Team Members

California:
- Andrew - MEP
- Thomas - Structures
- Arianna - Apprentice

Puerto Rico:
- Ana V. - Architect
- Stephanie - Architect

Denmark:
- Hussain - Construction

Germany:
- Chris - LCFM

Slovenia:
- Ana K. - Structures
Maryland: Sarah

Puerto Rico: Bianca

Germany: Felix
Slovenia: Jure
Climate

red: natural climate
blue: comfort zone
Sun

Summer Solstice
Morning

Noon

Afternoon

TEAM ISLAND - SITE CONDITIONS
Rules

1. Socialize before each meeting
2. Do the cog-games together
3. Work parallel not “step by step”
4. “Why not?”
5. Daily workflow report on Facebook
6. Let us know when you’re tired or overworked
7. Be on time and prepared and come with a open mind
8. Give every idea a chance
9. Changing of weekly roles (facilitator, secretary,....)
10. Let us know, if you can’t work on project
Tools

1. Idea

BrainMerge

2. Task

K

WhatsApp

3. Work

4. Storage

Dropbox

box

TEAM ISLAND - TEAM PROCESS
Team Island - Team Process

Meetings at the Beginning
- Collaboration: 30%
- Communication: 30%
- Coordination: 40%

Meetings just now
- Collaboration: 50%
- Coordination: 30%
- Communication: 20%
Multidisciplinary solutions

Example - Water Damper

SE: allows a sustainable earthquake protection

MEP: water storage, thermal mass & heat storage

LCFM: allows a sustainable risk and water cost reduction
Bird of Paradise

A living focal point
Building Location

TEAM ISLAND - ARCHITECTURE - Bird of Paradise
Vertical Layout
First Intermediate Floor

- Auditorium
- Student Offices
- Large Classroom
Floor Layout

Second Intermediate Floor

- Elevator
- Bathroom
- Small Classroom
- Fire staircase
- Shaft
- Student Offices
Collaboration Space
Atrium

TEAM ISLAND - ARCHITECTURE - Bird of Paradise
Elevations

NORTHWEST ELEVATION

NORTHEAST ELEVATION

TEAM ISLAND - ARCHITECTURE - Bird of Paradise
Main Entrance
Armadillo Lizard

An allegory of movement
An allegory of movement
Embrace and rupture
Floor Layout

Third Floor

- Administrative Office
- Bathroom
- Electrical
- Fire staircase
- Instructional lab
- Chief Office
- Faculty Offices
- Shaft
- Elevator
WEST ELEVATION

EAST ELEVATION
Elevations

North elevation
Main Entrance
**Wind**
Hurricane season: high wind from NE
Avg Velocity: $v = 160-170$ mph

**Earthquakes**
0.2s SRA = 1.0g
1.0s SRA = 0.4g
Critical Damping 5%

*Based on ACSE 7 - 2010 Ed.*
Soil Conditions

Based on California Building Code

Soil Profile
Bearing Capacity: 5000 psf

- Medium to Very Stiff Clayey Soil
- Excavation Line
- Water Table

Live loads (psf)
- Offices: 50
- Lounge: 80
- Classroom & seminar: 40
- Auditorium: 100
- Lab: 100
- Common space: 60-80
- Corridor: 80-100
- Storage: 150-250
- Mech/elec. room: 100
- Stairs: 100
- Roof: 40
Foundations

TEAM ISLAND - STRUCTURE
Column Support

Retaining System
Concrete Cantilever Wall

Avoid Perforation
Thickened Plate
Foundation Slab

Concrete Wall
Backfill
Soil
Reinf. Steel

Level 0
12’

Level 1
7’

5’

Level 0

Water Table
Concrete Structure

Typical dimensions

- Beams 20”
- Slabs 10”
- Columns 25”x25”
- Slanted columns 12”x24”
- Walls 12”

TEAM ISLAND - STRUCTURE - Bird of Paradise
Concrete Structure

Beams and Columns

Cast in site + Prefabricated Floor slabs

Bubble Slab
Steel Structure

Typical dimensions

- Columns 24”
- Slanted columns 24”
- Beams 16”
- Beams 36” (auditorium span)
- Slab 6”
Tension Ring

Inspiration

Exploration

TEAM ISLAND - STRUCTURE - Bird of Paradise
Shape Exploration - Parametric Design
Inner Structure

Integration with architecture
Column Connection

Tapered columns

Concrete Option

Steel Option

Y columns
Gravity Load Path

TEAM ISLAND - STRUCTURE - Bird of Paradise
Lateral Load Path

TEAM ISLAND - STRUCTURE - Bird of Paradise
Water Dampers

\( M_{\text{water}} \sim 1-3\% \) of the building’s mass

Effective Mass of 60-80%

Expected Number of Tanks

Small Size 16-20

Big Size 10-12

<table>
<thead>
<tr>
<th>Amount of Water (Tons)</th>
<th>Tank Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small</td>
</tr>
<tr>
<td>Strong</td>
<td>10.61</td>
</tr>
<tr>
<td>Weak</td>
<td>3.54</td>
</tr>
</tbody>
</table>

TEAM ISLAND - STRUCTURE - Bird of Paradise
Tank distribution

Large Tanks x12

Small Tanks x16
Concrete Structure

Typical dimensions
- Beams 20”
- Slabs 10”
- Columns 17”x24”
- Walls 12”
Steel Structure

Typical dimensions

- Beams 16"
- Slabs 6"
- Columns 24"
Cantilever Support

TEAM ISLAND - STRUCTURE - Armadillo Lizard
Building Separation

TEAM ISLAND - STRUCTURE - Armadillo Lizard
Gravity Load Path
Lateral Load Path

TEAM ISLAND - STRUCTURE - Armadillo Lizard
Supporting Arches

Inspiration

Exploration

TEAM ISLAND - STRUCTURE - Armadillo Lizard
<table>
<thead>
<tr>
<th>Conditioning</th>
<th>Dehumidification</th>
<th>Ventilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioning</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioner</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioning</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioner</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioning</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioner</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioning</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
<tr>
<td>Packaged Unit</td>
<td>Water Source Heat</td>
<td>Active Chilled Beams</td>
</tr>
<tr>
<td>Bypass Fresh Air</td>
<td>Pump</td>
<td>CHW</td>
</tr>
<tr>
<td>Conditioner</td>
<td>Dehumidification</td>
<td>Ventilation</td>
</tr>
</tbody>
</table>

**HVAC Equipment**

**Packaged Unit Bypass Fresh Air**

**Water Source Heat Pump**

**Active Chilled Beams**
## HVAC Equipment

<table>
<thead>
<tr>
<th></th>
<th>Packaged Unit Bypass Fresh Air</th>
<th>Water Source Heat Pump</th>
<th>Active Chilled Beams</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Duct Size</strong></td>
<td>30” x 12”</td>
<td>27” x 9”</td>
<td>27” x 9”</td>
</tr>
<tr>
<td><strong>Pros</strong></td>
<td>Single System Lower Cost</td>
<td>Smaller Ducts Reuses Water Dampers Space Behind Bathrooms</td>
<td>Smaller Ducts More Efficient</td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td>Larger Ducts Less Efficient</td>
<td>More Equipment</td>
<td>Cooling Capacity Condensate Capture</td>
</tr>
</tbody>
</table>
Natural Ventilation

Orthogonal

Rotated

WIND DIRECTION
Natural Ventilation
Floor Sandwiches

Concrete: 20” Beams -> 16” clear
Steel: 22” Beam/Slab -> 14” clear
Duct Distribution
Annual kWh/kWdc Production vs Tilt and Azimuth

**Solar Production**

**Electric Power Sources**

- **Grid Energy**
- **Solar**

Annual MWh Source

West | South | East
---|---|---
Vertical Tilt

**TEAM ISLAND - MEP**
Water Flow

**In:** Rain

- Collection Tank
- Non Potable Filtration
- Interior gardens
- Toilets
- Out: Black Water (to sewer/treatment)

**In:** Stormwater

- Potable Purification
- Faucets Showers Cleaning
- Seismic Damping
- Out: Greywater
- Landscape

**In:** city (clean)

**Out:** Greywater

**Use:**
- Heating/Cooling
- Emergency (?) (fire suppression)

**Use inside**
- To explore next

**Campus loop:** chilled

**Filtration**
-非饮用
- 水处理

**Purification**
- 饮用

**Waste**
- 弃水

**Water sources**
- 水源

**Non Potable**
- 景观

**Potable**
- 城市

**Seismic Damping**
- 使用

**Landscape**
- 使用

**Camping loop: chilled**
- 使用

**TEAM ISLAND - MEP**
Estimated Supply: 56.35 in per year, normal. Assume 80% catchment efficiency. Total supply depends on roof area:

Estimated Demand: ~1,080,000 gallons per year. Assume 300 people. Baseline of 15 gallons/person/day.

33,000 sq. ft. 9,750 sq. ft.
## Water Goals

<table>
<thead>
<tr>
<th>Roof Catchment Capacity (annual, gallons)</th>
<th>Self-Sufficiency Goal</th>
<th>Target Reduction (From baseline of 15 gpd)</th>
<th>Required Catchment Storage Tank</th>
<th>Pros and Cons</th>
</tr>
</thead>
</table>
| 927,000 gal.                             | 13 gallons/person/day  | 14.5% reduction                           | 98,000 gal. (10’x36’x36’ tank)  | + Plenty of roof area  
+ Can meet whole building needs  
- May not be able to handle effluent volume |
| 274,000 gal.                             | 4 gallons/person/day   | 76.6% reduction                           | 30,000 gal. (10’x20’x20’ tank)  | + Much smaller tank  
+ Green Roof - could handle all effluent treatment on site  
- Extreme water reduction |
Off-site logistics

Construction site

Centenario Park
Off-site logistics
THINK SAFETY

No unauthorised entry

All visitors and delivery drivers must report to the site office

Safety helmets, safety footwear and high visibility clothing must be worn at all times on this site

You must be safety inducted to start work on this site

Wear eye, ear, hand and respiratory protection where appropriate

Danger of underground services

CONSTRUCTION TRAFFIC MAXIMUM SPEED LIMIT 5 M.P.H.

Check before you dig
Schedule and Milestones

Milestone 1: Construction Start

Milestone 2: Building enclosure

Milestone 3: Testing and handover
Equipments

**Excavators**
Rental from GT Rental 15 min drive from the site

**Cranes**
Rental from Esmo Grúas Hidráulicas 15 min drive from the site

**Lifts**
Rental from GT Rental 15 min drive from the site
Cost Estimation

TEAM ISLAND - CONSTRUCTION MANAGEMENT
Risk identification

Risks

- Hurricane
  - Rain (salt)
- Vandalism
  - Subsoil
- Design not accepted
- Technical risk
- Wrong sizing
- Wrong sizing
- Construction schedule
- Earthquake
  - Technical risk
- CM/ LCFM
- A/SE/ MEP/ LCFM
- A/SE/ LCFM

TEAM ISLAND - LIFE-CYCLE MANAGEMENT
## Risk identification

<table>
<thead>
<tr>
<th>Risk</th>
<th>Description</th>
<th>Allocation</th>
<th>Consequences</th>
<th>Estimated risk cost (0-100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Contractor</td>
<td>Owner</td>
<td></td>
</tr>
<tr>
<td><strong>Construction period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction schedule</td>
<td>Formation of latencies and changes in planning</td>
<td>X</td>
<td>Non-availability</td>
<td>30</td>
</tr>
<tr>
<td><strong>Construction &amp; operation period</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hurricane</td>
<td>Damage to building</td>
<td>X</td>
<td>Repair &amp; replacement costs, non-availability</td>
<td>81</td>
</tr>
<tr>
<td>Vandalism</td>
<td>Damages or thefts</td>
<td>X</td>
<td>Non-availability, repair, replacement &amp; cleaning costs</td>
<td>45</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Damages on building</td>
<td>X</td>
<td>Repair &amp; replacement costs, non-availability</td>
<td>50</td>
</tr>
</tbody>
</table>
Risk strategy

Hurricane:

Earthquake:

Vandalism:

Construction schedule:

TEAM ISLAND - LIFE-CYCLE MANAGEMENT
## LC Costs

### TEAM ISLAND - LIFE-CYCLE MANAGEMENT

<table>
<thead>
<tr>
<th></th>
<th>Concrete</th>
<th>Steel</th>
<th>Concrete</th>
<th>Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construction cost</strong></td>
<td>$9.000.000</td>
<td>$10.000.000</td>
<td>$8.100.000</td>
<td>$8.600.000</td>
</tr>
<tr>
<td><strong>Replacement</strong></td>
<td>$2.400.000</td>
<td>$2.400.000</td>
<td>$2.400.000</td>
<td>$2.400.000</td>
</tr>
<tr>
<td><strong>Energy costs</strong></td>
<td>$2.800.000</td>
<td>$3.000.000</td>
<td>$2.800.000</td>
<td>$3.000.000</td>
</tr>
<tr>
<td><strong>Other O&amp;M</strong></td>
<td>$7.700.000</td>
<td>$7.800.000</td>
<td>$4.700.000</td>
<td>$4.800.000</td>
</tr>
<tr>
<td><strong>O&amp;M costs total</strong></td>
<td>$12.900.000</td>
<td>$13.300.000</td>
<td>$9.800.000</td>
<td>$10.200.000</td>
</tr>
<tr>
<td><strong>SUM</strong></td>
<td>$21.900.000</td>
<td>$23.300.000</td>
<td>$18.000.000</td>
<td>$18.800.000</td>
</tr>
</tbody>
</table>
# LEED Certification

<table>
<thead>
<tr>
<th>Steel</th>
<th>Concrete</th>
<th>LEED Criteria</th>
<th>Steel</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>INTEGRATIVE PROCESS = 1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>LOCATION &amp; TRANSPORTATION = 15</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>SUSTAINABLE SITES = 12</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>WATER EFFICIENCY = 12</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>ENERGY &amp; ATMOSPHERE = 31</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>MATERIAL &amp; RESOURCES = 13</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>INDOOR ENVIRONMENTAL QUALITY = 16</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>INNOVATION = 6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>REGIONAL PRIORITY = 4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
<td><strong>56</strong></td>
</tr>
</tbody>
</table>

**Total Score:** 57 for Steel and 58 for Concrete.
## Decision Matrix

**Too close to call <2% difference**

<table>
<thead>
<tr>
<th>Point legend</th>
<th>CONCRETE</th>
<th>STEEL</th>
<th>CONCRETE</th>
<th>STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Worst</td>
<td>Points</td>
<td>Points</td>
<td>Points</td>
<td>Points</td>
</tr>
<tr>
<td>4 Best</td>
<td>Points</td>
<td>Points</td>
<td>Points</td>
<td>Points</td>
</tr>
<tr>
<td><strong>AVG. WEIGHT</strong></td>
<td>7.70</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1 Space quality</td>
<td>7.03</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2 Social interaction</td>
<td>4.98</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3 Structure</td>
<td>5.65</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4 Complexity (structure)</td>
<td>8.58</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>5 Energy and atmosphere</td>
<td>8.30</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6 Materials and resource</td>
<td>5.60</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>7 Schedule &amp; latency</td>
<td>6.88</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>8 Constructability &amp; cost</td>
<td>7.70</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>9 O&amp;M cost</td>
<td>7.53</td>
<td>3</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>10 Risk</td>
<td>8.65</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>11 Consistence big ideas</td>
<td>8.93</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>12 Merging disciplines</td>
<td>3.25</td>
<td>2.67</td>
<td>3.33</td>
<td>2.42</td>
</tr>
<tr>
<td><strong>Total Weighted Score</strong></td>
<td><strong>283</strong></td>
<td><strong>183</strong></td>
<td><strong>287</strong></td>
<td><strong>206</strong></td>
</tr>
</tbody>
</table>
Decision Matrix

Combined Scores

TEAM ISLAND - DECISION
Decision

IT'S A TIE!?
Thank you all!

Renate, Owners, Mentors, Course assistants and many others...
Questions
More energy consumption from Lizard concept *mention this in next slide or verbally*

In excess of carbon footprint targets *again, mention in next slide*

Somewhat in excess of energy targets *just mention this verbally*