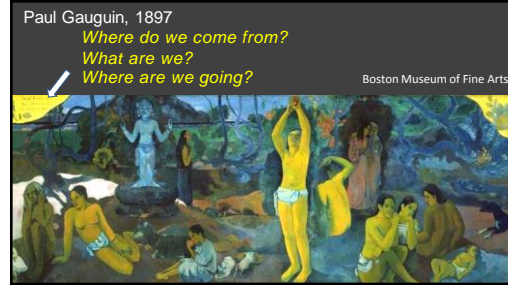


The follow-on to Gus Armeniades' June lectures on *Judging Science*

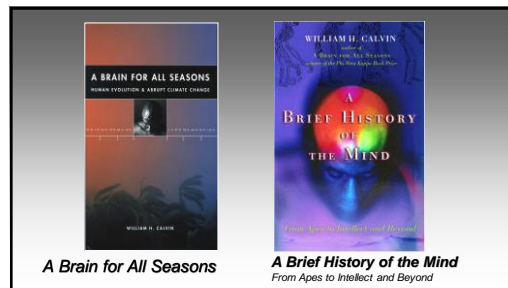
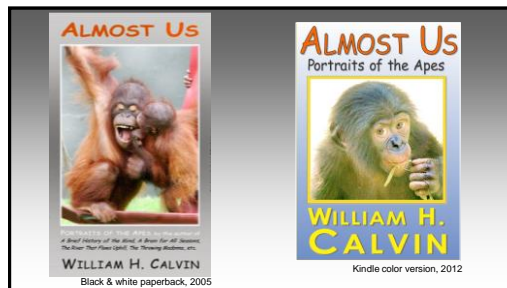
The Evolution of Us

Four Mondays starting October 6,
3-4pm



The Evolution of Us

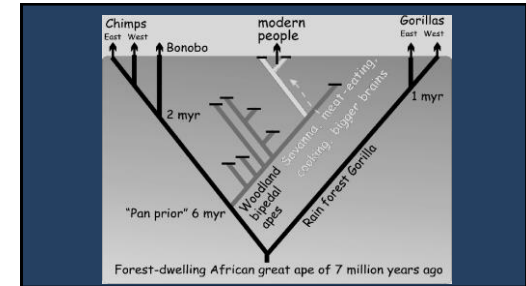
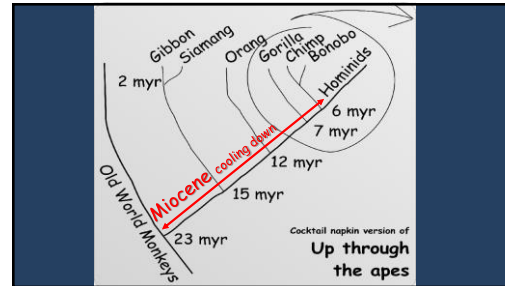
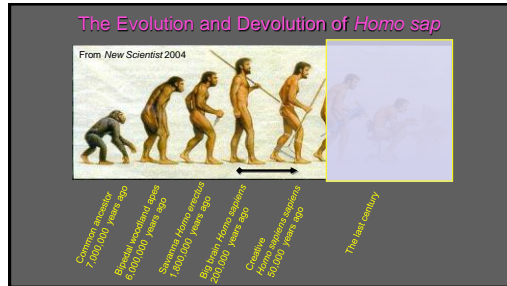
1. Smart Animals and the Great Apes
2. Post-Ape, Pre-Human
3. Our Kind of Language
4. Creativity and Planning Ahead



The Evolution of Us

FIRST LECTURE:

Smart Animals and the Great Apes



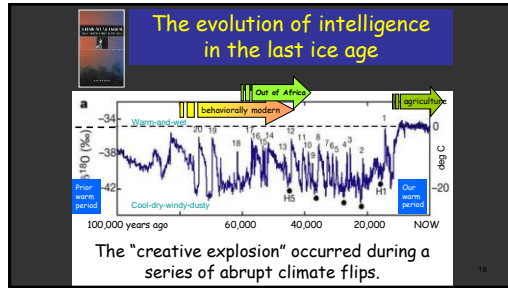
The Walk Through Time, part 1

- 7,000 mya Our Supernova, where all of our elements were made
- 5,000 mya Our Sun ignites from blast remnants
- 4,600 mya Earth coalesces
- 4,000 mya Crust forms atop molten core
- 3,700 mya Oceans form, rain falls, first cells and replication
- 3,500 mya Life begins with present GCAT genetic code
- 3,000 mya Mountain-building begins atop stable crust
- 2,500 mya Bacteria photosynthesize, oxygen into air
- 1,300 mya Cells with nucleus as a DNA vault
- 1,000 mya Sex begins. Colonies of cells.
- 680 mya Jellyfish. Most modern phyla exist.
- 570 mya Cambrian Explosion of species
- 500 mya First vertebrates

The Walk Through Time, part 2

- 400 mya Plants on land, spiders, amphibians
- 340 mya Reptiles
- 225 mya Permian Extinction
- 200 mya Birds from dinosaurs
- 65 mya Cretaceous Extinction, then mammals take over
- 50 mya Monkeys evolve from prosimians
- 30 mya Apes evolve from Old World Monkeys
- 22 mya Gibbons branch off
- 14 mya Orangutans
- 8 mya Gorillas
- 6 mya Chimpanzee branch and bipedal woodland apes
- 2.7 mya Ice ages begin, toolmaking and brain size increase

- 2.7 mya Ice ages begin, toolmaking and brain size increase
- 2.5 mya Chimp-bonobo split, hominid-australopithecus split
- 1.8 mya *Homo erectus* and first "Out of Africa" grasslands migration. Fire?
- 0.8 mya *Homo heidelbergensis*, brain size grows faster
- 0.5 mya Neanderthals split off, staged toolmaking (core and flake)
- 0.2 mya *Homo sapiens* (us) at end of penultimate ice age
- 0.1 mya Behaviorally-modern *Homo sapiens sapiens* ("doubly wise") at end of prior warm period.
- 75,000 yr Populations shrink due to climate's hard times
- 55,000 yr Wildly fluctuating climate, another "Out of Africa" that populates the world
- 40,000 yr Neanderthals die out over thousand-year period
- 21,000 yr peak of ice age, starts to warm up
- 15,000 yr Abrupt warming event, ice begins more rapid melt
- 13,000 yr Abrupt cooling then, 1300 years later, abrupt warming. Agriculture begins.
- 5,200 yr Sahara rainfall crashes over 200 years, triggers irrigation civilization in Nile, Indus-Euphrates, and China
- 1976 Earth can no longer compensate for greenhouse gases, fast warming starts
- TODAY *Homo sapiens sapiens* ("doubly wise") demoted to *Homo sapiens*



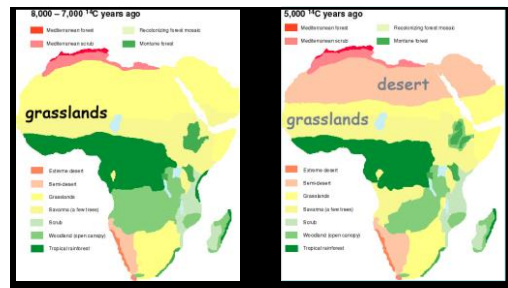
What it takes to finally settle down.

Table 2 Four agricultural societies developed independently

Location	Species	Development accomplished
Levant	Wheat, barley, chickpeas, flax, sheep, goats	~ 9,000 ybp
China	Rice, millet, pigs, silkworms	by 9,500 ybp
Mesoamerica	Corn, beans, squash, turkey	by 5,500 ybp
Andes and Amazonia	Potato, manioc, guinea pig, llama	by 5,500 ybp

Springer

Joan Feynman · Alexander Ruzhickin
 "Climate stability and the development of agricultural societies."
Climatic Change (2007) 84:295–311 DOI 10.1007/s10584-007-9248-1



About 5,200 years ago, the Sahara lost its monsoon rainfall and, over several centuries, lost its grass and grazing animals.

This was the stimulus for the great Nile irrigation civilizations and the need for tax accountants. (That's how *writing* began, 3200 BCE).

The Evolution of Us

FIRST LECTURE:

Smart Animals and the Great Apes

Smart Species have arisen at least **three times**.

1. *Octopus among the Cephalopods among the Molluscs*
2. *Corvids among the Birds (jays, crow, raven, magpie)*
3. *Mammals*
 1. Rats about as smart as an octopus or raven,
 2. Dogs a bit more so,
 3. Primates but especially great apes



Play face of a tame woolly monkey along the Amazon River in Peru.

PLAY FACE

Open
mouth,
lips
rounded
inward.



But nearly all mammals play, at least before adulthood.

Apes just have a longer juvenile stage.



Images of Nature

Except from mother to infant, food sharing is not common among primates.

We see it in a few species when males have meat and share with their consort of the day. Within same-sex pairs, it is found only in some highly tolerant capuchin monkeys and great apes: chimps, bonobos, and orangutans. [Not gorilla.]

—the primatologist Carel van Schaik, *Among Orangutans: Red Apes and the Rise of Human Culture*, 2004

HALFWAY INTO SHARING THINGS



AN APE SOMETIMES "SHARES FOOD" by allowing others to take a few leaves, while firmly holding on to the branch itself. It's a long way from going around and offering food to strangers, one at a time, but "tolerated scrounging" is a start.



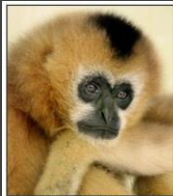
The 570-pound gorilla, Winston's four-year-old grandson, Ajari, hopes that he will share some bamboo leaves.

He didn't.



Dejected.
But, just in case, staying in plain sight.

THE LESSER APES



Female Gibbon



Female Siamang

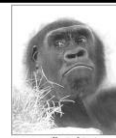


Siamangs are the most acrobatic of the apes.

THE REMAINING GREAT APES



Orangutan (SE Asia)



Gorilla (Africa)



Chimpanzee (Africa)



Bonobo (Africa)



COMMON FEATURES

The play face is common in primates and, indeed, in many mammals.

Will now start listing features that make their first appearance *only* when we get to the great apes.

At emotionally meaningful moments, apes can put themselves into another's shoes. *Few animals have this capacity... Monkeys fail to provide reassurance even if their own offspring has been bitten.*

They do protect them [when attacked], *but show none of the cuddling and stroking with which an ape mother calms down an upset youngster.*

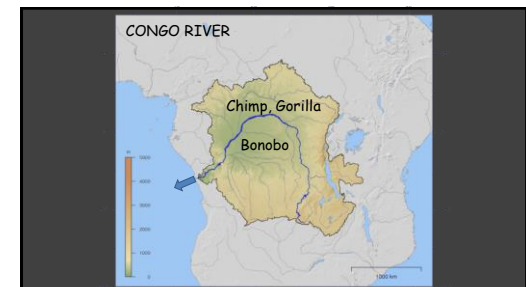
-FRANS DE WAAL, *Our Inner Ape*, 2005.

- *The royal wrist: adult apes may extend the back of their hand to be kissed by an infant, which reassures it.*
- When fruit is out of reach, some chimps (and orangutans) will use a long stick to hook and pull down a branch.
- Some chimps will use a stick to comb tangles out of their hair.

- *Patting, the reassuring touch, and the arm around the shoulder.*
- *Kissing and embracing.*
- *Tickling oneself with an object.*
- Only chimps and humans exhibit both the cooperative hunting of game and
- the five-on-one gang warfare that often kills a lone neighbor.

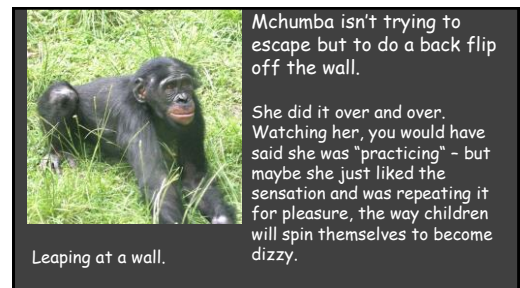
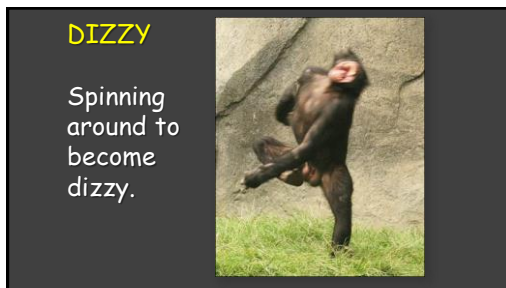
[Gombe's five-on-one gang warfare] involved chimps who actually knew each other.... Any association with the enemy was grounds for attack.... So us-versus-them among chimpanzees is a socially constructed distinction in which even well-known individuals can become enemies if they happen to hang out with the wrong crowd or live in the wrong area.

-FRANS DE WAAL, *Our Inner Ape*, 2005





- A bonobo may play a version of blindman's buff, holding a hand over his eyes or draping a blanket over his head - and then show off how well he can balance on a rope without looking where he is going.
- Frequent sexual intercourse. Indeed, the various nonreproductive sexual behaviors occasionally seen in chimpanzees, gorillas, and humans are seen in almost every bonobo.
- It is said that chimpanzees resolve social conflicts with power while bonobos resolve them with sex.



I've also seen Mchumba spin several dozen times. Maybe sensation-seeking is how real practicing got started.



LANGUAGE-REARED from an early age, Kanzi, 25, is now at the Great Ape Trust of Iowa.



Kanzi, 25, in conversation with Sue Savage-Rumbaugh.



Panbanisha, 20, and Kanzi, 25, use the language keyboard at the Great Ape Trust of Iowa.

CONTEMPLATION?



The bonobo, Makasi, and the toddler are about the same age and height, but their head sizes are quite different.

ORANGUTAN

This is Indah, 28, a female Sumatran orangutan at the San Diego Zoo.



If you happen to forget a screwdriver in the **gorilla** cage, the animals will hesitantly approach it, briefly sniff it, and subsequently ignore it.

Leave it in a **chimp** cage, and it will be used in vigorous display, thrown about, and forgotten.

But if you leave it in the **orangutan** cage, one of the animals will unobtrusively pick it up, hide it, and use it to let itself out when you've left for the day.

- the primatologist BENJAMIN BECK

[Supinah, a young adult female at a rehab center in Borneo] was a prodigious imitator: she

- hammered nails,
- sawed wood,
- sharpened axe blades,
- chopped wood,
- dug with shovels,
- siphoned fuel,
- swept porches,
- painted buildings,
- pumped water,
- blew blowguns,
- fixed blowgun darts,
- lit cigarettes,
- (almost) lit a fire,
- washed dishes and laundry,
- baled water from a dugout by rocking it from side to side,
- put on boots,

IMITATION

There is nothing like this in the other apes.

- tried on glasses,
- combed her hair,
- wiped her face with Kleenex,
- carried parasols against the sun, and
- applied insect repellent to herself.

Whenever the job involved a complex technique, hers matched the one used in camp.

- the primatologist Anne Russon, *Orangutans: Wizards of the Rainforest*, 2004



In zoo settings, orangutans are much faster to learn tool use than chimps and are also more creative.

Satu, 13, softening up bark.

Like monkeys, nearly all gorillas fail to recognize themselves in a mirror.

The other great apes, on the first time they are given a mirror, instantly recognize themselves. Usually, they open their mouth and move their tongue. Next, they use the mirror to examine their backsides.

But not gorillas.

[Given a mirror,] most [other] apes open their mouth to inspect the inside, touching their teeth with their tongue or picking at them with their fingers guided by the mirror.

Sometimes, they go so far as to "embellish" themselves. Presented with a mirror, Suma, an orangutan at a German zoo, gathered salad and cabbage leaves from her cage, placed them on top of each other, then put the whole pile on her head. Staring in the mirror, Suma carefully rearranged her vegetable hat.

- the primatologist FRANS DE WAAL, *Our Inner Ape*, 2005



The End

My books and talks may be found at:
WilliamCalvin.org

Edvard Munch, The Scream 63