Embedding Environmental Enrichment Into Zoo Animal Facility Design

Zoo Design Conference

Wroclaw Zoo   5-7 April 2017

Jon Coe

Enrichment

Has become *de facto* the primary tool for addressing psychological wellbeing in zoo and aquarium animals*.

Enrichment Definition:

A dynamic process which structures and changes an animal's environment in a way that provides behavioral choices to animals and draws out their species-appropriate behaviors and abilities and enhances their welfare.

D. Shepherdson 2010

Evolution of Environmental Enrichment

2017 — Wroclaw Zoo Design Conference: New Five Freedoms

Welfare symposia e.g. CZS & Detroit Zoo

2003 — EE for Captive animals published

AZA Enrichment School

Behavioral Husbandry

2000 — AZA AWC formed

1999 — EE added to AZA Accreditation

Animal Welfare

1998 — 2nd Nature Published

1993 — 1st ICEE Portland, OR

1992 — Training Program at AZA

Enrichment

1991 — *SHAPE of Enrichment*

Training

1982 — Hal Markowitz

1979 — Old Five Freedoms

Chart adapted from
D. Shepherdson, 2013
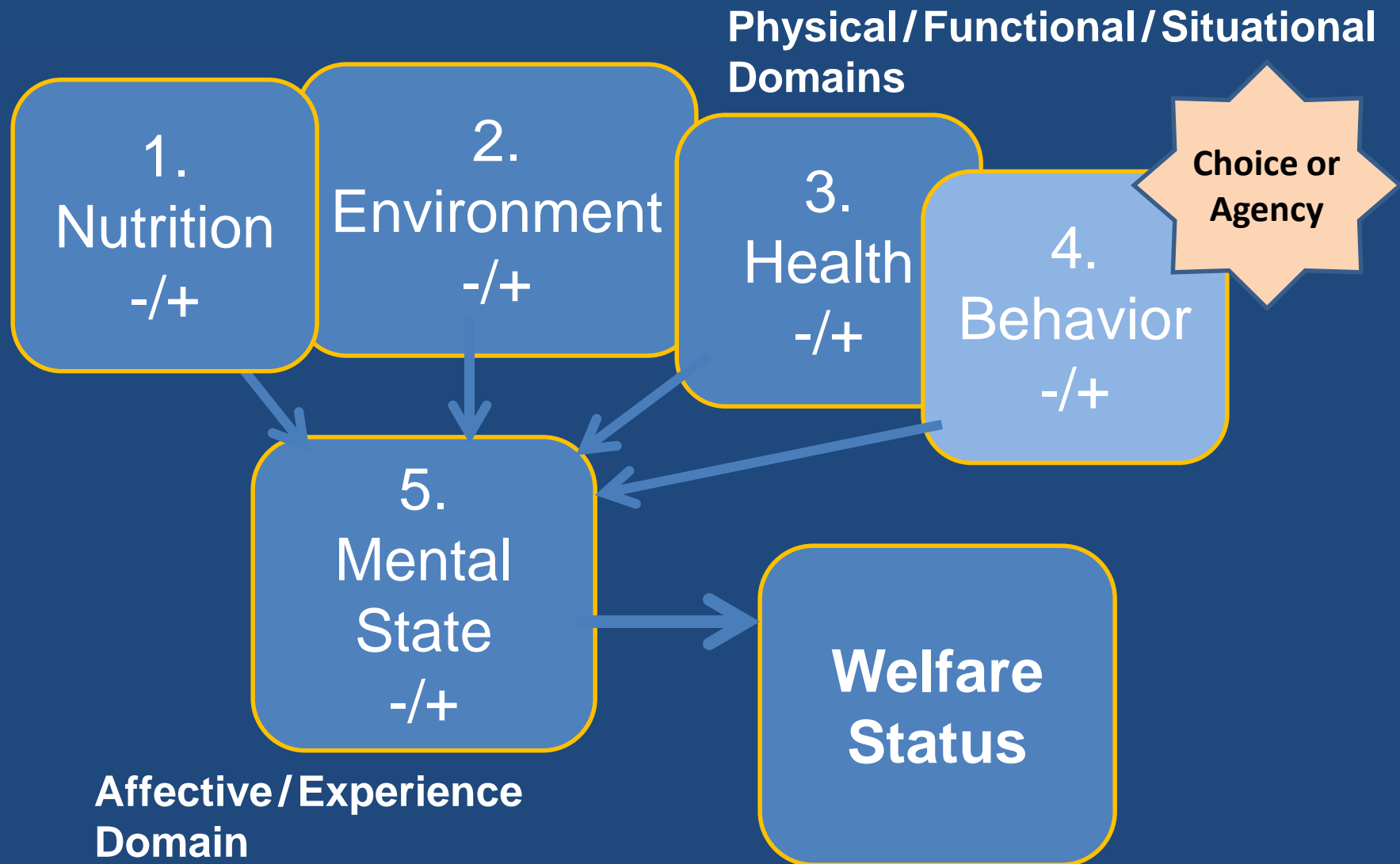
"Old Five Freedoms"…from:

- Hunger and Thirst

- Discomfort

- Pain, Injury or Disease

- Fear and Distress

- To Express Normal Behaviour

To…?

New Five Freedoms...to:

- Achieve Competence:
  "Effective performance of normal functions"

- Have Choice:
  "The right or ability to choose"

- Take Control:
  "The power to influence...the course of events"

- Experience Variety
  "The quality of being different or diverse; the absence of uniformity or monotony"

- Engage Complexity:
  "The quality of being intricate or complex"

Definitions: Oxford Living Dictionary (Online)

Five Domains of Animal Welfare

Physical / Functional / Situational Domains

1. Nutrition -/+

2. Environment -/+

3. Health -/+

4. Behavior -/+

Choice or Agency

5. Mental State -/+

Affective / Experience Domain

Welfare Status

Adapted from Mellor, D.J. & Beausoleil, N.J. 2015

"The organism with the greatest number of choices has the greatest freedom."

Jon Coe

Choice + Control = Freedom

Competent Wild Ape

Competent Zoo Ape

© ZOOLOGICO GUADALAJARA
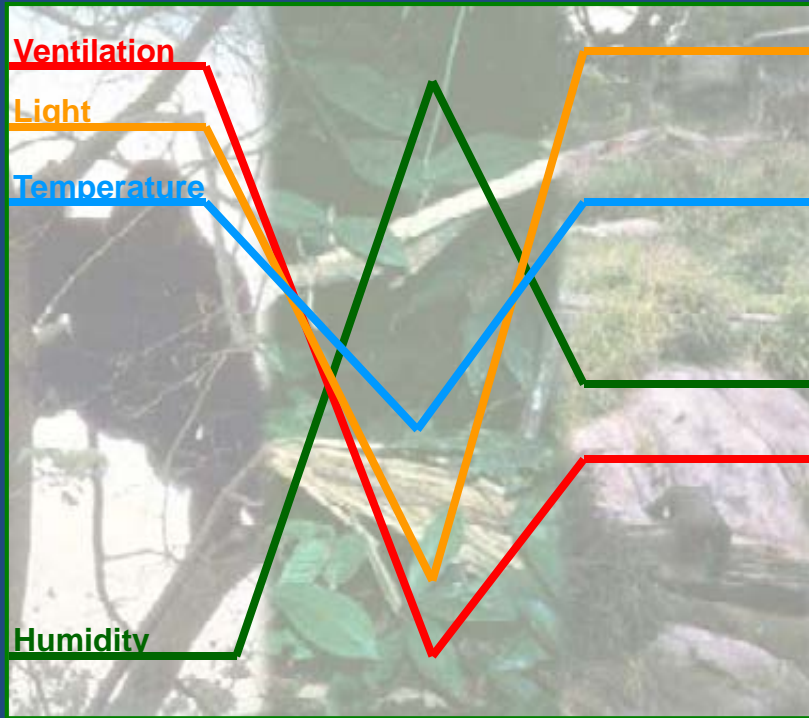
Forest Canopy   Forest Floor   Clearing

Rainforest Environmental Gradients (hypothetical)

Conventional Primate Holding Micro-Climate Gradients (hypothetical)

Environmental Choice

- Lighting
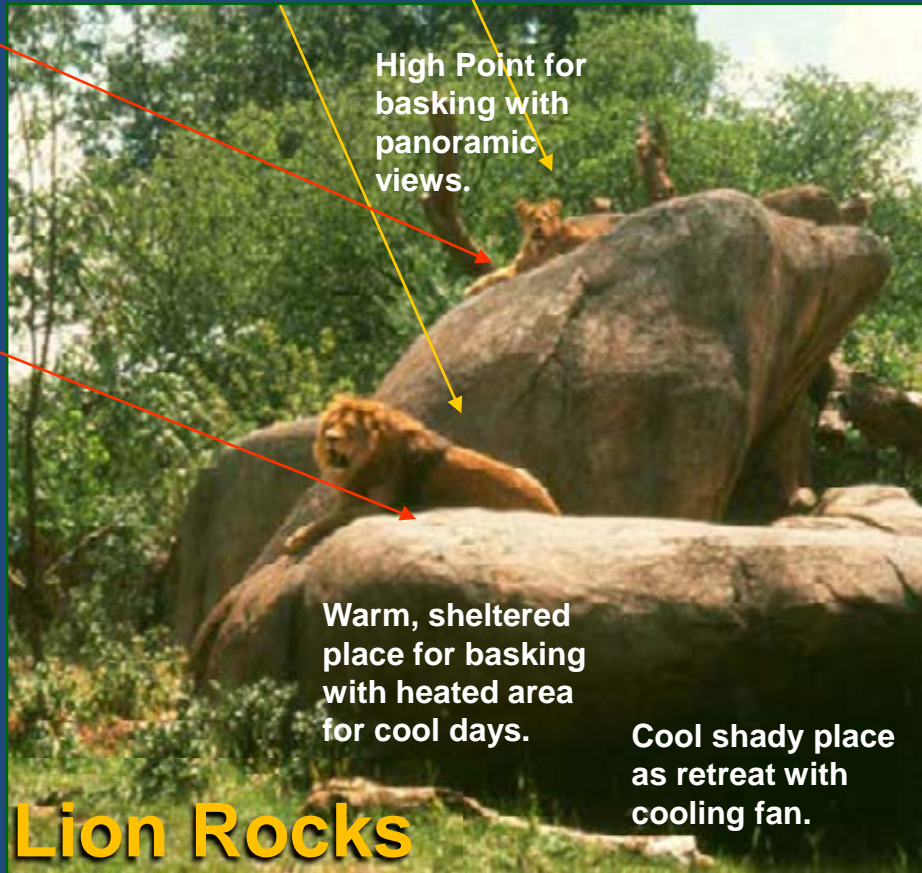- Heating and cooling
- Ventilation
- Create gradients and choices

Zoo Design Fundamentals:
"Nature is the Model"[*]

- **Copy Nature** – *not other zoos*[*]

- **Biomorphic** – *look and function is 'natural'*

- **Naturalistic** – *artificial appearance, natural function*

- **Soft Zoo Architecture**[**] – *plantings, mulch, logs, etc.*

- **Hard Zoo Architecture**[**] – *tile, concrete, steel, glass, etc.*

*David Hancocks   **Terry Maple

Permanent Enriching Structures

Build-in Features
of Enduring Interest to Animals

High Point for basking with panoramic views.

Warm, sheltered place for basking with heated area for cool days.

Cool shady place as retreat with cooling fan.

Lion Rocks

Place crickets, meal worms, honey, etc in hopper.

Artificial Termite Mound

Visitor Benefit: Animals well presented, even when resting

Visitor Benefit: Encourages activity

Moving Enrichment Features

OFF-EXHIBIT AREA WITH GOOD KEEPER ACCESS

STEEL SAFETY CAGE

SPRING EXTENDED

BIG CAT PULLING OUT "PREY" NEAR PUBLIC VIEWING
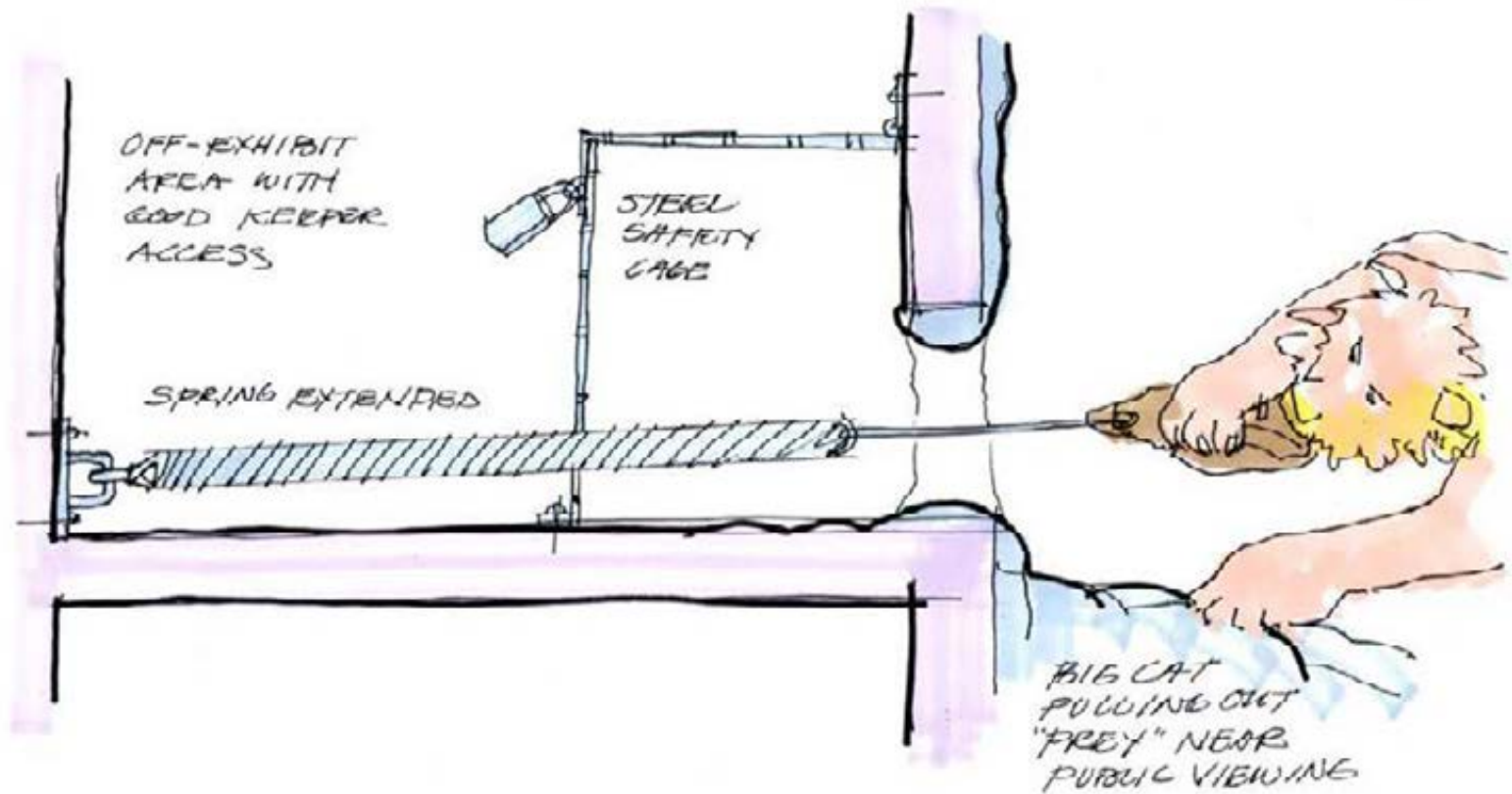
Hidden Bungee Feeder

Moving Enrichment Features
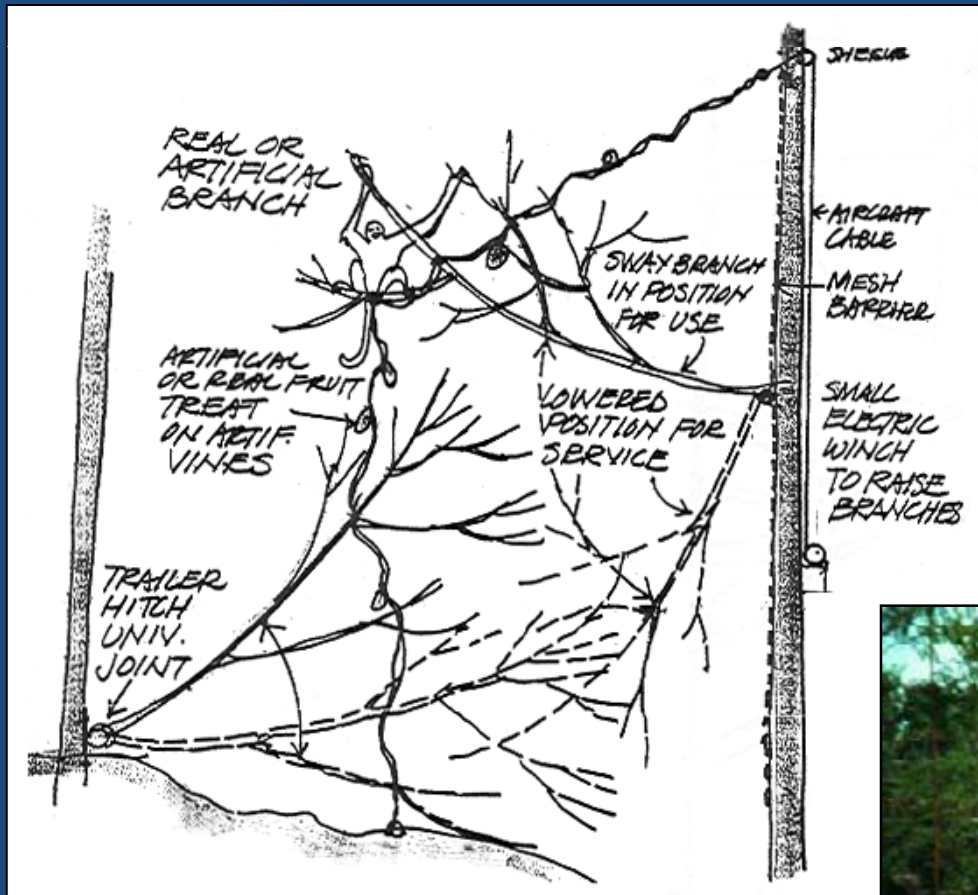
**Sway Branch Concept
"Everything Moves"**

Denver Zoo

Moving Enrichment Features

Low-Tech Sway Branch

Bamboo Pole
Note: Place in bamboo clump

Steel Rod driven into ground

1. Drill out partitions between segments.
2. Cut slot for pouring in refrigerated crickets and meal worms.
3. Drill holes for crickets and meal worms to escape.
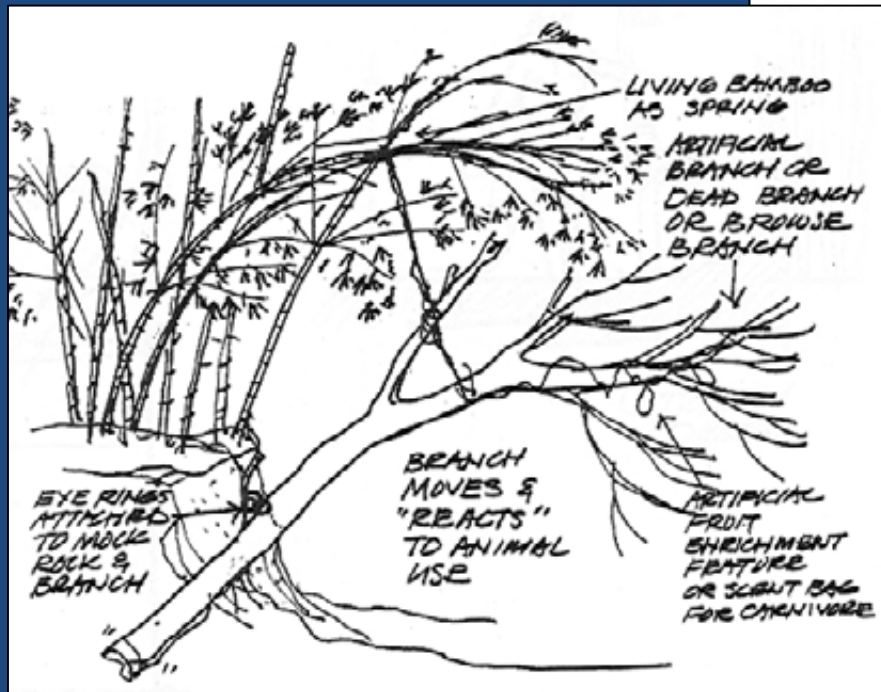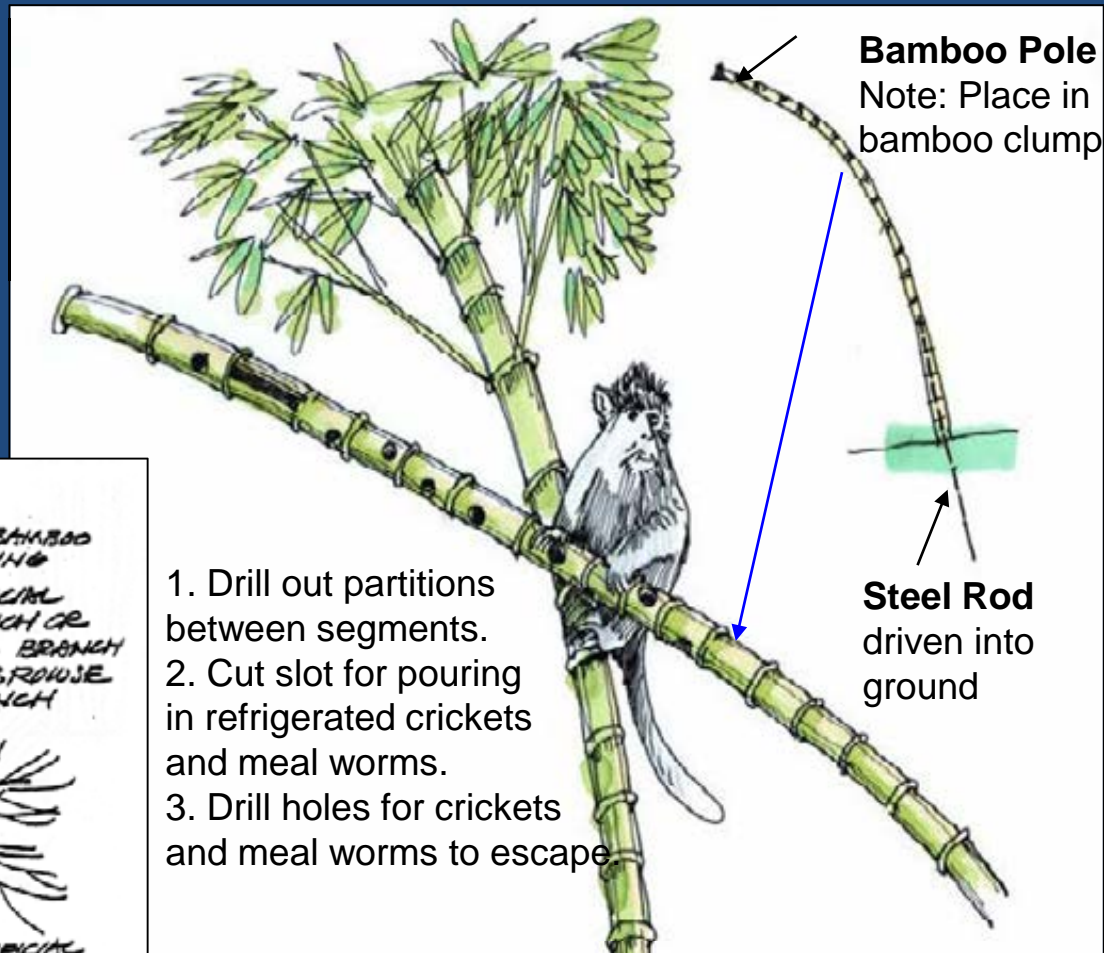
Changeable and Interactive Bamboo Cricket/Meal Worm Feeders

LIVING BAMBOO AS SPRING

ARTIFICIAL BRANCH OR DEAD BRANCH OR BROWSE BRANCH

EYE RINGS ATTACHED TO MOCK ROCK & BRANCH

BRANCH MOVES & "REACTS" TO ANIMAL USE

ARTIFICIAL FRUIT ENRICHMENT FEATURE OR SCENT BAG FOR CARNIVORE

Moving Enrichment Features

Bait fixed at top of post requires ladder to change

Pole doesn't move

Hidden pulley

Sway pole raised with hidden electric winch

Pole anchored to shackle
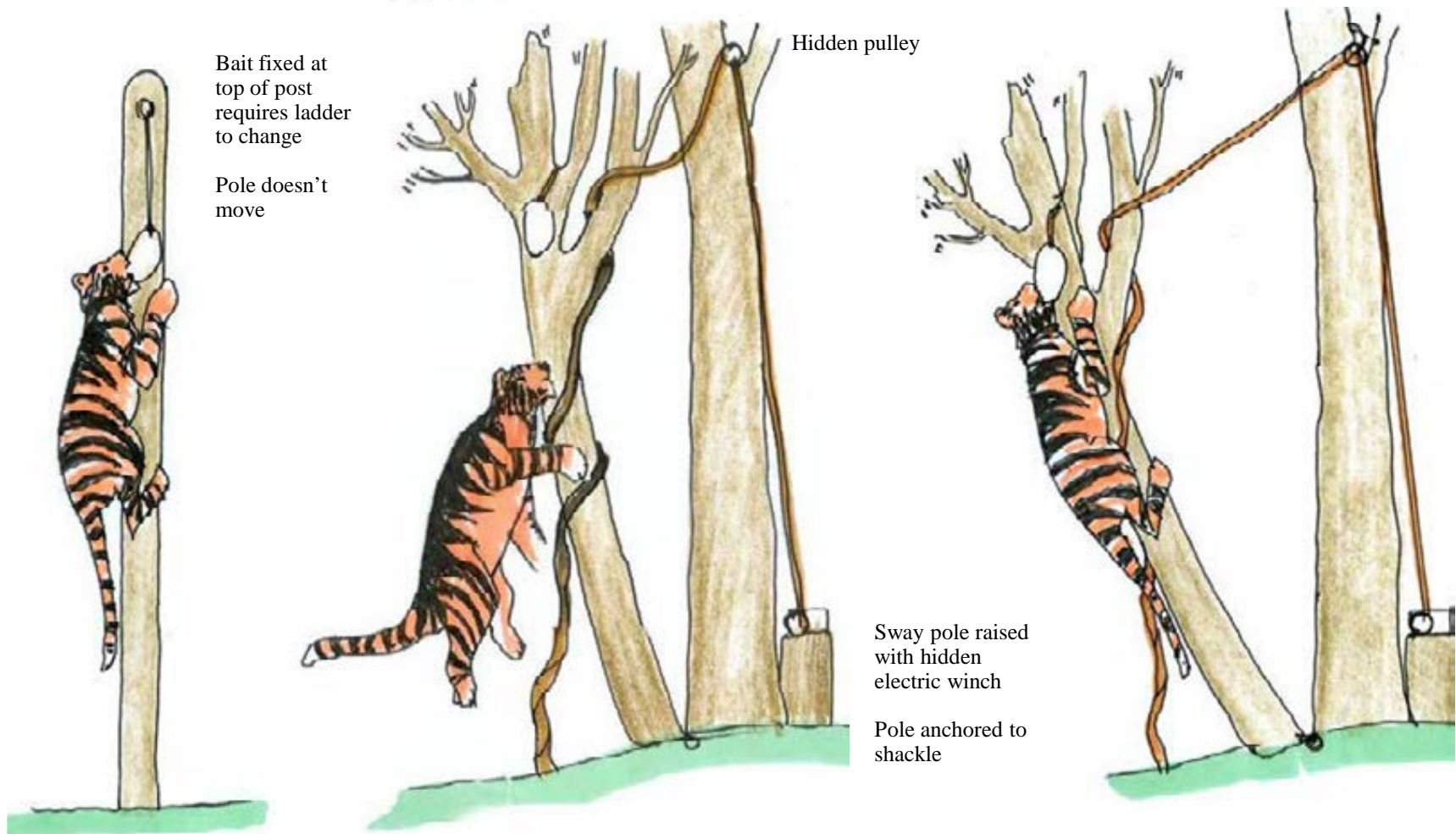
Artificial Feeding Pole

(From Young 2002 Fig 8.1)

Sway Feeding Pole

Feeding Poles

Moving Enrichment Features
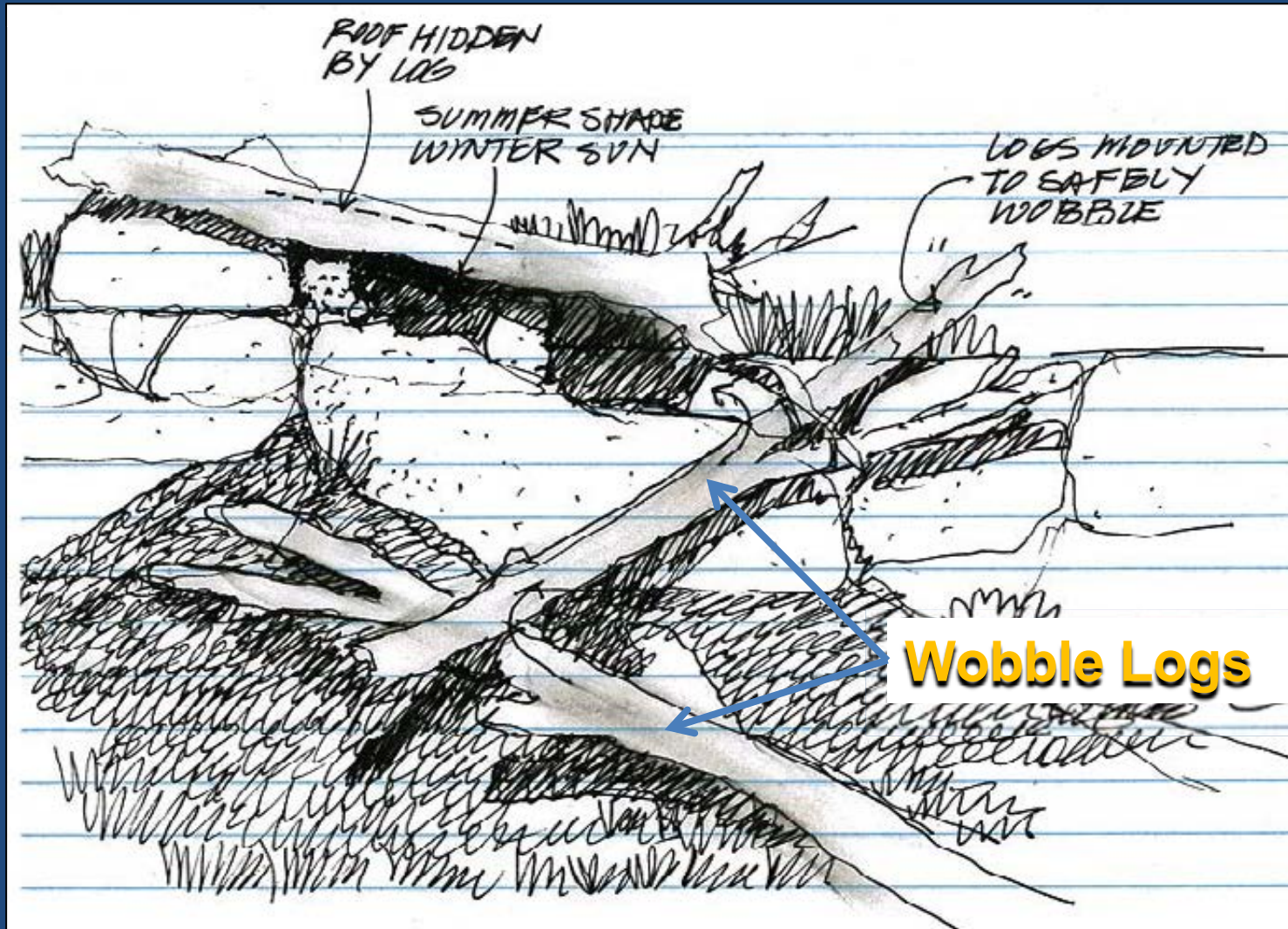
Melbourne Zoo Snow Leopard Exhibit

Moving Enrichment Features
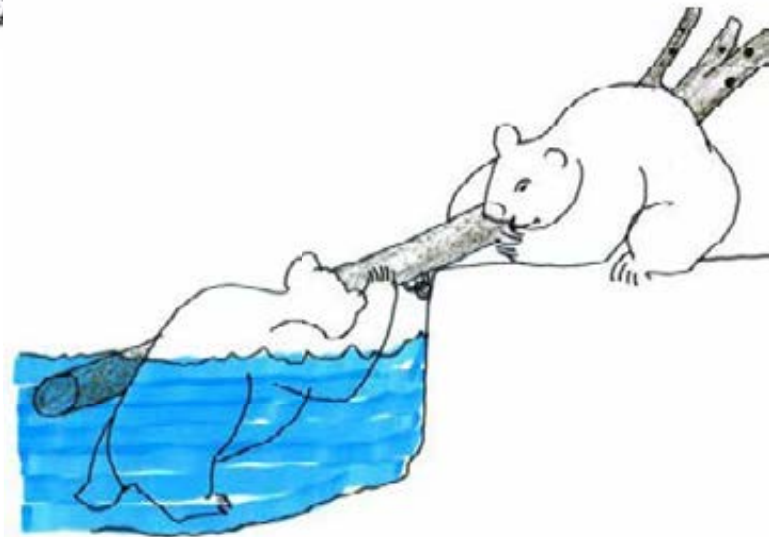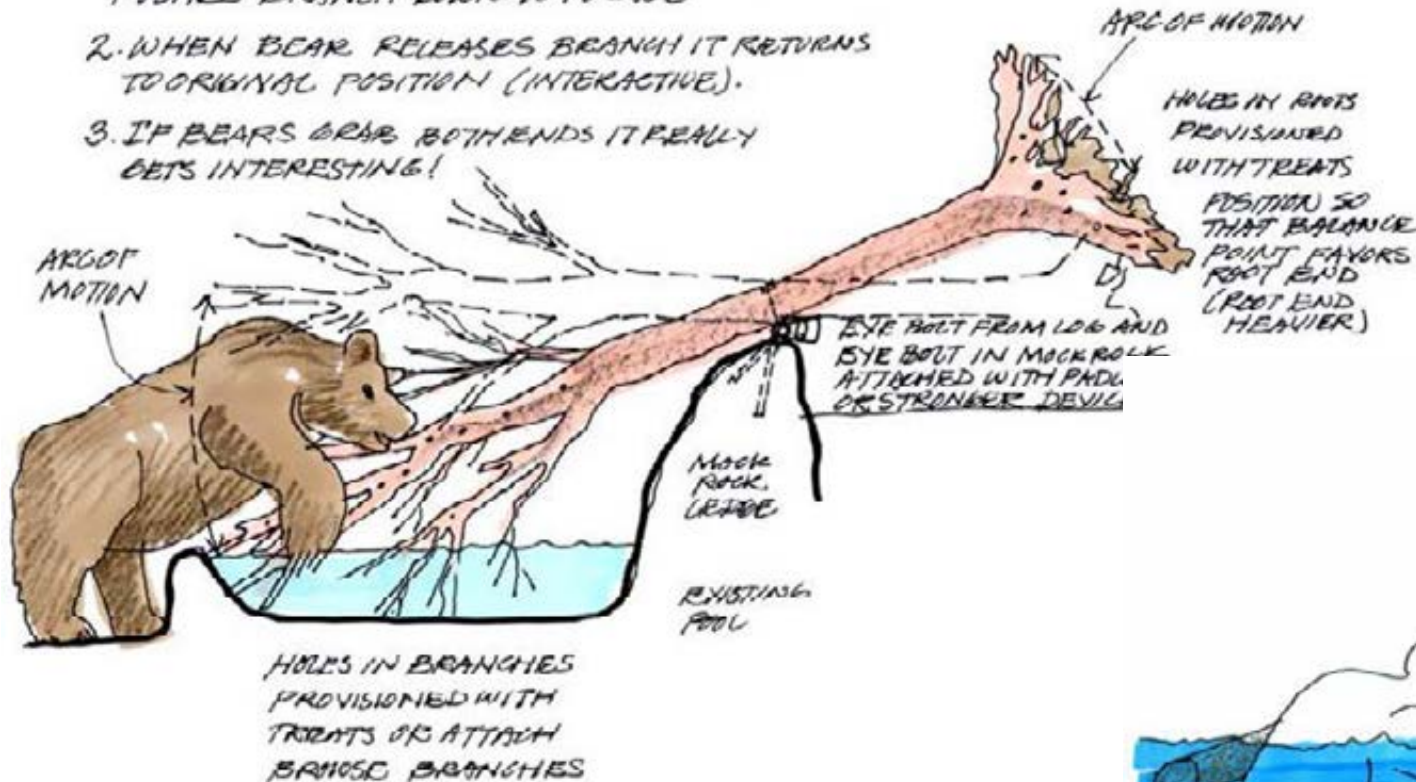
Balancing Treat Logs

Artificial Hunt "Clothes Line"

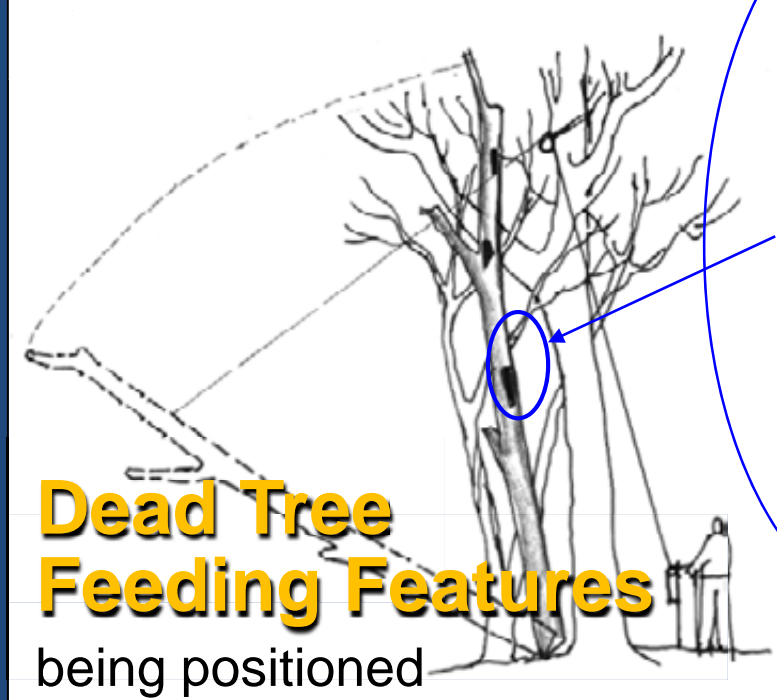**The Bored Big Cat**
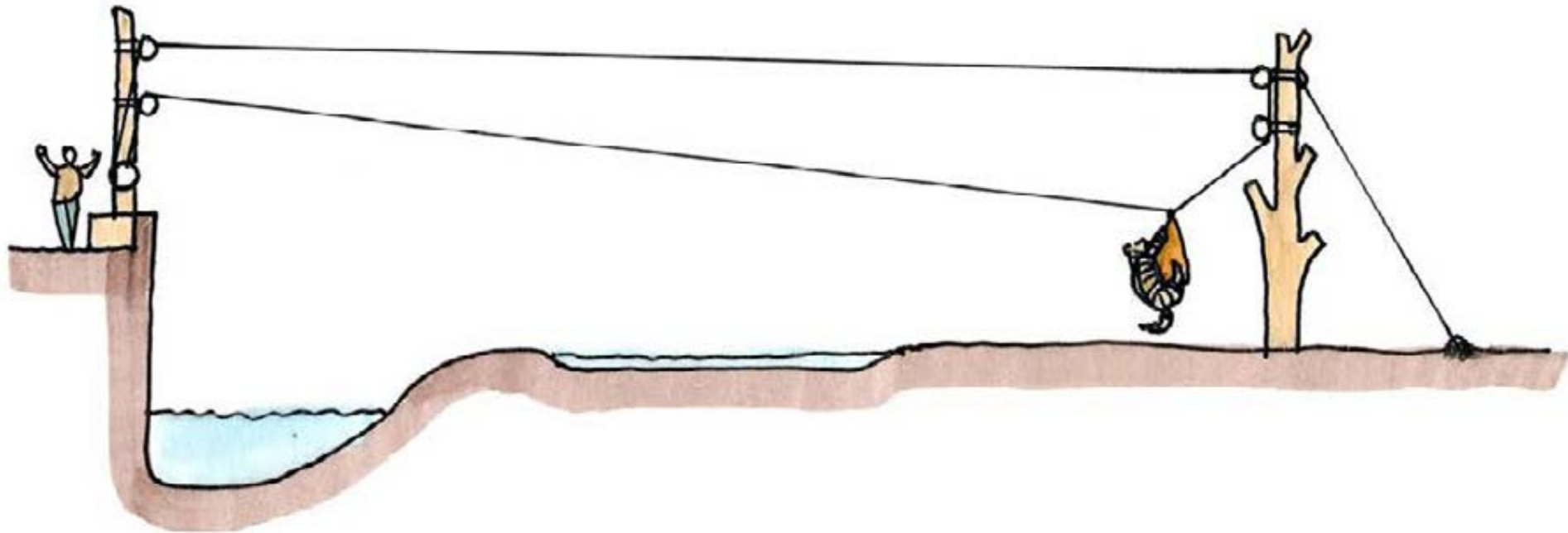
Moving Enrichment

Artificial Hunt

Artificial "Prey" is a bag filled with sand scented with blood, perfume or animal scent
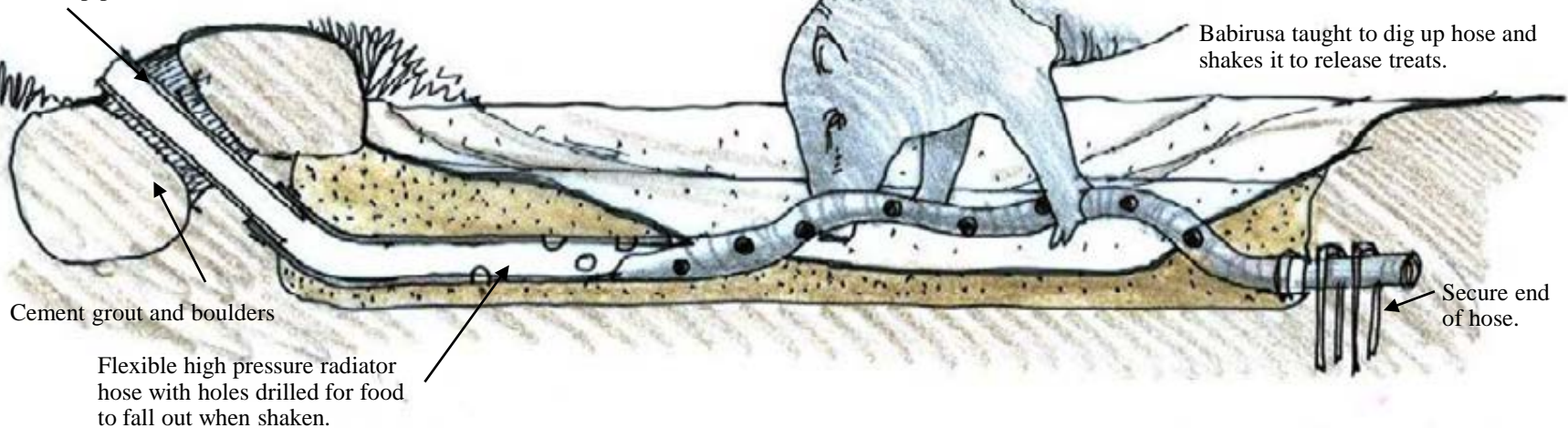
Food-Based Enrichment

Dead Tree Feeding Features
being positioned

Knot hole for injecting honey
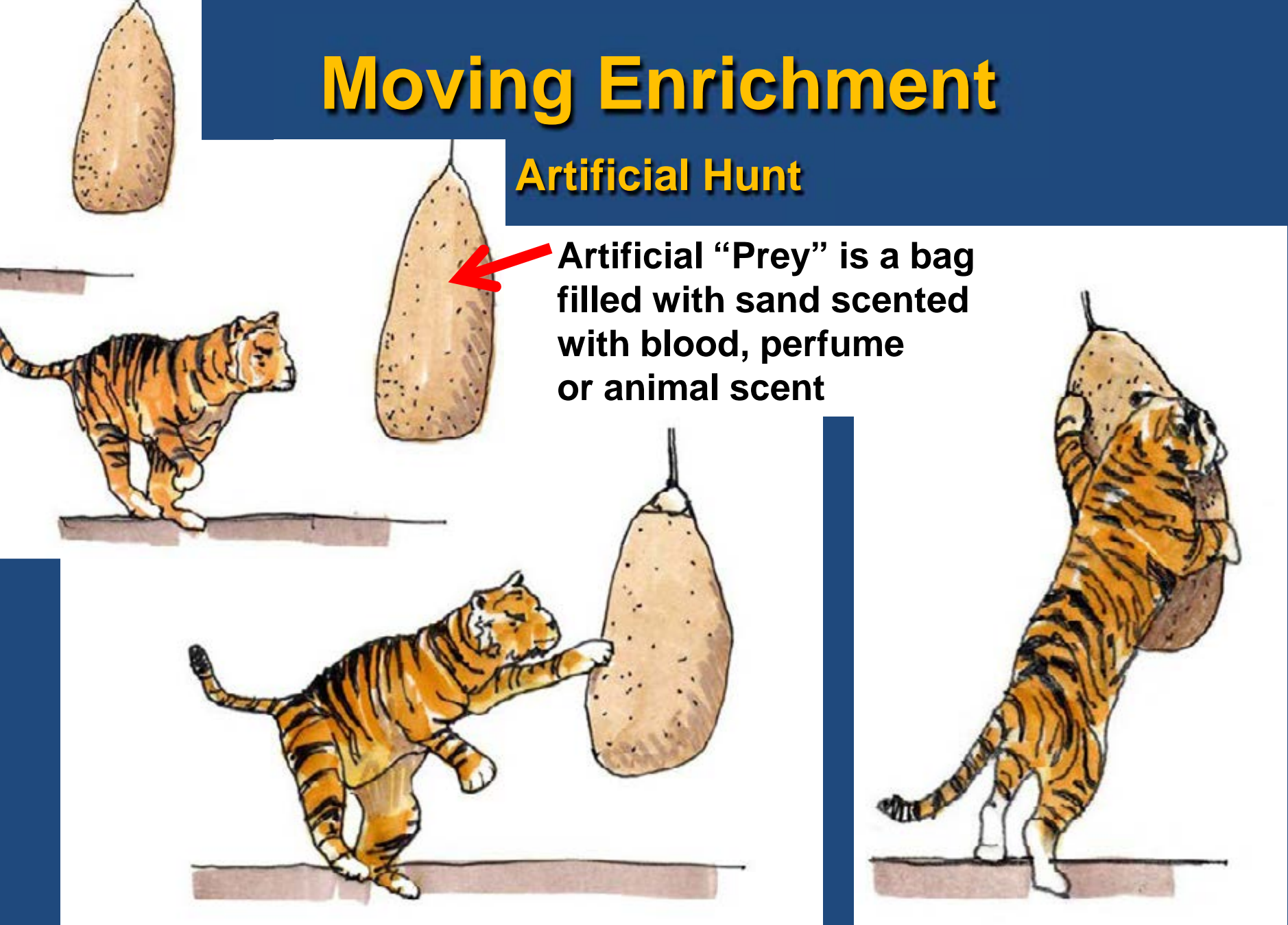
PVC Cricket or Meal Worm Feeders
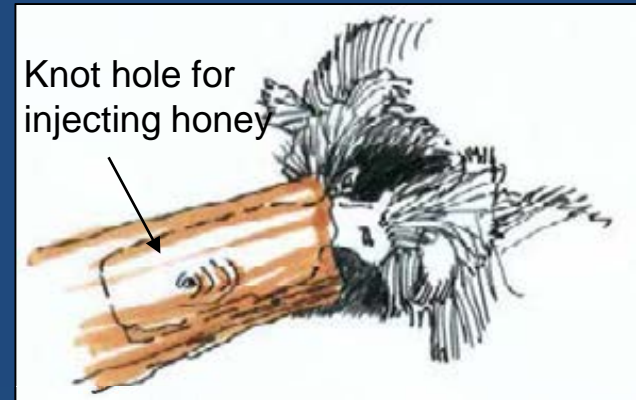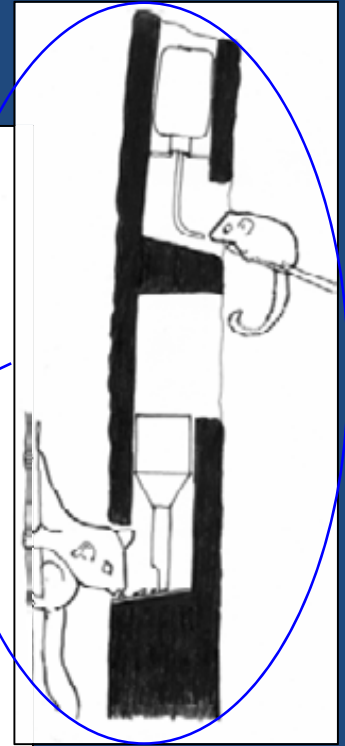
Sloth Bears at Honey Log

Active Feeding Features

Will the Babirusa use it?

Prototype at Houston Zoo

Pour nuts, meal worms etc. into PVC pipe.

Babirusa taught to dig up hose and shakes it to release treats.

Cement grout and boulders

Flexible high pressure radiator hose with holes drilled for food to fall out when shaken.

Secure end of hose.

Babirusa Root Feeder

Feeding Crane

Bored Hippos
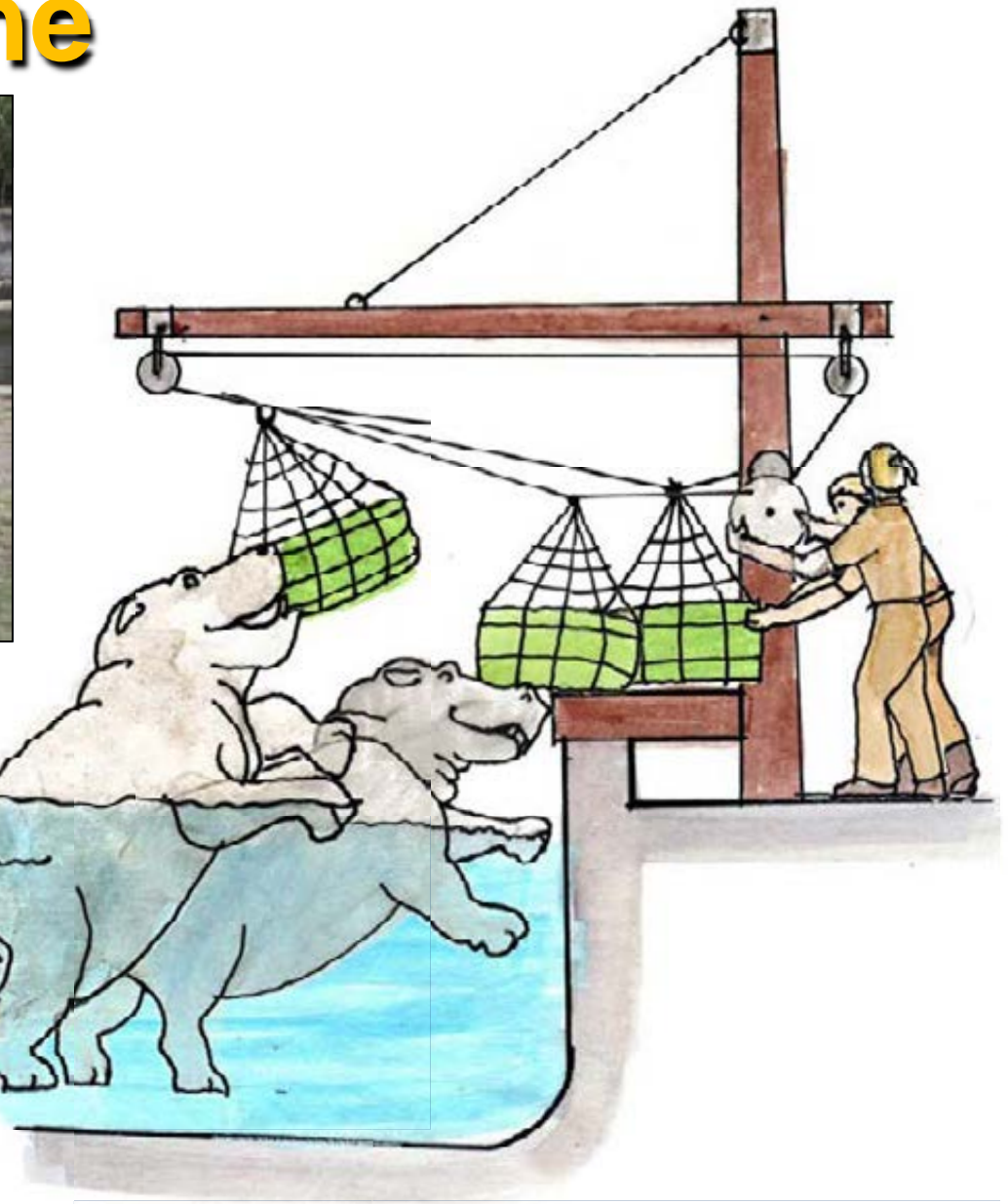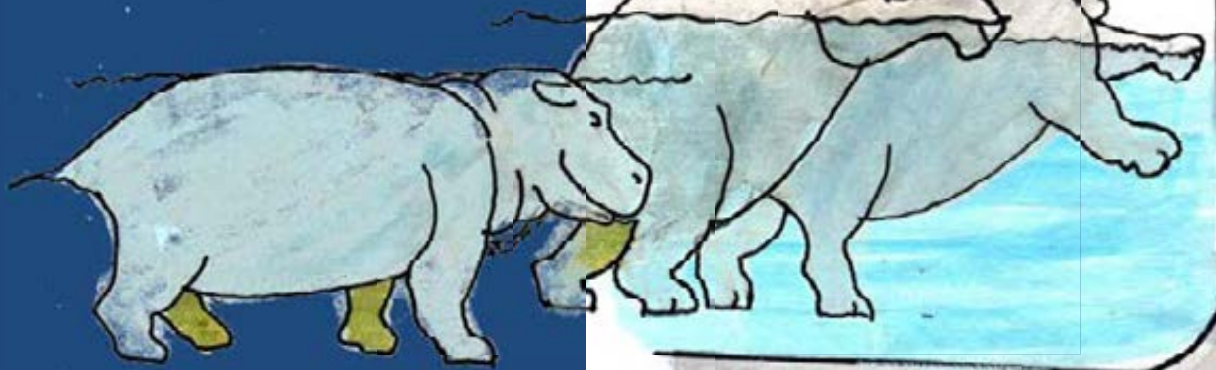
Moving Enrichment Features

Elephant Push Tree

Range of motion.

Tree in upright position

Large Log

Secure ropes used to raise browse

Truck tires set in sand (seen at Disney's Animal Kingdom)
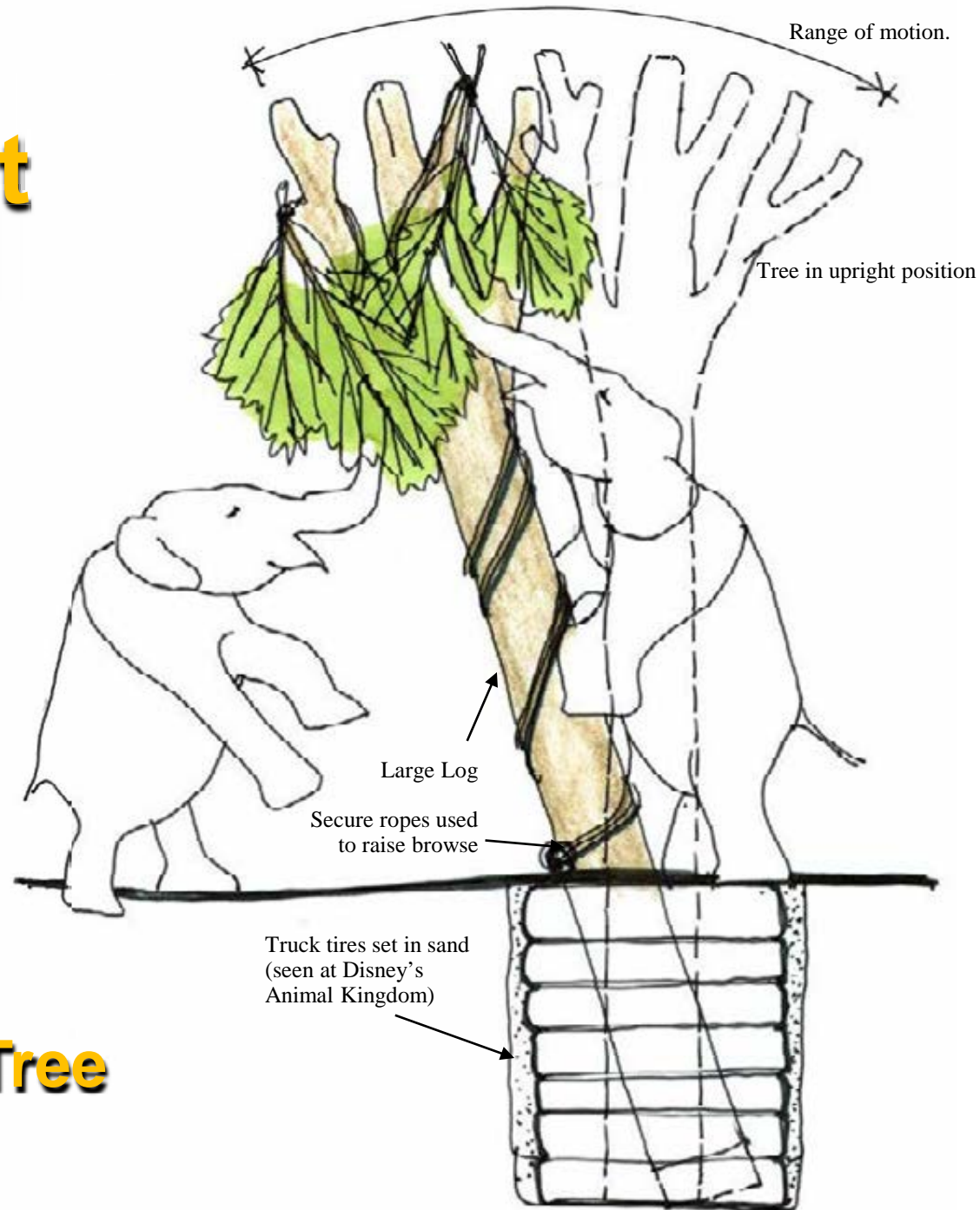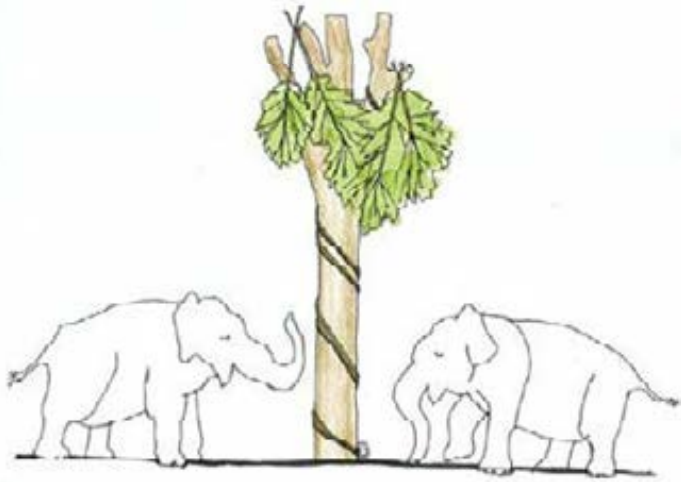
Conditioing and Training

Healesville Sanctuary **Healesville Sanctuary**
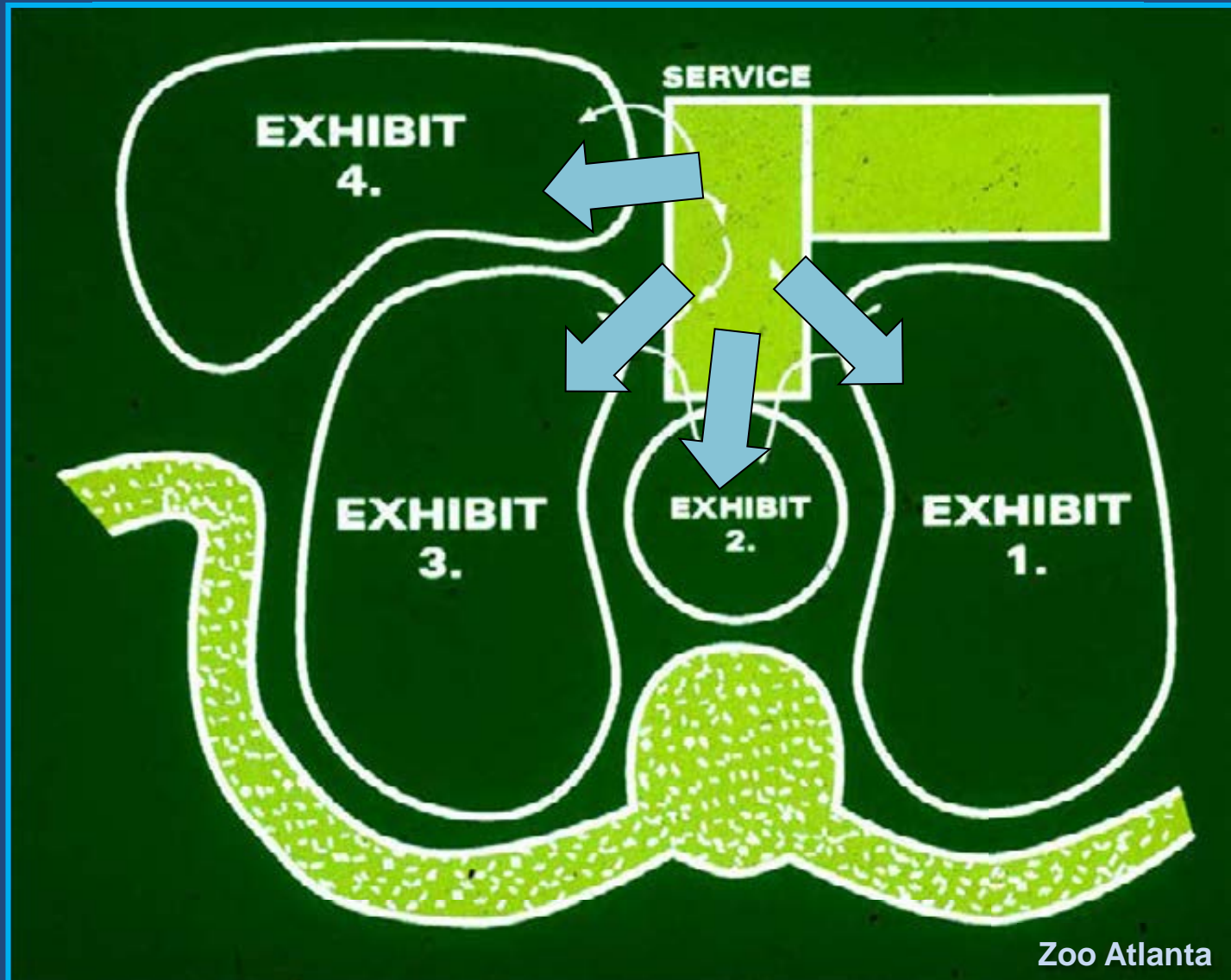
Santuario do Carasas, Brazil

Apenheul
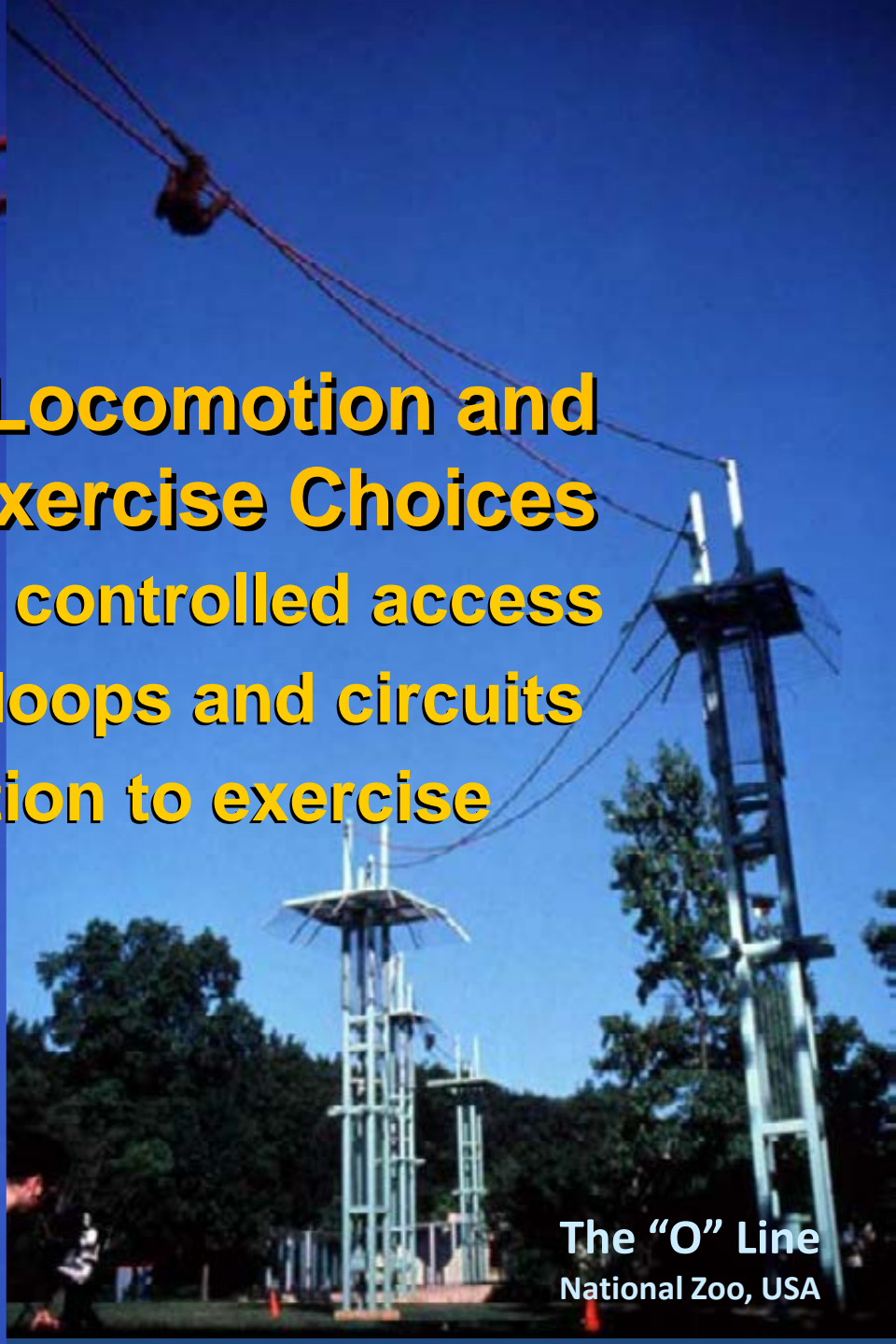Primate Park

© Louisville Zoo

Great Ape Rotation

Zoo Atlanta

Making Rotation *Work!*

Islands: Louisville Zoo's Rotation Concept
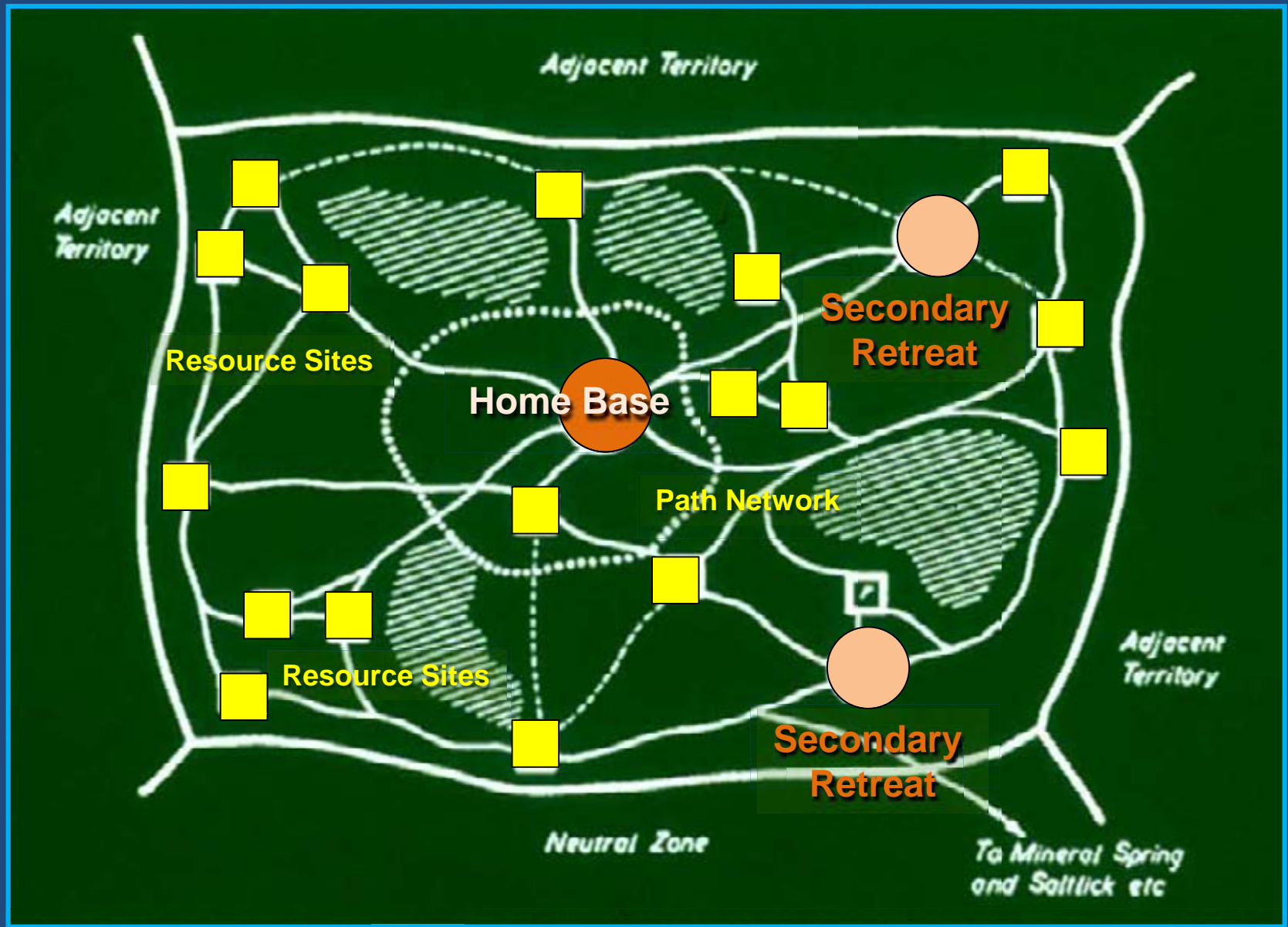

Transfers

Training

Rotation

Locomotion and Exercise Choices

➡ **Animal controlled access**

➡ **Varied loops and circuits**

➡ **Motivation to exercise**

The "O" Line
National Zoo, USA

Adjacent Territory

Adjacent Territory

Resource Sites

Home Base

Secondary Retreat

Path Network

Resource Sites

Secondary Retreat

Adjacent Territory

Neutral Zone

To Mineral Spring and Saltlick etc

Hediger's Concept of Territory

Big Idea: "Why can't we hook up everything in the zoo to everything else and basically let the animals have the run of the place?"
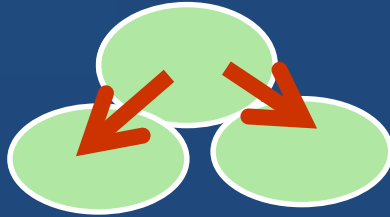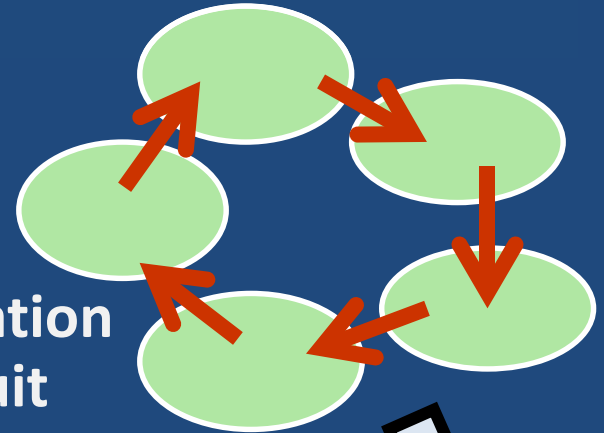
(Coe, 2009)

Evolution of Animal Rotation Networks
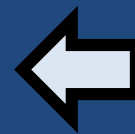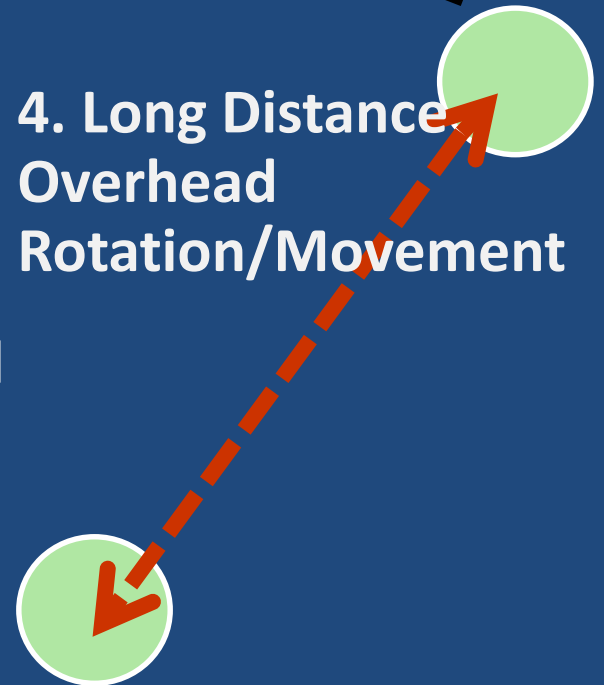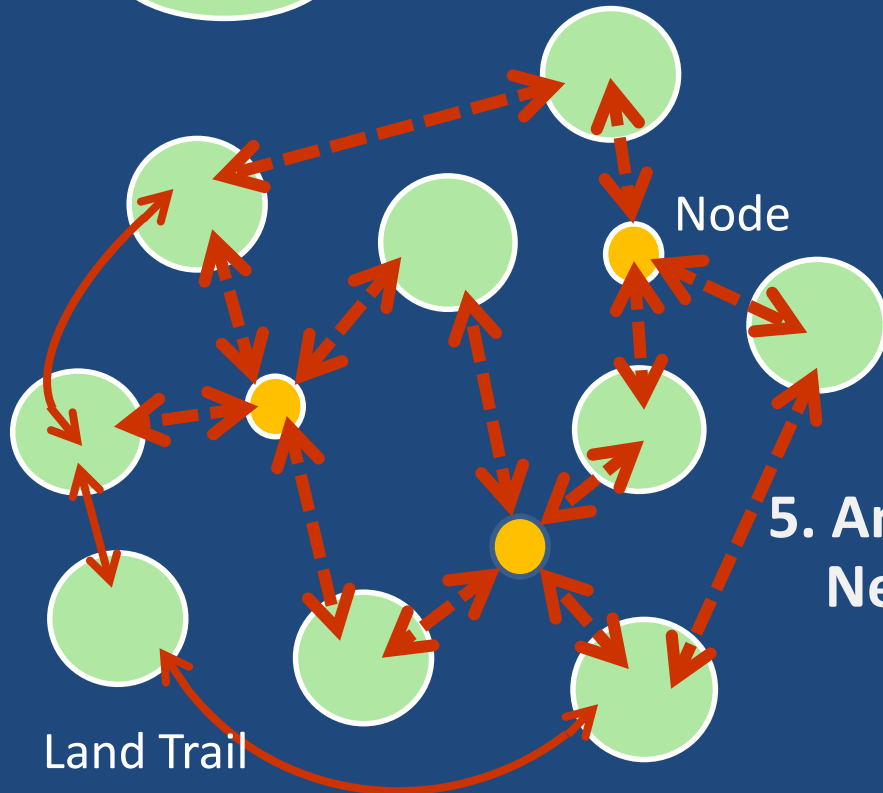
1. Single Exhibit

2. Adjacent Rotation

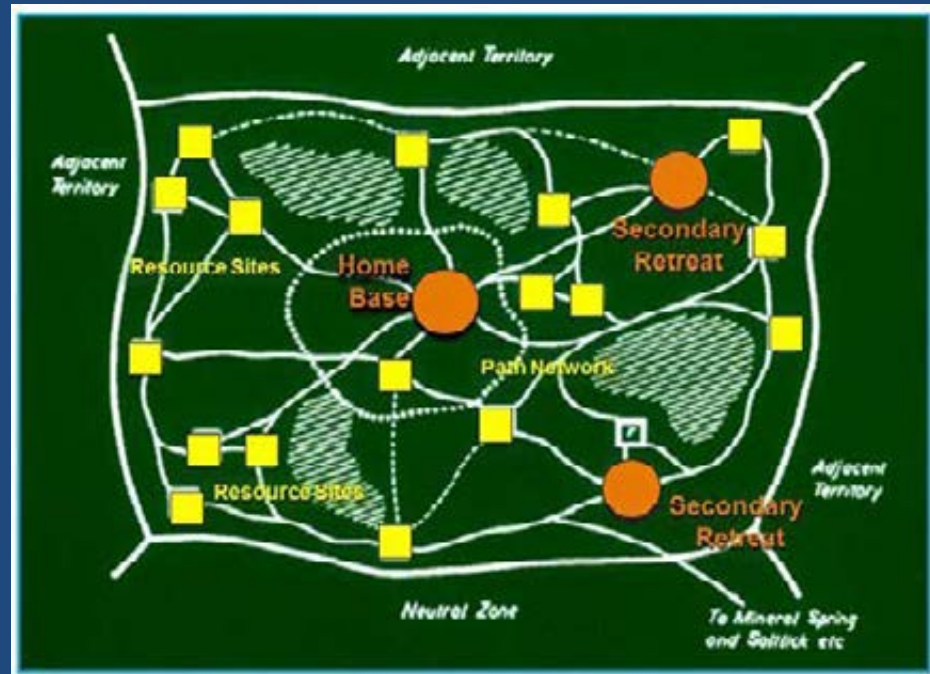**3. Rotation Circuit**

4. Long Distance Overhead Rotation/Movement

5. Animal Trail Network

Node

Land Trail

Animal Rotation Networks

Overhead Trail

Node

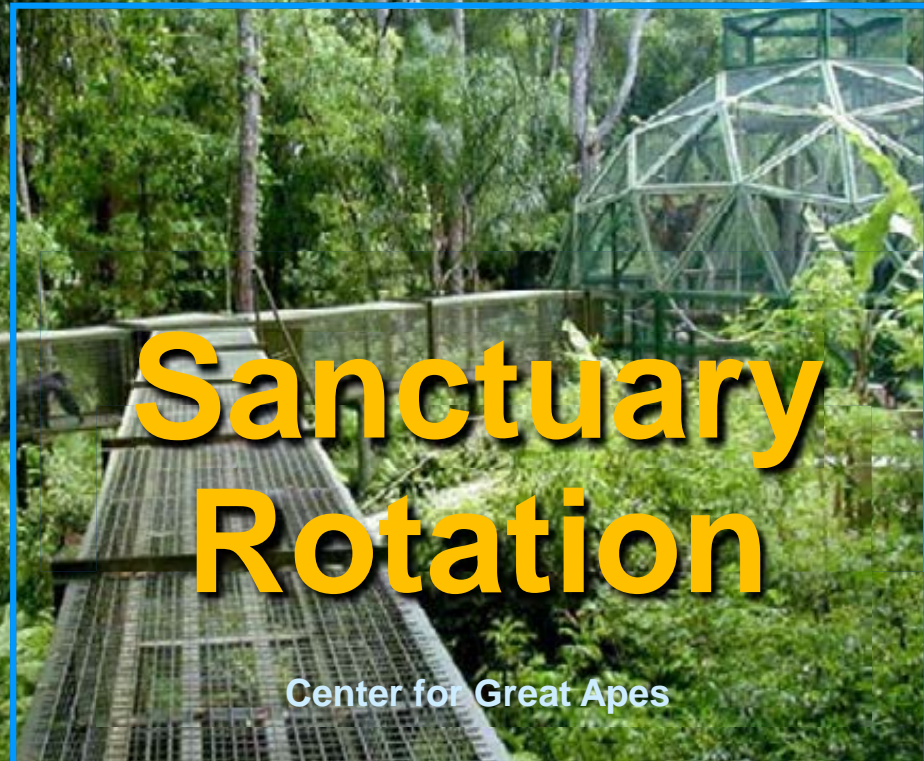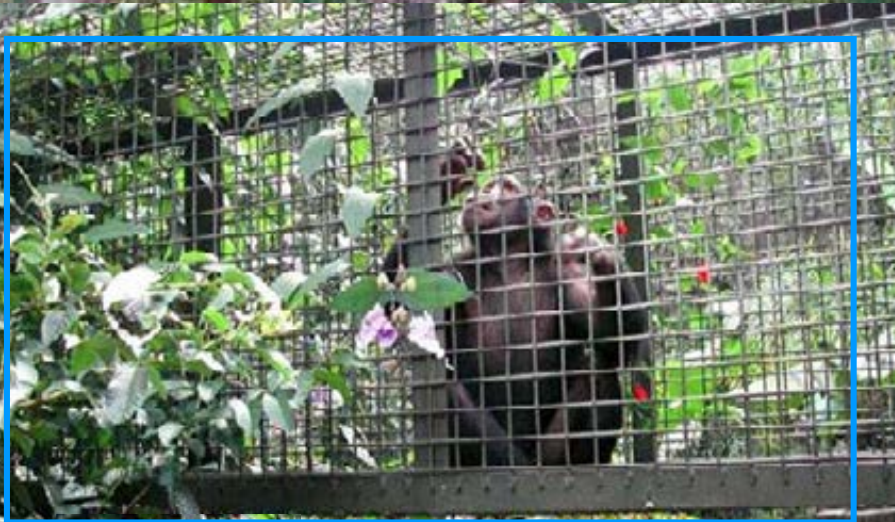Land Trail
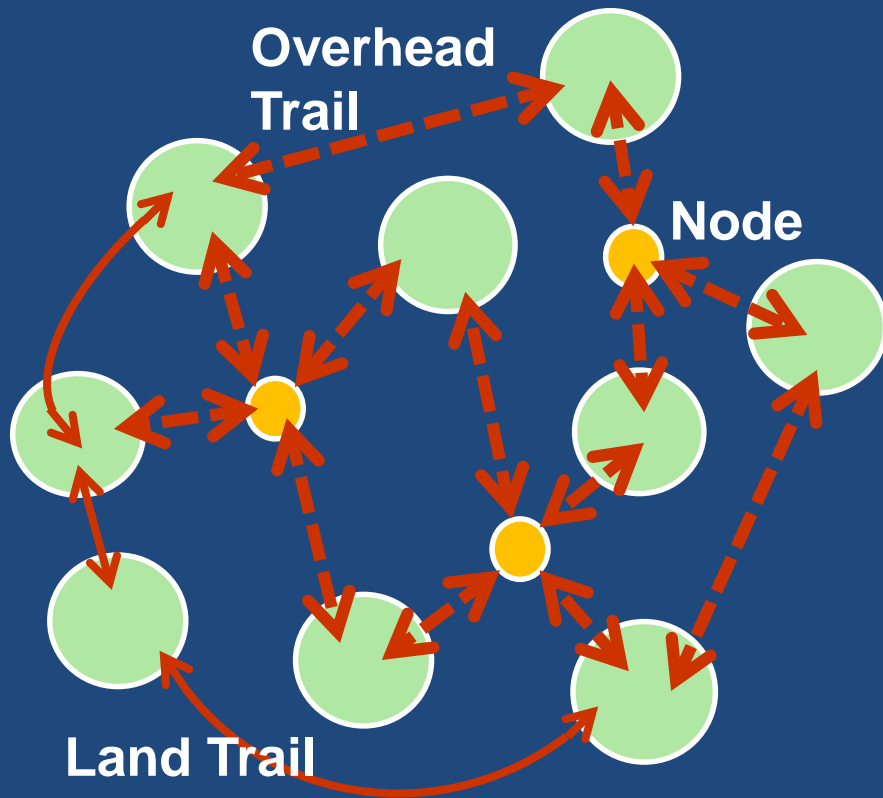
Animal Trail Network
Zoo Wide Concept

Nature is the Model
Hediger's Concept of Territory

Sanctuary Rotation

Center for Great Apes

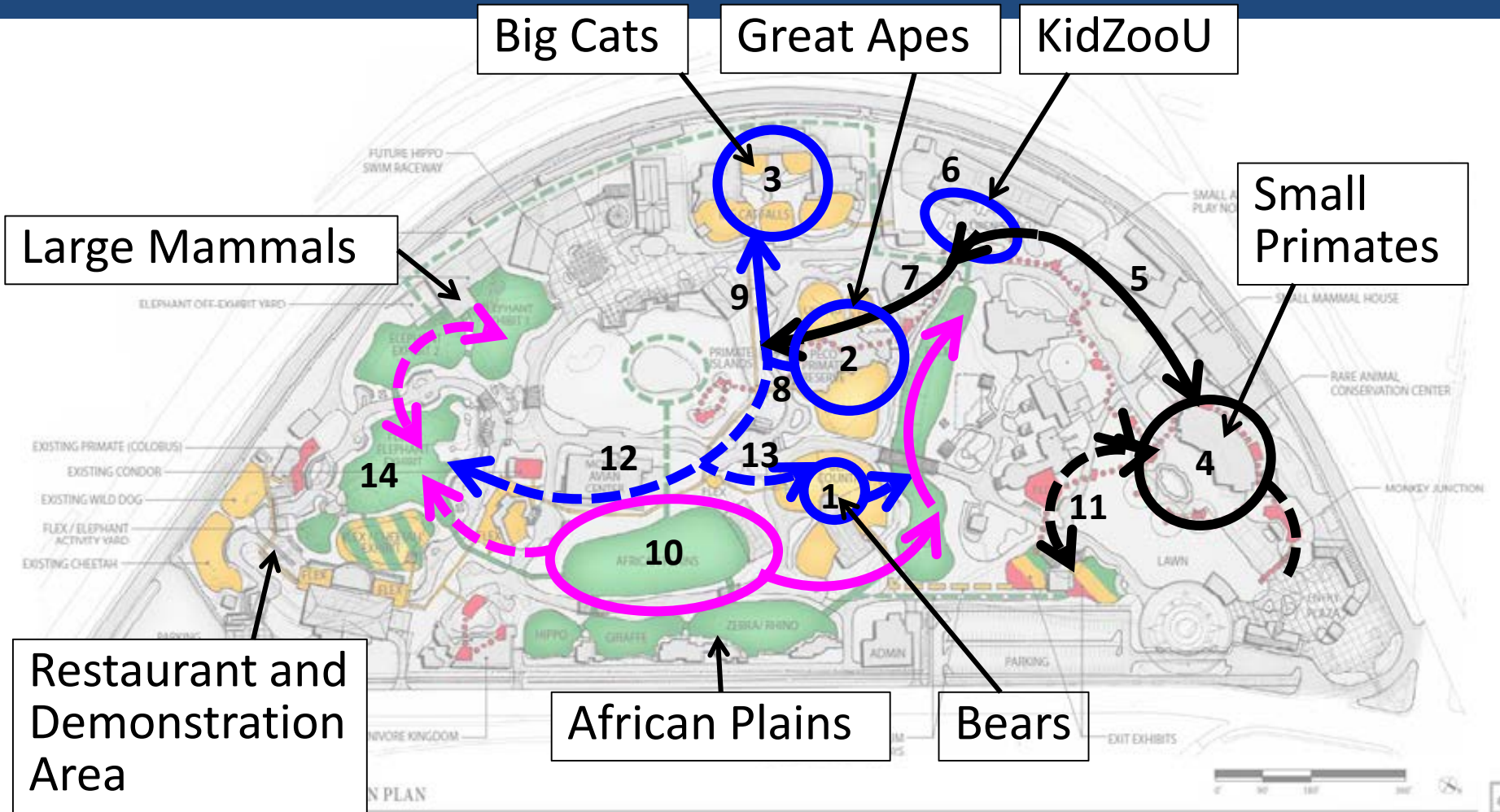**Zoo-Wide Rotation**
Tree Tops Trail   Philadelphia Zoo 360

Connecting the Zoo

Long-Term Phasing

Philadelphia Zoo

Tree-Tops Trail Species Using Phase One

Treetop Trail

Look up!

The meshed "trail" you see above you is an innovative animal pathway that stretches hundreds of feet through the trees. Monkeys and lemurs from inside the Rare Animal Conservation Center take turns using the trail and the "lookouts" hanging in the trees to travel, play, rest and explore.

Who's out and about today?

Blue-eyed black lemur

Bolivian gray titi monkey

Douc langur

Geoffroy's marmoset

Goeldi's monkey

Golden lion tamarin

Mongoose lemur
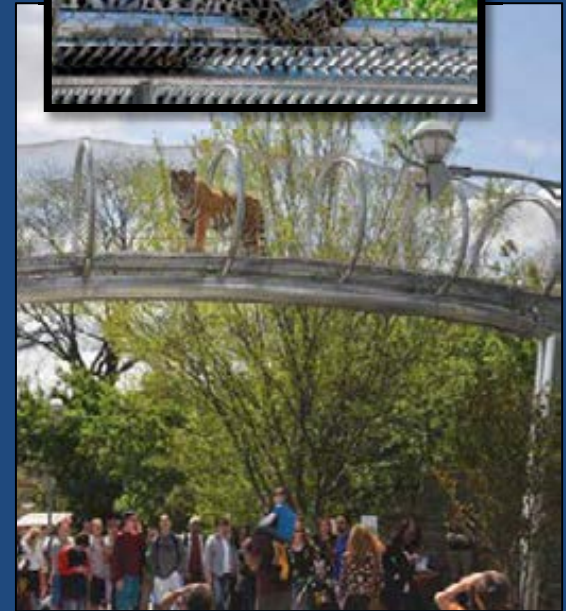
Pied tamarin

Red-capped mangabey

White-faced saki

Mid-Size Animal Trail

Big Cat and Future Ape Overpass

Photos and video: Philadelphia Zoo

Integrating Enrichment Activities

Built-in ("Hardware")
Staff Provided ("Software")

- Melbourne Zoo Model - Enrichment-driven design (EE + Training & Conditioning)

- Animal wellbeing co-equal with visitor experience, staff needs and zoo expenses.

- Staff & facility costs
  - Determined at each design stage
  - Short term
  - Long term

Project Partnering Process

- Project Design Charter "Stakeholder Bill of Rights" or "Enrichment Framework", at very beginning

- All stakeholders represented & responsible

- Well managed iterative, collaborative process

- Realistic construction and operating cost projections at each stage

- Full integration helps to secure built-in enrichment from budget cuts

Stakeholders

- Zoo Animals

- Free-Ranging Animals in the Zoo

- Zoo Plants

- Zoo Staff and Volunteers

- Zoo Visitors

- Zoo as a Business

Typical Questions

- What animal welfare benefits are desired?

- Type of stimulus?

- Species and individual animal personality?

- Training and conditioning?

- Visual/thematic/educational aspect?

- Materials in contact with animals?

- Mechanical system proposed?

- Likely Cost?

Importance of Prototyping

Melbourne Zoo Snow Leopard Enrichment
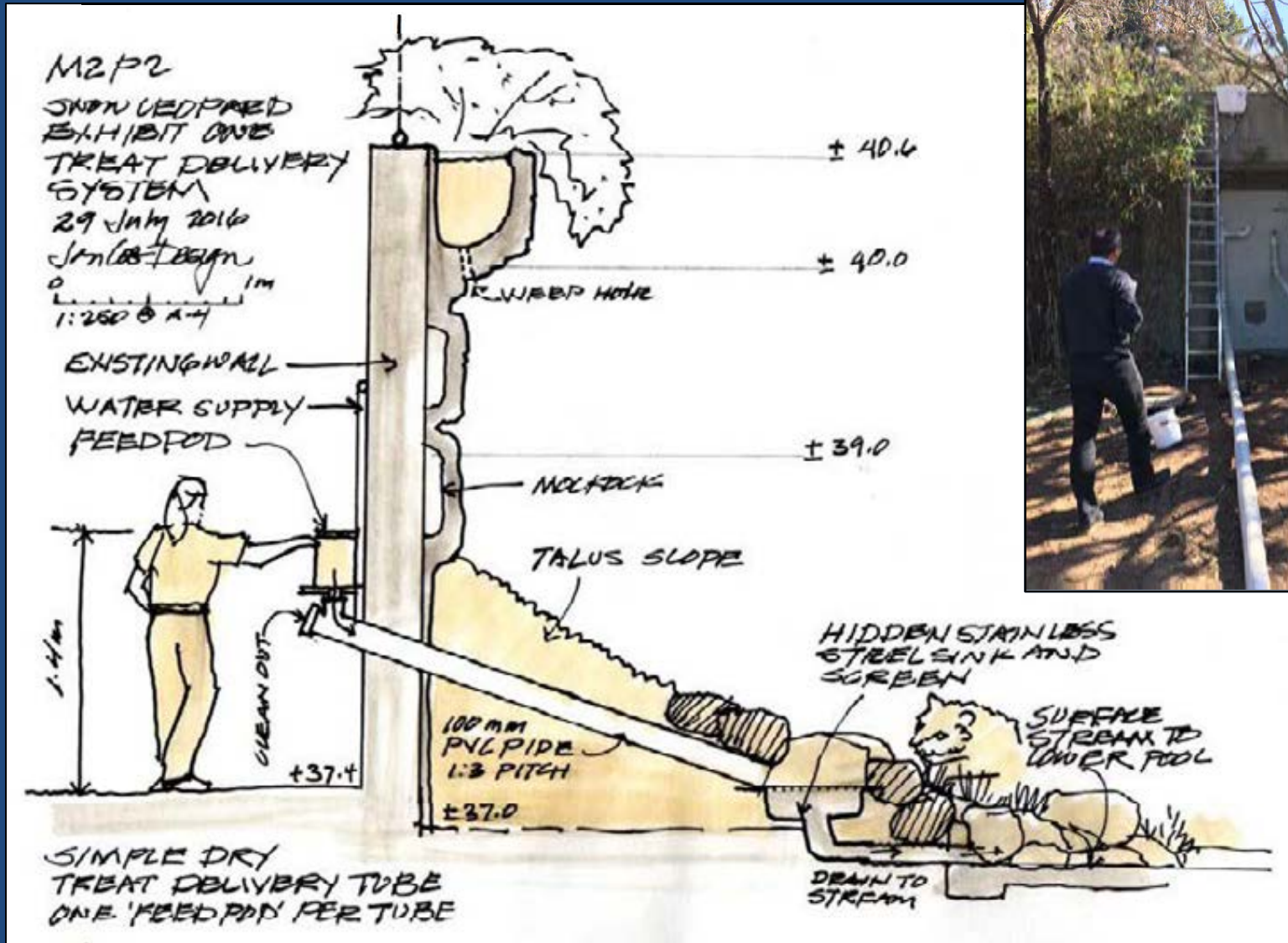
Why is EE important?

To Animals:

- Compensate for shortcomings in the captive environment

- Help animals reach optimum health and wellbeing

- Maintain long-term behavioural fitness within the population

Why is EE important?

To Keepers:

- Benefits "their animals"

- Novel, interesting work

- Additional job skills and professional growth

- Peer recognition

Why is EE important?

To Visitors:

- See animal better, (active animals are more interesting)

- See that animals are well cared for (people think animals doing interesting things are happier)
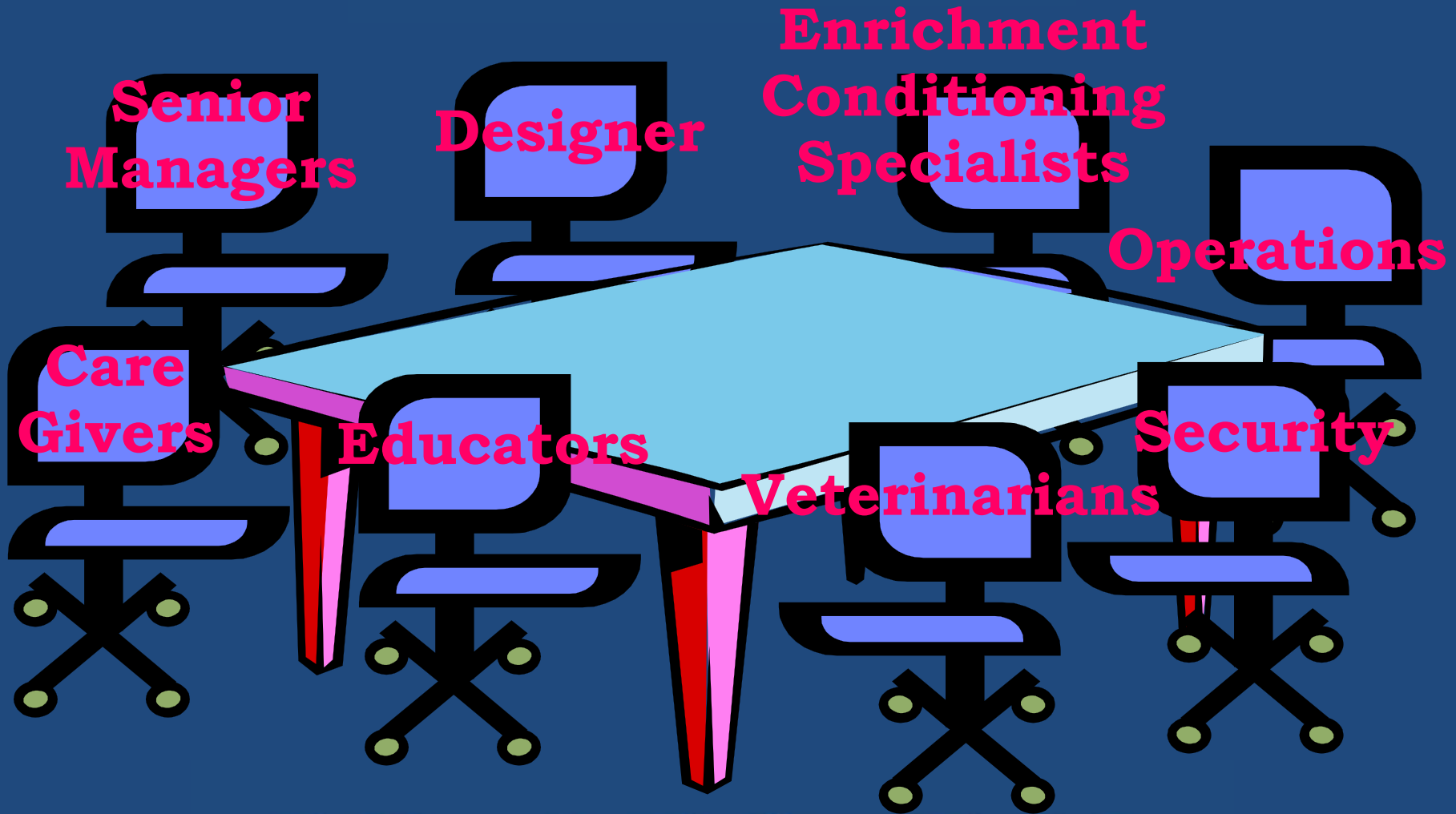
Why is EE important?

To Visitors:

- Watch caregivers providing training and enrichment is interesting and informative

- To occasionally participate in enrichment activities themselves

Let's think hard…*What are things we do for the animals that they could do better for themselves?*

Collaboration

Senior Managers
Designer
Enrichment Conditioning Specialists
Operations
Care Givers
Educators
Veterinarians
Security

A Seat at the Table

Summary

1. **What is best for the animals?**
   - ✓ Develops competence
   - ✓ A great place to live

2. **What is best for the visitors?**
   - ✓ Fun and exciting
   - ✓ What's the message?

3. **What is best for the business?**
   - ✓ Short term
   - ✓ Long term

4. **What is best for zoo staff?**
   - ✓ Safe
   - ✓ Rewarding

5. **What is best for research?**
   - ✓ Original
   - ✓ Useful

Exhibits are a Zoo's Natural Voice

Make enrichment count for

BOTH

Visitors and Animals!

Woodland Park Zoo   Photo: L. Sammons