Natural Wood Material
Biophilic Design
Study of Wood vs. Non-wood Finishes
Wood and Human Health

- Univ. of British Colombia & FP Innovations study
- 4 rooms: white furnishings vs. wood furnishings; plants vs. no plants

“Stress, as measured by sympathetic nervous system activation, was lower in the wood room in all periods of the study.”

Source: Wood and Human Health
# Biophilic Design Patterns

## Nature in the Space

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Stress Reduction</th>
<th>Cognitive Performance</th>
<th>Emotion, Mood &amp; Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Connection w/ Nature</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Non-Visual Connection w/ Nature (smell, touch)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Non-Rhythmic Sensory Stimuli</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Thermal &amp; Airflow Variability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Presence of Water</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dynamic &amp; Diffuse Light</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection w/ Natural Systems</td>
<td></td>
<td></td>
<td>✓</td>
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</tbody>
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Source: Terrapin Bright Green: *14 Patterns of Biophilic Design*, 2014
### How Might Wood Buildings Contribute to Biophilic Design?

#### Nature in the Space

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
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<tbody>
<tr>
<td>Visual Connection w/ Nature</td>
<td>Design opportunity (glazing/ courtyards)</td>
</tr>
<tr>
<td><strong>Non-Visual Connection w/ Nature</strong> (smell, touch)</td>
<td>Smell &amp; touch – might the soft wood feel &amp; wood scent contribute?</td>
</tr>
<tr>
<td>Non-Rhythmic Sensory Stimuli</td>
<td>Design opportunity (biomimicry)</td>
</tr>
<tr>
<td>Thermal &amp; Airflow Variability</td>
<td>Wood is a living material &amp; can help control temperature &amp; humidity</td>
</tr>
<tr>
<td>Presence of Water</td>
<td>Design opportunity (water features)</td>
</tr>
<tr>
<td>Dynamic &amp; Diffuse Light</td>
<td>Design opportunity (timber slats)</td>
</tr>
<tr>
<td>Connection w/ Natural Systems</td>
<td>Wood buildings support healthy forests</td>
</tr>
</tbody>
</table>

Source: Conversations and emails between Bill Browning (Terrapin Bright Green) and Melissa Kroskey (WoodWorks)
# Biophilic Design Patterns

## Natural Analogues

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<td>Biomorphic Forms &amp; Patterns</td>
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<td></td>
<td>✓</td>
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<tr>
<td>Material Connection w/ Nature</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Complexity &amp; Order</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prospect</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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### How Might Wood Buildings Contribute to Biophilic Design?

#### Natural Analogues

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<th>Pattern</th>
<th>Design opportunity</th>
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<tr>
<td>Biomorphic Forms &amp; Patterns</td>
<td>Design opportunity (symbolic patterns)</td>
<td></td>
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<tr>
<td>Material Connection w/ Nature</td>
<td>Wood material connects us w/ nature</td>
<td></td>
</tr>
<tr>
<td>Complexity &amp; Order</td>
<td>Wood grain pattern – might it stimulate our senses?</td>
<td></td>
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<tr>
<th>Nature of the Space</th>
<th>Prospect</th>
<th>Design opportunity (distant views – atriums/ open offices)</th>
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<tr>
<td>Refuge</td>
<td>Design opportunity (quiet spaces in an office warmed w/ wood)</td>
<td></td>
</tr>
<tr>
<td>Mystery</td>
<td>Design opportunity (open wood screens)</td>
<td></td>
</tr>
<tr>
<td>Risk/ Peril</td>
<td>Design opportunity (view down @ atrium)</td>
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Source: Conversations and emails between Bill Browning (Terrapin Bright Green) and Melissa Kroskey (WoodWorks)
Material Connection to Nature (visual)
Biophilic Pattern

• Wood is a natural material – timber is sourced from trees in our forests.
• Exposing natural materials provides a connection to nature in this biophilic pattern
Material Connection to Nature (non-visual)
Biophilic Pattern

Other sensory connections to nature:

- Soft feel of wood – might this contribute to this biophilic pattern?
- Smell of wood in offices might this contribute to this biophilic pattern?
- Smell of wood has surprised some designers who didn’t consider it in design
People Pay More $$$ for a Connection to Nature

- People pay more for good views of nature (obvious w/ real estate prices)
- Seeing higher leasing rates for offices w/ natural wood materials*

Source: WoodWorks: Breaking Convention with Wood Offices
Office Buildings
Biophilic Design
Wellness + Wood = Productivity
Workplaces

“Those in workplaces with a higher proportion of visible wood feel more connected to nature and rate their working environment far more positively.”

These people report:

• lower stress levels
• higher concentration
• improved overall mood

“Wood in the workplace is associated with higher productivity and reduced sick leave.”

Report based on survey of 1,000 typical Australians working indoors
Employee Retention
Healthy Building/ Biophilia

Cost of losing an employee (assume: $33/ hr):
$ 1,000 termination
$ 9,000 replacement
$15,875 lost productivity
$25,875 total

Sources by Terrapin Bright Green:
• Economics of Biophilia, 2012
• 14 Patterns of Biophilic Design, 2014
(includes list of testing citations)
Natural Materials for Warm Gathering Spaces
Amenity Spaces

• Modern amenities battle: Spaces for informal collaboration are in demand
• Amenities provide a place to recharge & interact
• Connection to nature proven most impactful through outdoor access*
• Connection to nature indoors through materials & views is beneficial*

* Source: 14 Patterns of Biophilic Design, Terrapin Bright Green, 2014 (includes list of testing citations)
Heavy Timber Revolution: California’s Hip New Commercial Block
ICE Block I

Location: Sacramento, CA
Architect: RMW Architecture & Interiors
Engineer: Buehler Engineering

“The building sold itself because of its unique character. There was no competition. A lot of the credit goes to the fact that it is a timber building.”

– Mike Heller, Heller Pacific
Tech Companies Invest in Healthy Corporate Campuses
Microsoft Silicon Valley Campus
Connecting with Nature & Targeting Environmental Goals
Microsoft Silicon Valley Campus
Biophilic Design
Schools
A Living/ Learning Destination for Students
Adohi Hall, University of Arkansas

Location: Fayetteville, AR
Architect: Leers Weinzapfel Associates; Mackey Mitchell Architects; Modus Studio (AOR)
Structural Engineer: Equilibrium Consulting; Engineering Consultants, Inc.

- 202,000 sf
- 708 bed student housing
- CLT and glulam framing

“...the wood-based construction system we developed forges a bond between setting, human comfort, and sustainability.”
– Andrea Leers, Leers Weinzapfel
Healthier Learning Environment for the 2nd Generation
Genentech Child Care Center

Location: South San Francisco, CA
Architect: Perkins+Will, in collaboration with Genentech
Structural Engineer: Rutherford + Chekene

Photo: Timothy Hursleys

- 57,000 sf
- CLT, glulam & light-framing
- Low windows at children’s level and clerestory glazing for reflected natural daylight
- Exposed glulam columns (in light-frame walls) - children can touch the natural wood at their level
Biophilic Design
Multifamily Residential
Multifamily – Structural Warmth is a Value-Add
Innovative, Sustainable, Tall Timber Multifamily Carbon 12

• 42,000 sf
• 8-story tower
• 14 condos + 2 retail units
• CLT and glulam framing
• Each unit has light & ventilation from 3 sides

Location: Portland, OR
Architect: Path Architecture
Structural Engineer: Munzing Structural Engineering

Photo: Andrew Pogue
Questions?

This concludes The American Institute of Architects Continuing Education Systems Course

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