Social Learning

Ontogeny

Development Over the Life Course

- Primates & Cetaceans both characterized by

  prolonged immaturity and **long life**

  - Indicates significant dependence on learning
  - A lot to learn to become competent (complex!) adults

Ontogeny

Different rules
at different ages

In multi-age groups,
<u>Role Models</u> can also vary with age

Ontogeny

Learning from Peers

(See Kuczaj & Eskelinen, 2014)

Ontogeny

Long lived

Spotted dolphins
gain spots as they age.
When elders (30+ yrs), spots “Fused”

Greying chimpanzee

Ontogeny

Menopause

Females survive past reproductive age

Humans
(altho <u>not</u>
other primates)

Pilot Whales

Elephants

Ontogeny

The death of a custom…

An anecdote

For many years, observers noted
one pod of Orca always went
"long way around"
one island in the sound

After two matriarches
passed away,
pod took more efficient route

Ontogeny

Even the most fundamental reproductive skills involve

LEARNING

Ontogeny

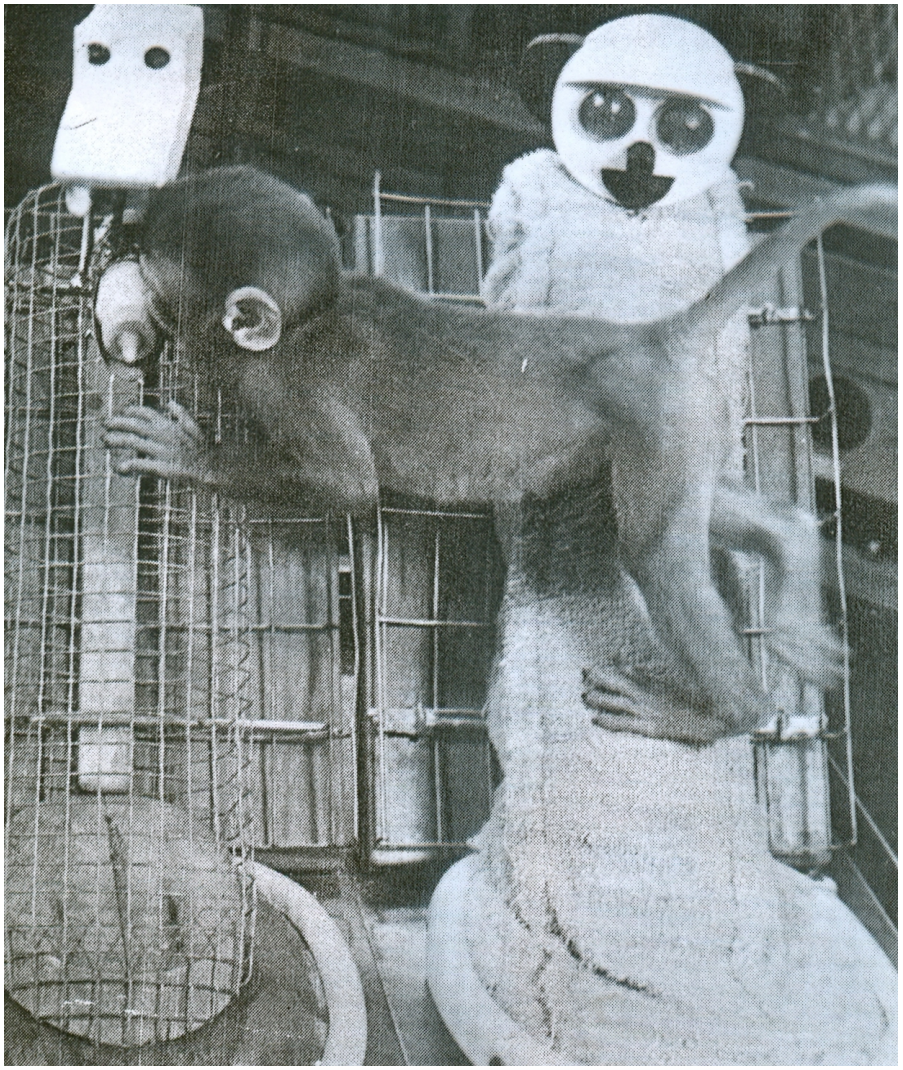
Harlow:
Rearing Primates in Isolation

In the absence of this . . .

. . . Primates end up like this.

Ontogeny

Harlow:
Rearing Primates in Isolation



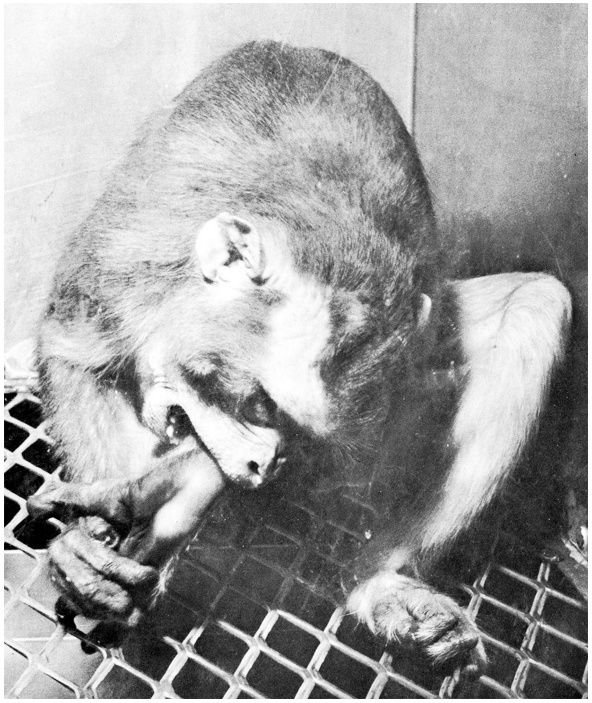
Isolates prefer “cloth mother”
they can cling to
over wire mother, even tho
only latter has food.

Ontogeny

Harlow:
Rearing Primates in Isolation

When isolates are put together, they cling to one another continually

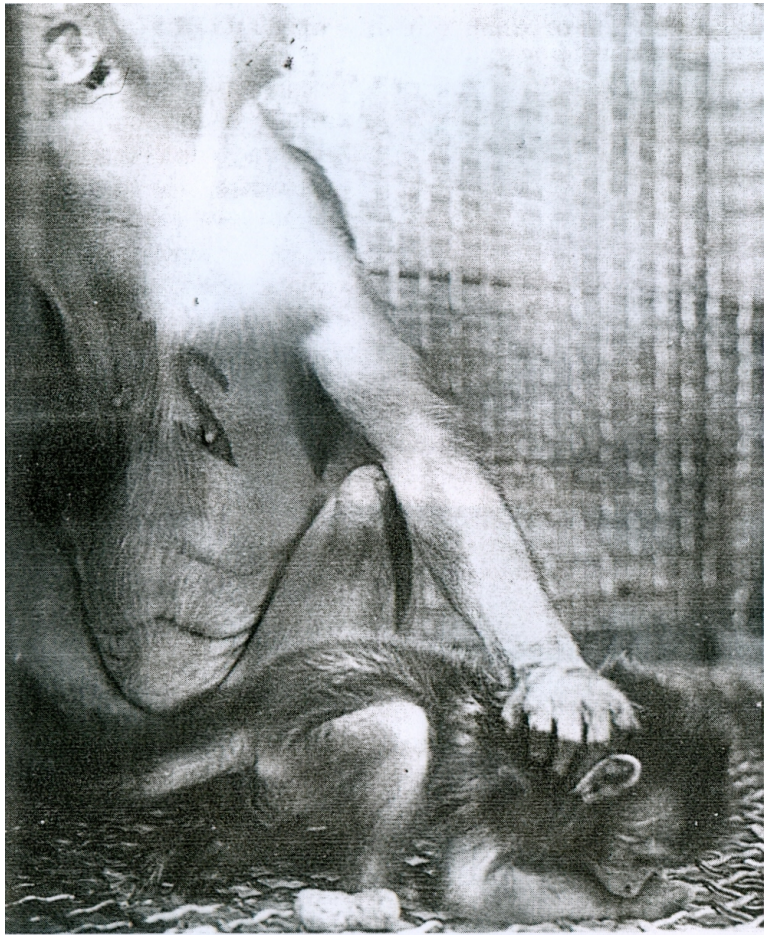
Older, when alone, show self-abuse



Ontogeny

Harlow:
Rearing Primates in Isolation

As adults, show poor
mating/parenting skills



So, even the most basic
"survival instincts"
– like how to successfully reproduce –
are subject to the effects of
Social Learning

Fortunately, even if not mothered as an infant, young primates can, in a social setting, recover many skills

- Orphans
  - Adoption of orphaned infants in the wild rare, but occurs

- At the Zoo
  - If mother not competent, infants were raised in nursery
  - At first not returned to group until 3 years old!
  - Low ranking, subject to some abuse
  - But, if socialize with mothers & offspring, can still become good mothers themselves!

Cultural Traditions

Controversial!

- Some argue "culture" requires human-specific cognition
  - e.g. "Cultural transmission" requires intentional imitation? Teaching?
- Data best when population diffs **not** attributable to ecological diffs **alone**
  - e.g. Nuts and stones available in 2 chimp habitats,
    but only one population uses stones to crack nuts
- Otherwise hard to tell if acquired via individual trial-and-error learning
  vs. social influence

Many documented traditions outlive their inventors!

i.e. Still practiced generations later

Cultural Traditions

Cultural Differences

Tai chimps crack nuts with hammer stone

Gombe chimps crack nuts with wood hammer

Cultural Traditions

Chimps in Bossou
"termite fish"
stripping sticks to
dip into their mounds.

Chimps in Mahale
"ant fish" instead,
even tho termites are available

Cultural Traditions

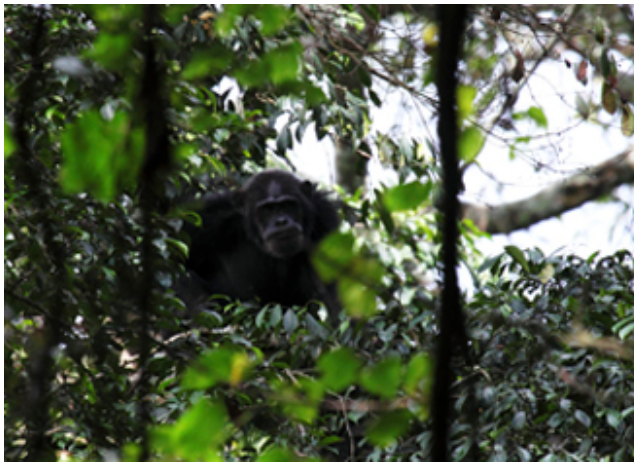
- Japanese Macaques are provisioned on beach with sweet potatoes, seeds
- Adolescent female **Imo** invented washing potatoes before eating
  - Removes grit, adds salty flavor
- Also first to toss seeds in water, separating them from sand

- Practice spread laterally to **Imo**'s friends,
  - then to their mothers,
  - then to others,
  - except oldest adult males
- Today, all descendants still practice this

Cultural Traditions

Cooperative Hunting in Tai Chimps

- Participants have **specific roles**



"Catcher" awaits prey being driven its way

"Flankers" move silently into positon

Cultural Traditions

Cooperative Hunting in Tai Chimps

- Participants have **specific roles**

"Driver"
noisily drives
monkey between
Flankers to Catcher

"Catcher"
if he's lucky,
catches prey

Cultural Traditions

Cooperative Hunting in Tai Chimps

Share meat only with collaborators

Cultural Traditions

Chimpanzees Mob Monkeys in Kibale

"Free for all"
no obvious collaboration

Cultural Traditions

Kibale Chimps Share Meat Politically

Unlike Tai chims, not based on participation in collaboration, but on power in group

Cultural Traditions

Ecology *does* matter…

Thick, ancient **Tai** forest –
many ways monkey can escape.

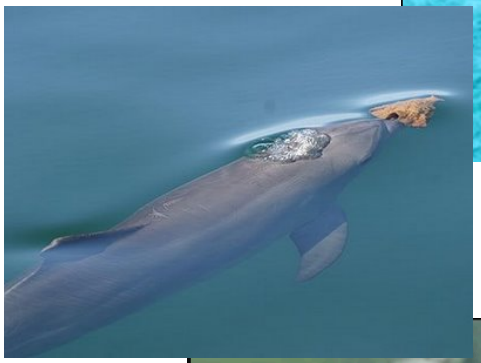
Requires collaboration
for hunting success.

In more open **Kibale** woodland,
easier to isolate
and/or mob monkey

See Whiten et alal. 1999
for many other primate examples!

Cultural Traditions

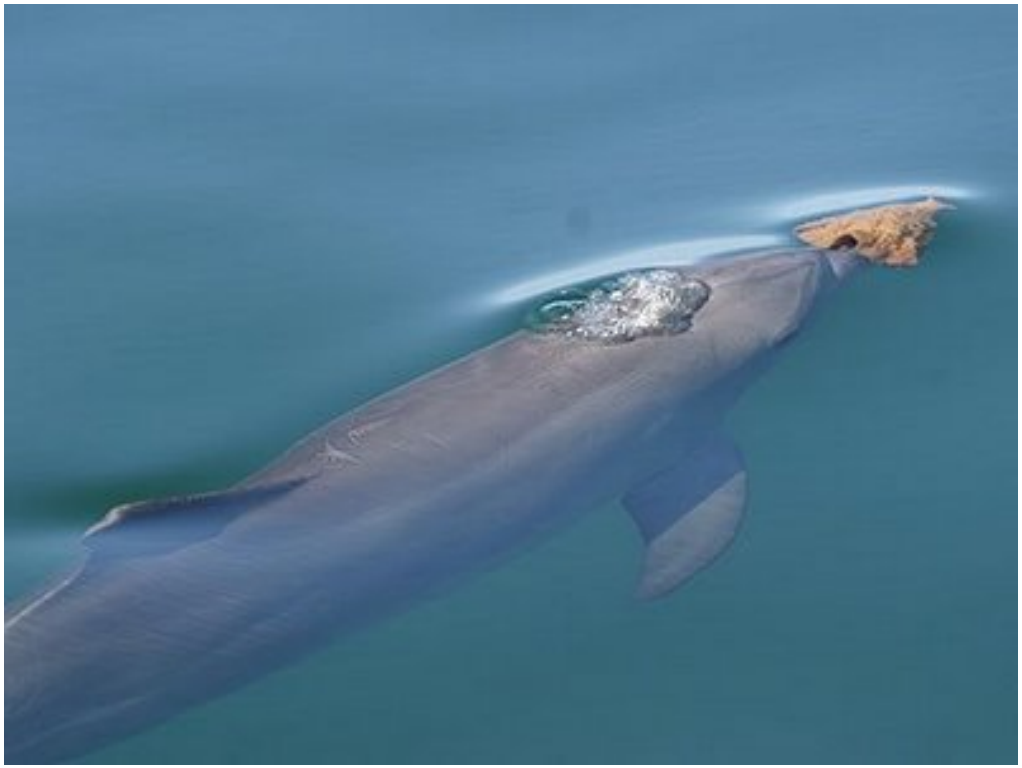
- Foraging traditions can vary between, even within, a population
  - e.g. Bottlenose do...
    - Kerplunking
    - Sponging
    - Beaching prey
    - Crater fishing, etc.



Cultural Traditions

Sponge Carrying in Shark Bay

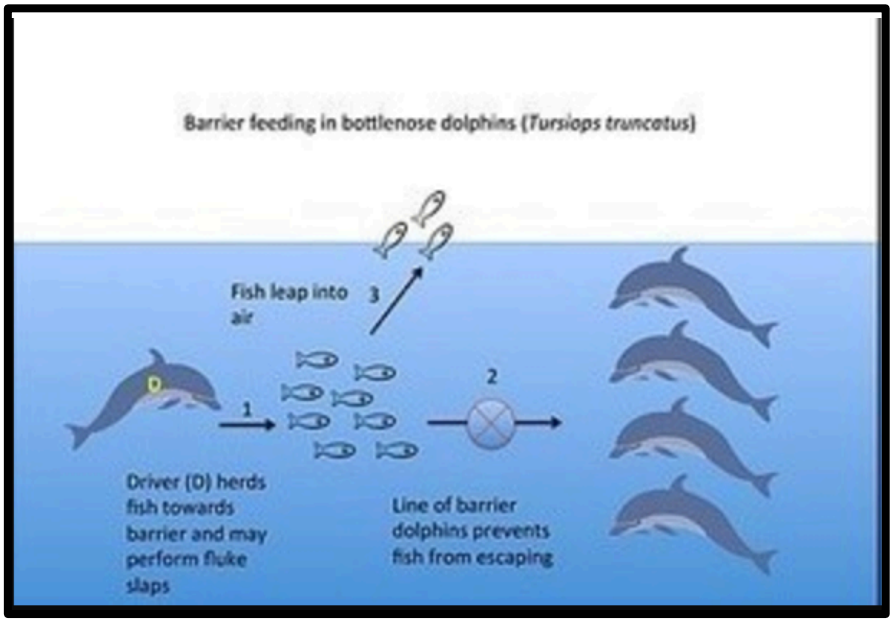
Documented as being "passed down" to offspring
of the relatively few practitioners from that population



Mann et al., 2009

Cultural Traditions

Collaborative foraging
(unlike in primates)
is commonplace in dolphins



- Can include practiced roles
  - Driver & Barrier
- Well practiced teams more efficient

Cultural Traditions

Bottlenose coalitional behavior varies across populations

Australia – 3 males/coalition

Florida – 2 males/coalition

Scotland
No coalitions!

Cultural Traditions

Occasional, Distinctive Behaviors

"Fads"

- Orca pod carry fish bits
  - Short-lived (e.g. 2 days),
  - Practiced by large subset of animals

- Tail Walking
  - Commonly trained in captivity
    - Seldom seen in wild
  - Appeared, for a few weeks, in one wild group of Bottlenose

Cultural Traditions

Rituals

- Orca greeting ceremony, rarely seen
  even tho involves a commonly-observed group

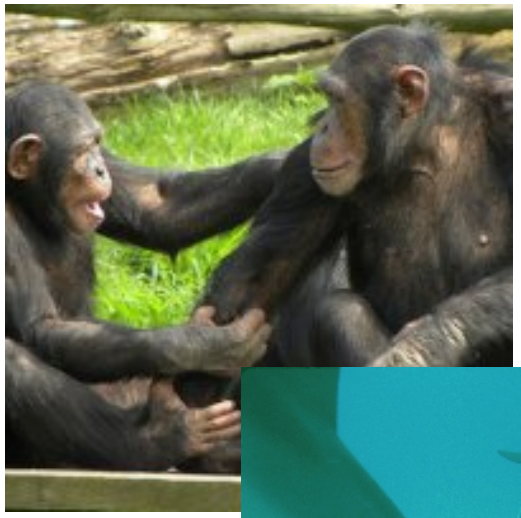
- Neighboring groups line up head to head*, silent,
  until all in line, then sudden noisy interaction

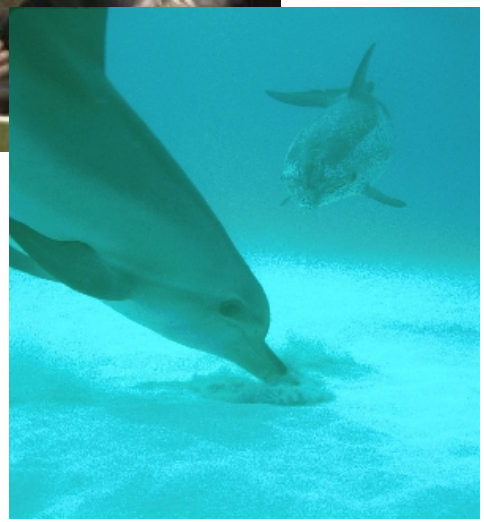
* Note: Above image fabricated via duplication

Cultural Traditions

Much of basic, daily behavior is likely "Enculturated"

i.e. largely learned through observation & co-participation





Cultural Traditions

Despotic Rhesus & Egalitarian Stumptail Macaques

Rhesus – live by strict hierarchy

Stumptails – less rigid society

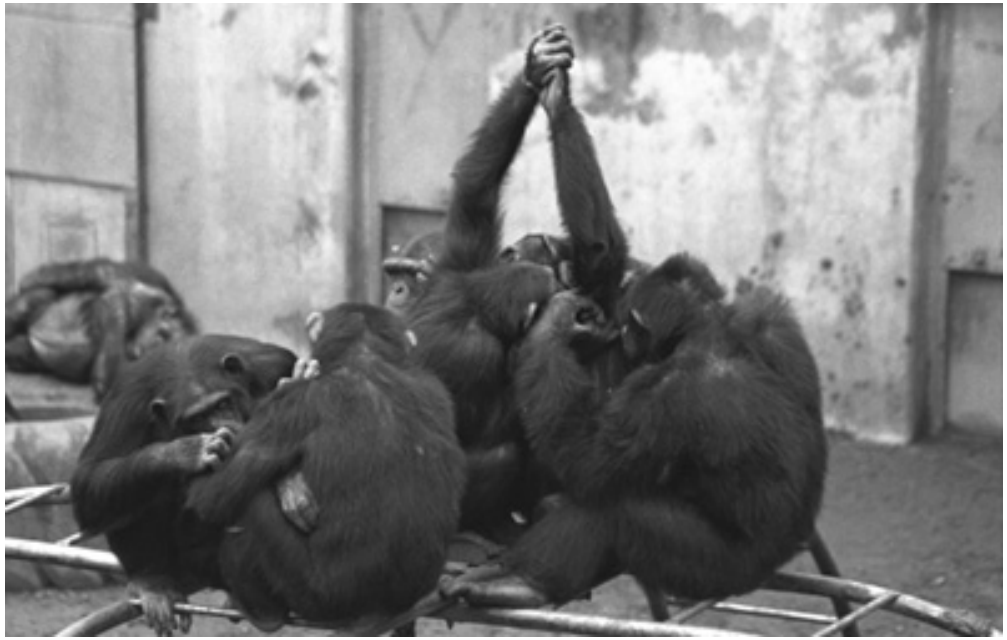
A macaque raised in "other" culture,
though still retains species-specific temperament,
adopts many culture-specific behaviors.

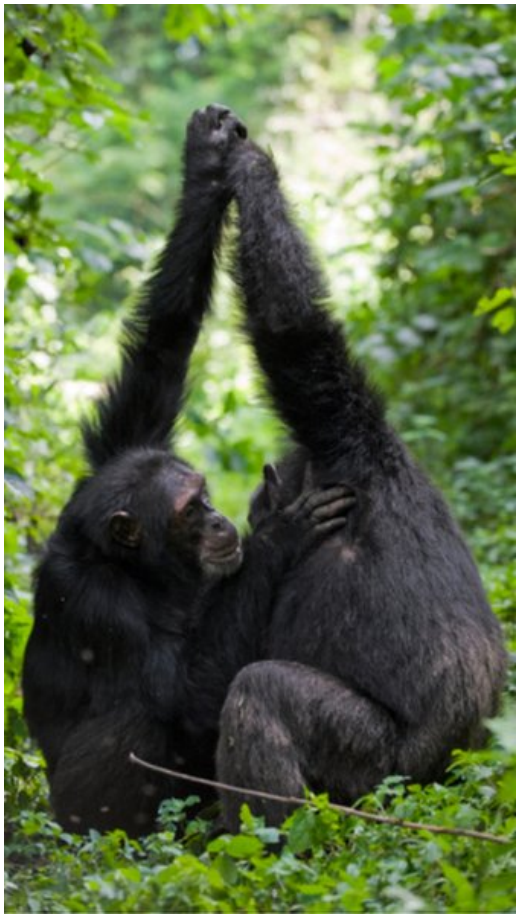
Mechanisms of Social Learning

- Social Reinforcement
- Synchrony & Imitation
- Teaching

Social Reinforcement

- Effective engagement is reinforcing,
  - even if not deliberate, planned
  - "This is how we do it"
  - Can include arbitrary practices
    - e.g. Arm-clasp grooming in certain chimp pops.



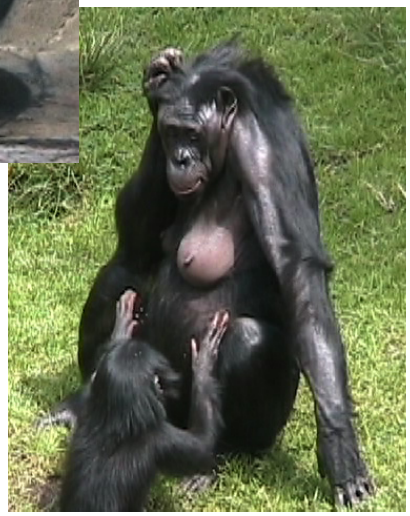


Social Reinforcement

Ontogenetic Ritualization

Reach as a portion of carrying.

- Portion of shared practice becomes a signal for such engagement...
  - Can be for *only* those participants
  - e.g. Element of group-specific play behavior can come to work to solicit play in that group

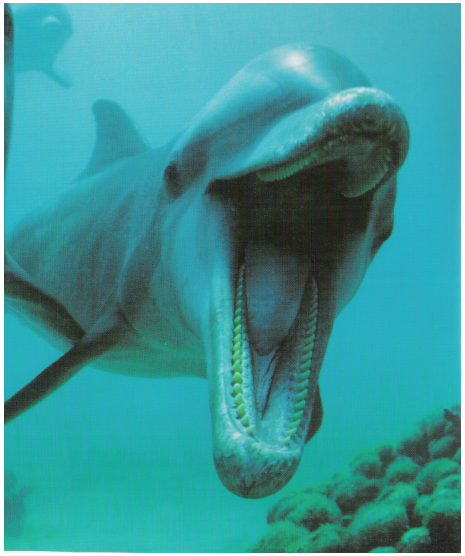


Reach as a request to carry.

Social Reinforcement

Ontogenetic Ritualization

- Common gesture/postures **afford** next step:
  - Pout >> Suckle
  - Laugh >> Play bite
  - Bare teeth >> Real bite

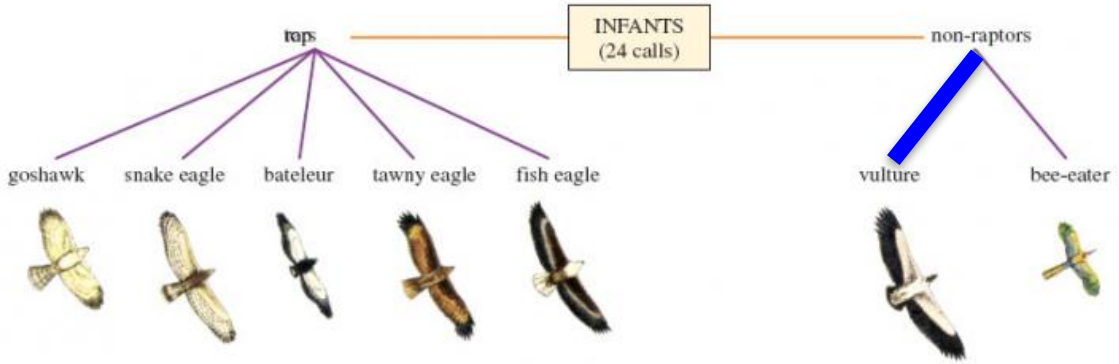


- e.g. “Present for groom” = position yourself towards them such that minimal effort by the other is required
  - This increases likelihood that grooming will occur
  - If grooming does occur, **reinforcing**!

Social Reinforcement

Vervet Alarm Call Learning

Infants -
Begin calling @ ~1year,
at do first right category/
wrong instance
(e.g. *Eagle* call to Vulture)



Social Reinforcement

Vervet Alarm Call Learning

Infants -
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The distribution
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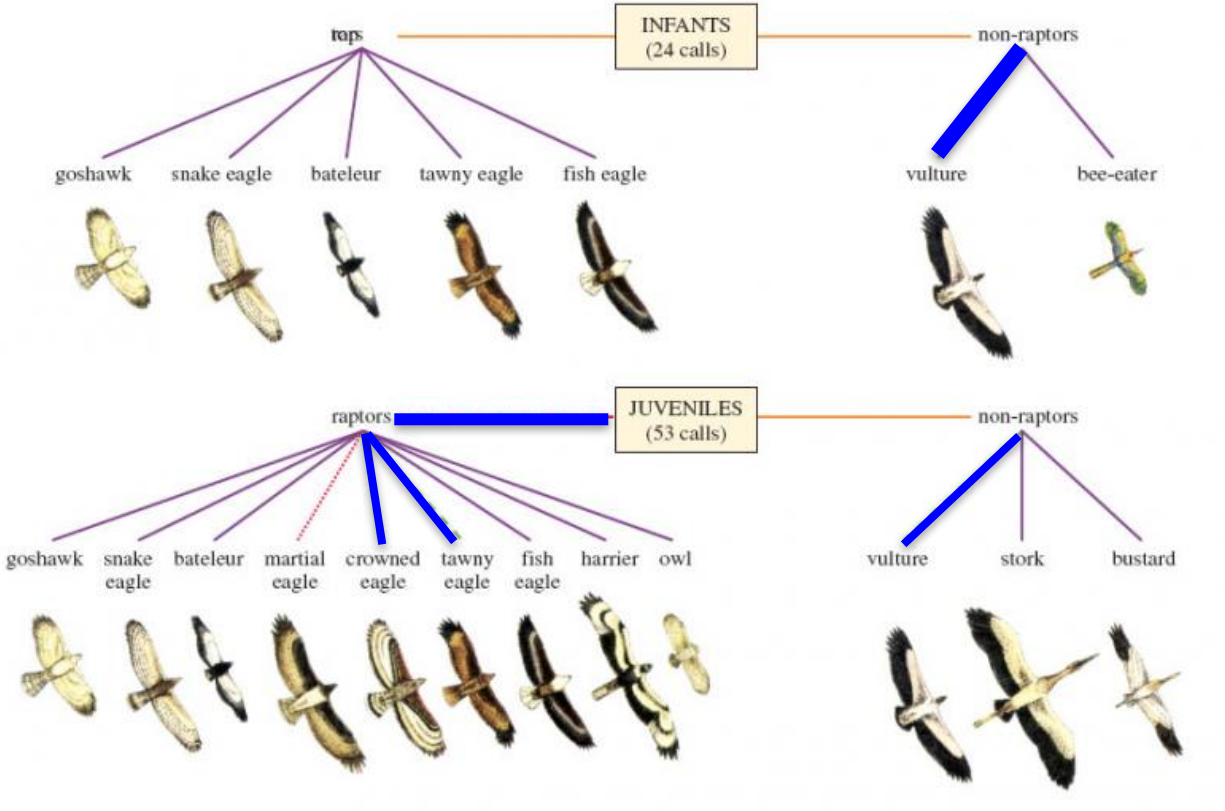

Social Reinforcement

Vervet Alarm Call Learning

Infants -
Begin calling @ ~1year,
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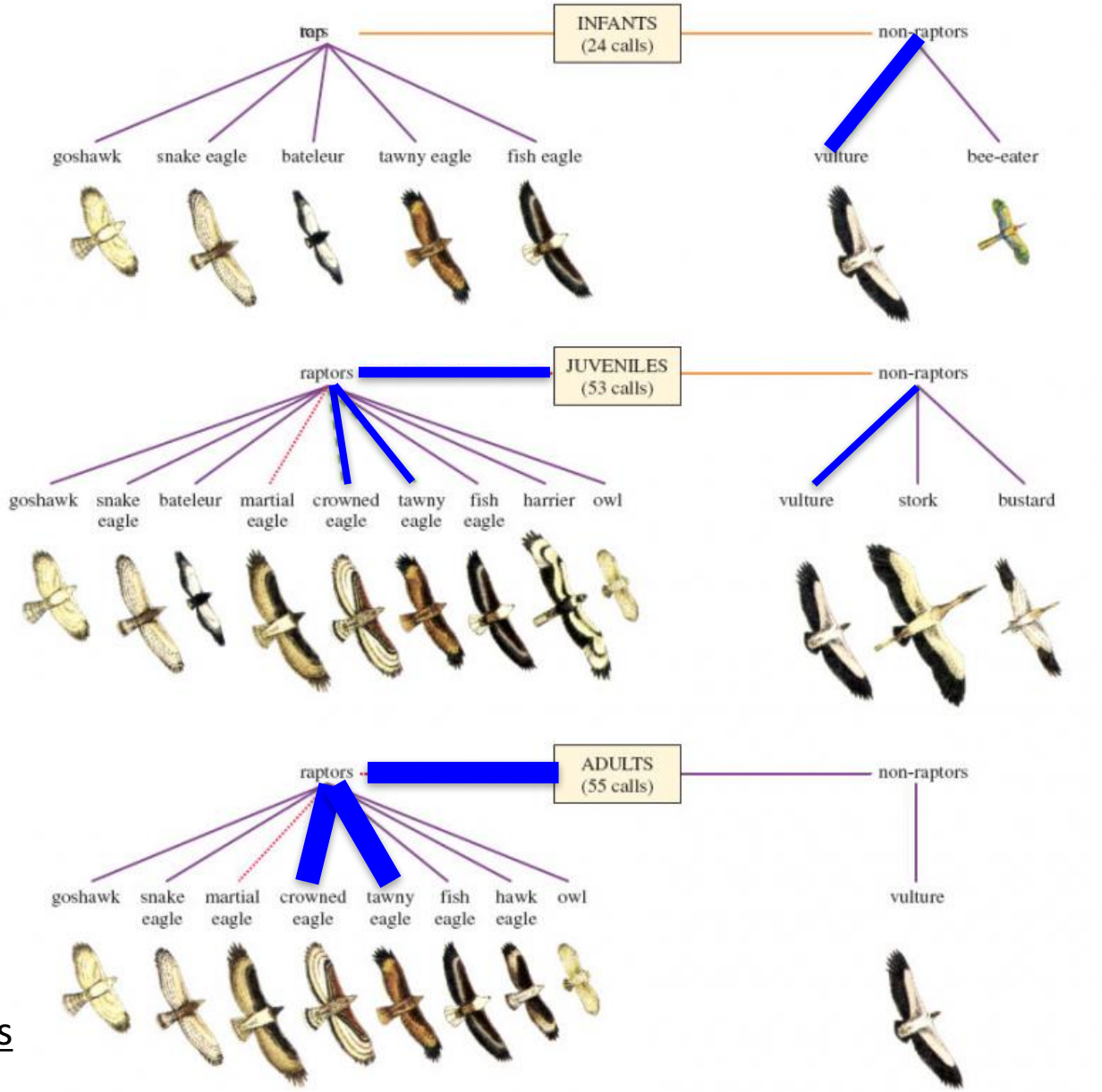
(e.g. *Eagle* call to Vulture)

The distribution
of targets of their calls
changes with age

Eventually,
learn to <u>only</u> alarm
to species that are a threat

NOTE! Which are also
to those to which
<u>everyone in the group alarms</u>



Social Reinforcement

Vervet Alarm Call Learning

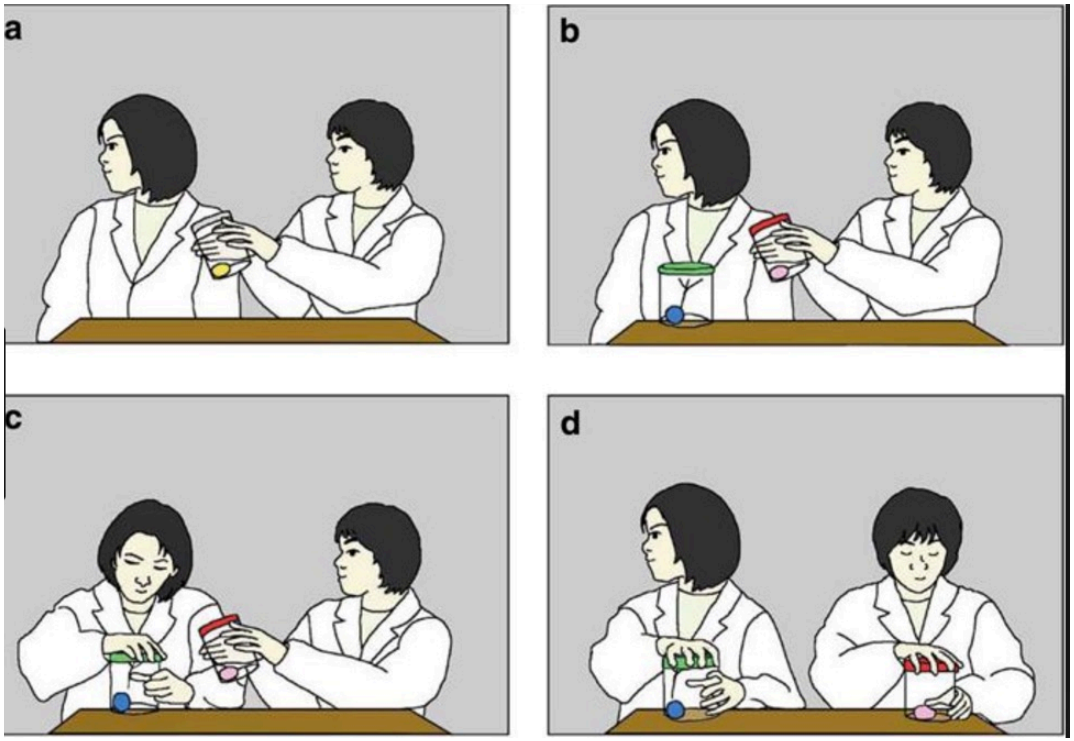
Most likely learn through
<u>feedback from others' response</u>

Its reinforcing (exciting! and better protection)
to cause others to react!

Imitation may also play a role...?

Social Reinforcement

Can also learn by observing reinforcement gained by others!

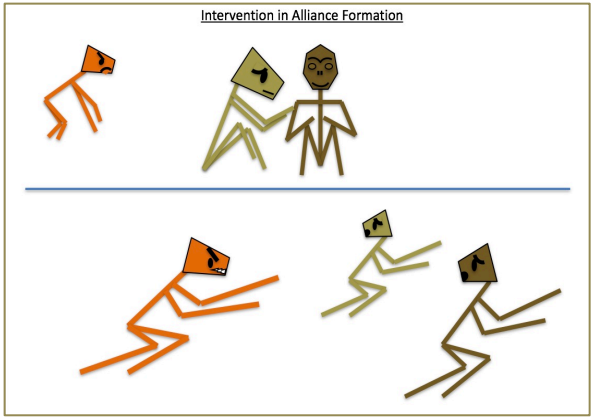


Anderson et al. 2013

- Cebus sees human being helpful/not to other human
- More likely to later solicit food from helpful than non-helpful

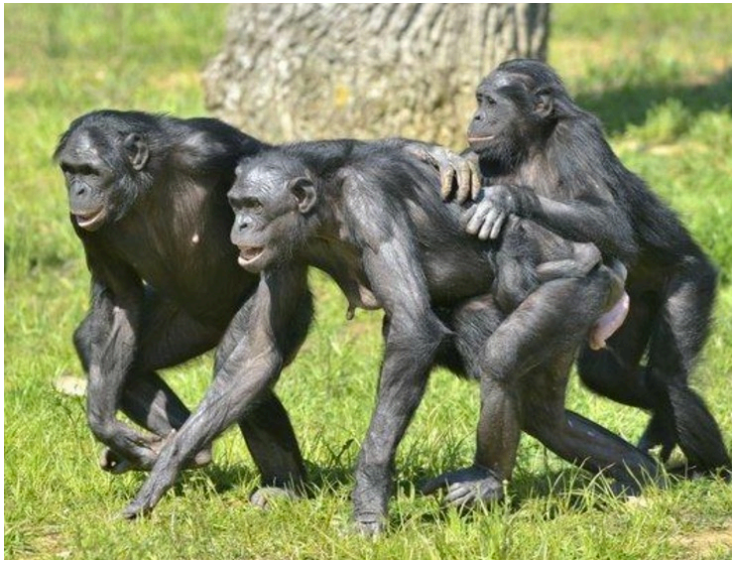
Social Reinforcement

Some behavior is selectively <u>punished</u> by others



- e.g. Coalition building disrupted by dominants,
- e.g. Females mating with errant males harassed by dom
- e.g. Orcas hold infants out of water, or temporarily pin them (or trainer) to bottom, as reprimand
- e.g. Spotted dolphins sanction (or just gang up on?) rule breakers?

Synchrony & Imitation



Synchrony in Cetaceans

Begins day one...

Offers many opportunities to observe, imitate, learn

Synchrony in Cetaceans

Synchronous surfacings, leaps, indicate tight, prolonged associations

Synchrony in Cetaceans

Male coalitions in bottlenose dolphins produce elaborate synchronous displays

Primates

Doing what mom does

Primates

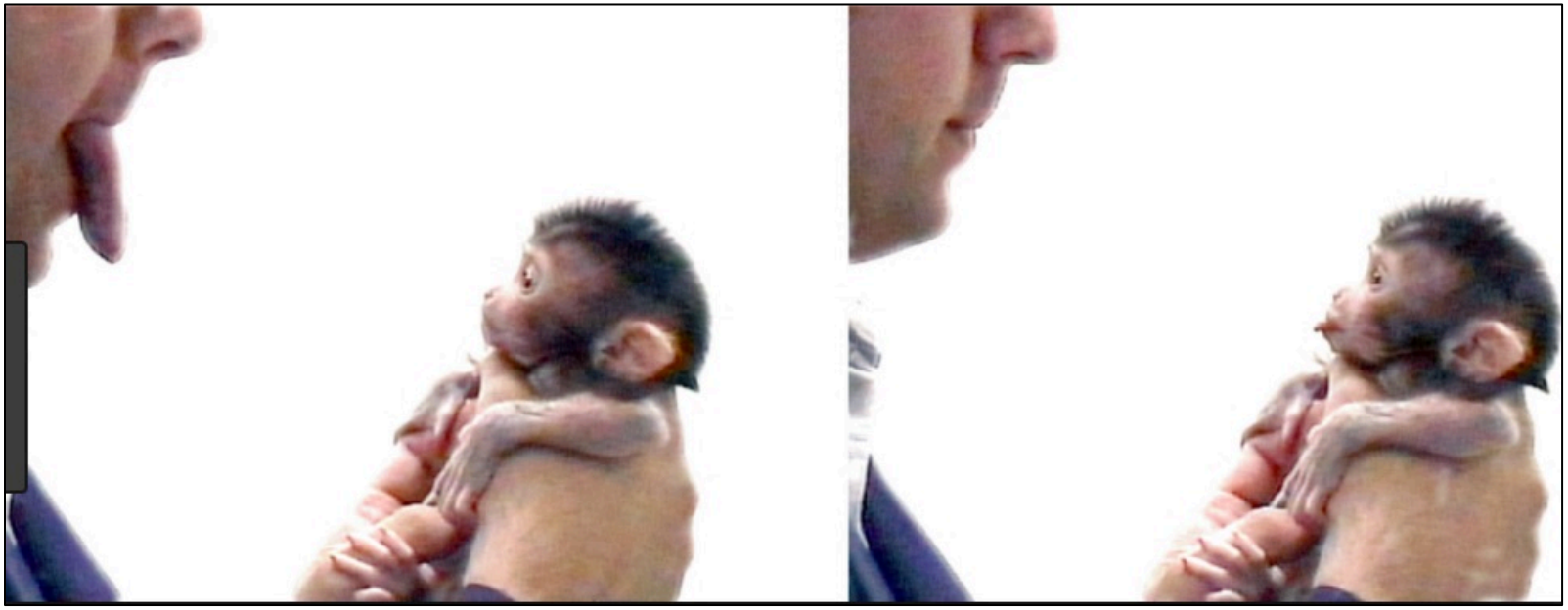
Primates have tendency to
Do as Others Do

- Especially youngsters show "monkey see, monkey do"
- Join in, but <u>not necessarily align</u> (synchronize) w/others

(See "Stick-Stick" video)

Primates

Especially for face moves,
primates come prepared to imitate



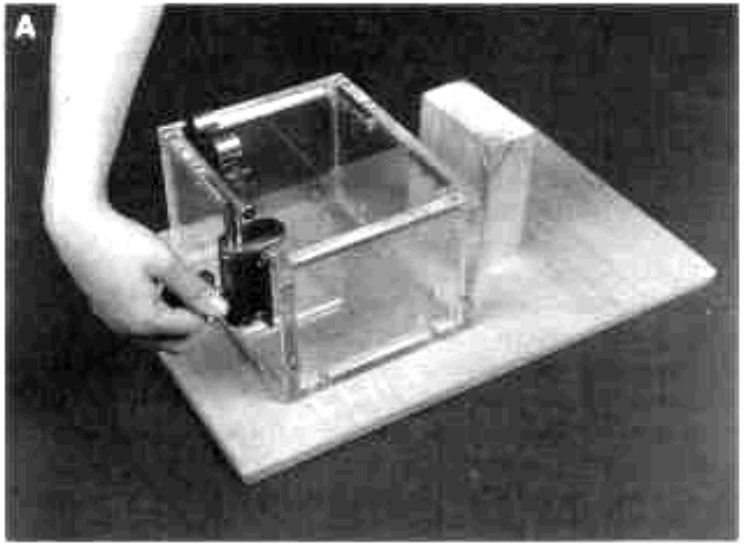
Rhesus newborn imitates tongue protrusion

However, primates' ability to use imitation has its limitations. . .

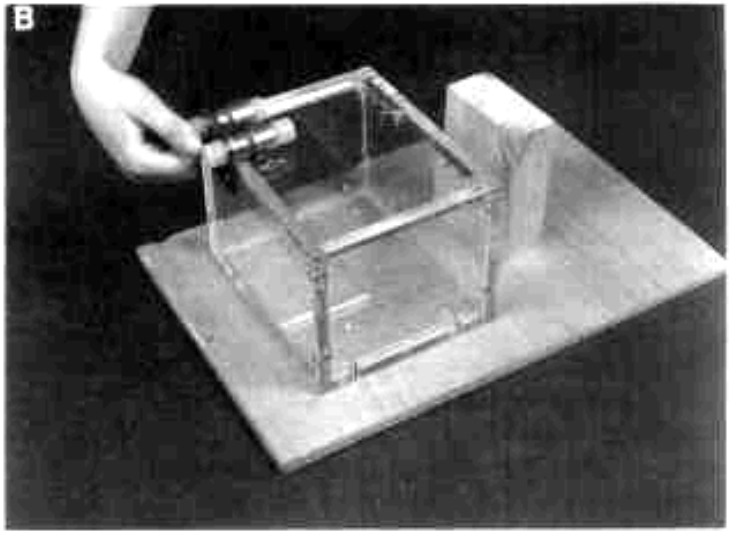
"Artificial Fruit" Experiments

(Whiten et al., 1996)

Group A observes one way to open box



Group B observes a different way to open box



NHPs more likely to imitate outcome = "**Emulation**"

- i.e. Got into box one way or another

Humans more likely to imitate means (see Horowitz 2003)

- i.e. Mimic particulars of how its done

Although Apes do show some success with "Do as I do"

Successful w/in limits –

e.g. Better with performing actions with/on body than to objects

Dolphins, compared to primates,
do <u>exceptionally well</u> at imitating on command

Recall their ability in the lab for
"Tandem Novelty"

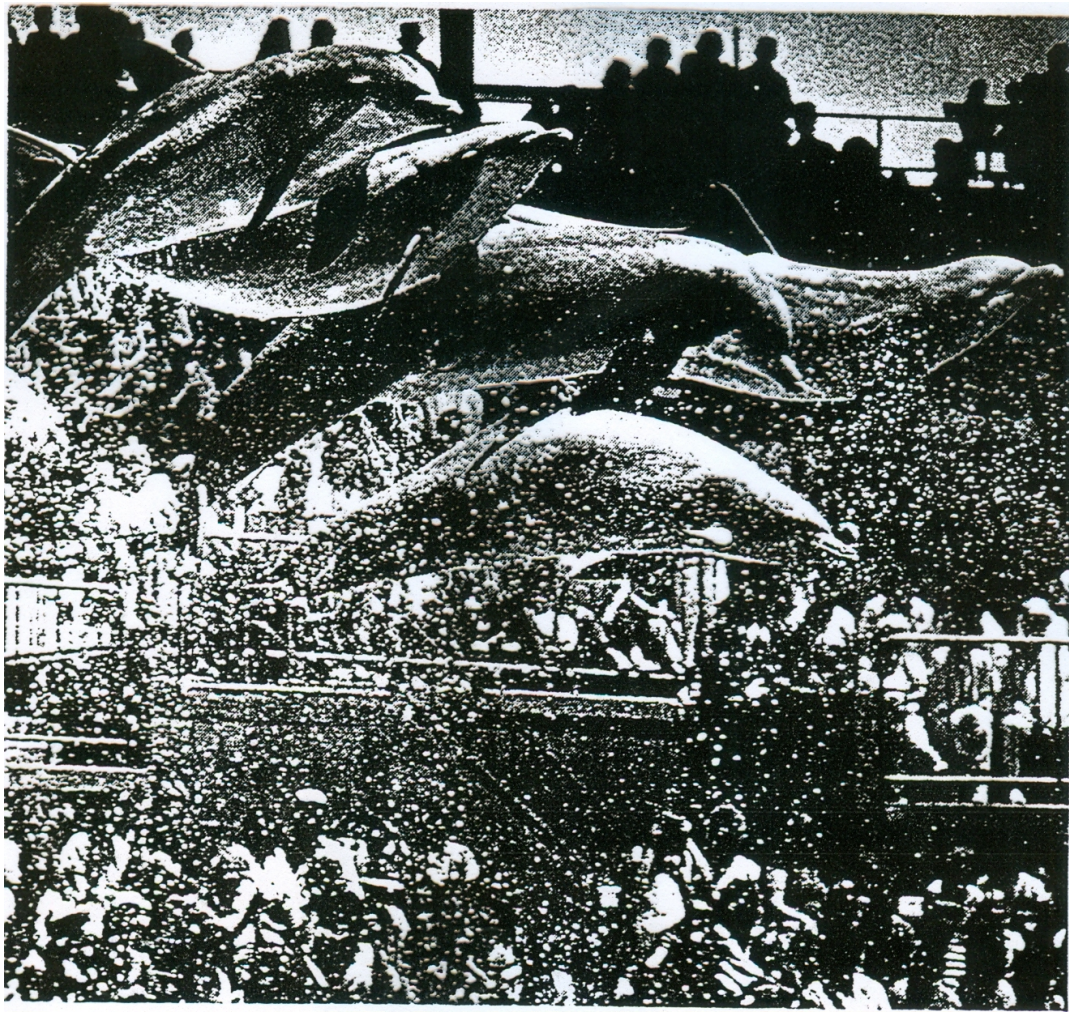
Dolphins, compared to primates,
do exceptionally well at imitating on command

Can mimic conspecifics
OR
translate from human model

- Altho best success w/juveniles vs. adults
- Existing social relations may constrain
  - e.g. Subordinate mimic dominant, not reverse

Follow command “Repeat” (Mimic Self)

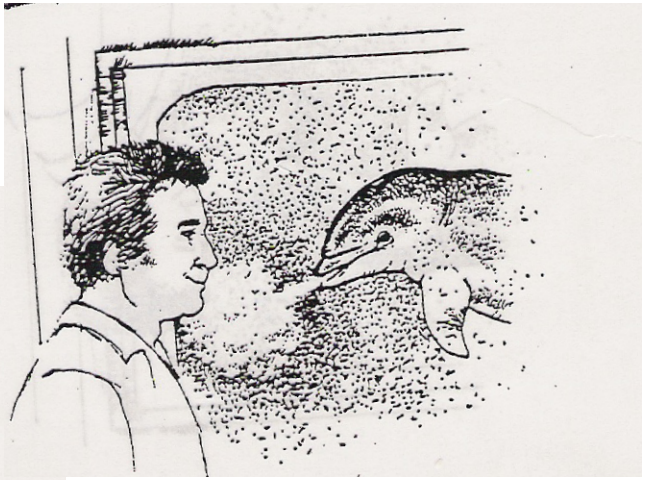
Spontaneous (untrained) behavior imitation in captivity

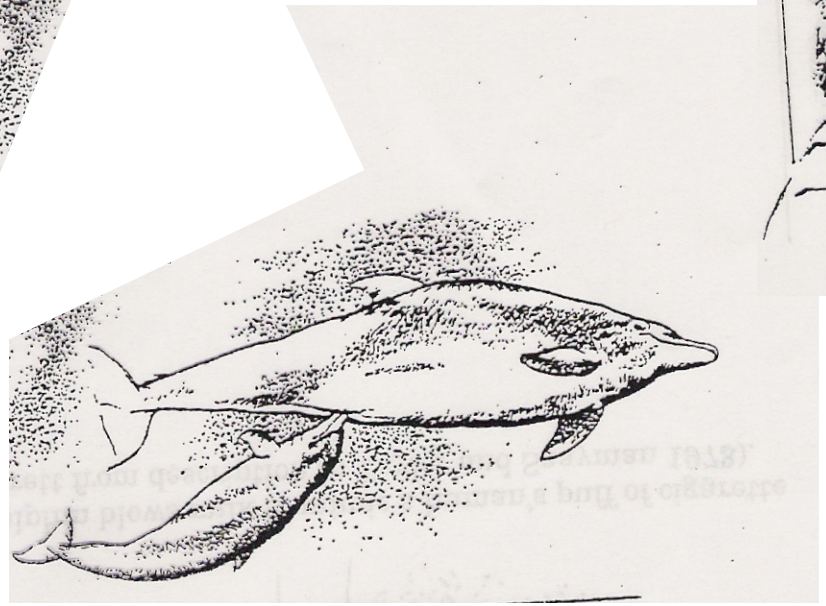


Performing animals sometimes learn others' show behaviors without training

Spontaneous (untrained) behavior imitation in captivity

Imitate humans:
Scrape window w/tool
Release milk like smoke etc.





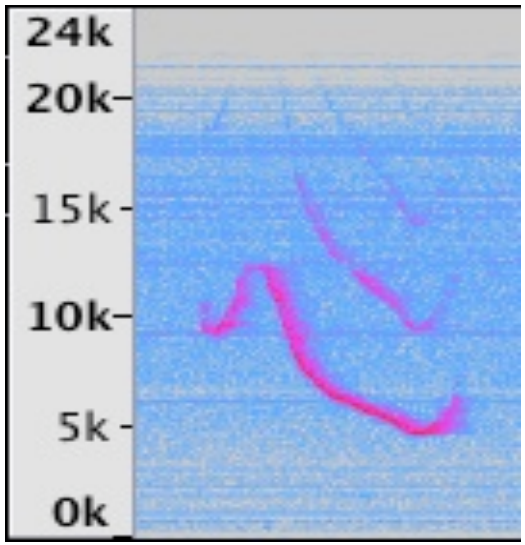
Tayler & Saayman, 1973

Both taxa react to being mimicked

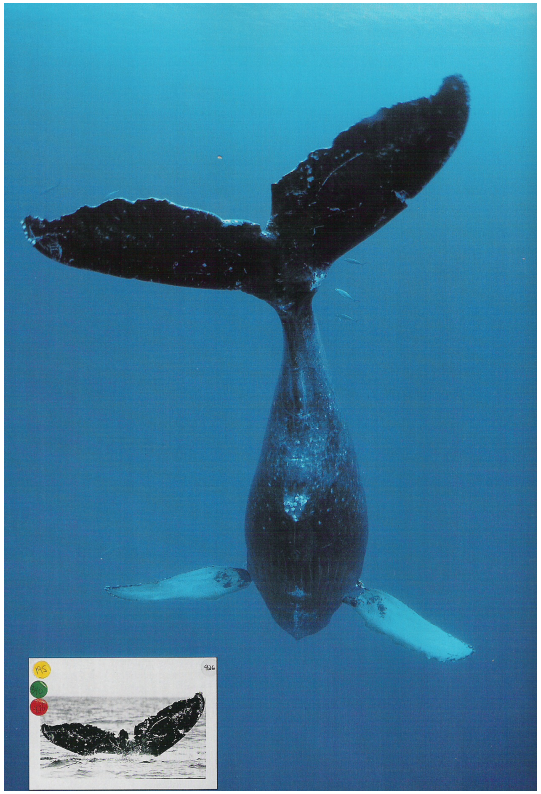
Produce novel and/or, repetitive moves

Cebus prefers human who mimics it over one who does not

Vocal Imitation

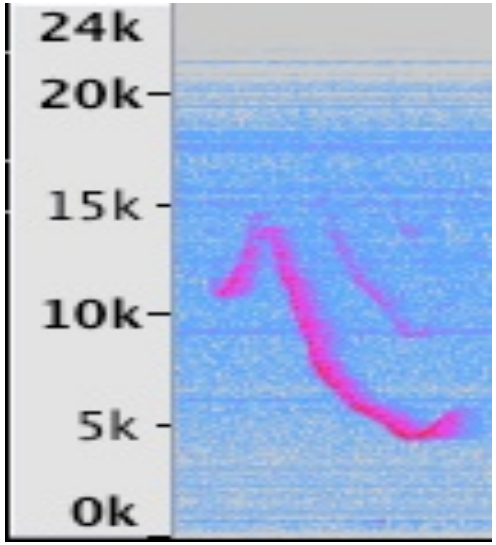


- Evident in <u>cetaceans</u>
  - But <u>not</u> in nonhuman primates
- <u>Rare</u> in mammals
  - More common in birds



Humpback whale song

Signature whistle by signatore...



... by mimic

Vocal Imitation

In the field...

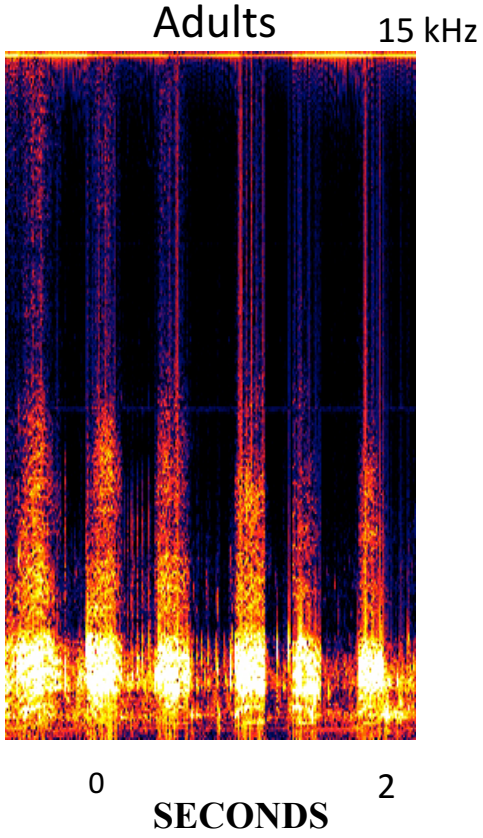
Spinner dolphins rest & play in shallow bays in Hawaii

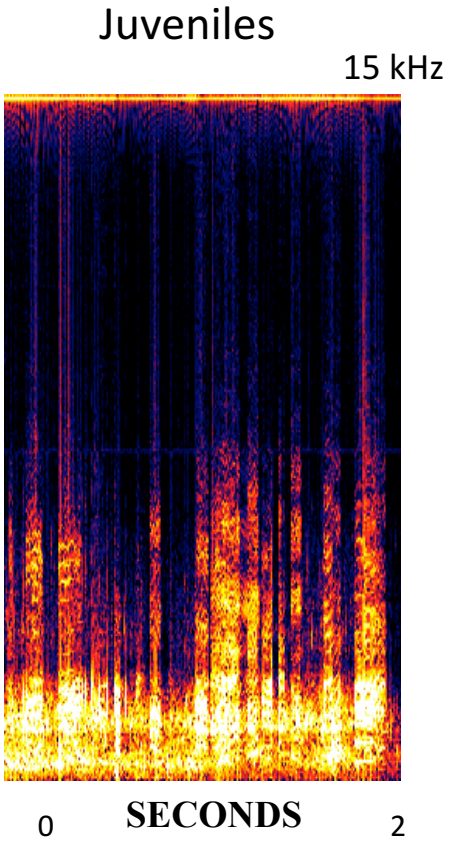
When time to move offshore, animals **CHORUS** their whistles

Only when ALL are participating, will they leave the bay

Vocal Imitation

In the field...





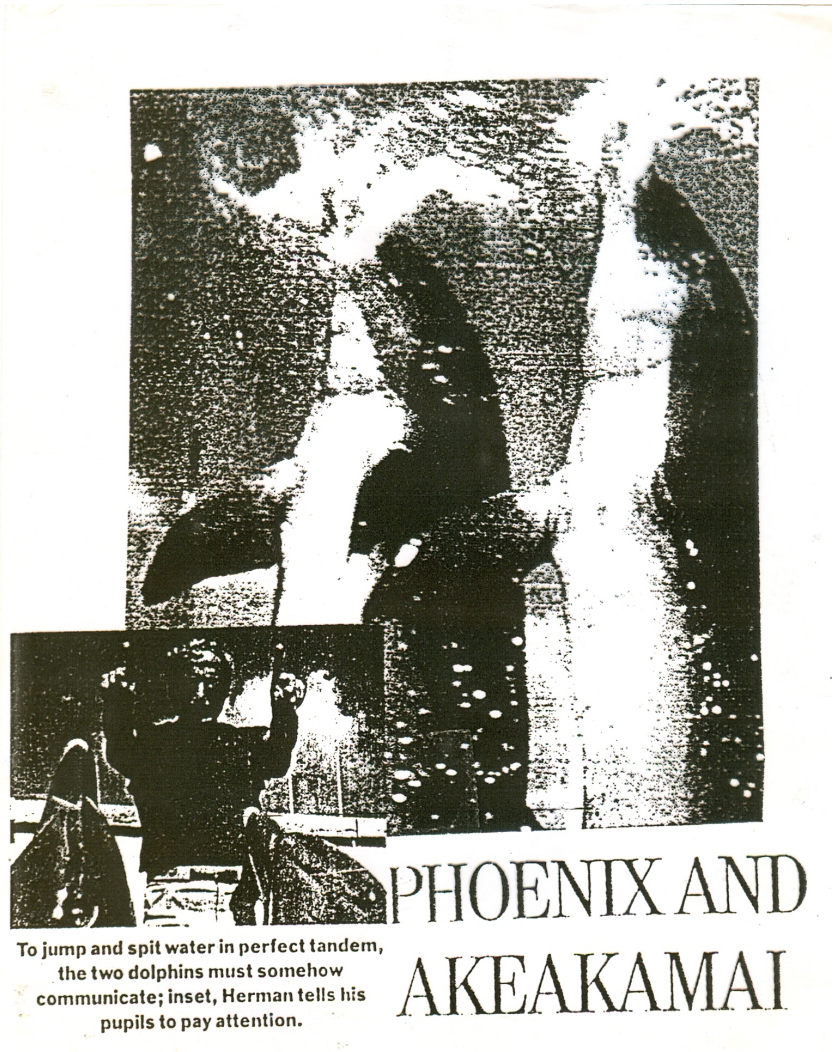
- Experienced Spotted alliances synchronize their intense burst-pulses directed at target
- Younger groups much poorer at synchronizing
  - So <u>requires group practice</u>

Vocal Imitation

Orca tank-mates from diff oceans
developed new tank-specific Pod-Call

Synchrony & Imitation

Trained Vocal Mimicry

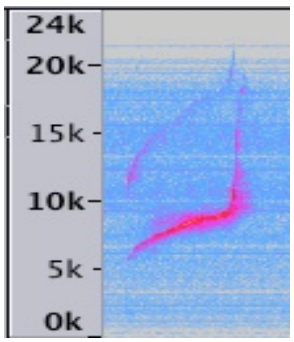


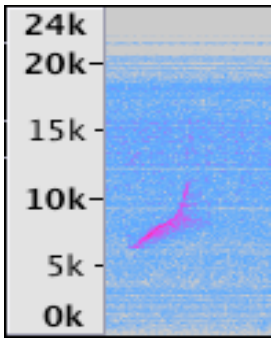
PHOENIX AND AKEAKAMAI

To jump and spit water in perfect tandem, the two dolphins must somehow communicate; inset, Herman tells his pupils to pay attention.

Phoenix showed some success at imitating computer-generated whistle-like sounds

Tended to match contour - did some transposition, compression & expansion





Vocal Imitation

Mimic trainer's whistle

Even mimic some human vocalizations or other environmental sounds

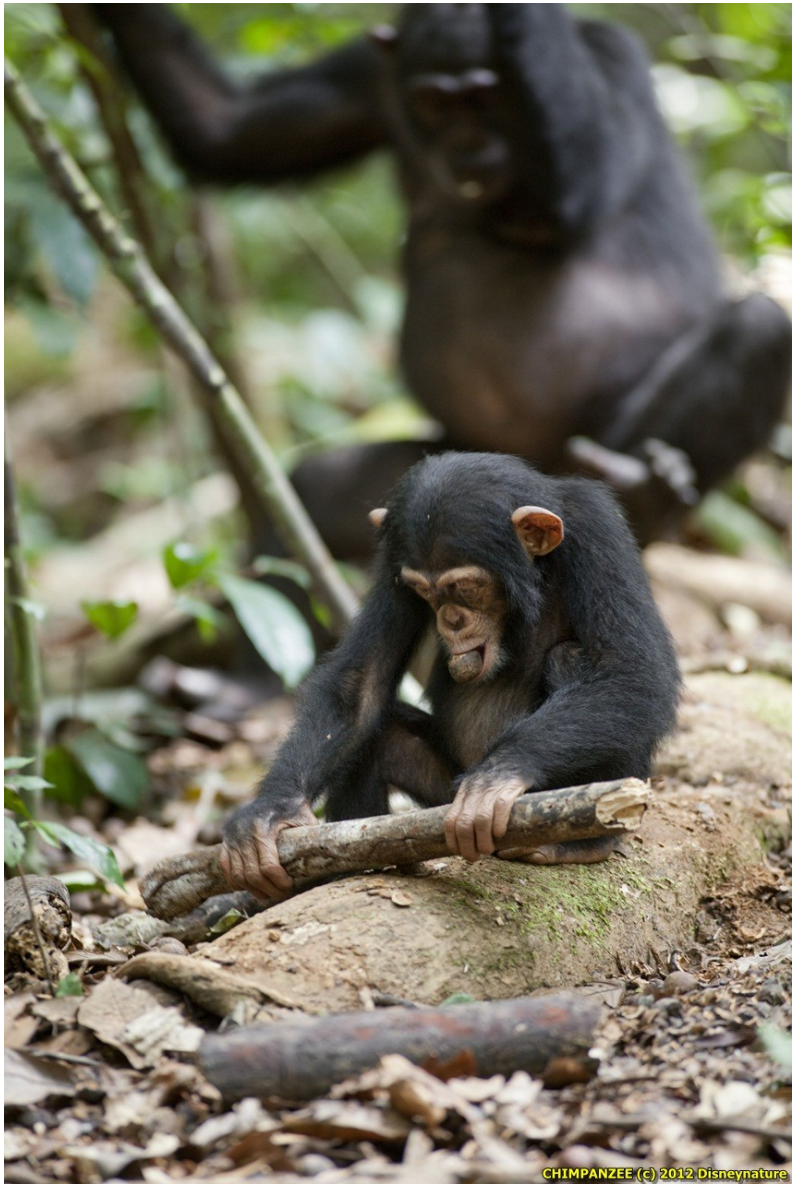
Pedagogy & Scaffolding

Primates Scaffold Learning in Young

Provide opportunities to
watch,
& to share reward

But they do NOT Teach

Young must use
Trial-and-Error, Practice
to Learn Skills



But they do NOT Teach

<u>EXCEPT</u>
If human-enculturated

e.g. Sign-language trained chimp instructs her infant to make signs

Humans TEACH!

Actively intervene in learning process of others

Cetaceans May Also Teach

Orcas push learner onto beach, or prevent, timed with prey availability, tides.

Guinet & Bouvier, 1995

Cetaceans May Also Teach

Crater Fishing in Spotted Dolphins -
Bender, Herzing & Bjorklund, 2008

When young watching,
Mothers repeatedly flush fish,
delay own feeding
(7X longer before eat)

Meets criteria of
“teacher” incurring a cost,
to benefit learning of novice