Geologic Time & Primate Evolution

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Geologic Time

- 65 mya what major event occurred?
- Mass extinction of dinosaurs @ the end of the Cretaceous Period (K-T extinction)
- Marks the beginning of a brand new geologic era: the Cenozoic
- We’ll focus on the epochs of this era
Paleocene

- Recommend use of mnemonic device for the ordering of the epochs
- Starting w/ the oldest...
- Paleocene (beg. 65 mya): adaptive radiation of mammals, rapid speciation
Eocene (beg. 53 mya)

- Eocene: fossils show the derived traits of primates: prosimian grade primates
- Where?
- Wyoming, Colorado, Montana…
  (of all places!)
Oligocene (beg. 37 mya)

- Fayum, Egypt: lush tropical environ, 1st of the other primate suborder appear?
- Anthropoids!
- Beg. Of Platyrrhine & Catarrhines distinctions
Miocene (beg. 22.5 mya)

- By far the longest epoch of Cenozoic, more weather & temp. fluctuations
- Fossils of anthropoids w/o tails: Hominoids
- Proconsul: oldest Miocene ape, “dental apes”
- Sivapithecus & Gigantopithecus (Asia):
  - [http://www.livescience.com/animals/051107_giant_ape.html](http://www.livescience.com/animals/051107_giant_ape.html)
- Dryopithecus (Europe)
Miocene Hominids

- Towards the end of this epoch a new primate family emerges, ours.
- Family Hominidae (Hominids = Humans)
- How do we distinguish between fossils of Miocene Hominoids & Hominids? What do we look for?

Evidence of bipedalism, how do we determine that?

Analysis of skeletal features (go to skeletal features of bipedalism pwrpt)
Miocene Hominids

- *Sahelanthropus tchadensis*:
  - 7.2-6.8 m.y.a.: debates regarding bipedality, computer images suggest habitual upright posture

- *Orrorin tugenensis* (original man): ~6 m.y.a.
  - Definitely bipedal (femur), ~1/2 doz. Individuals found
  - This & similar finds push back ape/human divergence
East Africa’s Great Rift Valley

- Rich in fossils of early human species
- Spans through modern day Kenya, Ethiopia, Uganda, etc.
- Historically: ↑ volcanism & plate tectonics activity (uncovers new strata), dating methods?
- Political turmoil affecting research access
Pliocene (5.3 mya)

• Once thought to be the epoch during which humans first emerged, new finds place bipedal origins to late Miocene
• New group of hominids: Genus Australopithecus lived & died out during this time
• Members of this Australopithecus divided in 2 grades: robust & gracile
• Towards the end of this epoch our Genus emerges
• (go to skeletal features of bipedalism pwrpt)
Why Bipedalism? Bipedalism Theories

- Clarification regarding how it emerged: difficult between evolving from an organism & evolving from a common ancestor with an organism.
- Once bipedalism emerged, how was it advantageous? (Selective advantage)
- Here’s what didn’t happen…

"Oh, he can walk upright whenever he wants to — he just likes to look up skirts!"

"Walking upright is okay, except I feel so conspicuous!"
Couple uses gorilla surrogate mom

APE GIVES BIRTH TO HUMAN BABY

NAPLES, Italy — In a historic first, an ape gave birth to a human baby — and we've got the photo to prove it!

"All four are doing absolutely 'prima' — the ape, the human mother and father and their brand-new 8-pound daughter Maria," Dr. Mario Balsillo told the magazine Opius in an interview of his private clinic here, 30 minutes after delivering the infant by cesarean.

Declared proud mama Angela Cervino, a 36-year-old secretary: "For my husband Carlo and me, this baby is the answer to our prayers. We call her Sofia. Having a child to love fulfills our lives. We couldn't be happier."

Last September, according to Opius, Dr. Balsillo and his team removed an ovum from Angela's ovary. They fertilized it with Carlo's sperm. Then implanted the embryo into the womb of a 39-year-old, 44-year-old with twin deficits Mina. Mina and I have been trying to become parents since we married."

"Carlo and I have been trying to become parents since we married."

"Carlo has been trying to become a surrogate because he's very special to us," Dr. Balsillo explains.

"She's known as Super Mina to the zoo. She gave birth to her first baby, a son, in 1984 and has given birth to two of her own. Mina had her own pregnancy, but has been born in the lab for 20 years. It's very exciting for a great ape in captivity to have a human child.

"When it came time to deliver the Cervino's baby girl, Mina was there. Under general anesthesia, Dr. Balsillo placed the baby in the womb of Sofia. Mina felt no pain or discomfort.

"She's a very gentle and calm animal. In fact, she even allowed to hold Maria so that she could be taken care of.

"I just have been able to carry a baby," Angela said. "Carlo, a housekeeper, explained the choice of an ape surrogate instead of a human surrogate. We have no other way to have a child who, like my wife, could not carry her own children. She paid a woman to carry her baby."

"When the child was born, she was ready to keep it. She became attached to Angela and — after all we've been through with the surrogacy — couldn't face any more disappointment."

Maria was chosen to be the surrogate because she's a very special child to us.

WORLD EXCLUSIVE PHOTO!

... & the amazing newborn is doing great, say doctors

Aristotle's guide to picking up chicks!

ATHENS — The ancient Greek philosopher Aristotle's many contributions to Western civilization are well known, but few realize he also wrote a book on how to pick up girls.

Aristotle penned a book on the subject of how to pick up girls, but few realize he also wrote a book on how to pick up girls, but few realize he also wrote a book on the subject of how to pick up girls. In addition to his books on politics, physics and metaphysics, Aristotle penned a book on the subject of how to pick up girls.

Unfortunately, no copies of the book exist today. It's one of those lost works written by the brilliant thinker whose lost contributions to Western civilization are well known. The lost book was discovered when the famous library at Alexandria burned to the ground in ancient times. Today, all historians know about the lost volume comes from references made by his late writers.
Bipedalism Theories

1. Positive feedback loop (tool use) model: (1st suggested by Darwin, f.b. loop developed by others later) Flow chart:

- Big Brain
- Tool use
- Smaller canines
- Bipedalism

Can you spot any problems/criticisms?
Several: fossil record shows big brain wasn’t 1st, ape ancestors aren’t using canines for diet, earliest bipeds didn’t make tools
2. Heat Stress/Control Model: bipeds were better able to keep cool in the savanna heat.

Apes: closer to the ground. Bipeds: taller, cooling breeze, less sun exposed surface area.

Prob: fossil finds suggest: bipedalism emerged in a forested canopy.

3. Energy Efficiency: Which is more efficient & how measured?
Theories cont’d

• Short distances? Long distances?

• Bipeds significantly more efficient for walking long distances

• May not account for initial selection, but forests were shrinking & advantage may have increased as we moved to savannas

• Daily energy requirements for a hominid would be 50% of those for a knuckle walker!
4. Reproductive Success (Child care & Provisioning or Carrying) Model: homebase camps, monogamy & sexual division of labor.

- Reprod. advantage for: carry tools, effective hunting, provision.
- for: carry offspring, effective gathering & exchange food for sex

Probs/Criticism: earliest bipeds didn’t live in base camps, dimorphism makes monogamy unlikely, Victorian gender dynamics
5. Bipedal Harvesting: based on study of gelada monkey

- Bipedal posture enables geladas higher success in harvesting food by shuffling from bush to bush

- Prob’s: palepollen analysis suggests those food sources weren’t available to earliest humans

6. Vigilance Model/predator avoidance: chimps patrolling the territory, posture?
• upright vantage point: better able to evade predators & spot potential prey
• Prob’s: accounts for standing, not so much for locomotion, also only applies to
• 7. Display Model: accounts for bipedalism through sexual selection, suggests that fully erect (excuse the pun) were more impressive, In a nutshell...ladies loved the bipeds! (Prob’s?)
• Only accounts for bipedalism in , (counter?)
• contributes to & in subsequent generations
Criteria/Dividing line for our Genus

- Review criteria for hominid family
- So, how is a species included in our Genus?
- Encephalization. Significant jump in cranial capacity that took place in a relatively short period of time
- Genus criteria: bigger brains
- Let’s take a look @ the earliest members of our genus (members of our genus pwrpt)