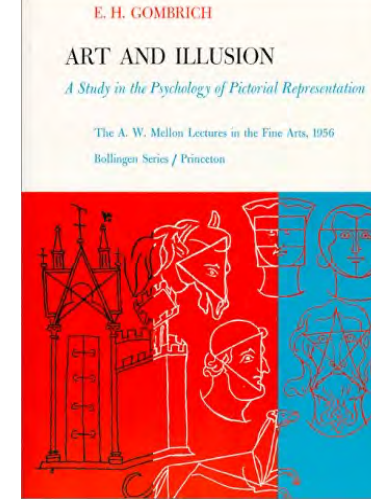
Leaders of the Bauhaus

There were more women students than men, until Gropius "balanced" the numbers.

The Bauhaus

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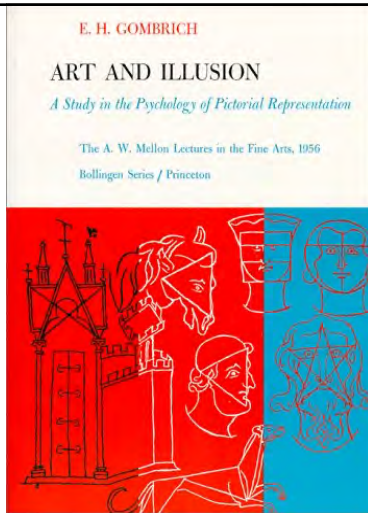
An Accidental Encounter with Real Answers

Reiter's Bookstore

Finding Answers

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An Accidental Encounter with Real Answers

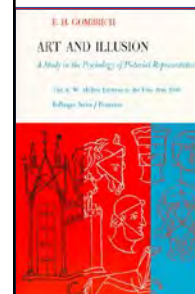
E.H. GOMBRICH
The granddaddy of design and neuroscience.

Finding Answers

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The Leaders Gombrich for Art



Finding More Answers

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The Leaders
Gombrich for Art Arnheim for Architecture

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The Leaders
Gombrich for Art Arnheim for Architecture

2-D **2-D**

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The Leaders
Gombrich for Art Arnheim for Architecture

2-D **2-D** **2-D/3-D** **3-D**


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The big one.

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The big one.

Because Environmental (Architectural) Experience is 3-D.

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How to make the transition from 2-D (initial brain processing) to understanding experience, full cognition of 3-D?

Figure/Ground Exercises

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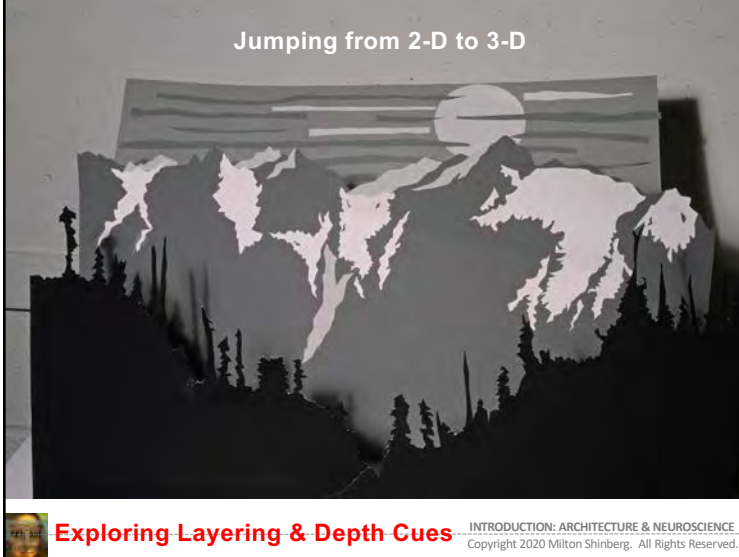


Exercises needed to be more SPATIAL, like Architecture

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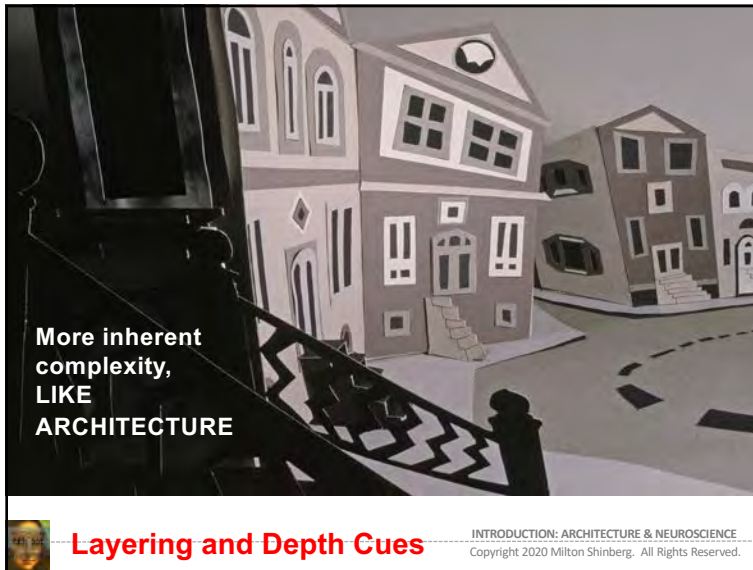
Jumping from 2-D to 3-D



Exploring Layering & Depth Cues

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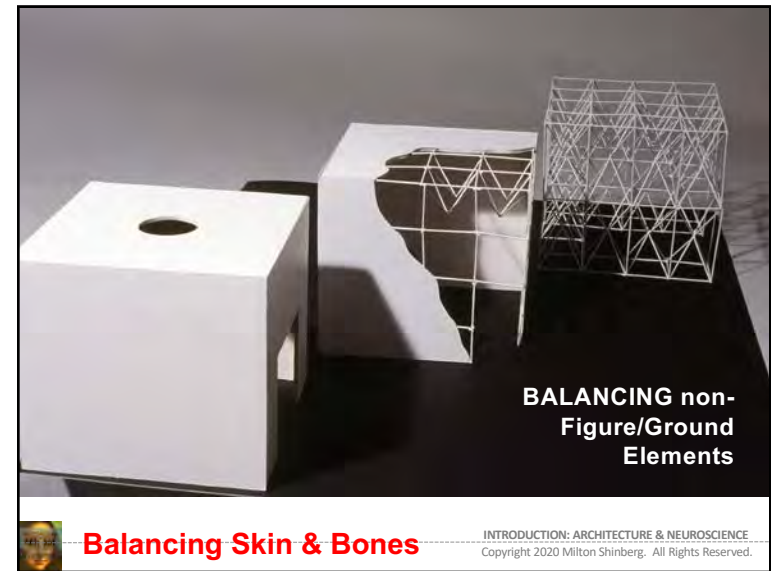
45



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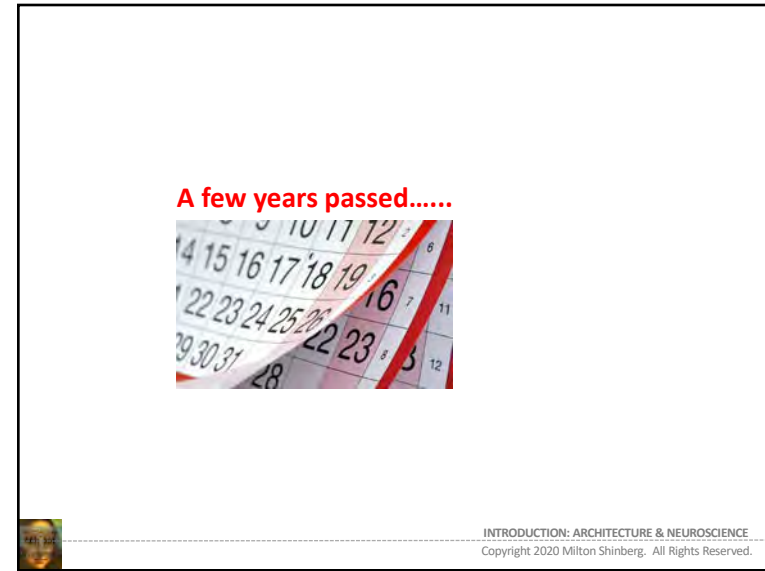
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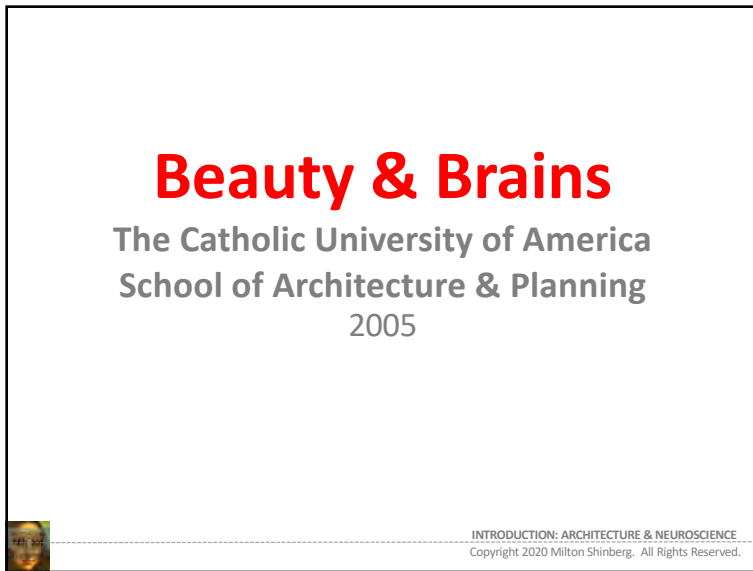
48



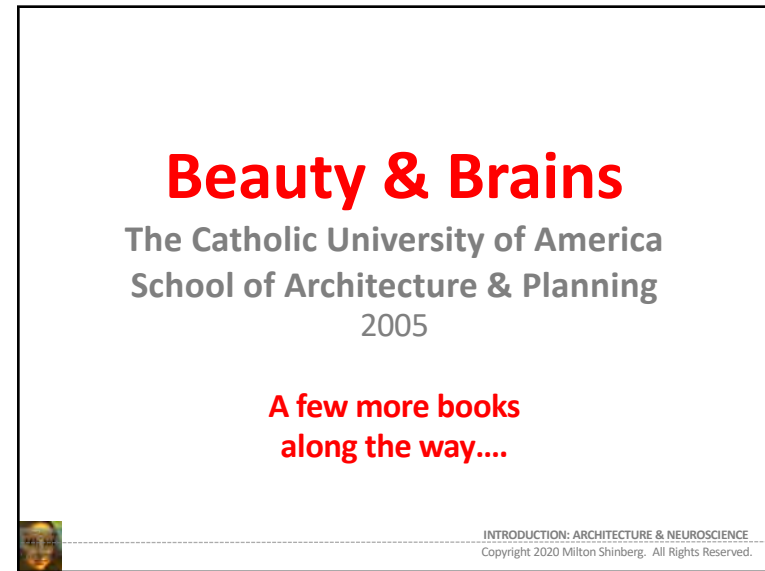
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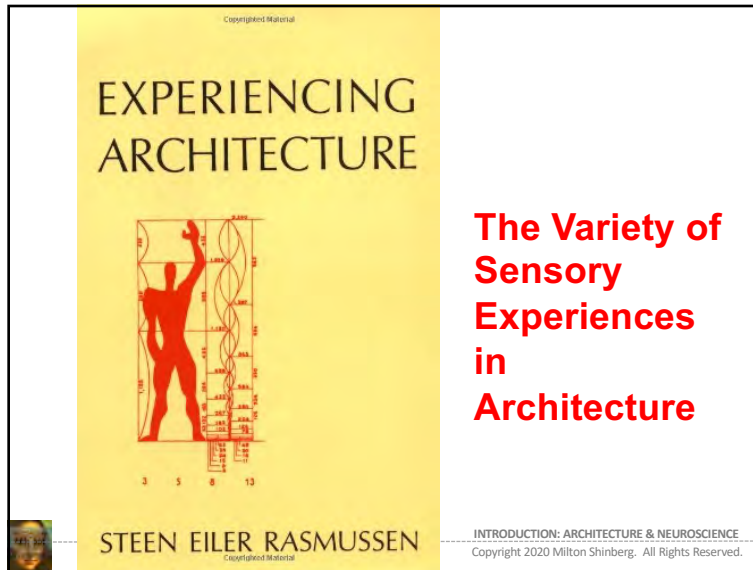
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51



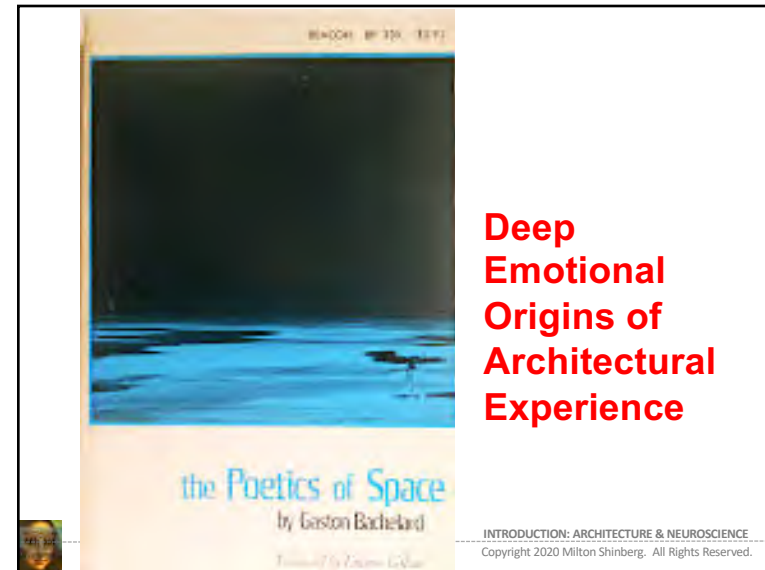
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**The Variety of
Sensory
Experiences
in
Architecture**

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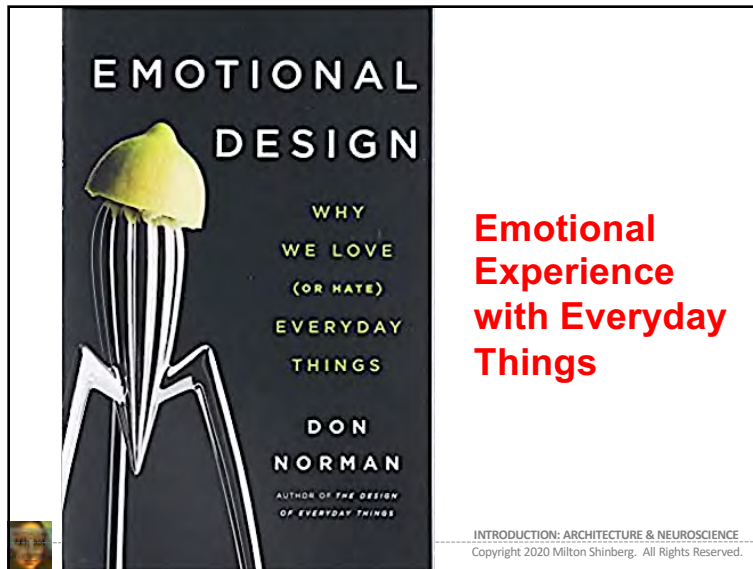
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**Deep
Emotional
Origins of
Architectural
Experience**

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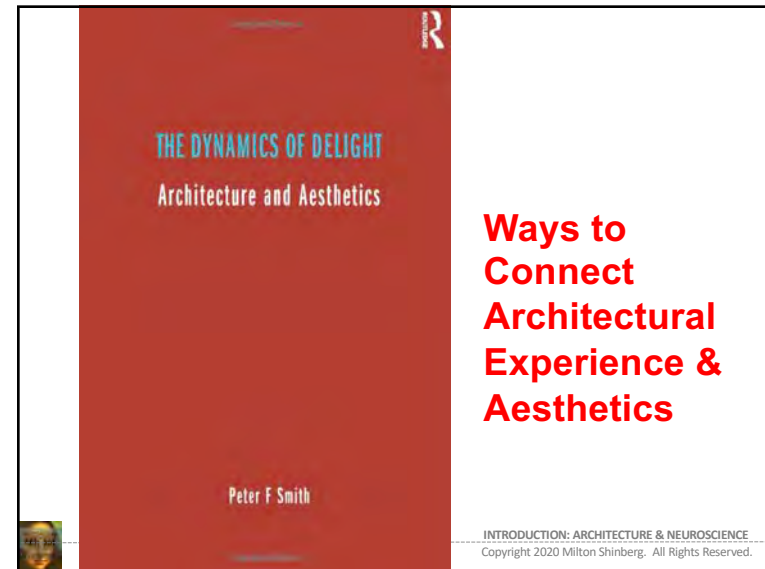
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**Emotional
Experience
with Everyday
Things**

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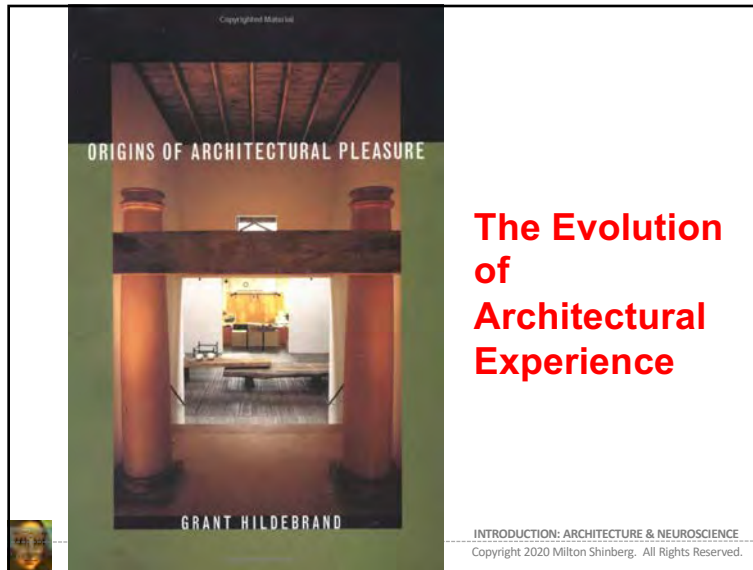
55



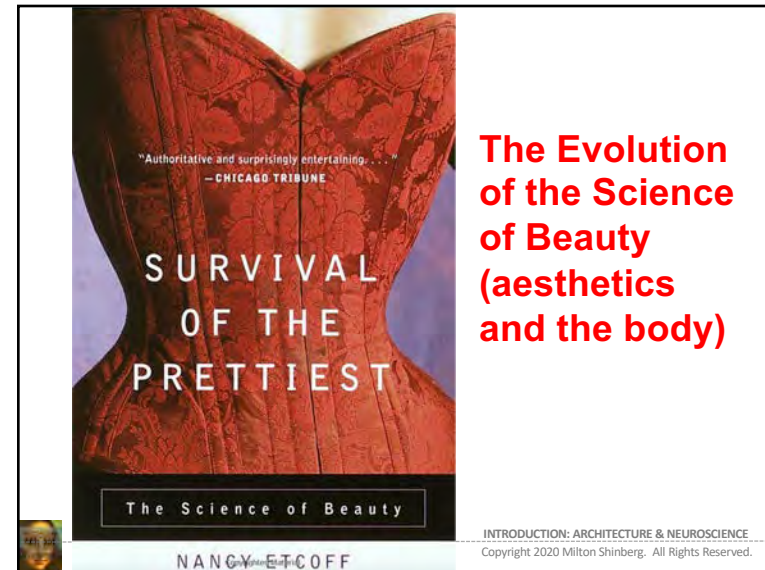
**Ways to
Connect
Architectural
Experience &
Aesthetics**

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Interest in the Architectural Profession



**The American
Institute
of Architects**



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John Eberhard FAIA

Former President of the American Institute of Architects'
Research Corporation
Chair, Department of Architecture, Carnegie-Mellon
Dean of Architecture at SUNY/Buffalo



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John Eberhard FAIA

Former President of the American Institute of Architects
Research Corporation
Chair, Department of Architecture, Carnegie-Mellon
Dean of Architecture at SUNY/Buffalo

The Latrobe Prize

**AIA 2003
San Diego Convention**

\$100,000 (about \$150,000 in 2020)



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Academy of Neuroscience For Architecture




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Examples of Presentation topics

Finding Your Way in the Built Environment

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Examples of Presentation topics

Finding Your Way in the Built Environment

The Senses and Architecture I: Vision

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Examples of Presentation topics


Finding Your Way in the Built Environment

The Senses and Architecture I: Vision

The Senses and Architecture II: Light, Smell and Sound
(Chair: **Juhani Pallasmaa**)

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Examples of Presentation topics

- Finding Your Way in the Built Environment
- The Senses and Architecture I: Vision
- The Senses and Architecture II: Light, Smell and Sound
(Chair: **Juhani Pallasmaa**)
- Bringing Neuroscience to Practice in Architecture**

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Examples of Presentation topics

- Finding Your Way in the Built Environment
- The Senses and Architecture I: Vision
- The Senses and Architecture II: Light, Smell and Sound
(Chair: **Juhani Pallasmaa**)
- Bringing Neuroscience to Practice in Architecture
- Emotion and Architecture**

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Examples of Presentation topics

- Finding Your Way in the Built Environment
- The Senses and Architecture I: Vision
- The Senses and Architecture II: Light, Smell and Sound
(Chair: **Juhani Pallasmaa**)
- Bringing Neuroscience to Practice in Architecture
- Emotion and Architecture
- How Architects Can do Experiments**

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THIS IS YOUR BRAIN ON URBAN DESIGN
Colin Ellard
Wednesday, January 25th 6:30pm
NewSchool Auditorium | Open to the Public

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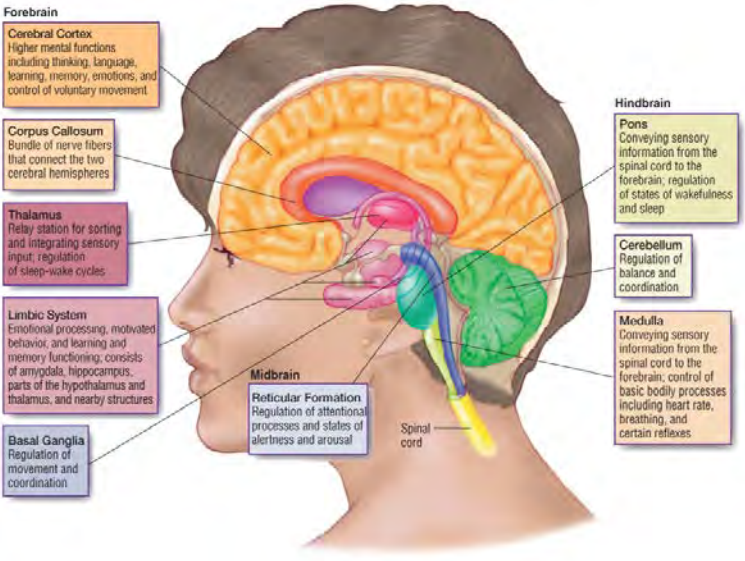
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Reality
 (including architectural reality)
 isn't "out there."

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Forebrain

- Cerebral Cortex**
Higher mental functions including thinking, language, learning, memory, emotions, and control of voluntary movement.
- Corpus Callosum**
Bundle of nerve fibers that connect the two cerebral hemispheres
- Thalamus**
Relay station for sorting and integrating sensory input, regulation of sleep-wake cycles
- Limbic System**
Emotional processing, motivated behavior, and learning and memory functioning; consists of amygdala, hippocampus, parts of the hypothalamus and thalamus, and nearby structures
- Basal Ganglia**
Regulation of movement and coordination

Midbrain

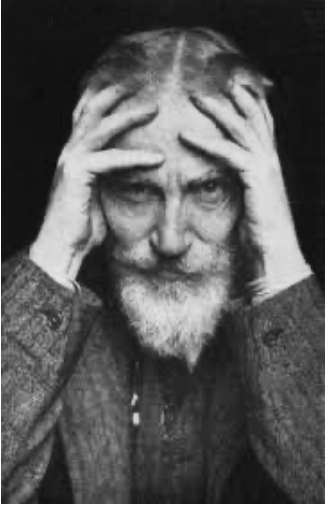
- Reticular Formation**
Regulation of attentional processes and states of alertness and arousal

Hindbrain

- Pons**
Conveying sensory information from the spinal cord to the forebrain; regulation of states of wakefulness and sleep
- Cerebellum**
Regulation of balance and coordination
- Medulla**
Conveying sensory information from the spinal cord to the forebrain; control of basic bodily processes including heart rate, breathing, and certain reflexes

Spinal cord

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Reality
 (including architectural reality)
 isn't "out there."

It happens **between your ears.**

George Bernard Shaw

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Cognition

"Cogno"
Latin for
"I know"

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Cognition

It's the
"AHA!"

the
"I get it!"



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Is the cognitive process
something you can feel?



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When the Cognitive Process
is going very well:
Pleasure Hormones

[the pleasure of a
new idea, high aesthetic
experience,
relief from "artistic
tension."]



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When there are major
challenges:
Stress Hormones

[frustration, high
levels of complexity,
no solutions]



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You can feel

Cognitive

Stress



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Try this:

7H15 M3554G3
53RV35 7O PR0V3
H0W 0UR M1ND5 C4N
D0 4M4Z1NG 7H1NG5!
1MPR3551V3 7H1NG3!
1N 7H3 B3G1NN1NG
17 WA5 H4RD BU7
YOUR M1ND 1S
R34D1NG 17
4U70M471C4LLY
W17H 0U7 3V3N
7H1NK1NG 4B0U7 17,
B3 PROUD! ONLY
C3R741N P39PL3 C4N
R3AD 7H15.



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7H15 M3554G3
53RV35 7O PR0V3
H0W 0UR M1ND5 C4N
D0 4M4Z1NG 7H1NG5!
1MPR3551V3 7H1NG3!
1N 7H3 B3G1NN1NG
17 WA5 H4RD BU7
YOUR M1ND 1S
R34D1NG 17
4U70M471C4LLY
W17H 0U7 3V3N
7H1NK1NG 4B0U7 17,
B3 PROUD! ONLY
C3R741N P39PL3 C4N
R3AD 7H15.

83

or this:

Read each color name.

red blue orange purple
orange blue green red
blue purple green red
orange blue red green
purple orange red blue
green red blue purple
orange blue red green
green purple orange red



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Word recognition comes primarily from one area in the brain.

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Word recognition comes primarily from one area in the brain.

Color recognition is concentrated in another.

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You're experiencing the stress of **Cognitive Conflict**

Usually unconscious but ongoing.....

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So, what makes
beauty?



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Why is one
world-famous?



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Why is one
world-famous?



And the other one
not as much?



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Why does one
invite us?



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Why does one **invite** us?



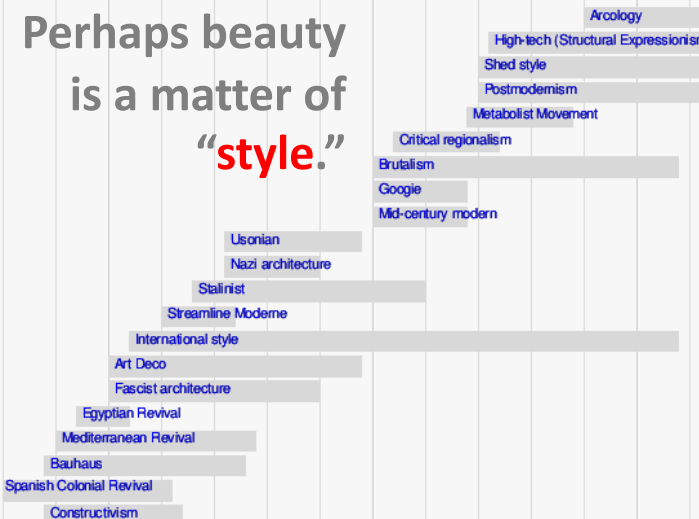
And the other **not so much?**



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Perhaps beauty is a matter of **“style.”**



- Arcology
- High-tech (Structural Expressionism)
- Shed style
- Postmodernism
- Metabolism Movement
- Critical regionalism
- Brutalism
- Google
- Mid-century modern
- Usonian
- Nazi architecture
- Stalinist
- Streamline Moderne
- International style
- Art Deco
- Fascist architecture
- Egyptian Revival
- Mediterranean Revival
- Bauhaus
- Spanish Colonial Revival
- Constructivism

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Bigger Differences?

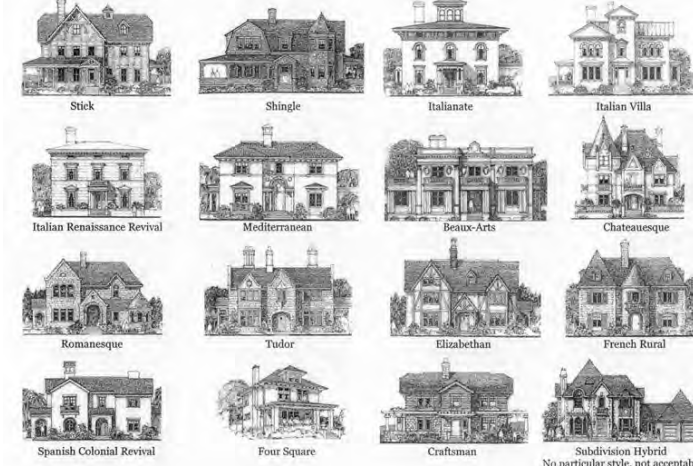


- ROMANESQUE
- NORMAN
- GOthic
- MEDIEVAL
- RENAISSANCE
- TUDOR
- ELIZABETHAN
- INDOISLAMIC
- BAROQUE
- JACOBINEAN
- PALLADIAN
- ROCOOCO
- GEORGIAN
- NEOCLASSICAL
- GOthic REVIVAL
- MOORISH REVIVAL
- BARONIAL
- FEDERAL
- REGENCY
- ITALIANATE
- EMPIRE
- INDOSARACENIC
- JACOBETHAN
- CHICAGO SCHOOL
- ART NOUVEAU
- PRAIRIE
- NATIONAL ROMANTIC
- EXPRESSIONIST
- MODERN
- CONSTRUCTIVIST

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Smaller Differences?



- Stick
- Shingle
- Italianate
- Italian Villa
- Italian Renaissance Revival
- Mediterranean
- Beaux-Arts
- Chateausque
- Romanesque
- Tudor
- Elizabethan
- French Rural
- Spanish Colonial Revival
- Four Square
- Craftsman
- Subdivision Hybrid
- No particular style, not acceptable

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Short-term = FAD
Things about which we might disagree more.

101




Long-term = Style
Things about which we might disagree less.

102



Long-term = Style
Things about which we might disagree less.

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Or, perhaps, not disagree at all.

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So, what makes **beauty?**


Is there **something deeper** that we can use in **design?**



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YES



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YES

That's what we'll be exploring.



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(b.t.w.)

Creativity is Intelligence having fun.

Albert Einstein

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108



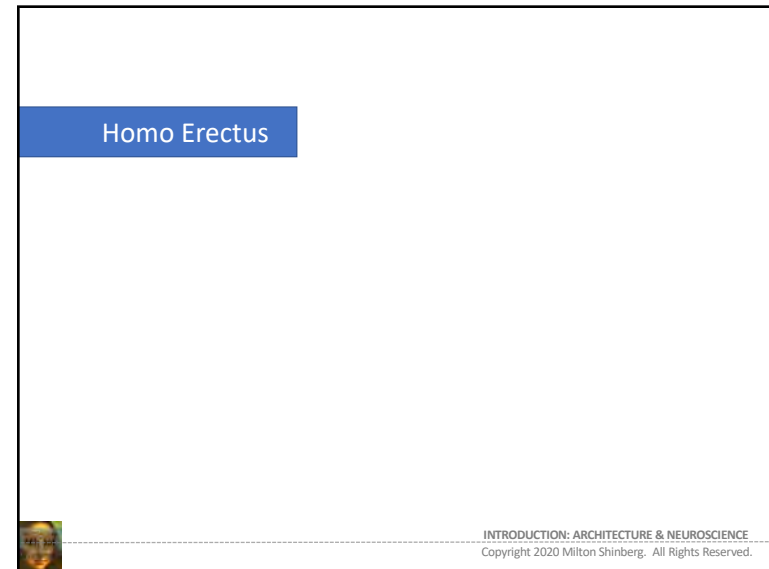
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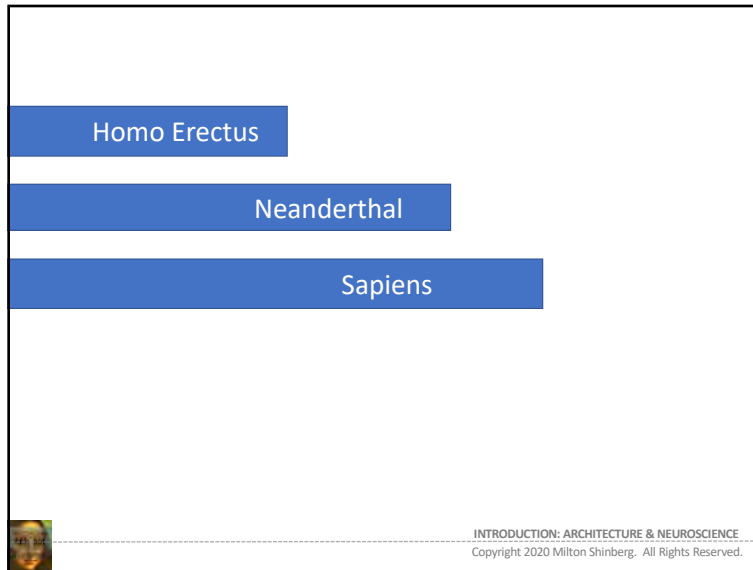
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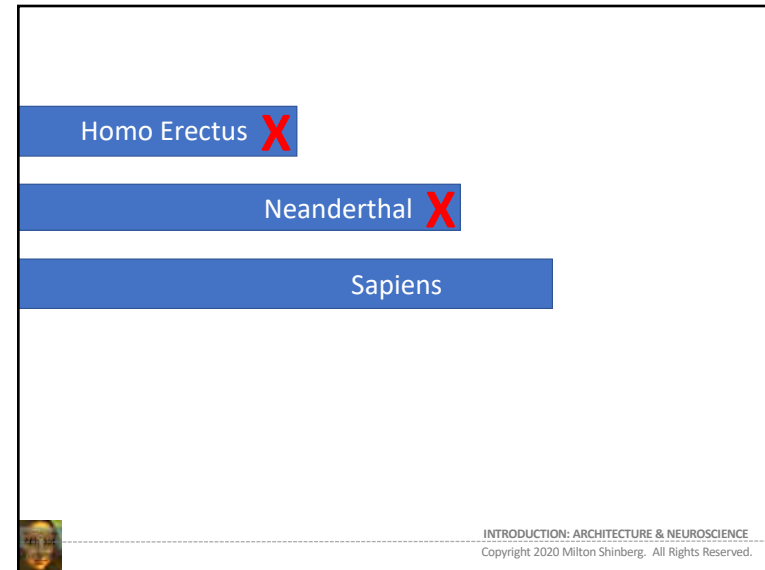
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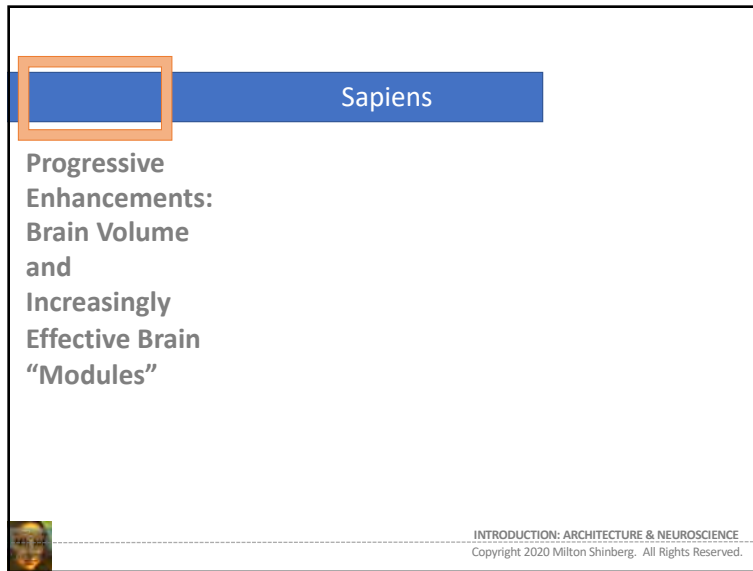
112



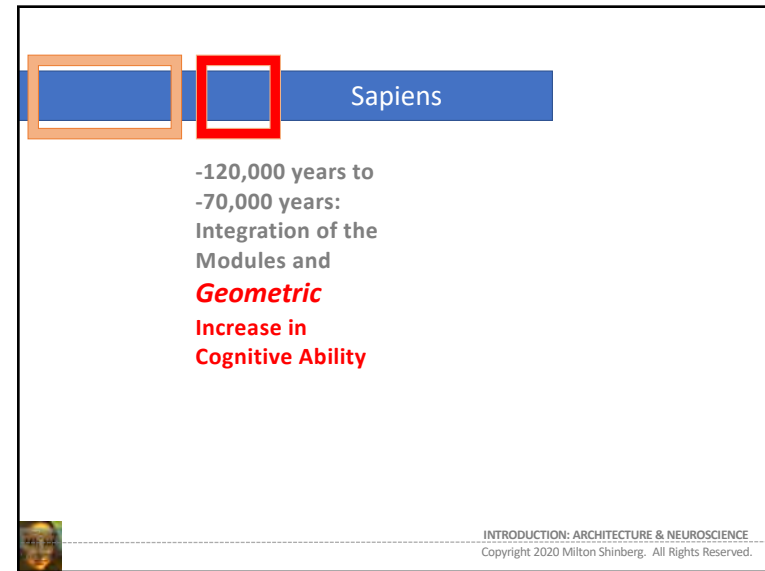
113



114



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Sapiens

-120,000 years to
-70,000 years:
Integration of the
Modules and
Geometric
Increase in
Cognitive Ability

No Increase in
Brain Volume

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Sapiens

-120,000 years to
-70,000 years:
Integration of the Modules and
Geometric
Increase in
Cognitive Ability

No Increase in
Brain Volume

Social Organization
Language
Advances in Tools

Art

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Homo Erectus

Neanderthal

Sapiens

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Homo Erectus

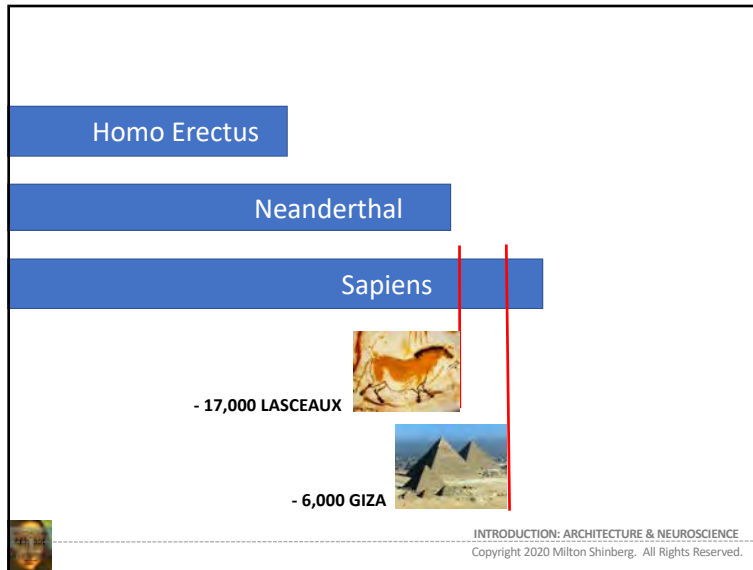
Neanderthal

Sapiens

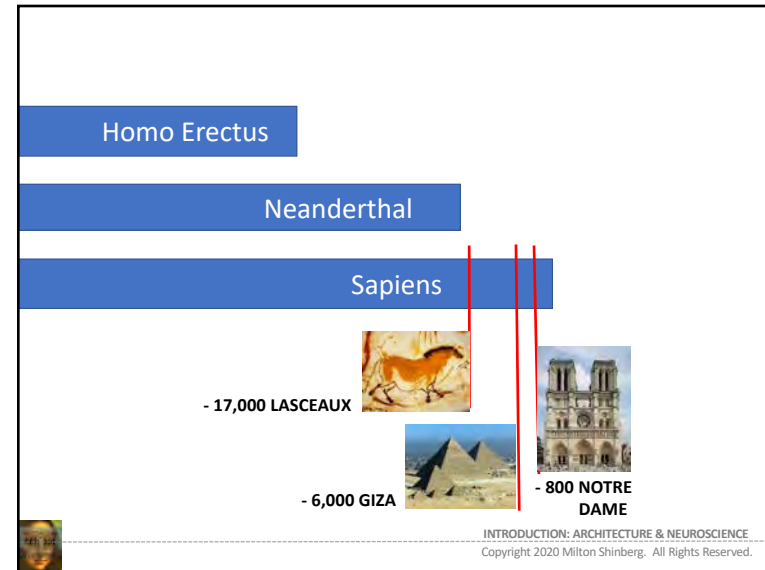
- 17,000 LASCEAUX

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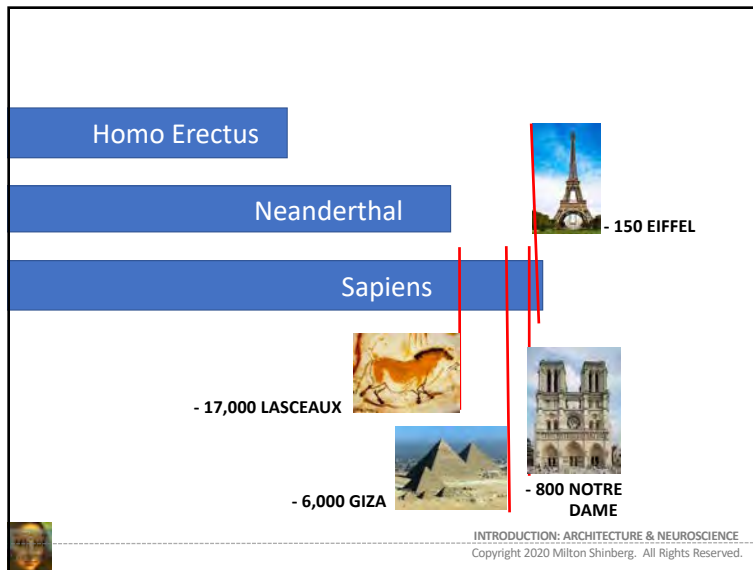
120



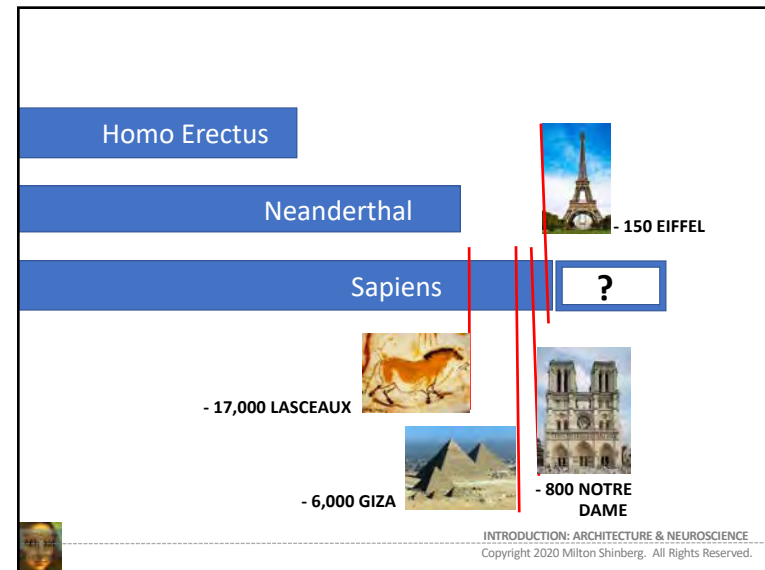
121




122




123





124



How did we
get from here




125



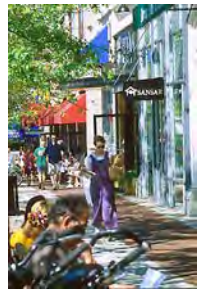



How did we
get from here

to here



126

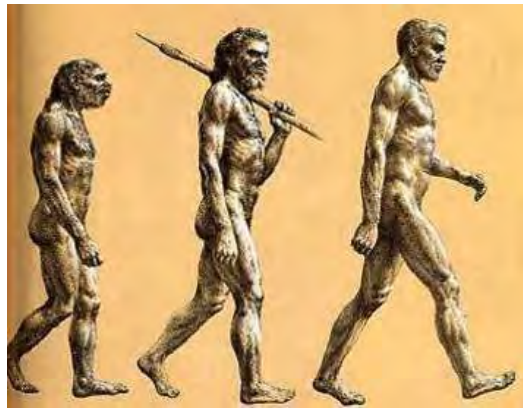
How did we
get from here

to here


To here



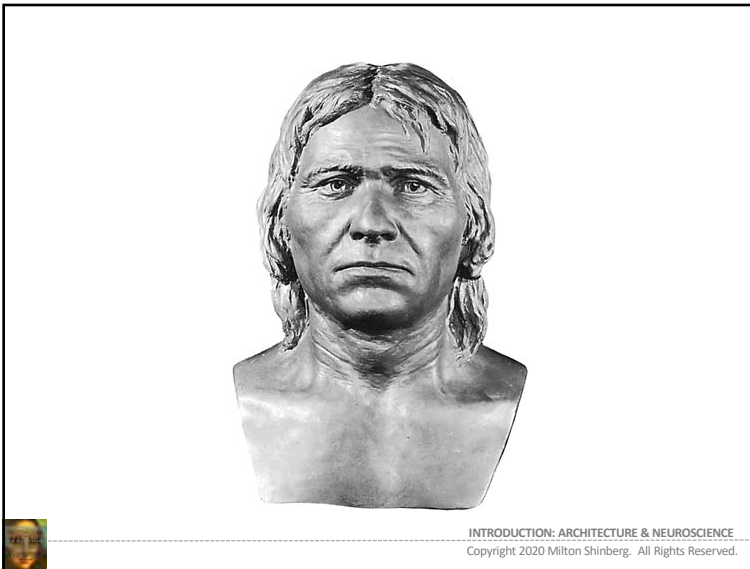
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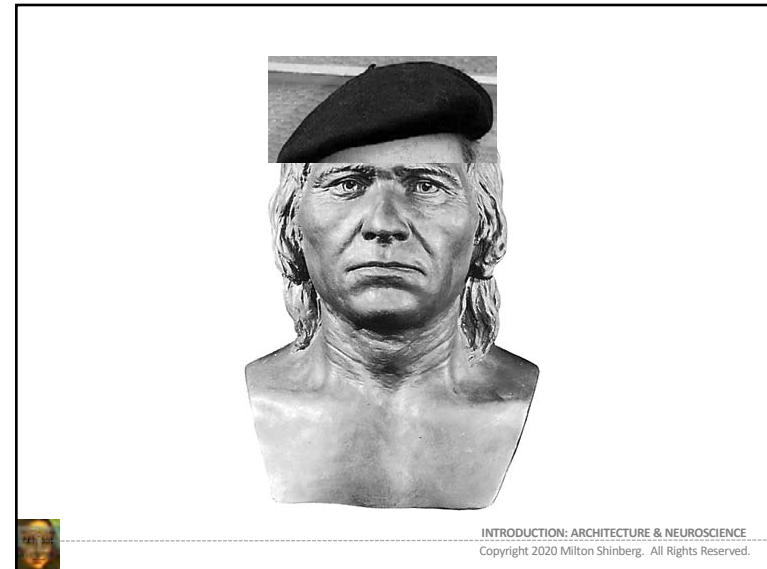
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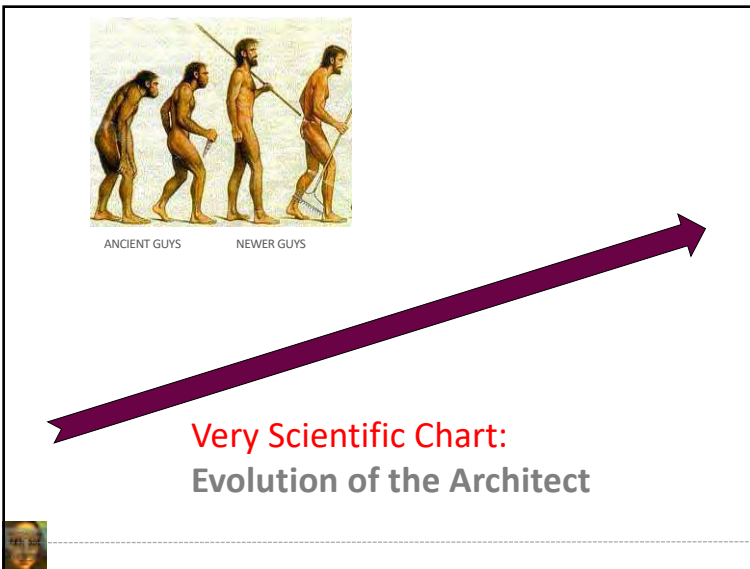
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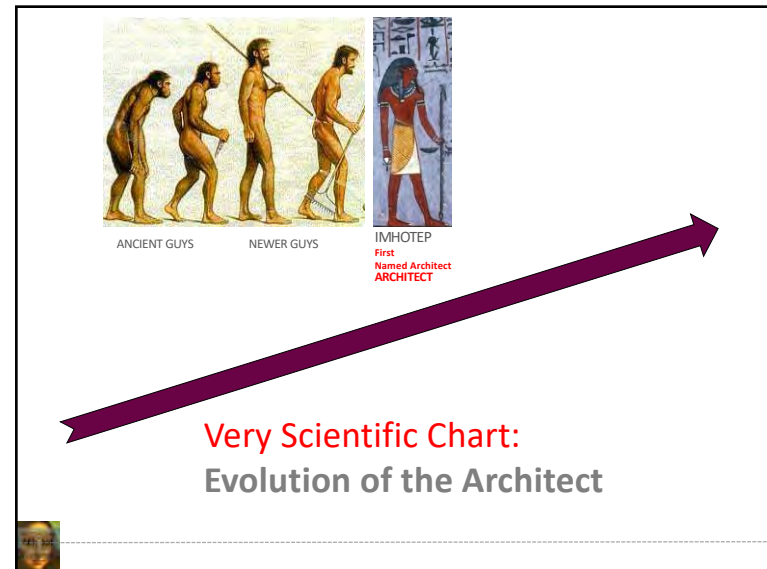
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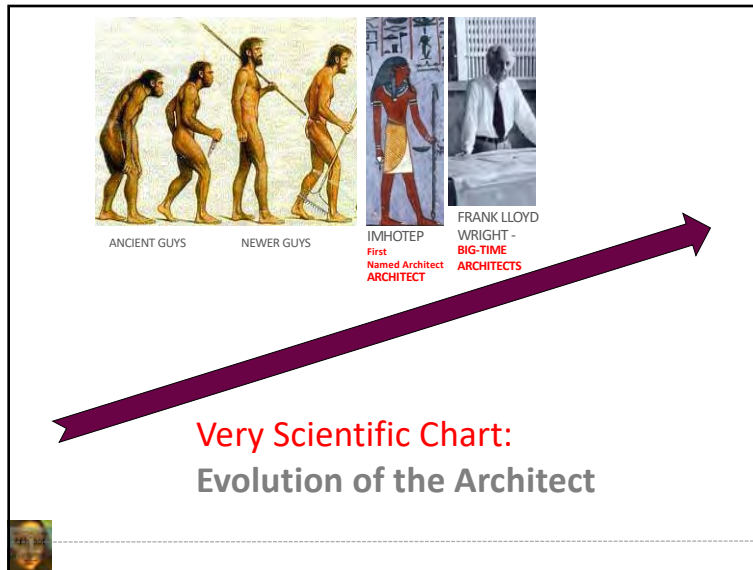
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131

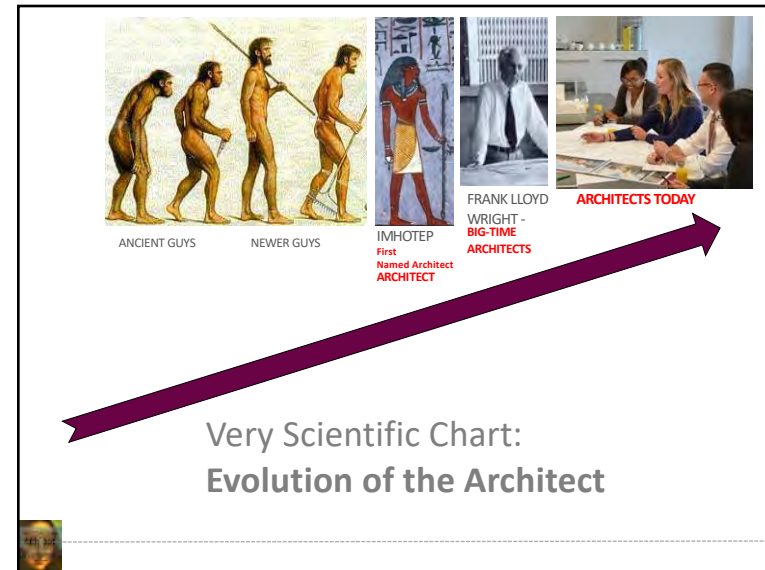


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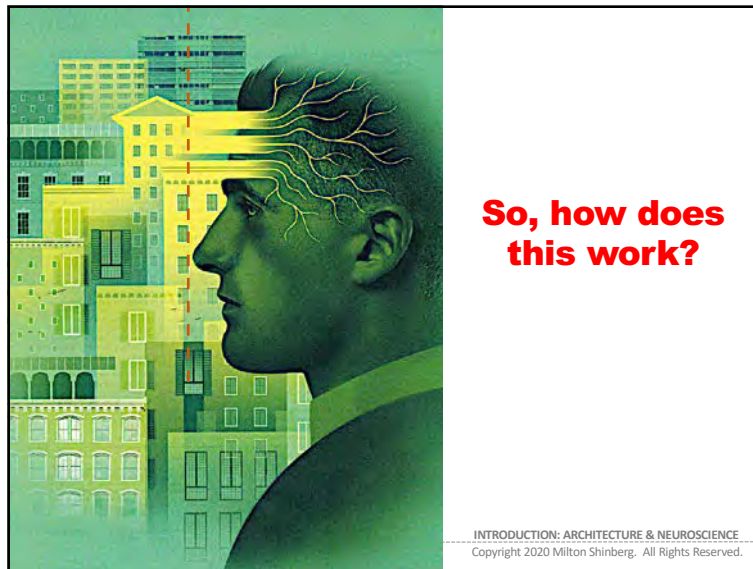
Very Scientific Chart:
Evolution of the Architect

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Very Scientific Chart:
Evolution of the Architect

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So, how does
this work?

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Our brains are *marinating* in
Cognitive Experience

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Every moment rests on all the preceding moments,



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Every moment rests on all the preceding moments, back to the womb.



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The brain can't "look" outward

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"It may feel as if we have direct access [to the physical world],

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“It may feel as if we have direct access [to the physical world], but this is an illusion created by the brain.”

Uta Frith 2007, quoted in
Eric Kandel,
Reductionism in Art and Brain Science

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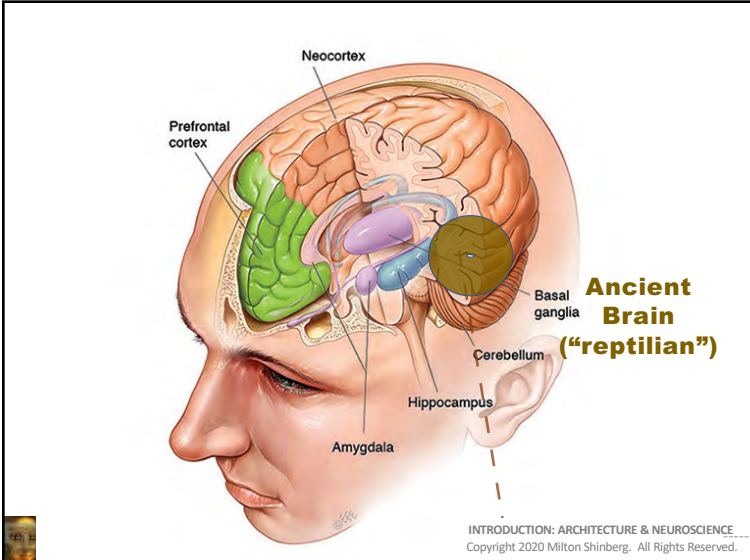
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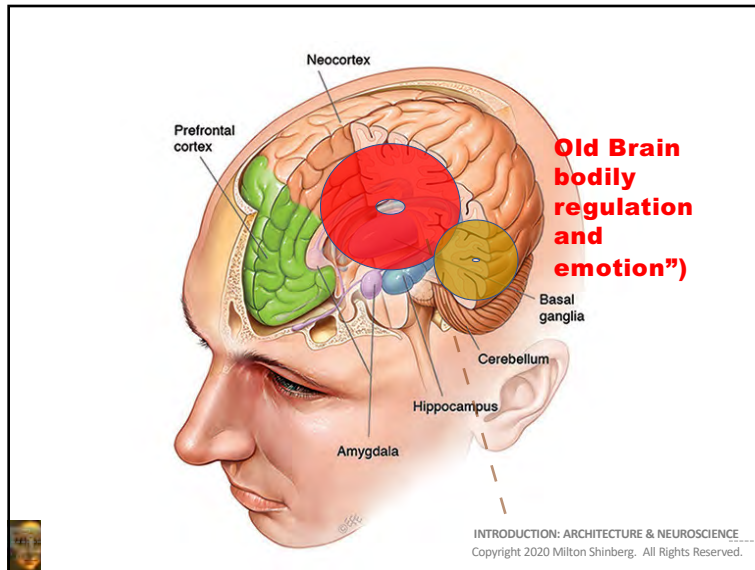


Ancient Brain (“reptilian”)

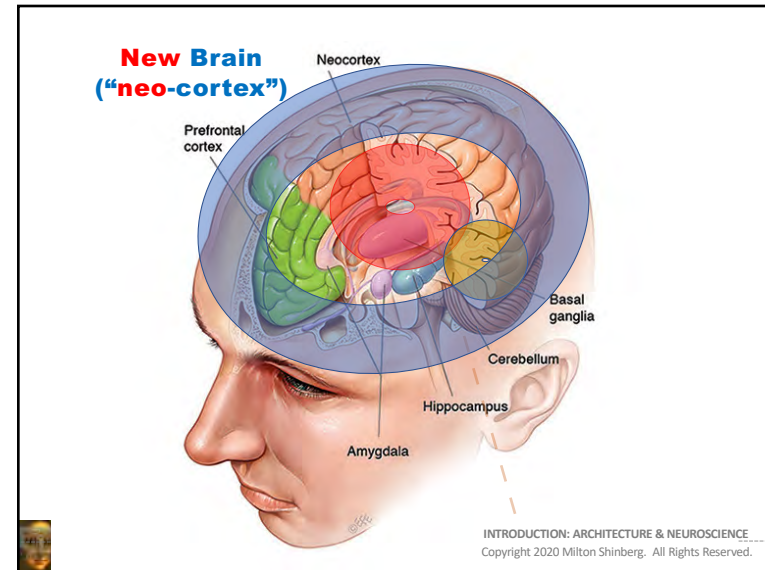
Neocortex
Prefrontal cortex
Basal ganglia
Cerebellum
Hippocampus
Amygdala

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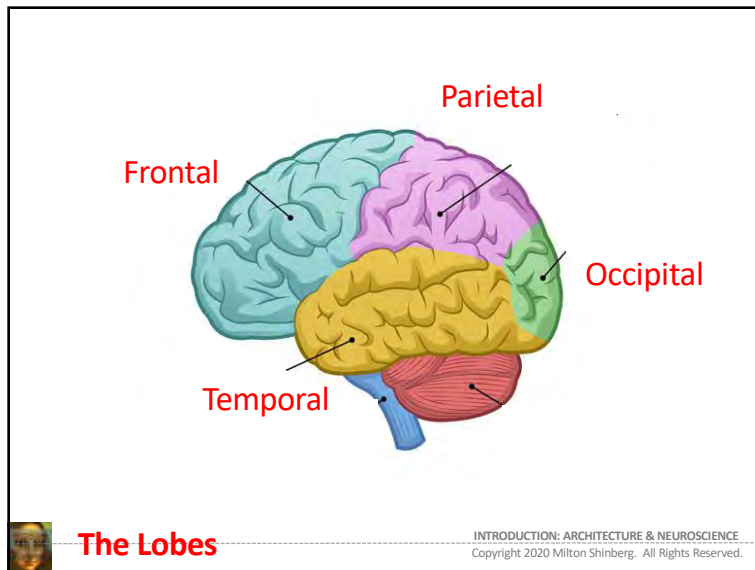
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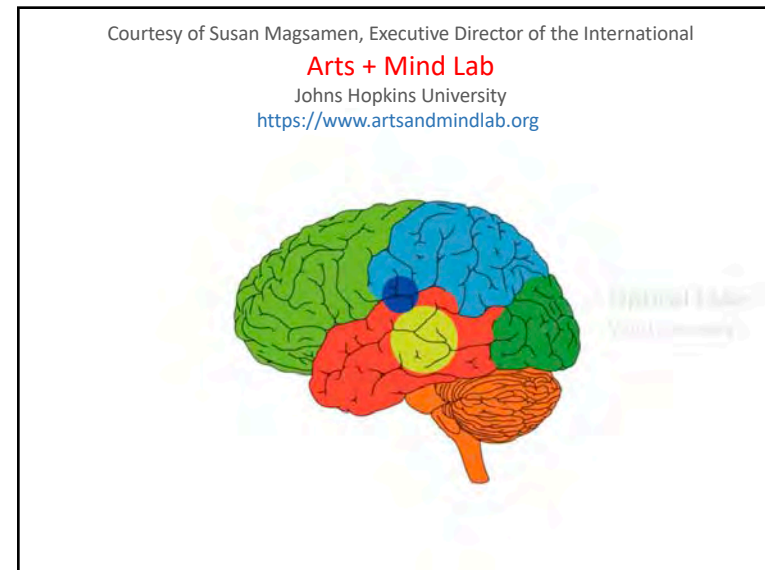
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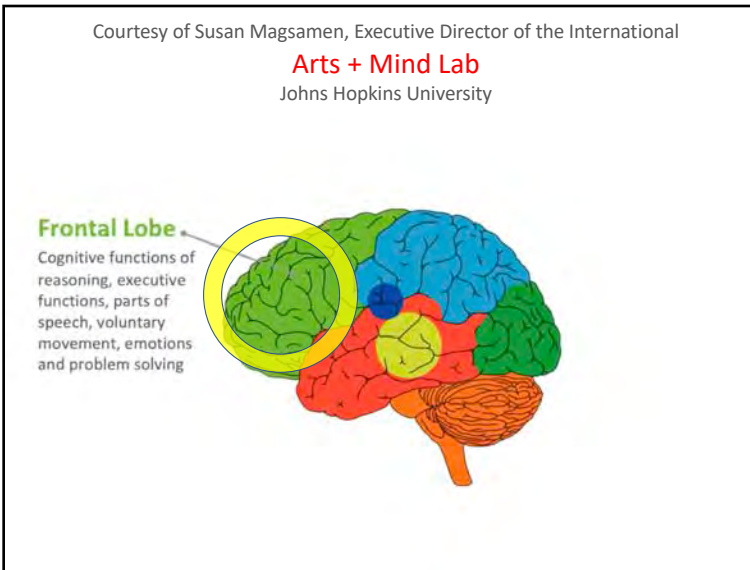
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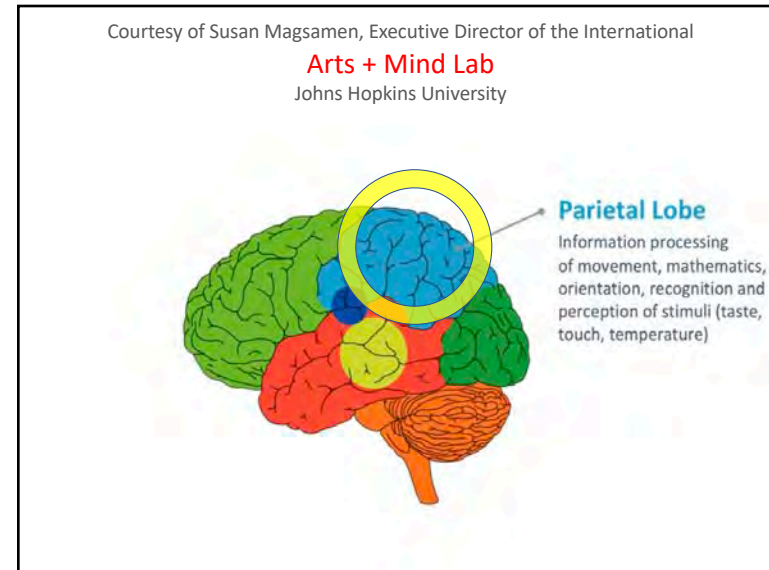
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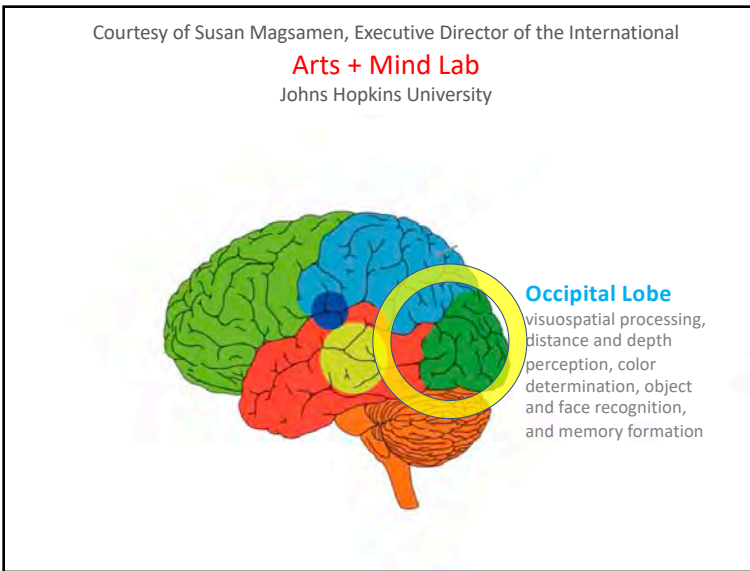
148



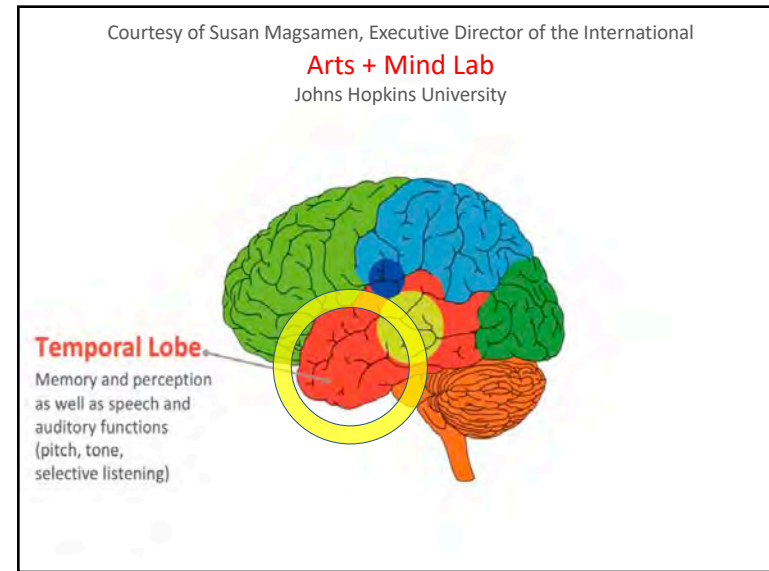
149



150

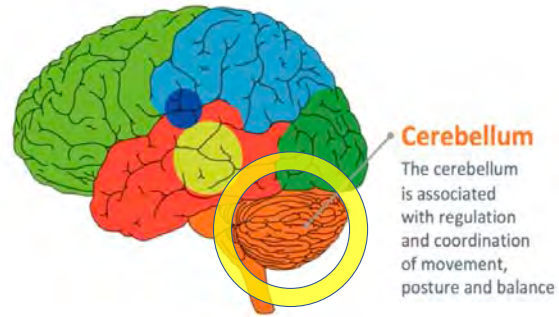


151



152

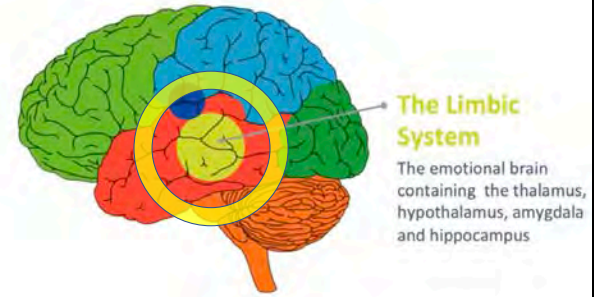
Courtesy of Susan Magsamen, Executive Director of the International
Arts + Mind Lab
Johns Hopkins University



Cerebellum
The cerebellum is associated with regulation and coordination of movement, posture and balance

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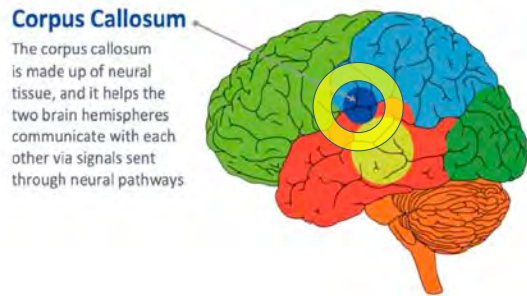
Courtesy of Susan Magsamen, Executive Director of the International
Arts + Mind Lab
Johns Hopkins University



The Limbic System
The emotional brain containing the thalamus, hypothalamus, amygdala and hippocampus

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Courtesy of Susan Magsamen, Executive Director of the International
Arts + Mind Lab
Johns Hopkins University



Corpus Callosum
The corpus callosum is made up of neural tissue, and it helps the two brain hemispheres communicate with each other via signals sent through neural pathways


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LeftBrain RightBrain

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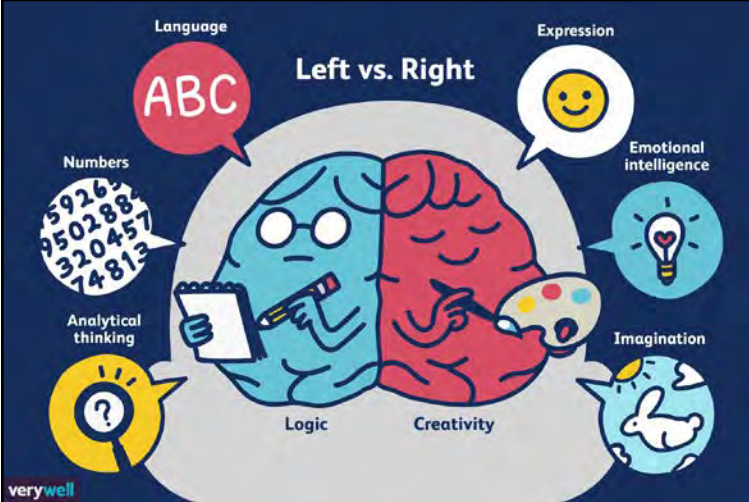
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**Left Brain Right Brain
Lateralization
Myth or Reality?**

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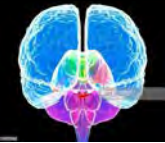


Left vs. Right

verywell

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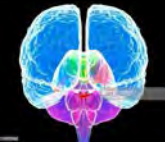
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“A person who is "left-brained" is often said to be more **logical, analytical, and objective.**”

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“A person who is "left-brained" is often said to be more logical, analytical, and objective.

A person who is "right-brained" is said to be more **intuitive, thoughtful, and subjective.”**

Corballis MC [Left brain, right brain: facts and fantasies](#). *PLoS Biol.* 2014;12(1):e1001767. doi: 10.1371/journal.pbio.1001767

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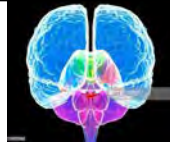
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Under this rubric,
Architects need both right-brain (more creative) and left-brain (more analytical) parts of the brain, to be successful.

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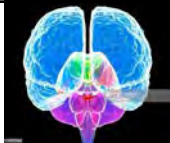
Lateralization of Brain Function

"The pop psychology notion of a left brain and a right brain doesn't capture their intimate working relationship. The left hemisphere specializes in picking out the sounds that form words and working out the syntax of the phrase, for example, but it does not have a monopoly on language processing. The right hemisphere is more sensitive to the emotional features of language, tuning in to the slow rhythms of speech that carry intonation and stress."

Carl Zimmer, *Discover* magazine.

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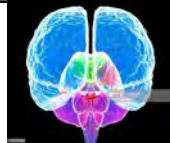
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Whether resident in the discrete hemispheres or not, there ARE differences in how each of us process, and in what capabilities we inherit and nurture.

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We'll explore how some of those affect how we experience (and design) the environment.

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**Can Neuroscience
Really help us
understand what's beautiful
&
design beautiful architecture?**



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**We'll start
with your own
insights.**



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**Here are a few samples
for your gut reactions and
silent votes (10 = best)**



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**Here are a few samples
for your gut reactions and
silent votes (10 = best)**

**and a few moments to
bring words to your
reactions.**

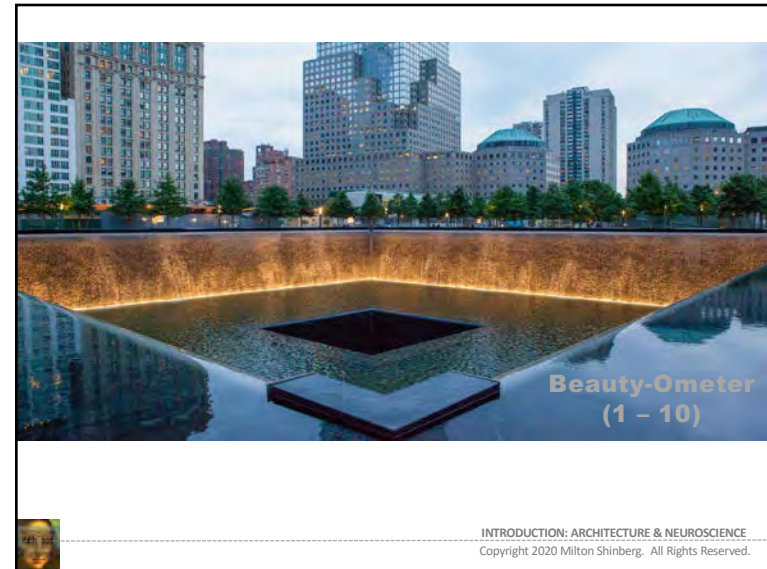


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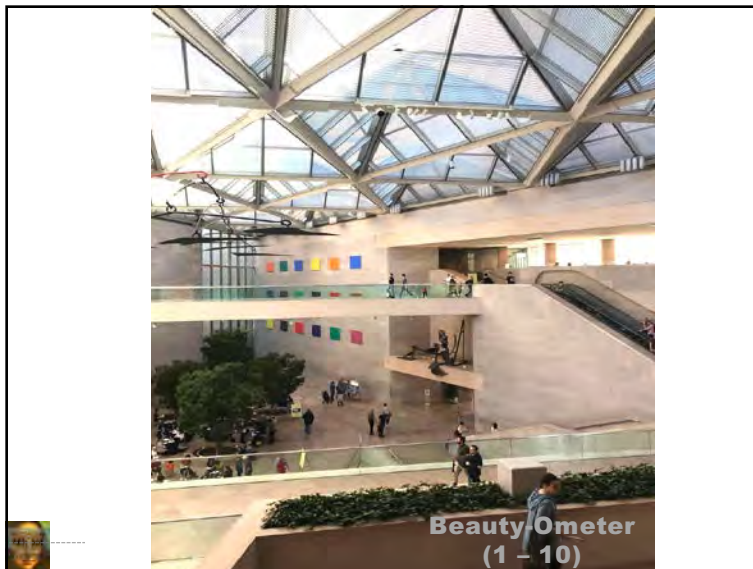
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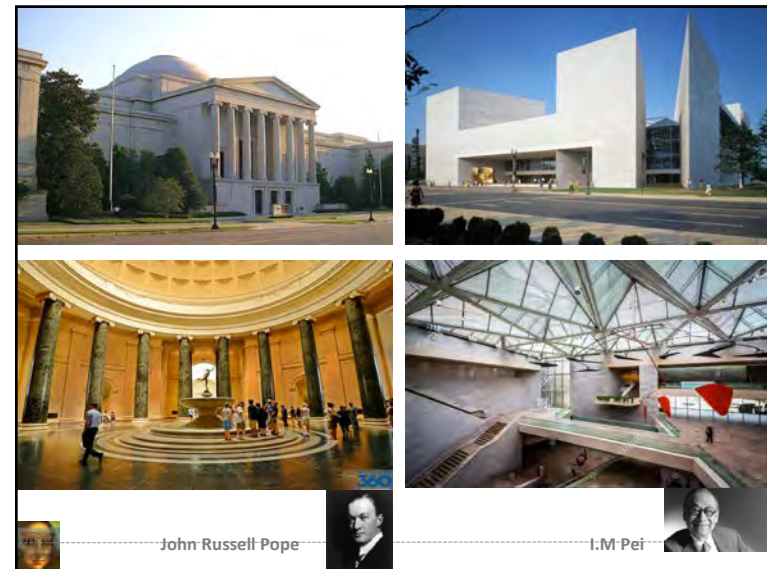
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**Beauty-Ometer
(1 - 10)**

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**Beauty-Ometer
(1 - 10)**

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Luis Barragan

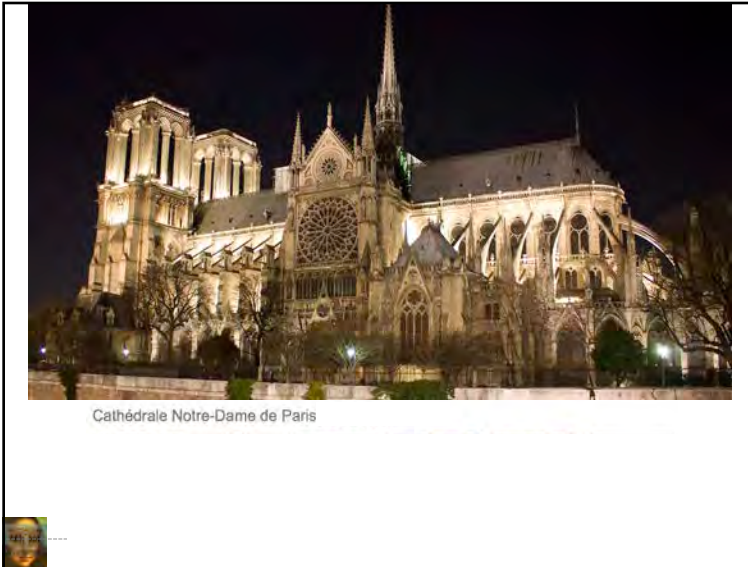
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E. Fay Jones

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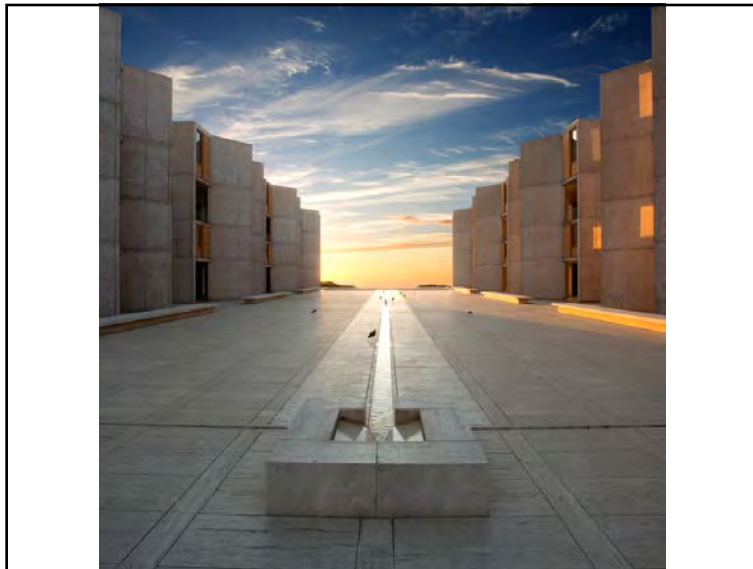
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**We'll use
neuroscientists and
architects
as resources.**


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Anjan Chatterjee

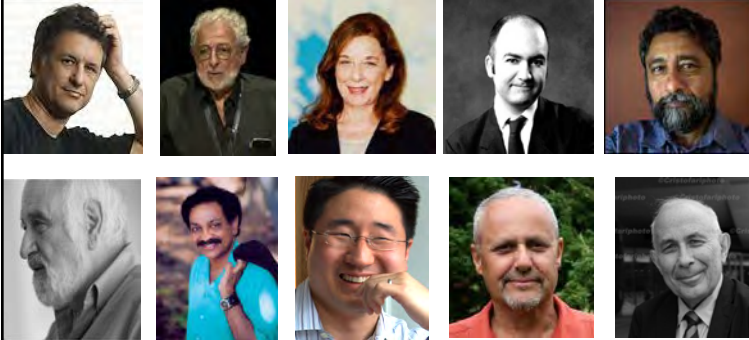
***“How your brain
decides what is
beautiful”***

Ted Talk August 8, 2017



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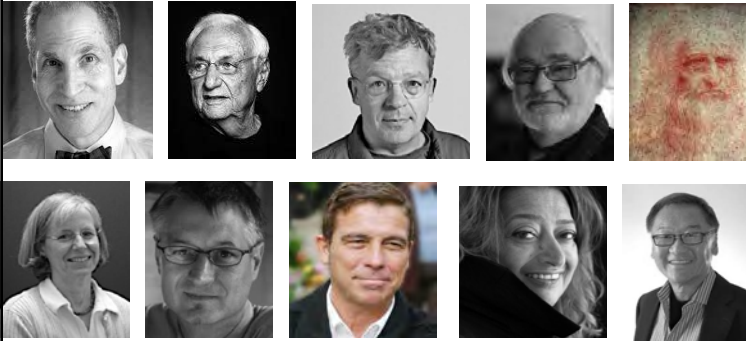
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Neuroscientists

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Architects

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and Artists too

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We'll be considering an
Alternative Approach
to design.

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Instead of
Starting with creating **FORM**
(as architects usually do),

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and then
Moving toward the
Experience of Architecture



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we'll investigate
Starting with the
Experience of Architecture



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194

and *then*
Moving toward Form



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We can design for
Character
and the
Feeling
of Spaces
& Places



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We can design for
Character
 and the
Feeling
 of Spaces
 & Places

Warm
Safe
Energizing
Relaxing
Natural

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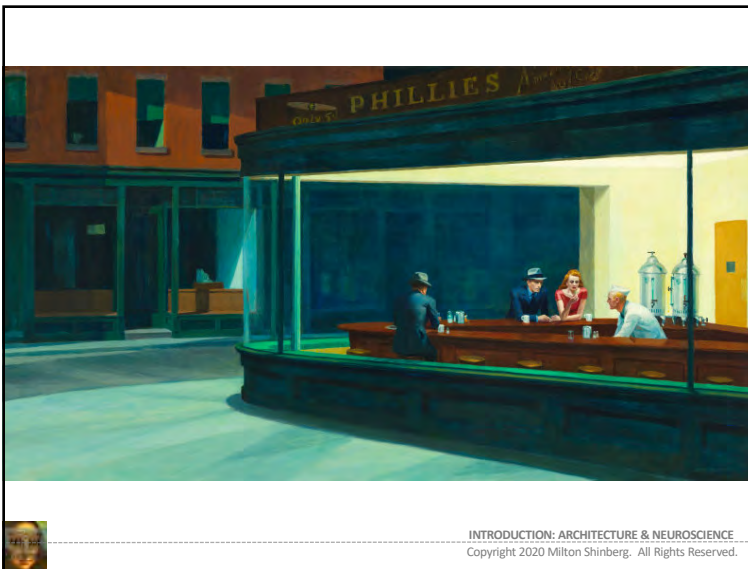
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because
**Architectural Experience Runs on
 Emotion, as well as Form.**

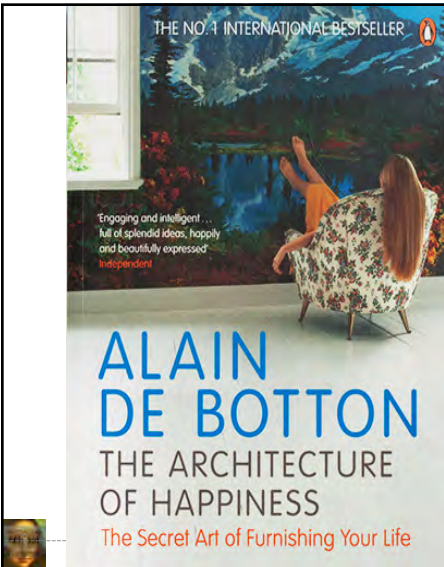


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THE NO. 1 INTERNATIONAL BESTSELLER

Engaging and intelligent...
 full of splendid ideas, happily
 and beautifully expressed
Independent

**ALAIN
 DE BOTTON**
 THE ARCHITECTURE
 OF HAPPINESS
 The Secret Art of Furnishing Your Life

Can we
 design
 happiness?

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We'll look at Theories of Beauty that Architects invoke.

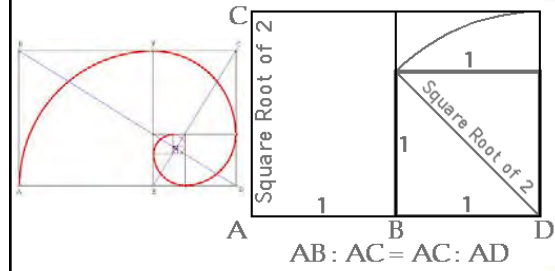


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The Golden Ratio

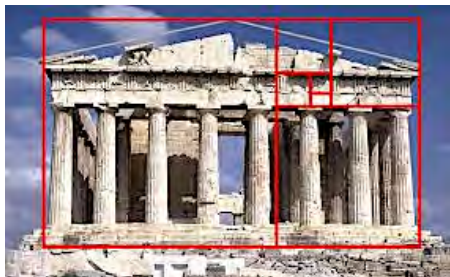


1.618033988749894848204586834
in mathematics, art, and **architecture**



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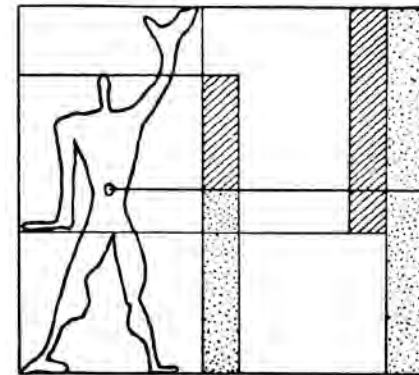


Iktinos and Callicrates, with Phidias



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From Le Corbusier, *The Modulor*, Cambridge, Mass., Harvard University Press, 1954.



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We'll look at
Symmetry
as one contributor.



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and
places in which
Symmetry
is less important.



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Mesa Verde, Chaco Canyon

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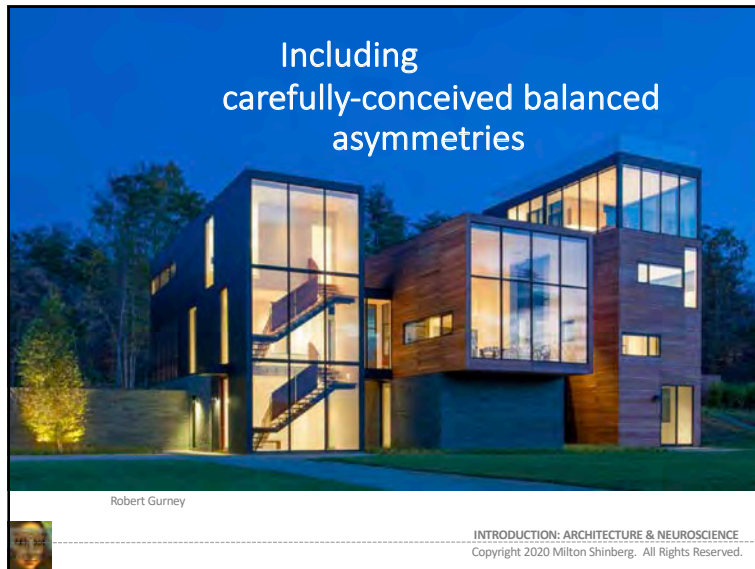
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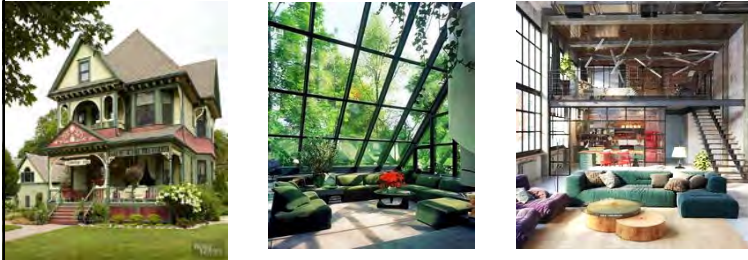


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And others, from non-architects' Architectural Preferences



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Table A Image 5

Sus Comentarios Your Comments

OVER-ALL

- DIG IT, POSITIVE
- LIKE ANGLES

CAN IT BE PUT TO GOOD USE?

- DOESN'T LOOK LIKE A SCHOOL
- INTERESTING / STUNNING - DIFF. THAN TYPICAL ARCH. IN AREA
- NO REAL REACTION EITHER WAY

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Community Design Charrettes

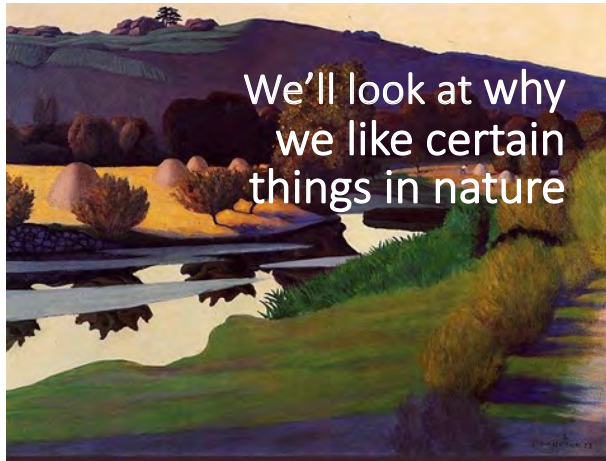
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We'll look at why
we like certain
things in nature



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We'll look at why
we like certain
things in nature
and how that
relates to
Architecture



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We'll look at
connections between
Research & Design



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**Evidence-Based
Design**

**Study Says
Natural Classroom Lighting
Can Aid Achievement**

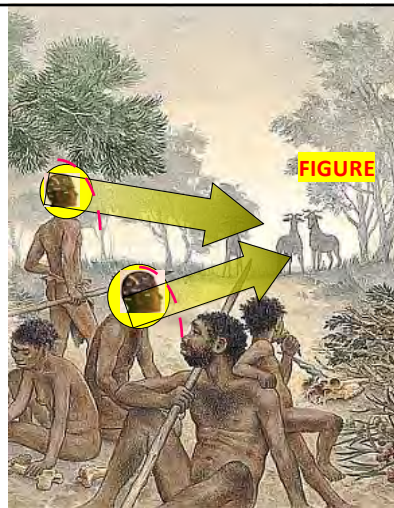
Washington Post, Friday, November 26, 1999
Study by the Heschong Mahone Group



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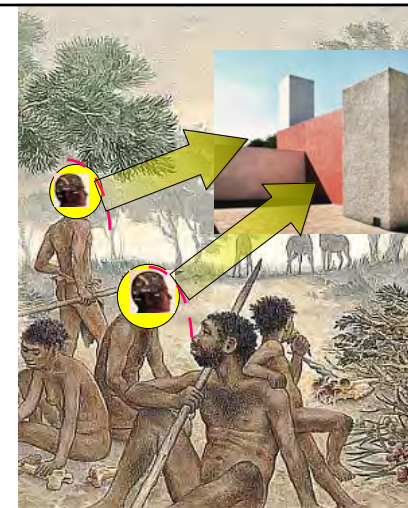
and how we see the world in Nature....



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and how we see the world, and in architecture.



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We'll consider the magnificent

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We'll consider the magnificent and the mundane.....



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...and search for what makes architecture satisfying and effective.



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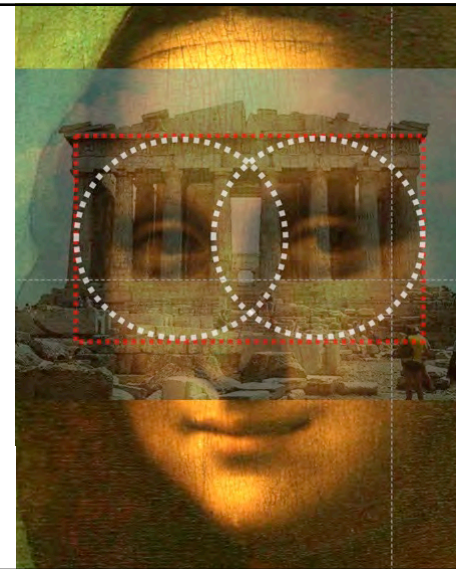
and we'll do it
all in one
semester!



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and we'll do it
all in one
semester!

Next Week
PERCEPTION



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