

HOW CAN WE IDENTIFY GREAT  
DESIGN?  
WHERE DOES IT COME FROM?  
HOW IS IT FORMED?

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SYSTEM DESIGN PRINCIPLES 4-14-2010



# OVERVIEW

- Is there science to guide great design?
- There are myriad “rules of thumb” and “patterns” born of experience that proffer assurance of successful design in this situation or that one.
- However, to aspire to great design we need to reach for a comprehensive perspective on design that guides our design choices.



# WHAT MAKES GREAT ARCHITECTURE?

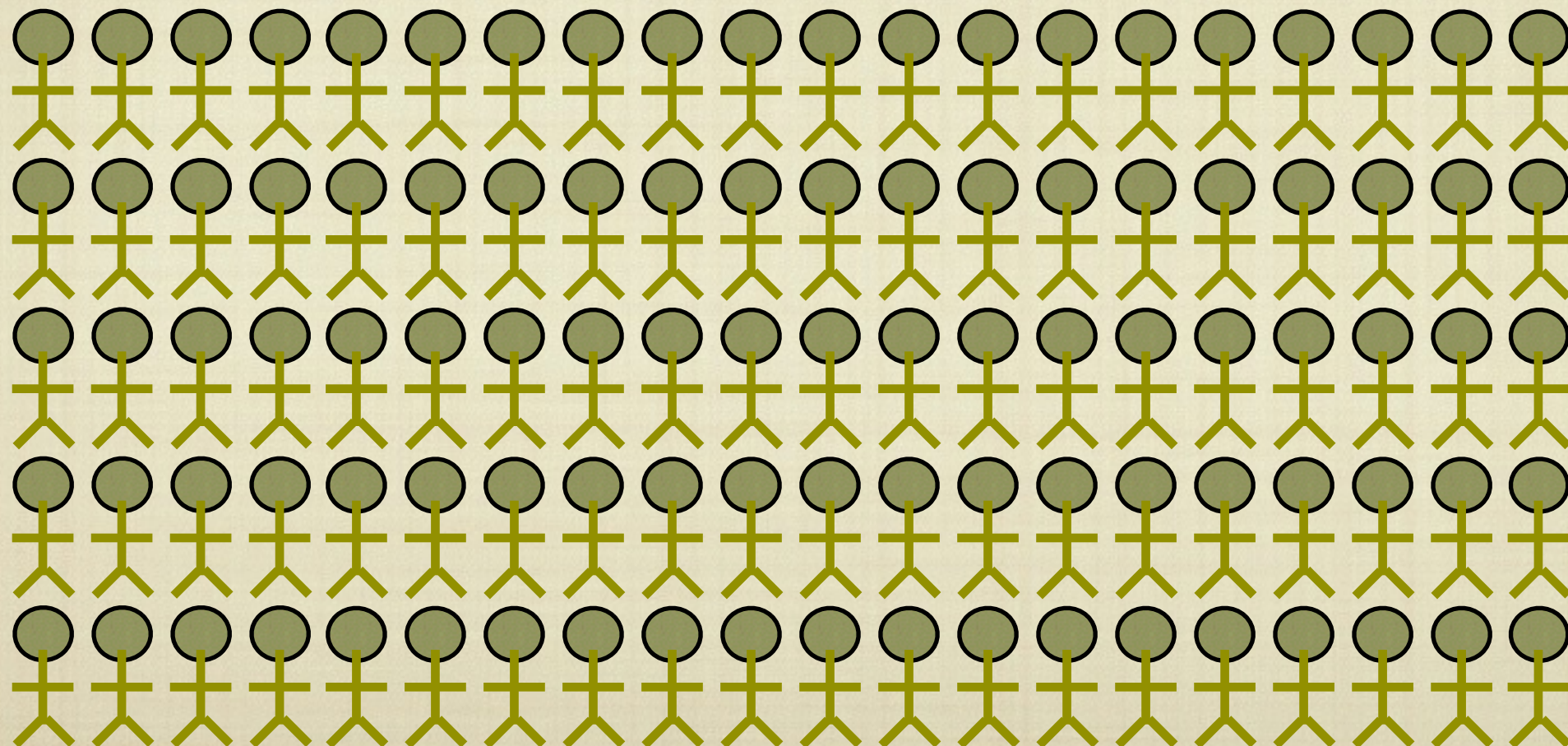
OOPSLA 1996 KEYNOTE SPEECH INTRODUCTION BY JIM  
COPLIEN

- “ONCE IN A GREAT WHILE, A GREAT IDEA MAKES IT ACROSS THE BOUNDARY OF ONE DISCIPLINE TO TAKE ROOT IN ANOTHER. THE ADOPTION OF **CHRISTOPHER ALEXANDER’S** PATTERNS BY THE SOFTWARE COMMUNITY IS ONE SUCH EVENT.”
- “ALEXANDER BOTH COMMANDS RESPECT AND INSPIRES CONTROVERSY IN HIS OWN DISCIPLINE; HE IS THE AUTHOR OF SEVERAL BOOKS WITH LONG-RUNNING PUBLICATION RECORDS,
  - THE FIRST RECIPIENT OF THE AIA GOLD MEDAL FOR RESEARCH,
  - A MEMBER OF THE SWEDISH ROYAL ACADEMY SINCE 1980,
  - A MEMBER OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES,
  - RECIPIENT OF DOZENS OF AWARDS AND HONORS INCLUDING:
    - THE BEST BUILDING IN JAPAN AWARD IN 1985,
    - THE AMERICAN ASSOCIATION OF COLLEGIATE SCHOOLS OF ARCHITECTURE DISTINGUISHED PROFESSOR AWARD.”



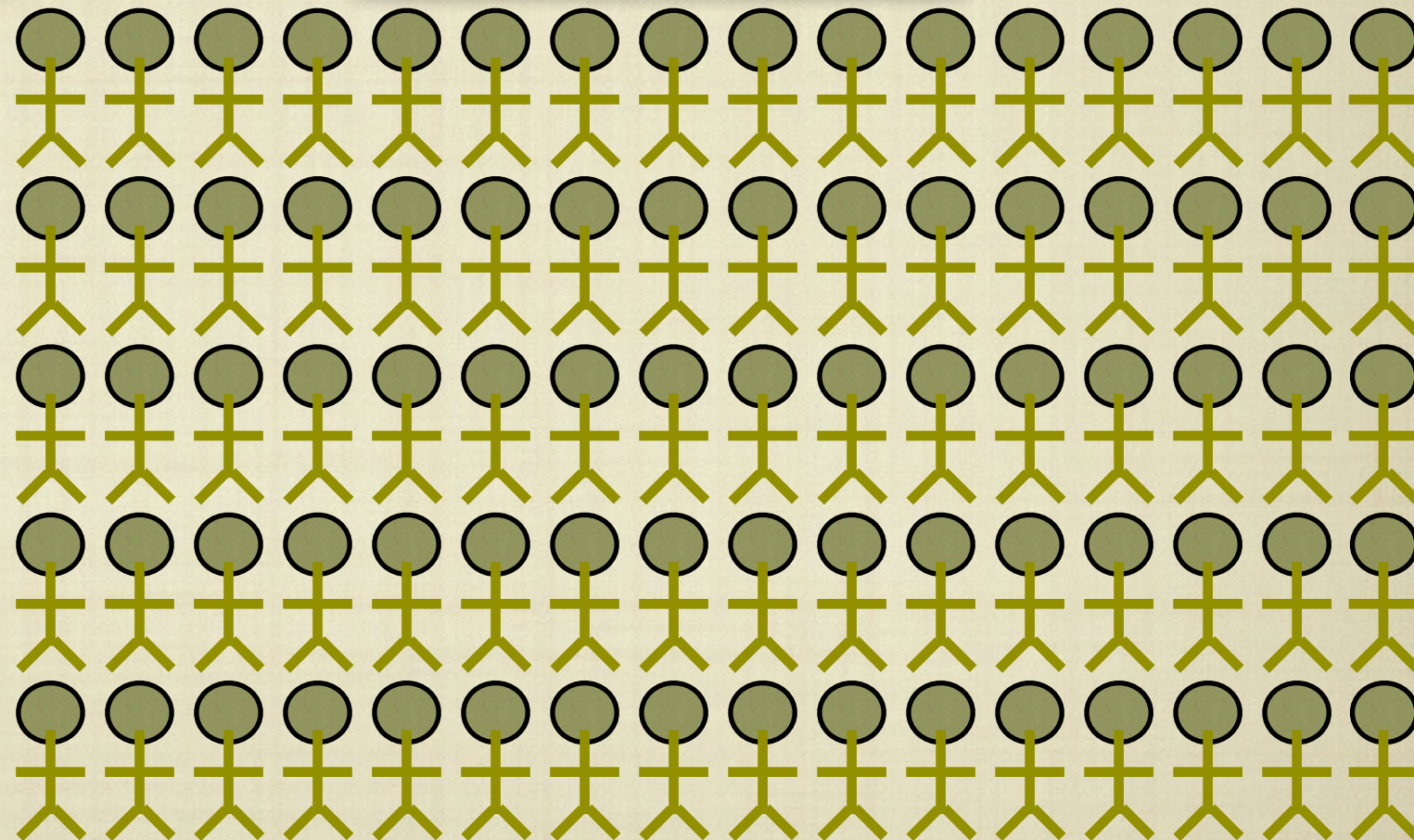
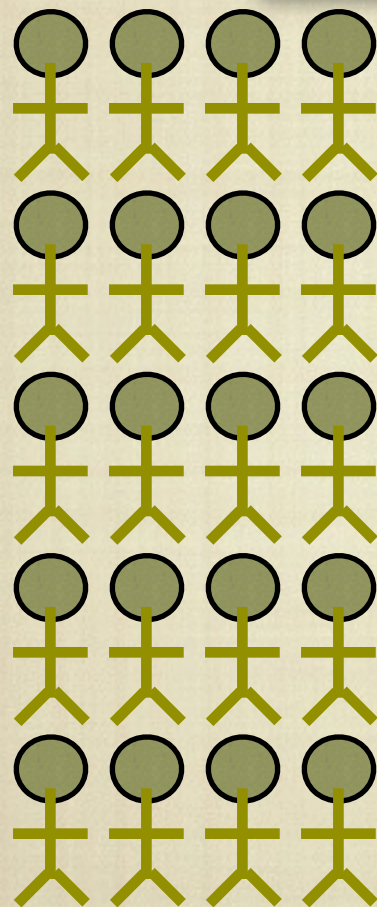


>80% CONSISTENTLY AGREE ON WHICH SYSTEM  
OF VISUAL IMAGES EXHIBIT “LIFE”





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# THE NATURE OF ORDER

- **“THE ARRANGEMENT OF THINGS IS BASED UPON THEIR ARRIVAL AT RELATIVE POSITIONS INFLUENCED BY FORCES THAT GUIDE THEIR MOVEMENT OR EVOLUTION. CONTINUOUSLY GUIDED BY THESE FORCES ORDER EMERGES AND IS PRESERVED OVER TIME, SPACE OR CHANGE AS ELEMENTS SYSTEMATICALLY CONFORM AS CONSTITUENT COMPONENTS OF A WHOLE ACHIEVING AN ARRANGEMENT OF ‘WHOLENESS’.” (ALEXANDER)**
- **WHOLENESS IS STABLE, DISORDER IS NOT!**



# WHOLENESS & CENTERS

- CENTER - “A DISTINCT SET OF POINTS IN SPACE, WHICH, BECAUSE OF ITS ORGANIZATION, BECAUSE OF ITS INTERNAL COHERENCE, AND BECAUSE OF ITS RELATION TO ITS CONTEXT, EXHIBITS CENTEREDNESS, FORMS A LOCAL ZONE OF RELATIVE CENTEREDNESS WITH RESPECT TO OTHER PARTS OF SPACE.”
- “IN ANY GIVEN REGION OF SPACE, SOME SUB-REGIONS HAVE HIGHER INTENSITY AS CENTERS; OTHERS HAVE LESS...OR NONE. THE OVERALL CONFIGURATIONS OF THEIR NESTED CENTERS, TOGETHER WITH THEIR RELATIVE INTENSITIES, COMPRISE A SINGLE STRUCTURE – ‘THE’ WHOLENESS OF THAT REGION.”



# CENTER PROPERTIES

- ALEXANDER IDENTIFIES FIFTEEN PROPERTIES OF CENTERS THAT CONTRIBUTE TO THE DEGREE OF LIFE EXPERIENCED BY AN OBSERVER.
- “QUANTUM MECHANICS ASSERTS, VIA THE MATHEMATICS, THAT PARTICLES ARE PHYSICALLY AFFECTED IN THEIR BEHAVIOR BY THE WHOLENESS OF THE SPACE IN WHICH THEY MOVE. ... [WHOLENESS] IS NOT RESTRICTED TO BUILDINGS OR WORKS OF ART, BUT IS VALID AND ESSENTIAL EVEN IN THOSE PARTS OF THE WORLD THAT WE HAVE HISTORICALLY BELIEVED TO BE MECHANICAL IN NATURE.” (ALEXANDER)



A CONTEMPLATIVE TOUR OF  
ALEXANDER'S 15  
PROPERTIES OF CENTERS

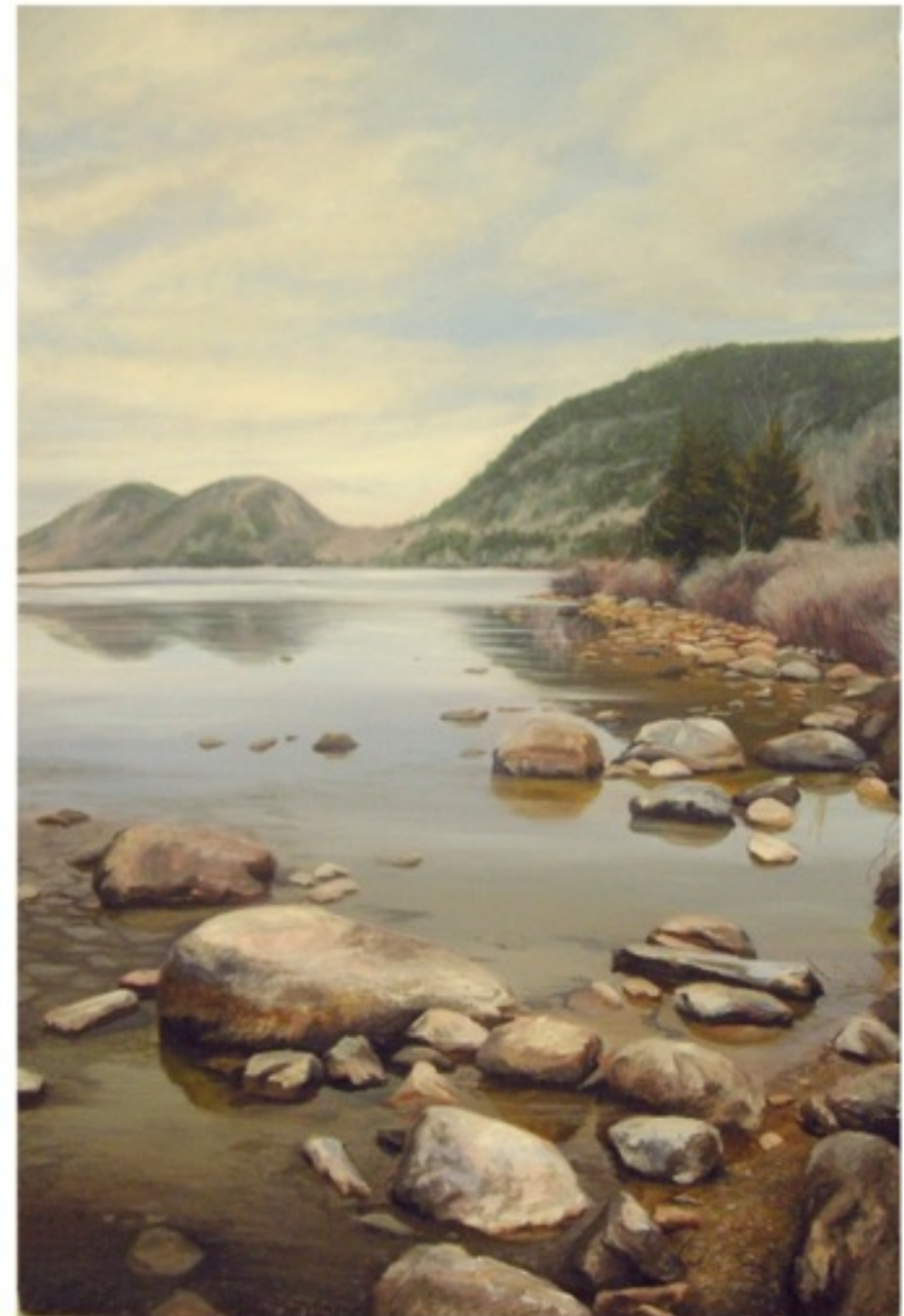


# LEVELS OF SCALE

A STRONG CENTER IS MADE STRONGER PARTLY BY SMALLER STRONG CENTERS CONTAINED IN IT, AND PARTLY BY ITS LARGER STRONG CENTERS WHICH CONTAIN IT.

*A balanced range of sizes is pleasing and beautiful.*

JORDAN POND WITH A VIEW OF THE BUBBLES



HANNAH COLE SCHIANO



# STRONG CENTERS

A STRONG CENTER REQUIRES A  
FIELD-LIKE EFFECT CREATED BY  
OTHER CENTERS.

*Good design offers areas of  
focus or weight.*

HAGIA SOPHIA



ISIDOROS AND ANTHEMIOS



# BOUNDARIES

THE FIELD-LIKE EFFECT IS  
STRENGTHENED BY THE  
CREATION OF A RING-LIKE  
CENTER.

*Outlines focus attention on the  
center.*

RED LILY PADS FROM THE GUGGENHEIM



ALEXANDER CALDER



# ALTERNATING REPETITION

CENTERS ARE STRENGTHENED  
WHEN THEY REPEAT, BY THE  
INSERTION OF OTHER CENTERS  
BETWEEN THEM.

*Repeating various elements  
creates a sense of order and  
harmony.*





# POSITIVE SPACE

A CENTER SHOULD DRAW  
STRENGTH FROM THE CENTERS  
IMMEDIATELY ADJACENT.

*Background should reinforce  
rather than detract from the  
center.*

LA DANSE



HENRI MATISSE



# GOOD SHAPE

THE STRENGTH OF A GIVEN CENTER DEPENDS ON ITS ACTUAL SHAPE. AND THE SHAPE, ITS BOUNDARIES AND THE SPACE AROUND IT MUST BE MADE UP OF STRONG CENTERS.

*Simple forms create an intense, powerful center.*

BATTLE SCENE



PAUL KLEE



# LOCAL SYMMETRIES

THE INTENSITY OF A CENTER IS INCREASED BY THE EXTENT TO WHICH OTHER SMALLER CENTERS ARE THEMSELVES ARRANGED IN LOCALLY SYMMETRICAL GROUPS.

*Organic, small-scale symmetry works better than precise, overall symmetry.*



Faith Ringgold  
TAR BEACH 2



# DEEP INTERLOCK AND AMBIGUITY

THE INTENSITY OF A CENTER CAN BE INCREASED WHEN IT IS ATTACHED TO NEARBY STRONG CENTERS THROUGH A THIRD SET OF STRONG CENTERS THAT AMBIGUOUSLY BELONG TO BOTH.

*Looping, interconnected elements promote unity and grace.*

FLAMING JUNE



LORD FREDRICK LEIGHTON



# CONTRAST

A CENTER IS STRENGTHENED BY THE SHARPNESS OF DISTINCTION BETWEEN ITSELF AND THE SURROUNDING CENTERS.

*Unity is achieved with visible opposites.*

FRANK



CHUCK CLOSE



# GRADIENTS

A CENTER IS STRENGTHENED BY  
A GRADED SERIES OF  
DIFFERENT SIZED CENTERS  
WHICH THEN POINT TO A NEW  
CENTER.

*The proportional use of space  
and pattern creates harmony.*



ALVAR AALTO, ELISSA AALTO  
AND  
HARALD DEILMANN



# ROUGHNESS

THE WAY A CENTER DRAWS ITS  
STRENGTH FROM  
IRREGULARITIES IN SIZES,  
SHAPES AND ARRANGEMENTS.

*Texture and imperfections  
convey uniqueness and life.*

STORY PAINTER



JACOB LAWRENCE

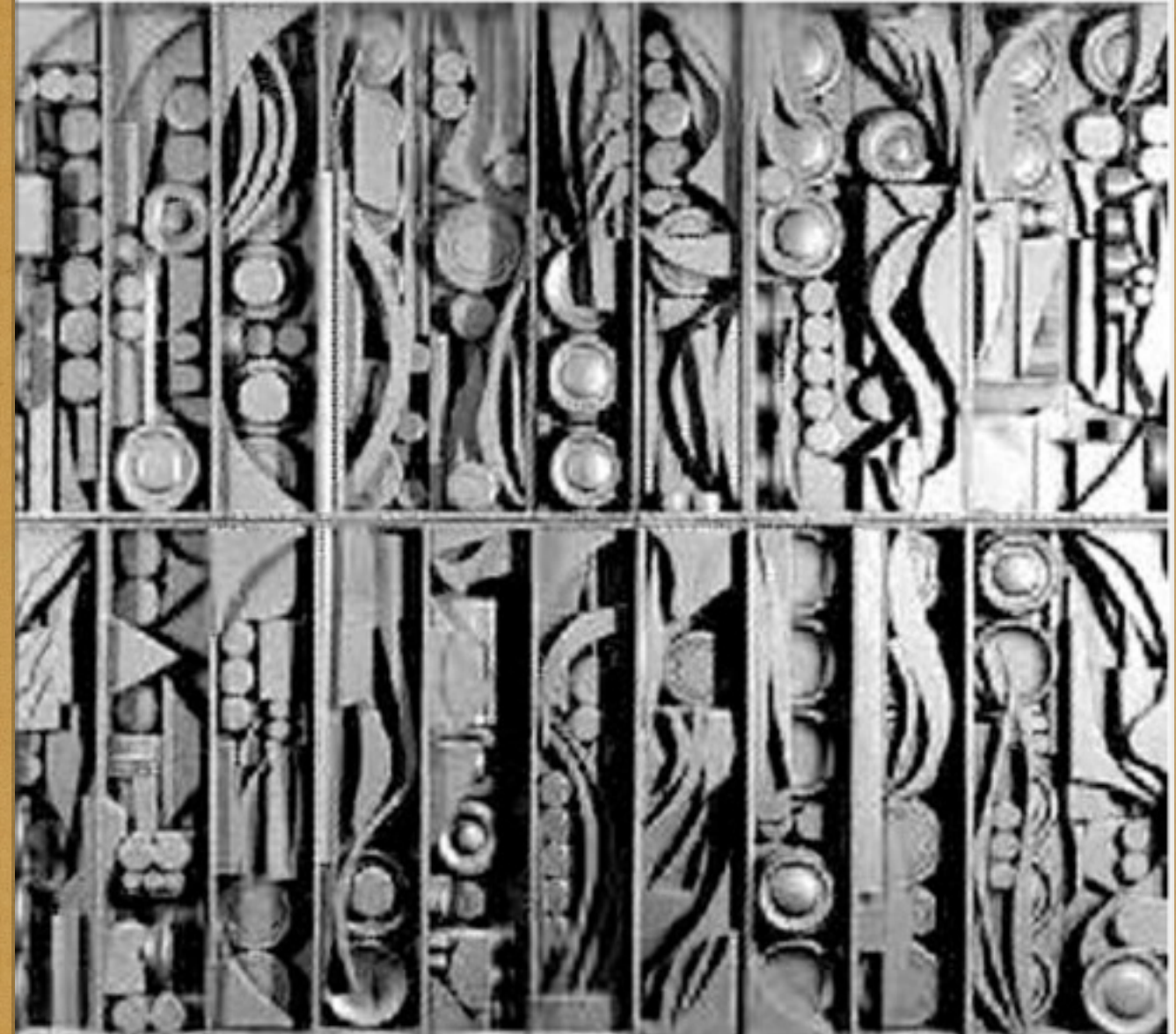


# ECHOES

THE STRENGTH OF A GIVEN  
CENTER DEPENDS ON  
SIMILARITIES OF ANGLE AND  
ORIENTATION.

*Similarities should repeat  
themselves throughout a  
design.*

RAIN GARDEN



LOUISE NEVELSON



# THE VOID

THE INTENSITY OF EVERY  
CENTER DEPENDS ON THE  
EXISTENCE OF A STILL PLACE —  
AN EMPTY CENTER.

*Empty spaces offer calm and  
contrast.*

TIDAL BROOK WITH GRASS



SALLY LADD COLE



# SIMPLICITY AND INNER CALM

THE STRENGTH OF A CENTER  
DEPENDS ON ITS SIMPLICITY.

*Use only essentials and avoid  
extraneous elements.*

BROTHERS' SHOP



MT. LEBONON SHAKER VILLIAGE



# NOT SEPARATENESS

THE STRENGTH OF A CENTER  
DEPENDS ON THE EXTENT TO  
WHICH THAT CENTER IS MERGED  
SMOOTHLY WITH SURROUNDING  
CENTERS.

*Designs should be connected  
and complementary, not  
egocentric and isolated.*

SAGRADA FAMILIA



ANTONI GAUDI



“The concept extends to any space where objects & relationships are observed.”

Alexander

Postulation:

“The elements of order that Alexander describes for physical architecture may be perceived in their counterparts present in any system architecture – specifically information systems.”

Waguespack



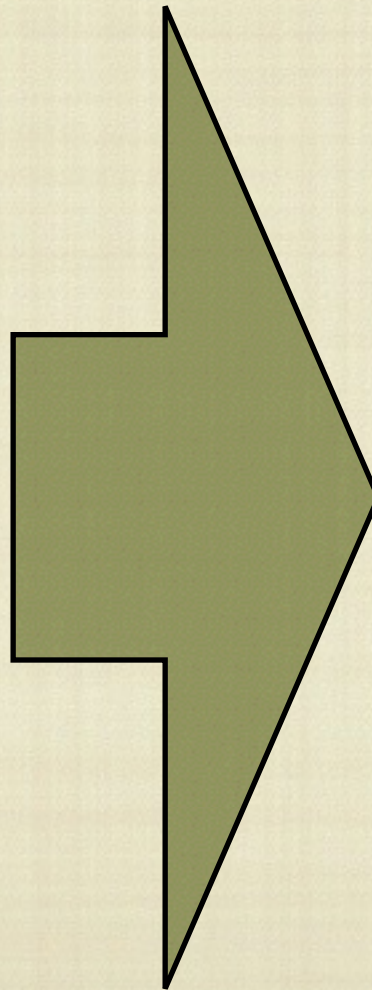
# CENTERS IN THE CONCEPTUAL WORLD

- TO APPLY ALEXANDER'S CONCEPTS OF PHYSICAL STRUCTURE TO INFORMATION SYSTEMS THEY MUST FIRST BE TRANSLATED FROM A LANGUAGE OF PHYSICAL SPACE TO A LANGUAGE OF COGNITIVE SPACE.
- PHYSICAL POSITION AND DISTANCE TRANSLATE TO CONCEPTS OF CONSONANCE IN "FIELDS" POPULATED BY ABSTRACTIONS RATHER THAN SHAPES.
- IN THIS COGNITIVE SPACE WE USE THE TERM **choice** AS THE COUNTERPART OF ALEXANDER'S TERM **center**.
- CENTER ==> CHOICE



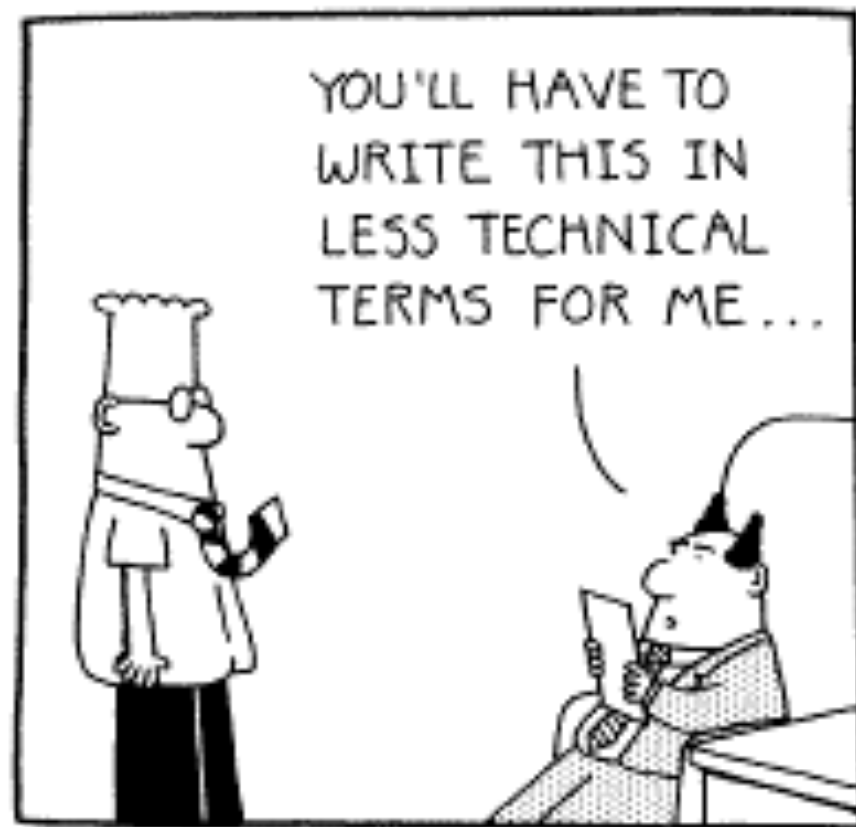
# MAPPED TO CHOICES

<b>ALEXANDER'S 15 PROPERTIES OF STRONG CENTERS</b>
<b>LEVELS OF SCALE</b>
<b>STRONG CENTERS</b>
<b>BOUNDARIES</b>
<b>ALTERNATING REPETITION</b>
<b>POSITIVE SPACE</b>
<b>GOOD SHAPE</b>
<b>LOCAL SYMMETRIES</b>
<b>DEEP INTERLOCK AND AMBIGUITY</b>
<b>CONTRAST</b>
<b>GRADIENTS</b>
<b>ROUGHNESS</b>
<b>ECHOES</b>
<b>THE VOID</b>
<b>SIMPLICITY AND INNER CALM</b>
<b>NOT SEPARATENESS</b>



<b>SYSTEM CHOICE PROPERTY</b>
<b>STEPWISE REFINEMENT</b>
<b>COHESION</b>
<b>ENCAPSULATION</b>
<b>EXTENSIBILITY</b>
<b>MODULARIZATION</b>
<b>CORRECTNESS</b>
<b>TRANSPARENCY</b>
<b>COMPOSITION OF FUNCTION</b>
<b>IDENTITY</b>
<b>SCALE</b>
<b>USER FRIENDLINESS</b>
<b>PATTERNS</b>
<b>PROGRAMMABILITY</b>
<b>RELIABILITY</b>
<b>ELEGANCE</b>





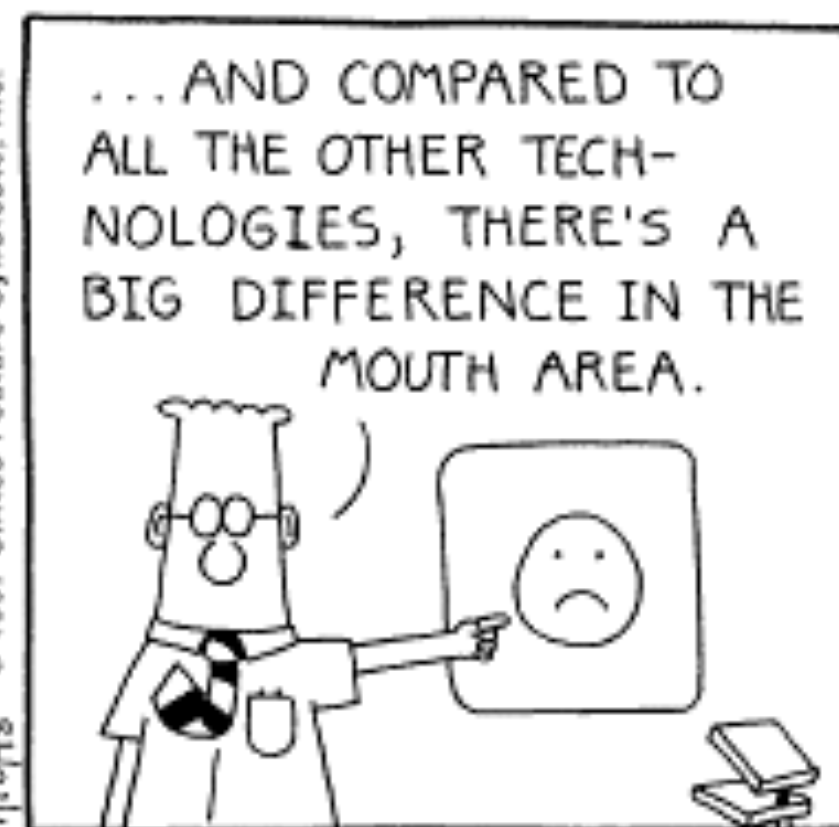
YOU'LL HAVE TO  
WRITE THIS IN  
LESS TECHNICAL  
TERMS FOR ME...

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MAKE IT EVEN LESS  
TECHNICAL FOR MY  
BOSS... EVEN LESS  
FOR OUR VP... EVEN  
LESS FOR OUR EVP...  
MUCH LESS FOR  
OUR CEO.

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... AND COMPARED TO  
ALL THE OTHER TECH-  
NOLOGIES, THERE'S A  
BIG DIFFERENCE IN THE  
MOUTH AREA.

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IT'S CALLED MULTIMEDIA,  
DOGBERT. NOW I CAN INCLUDE  
VIDEO AND MUSIC WITH  
MY COMPUTER PROGRAMS.



S. Adams

THIS MORNING I ADDED  
MY FACE PLUS THE THEME  
SONG FROM "STAR WARS"  
TO MY BUDGET SPREAD-  
SHEET.

9-7



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I ALREADY  
FORGOT HOW  
I SURVIVED  
WITHOUT  
IT.

IT CAN GET  
PRETTY UGLY  
WHEN SCIENCE  
AND ART  
COLLIDE.

