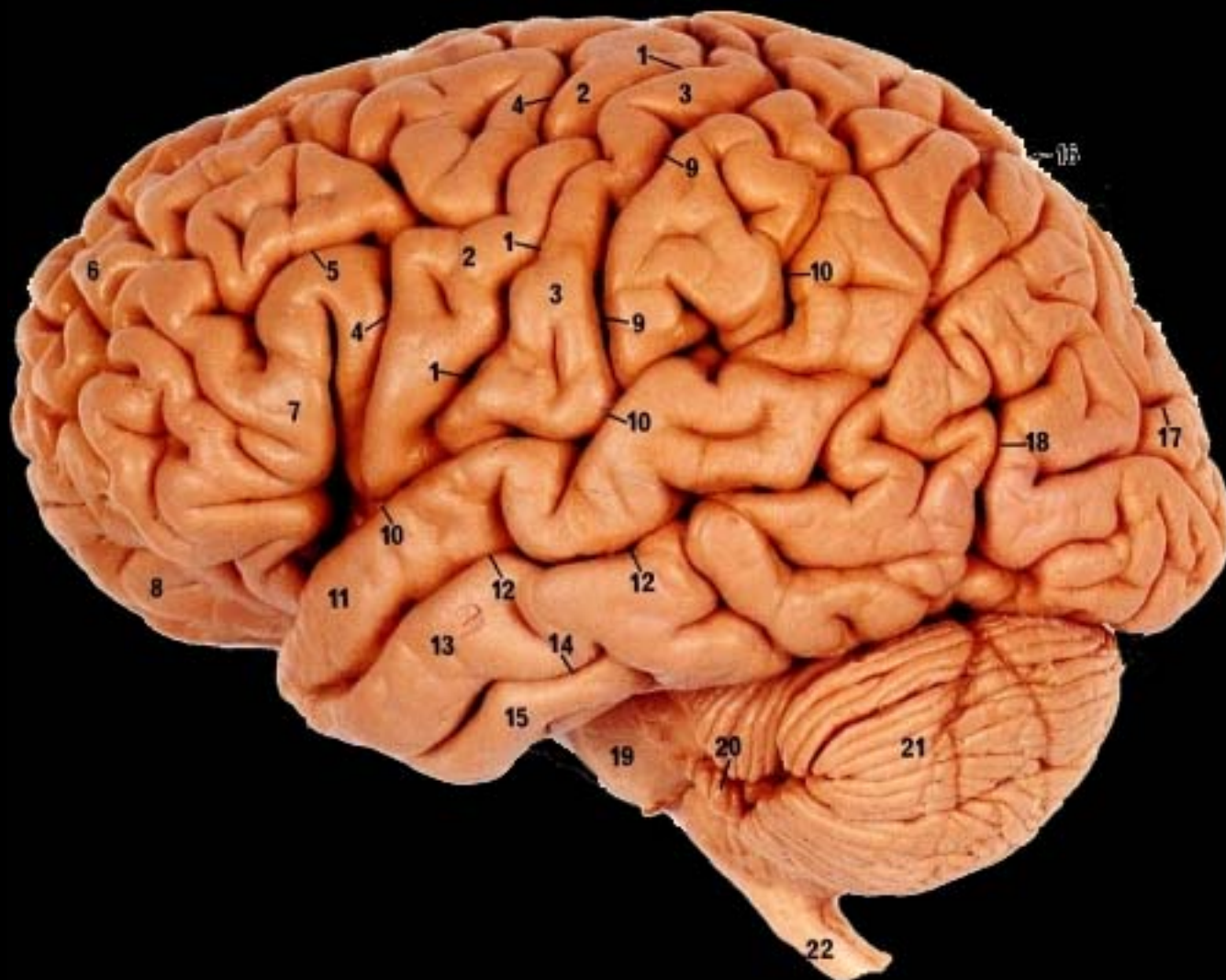


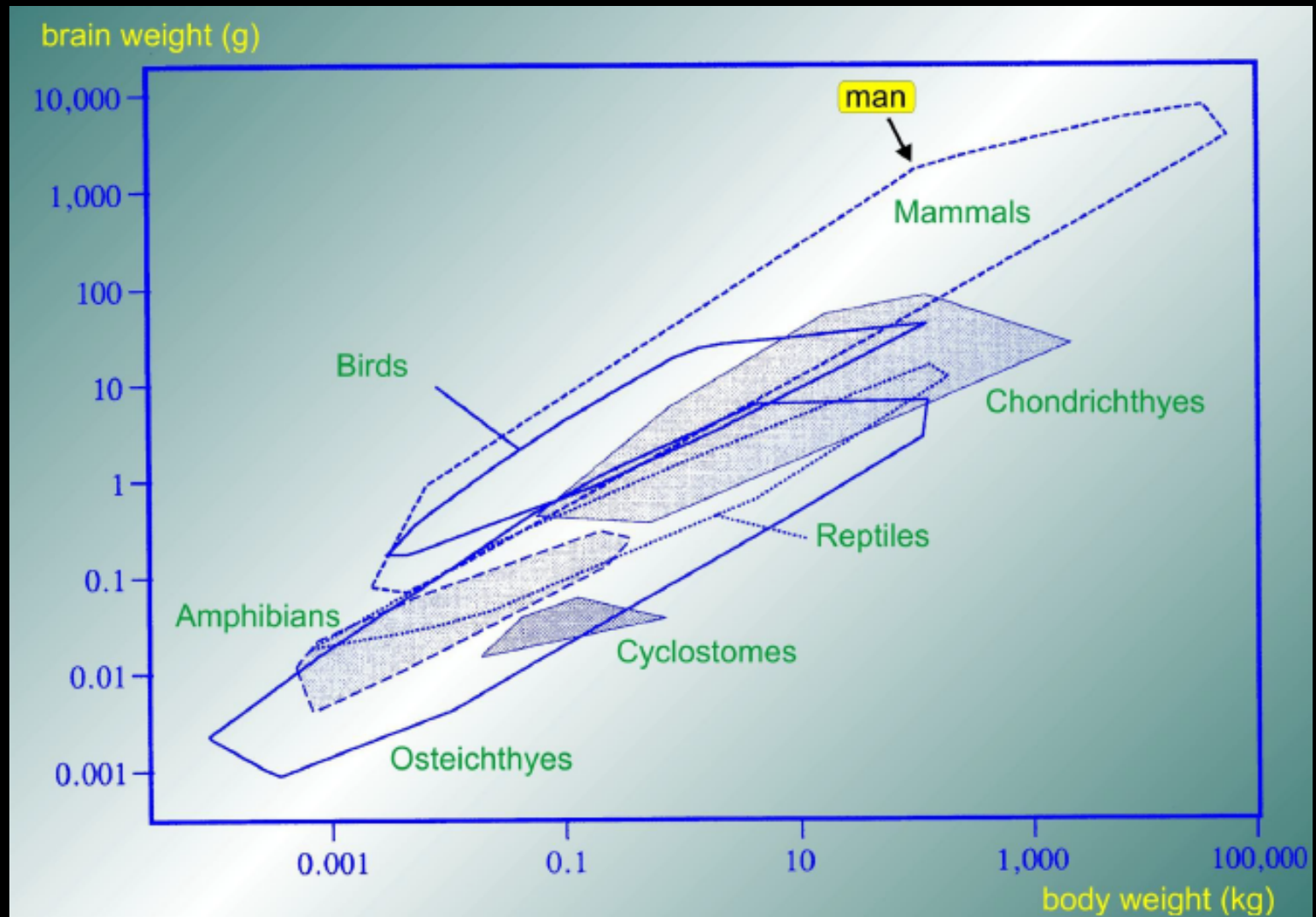
# L'evoluzione del cervello ominide e comparsa del cervello sociale

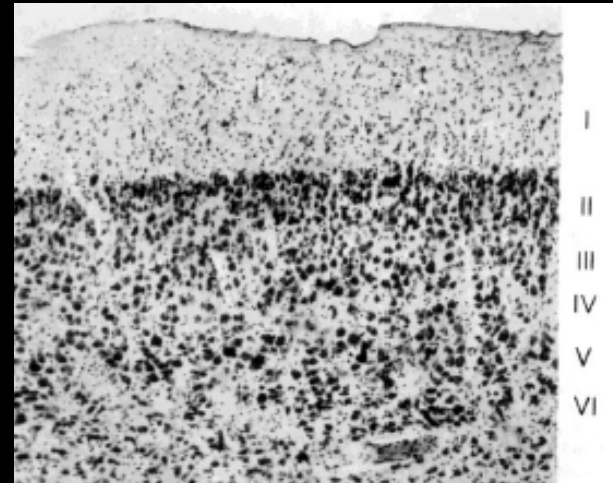
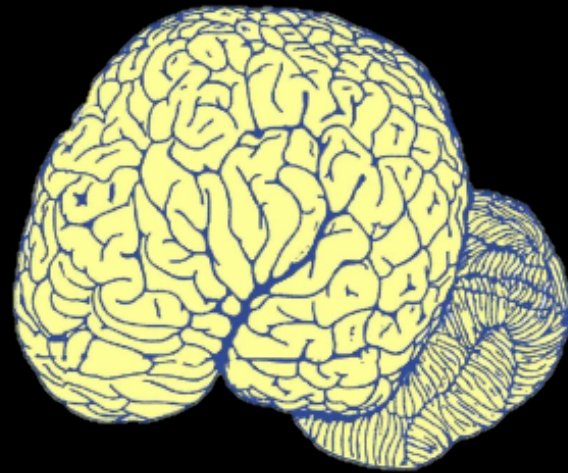






## Relazione fra la massa cerebrale e la massa corporea i diverse classi di vertebrati





**Whale**

**Human**

# Evoluzione della corteccia cerebrale nelle scimmie e nei primati

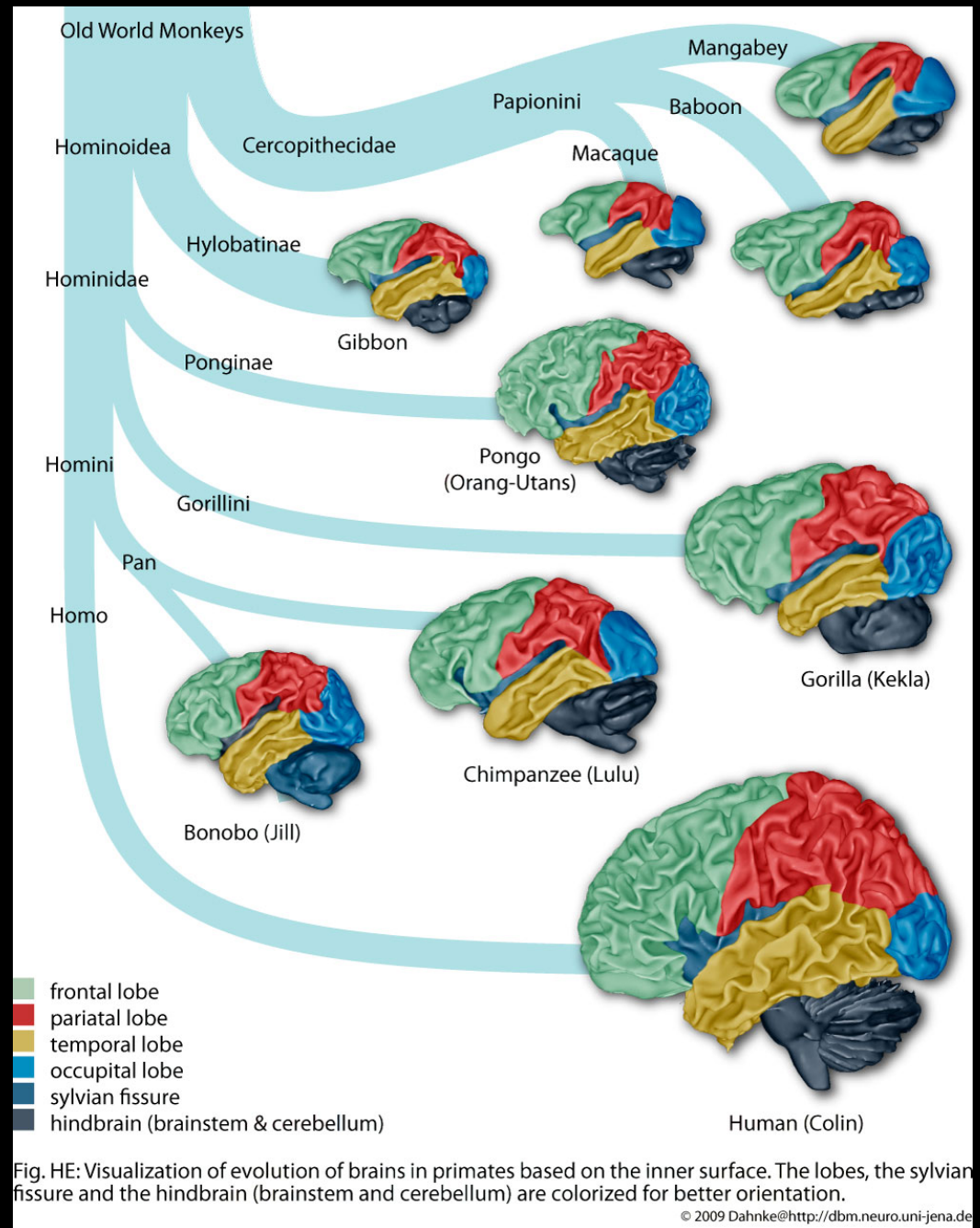
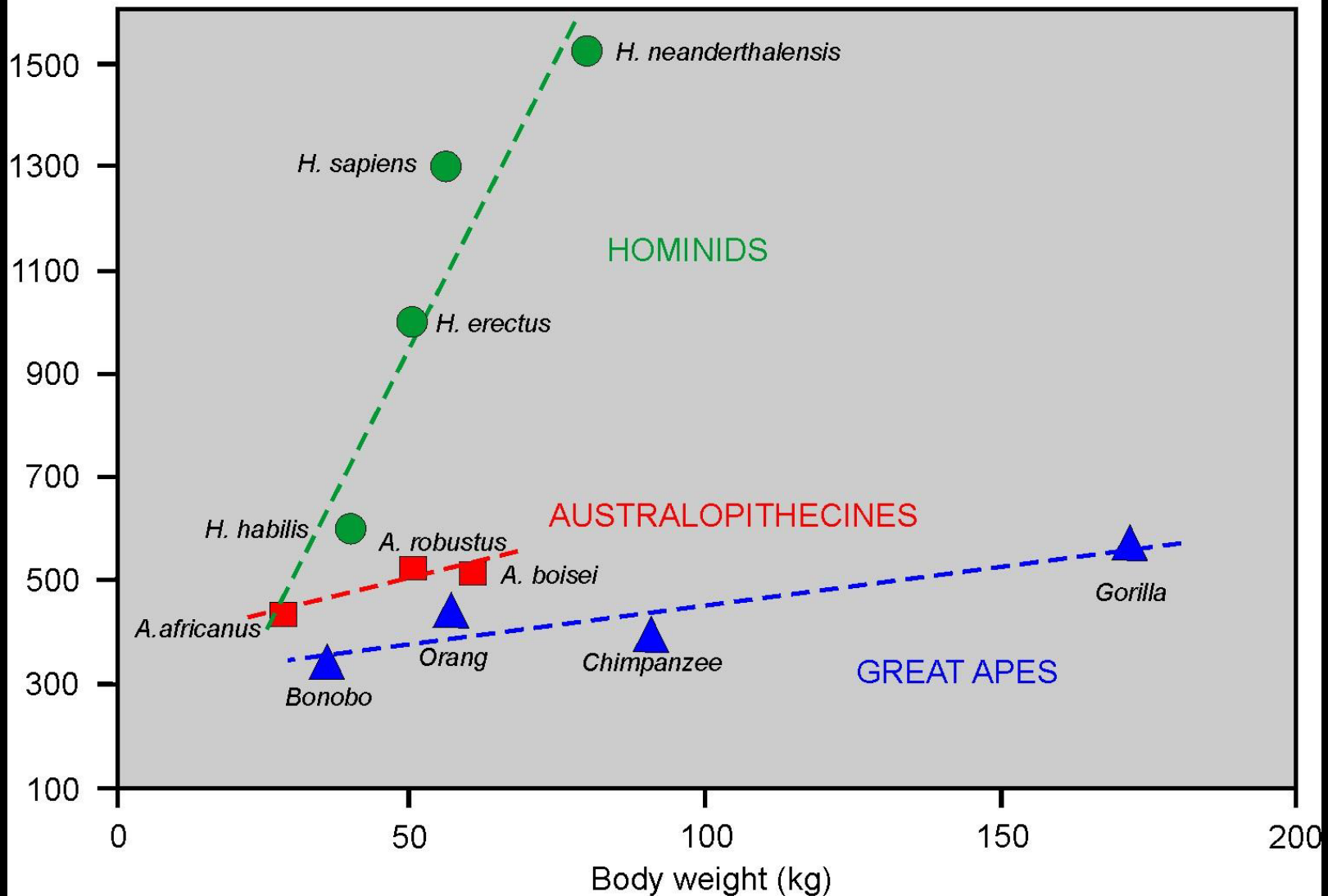


Fig. HE: Visualization of evolution of brains in primates based on the inner surface. The lobes, the sylvian fissure and the hindbrain (brainstem and cerebellum) are colorized for better orientation.

Endocranial/brain volume (cm<sup>3</sup>)



**che cosa ha determinato l'espansione della corteccia cerebrale nella nostra evoluzione?**



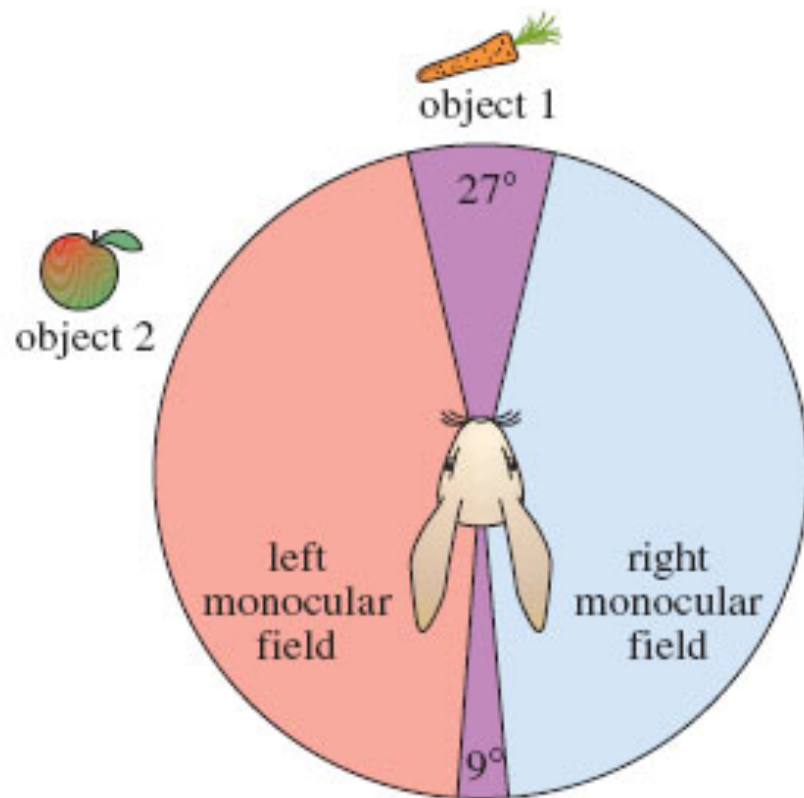


**Rispetto agli altri primati, la nostra specie ha**

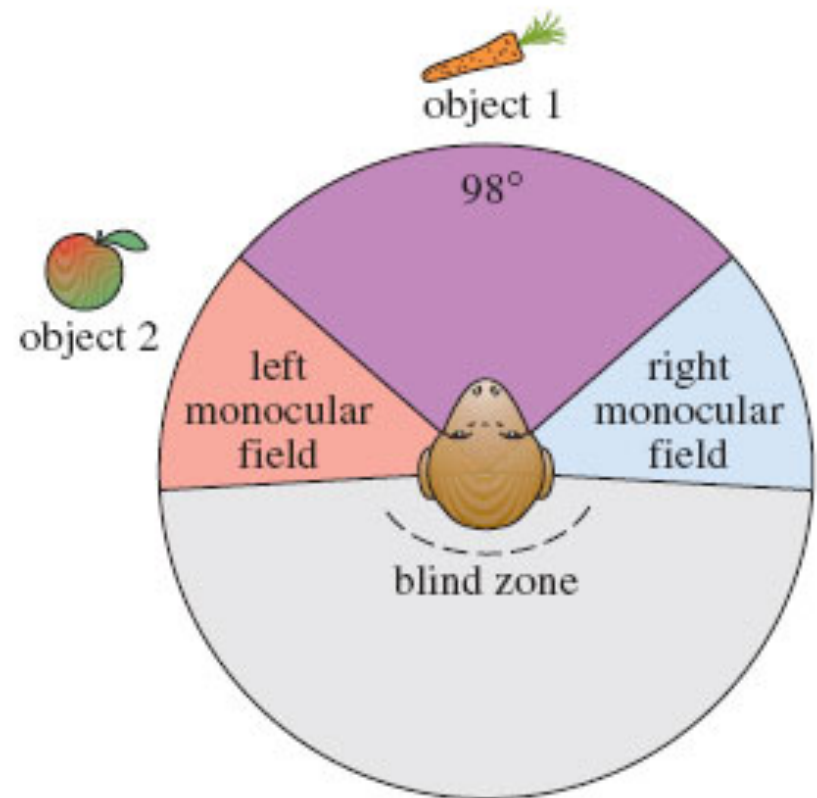
- **il cervello più grande (la neocorteccia più estesa)**
- **un periodo di sviluppo più prolungato**
- **Il cervello più immaturo alla nascita**

**Che relazione c'è fra questi fatti?**

**Qual è la spinta evoluzionistica che ha indotto l'espansione della corteccia cerebrale?**



(a) rabbit



(b) monkey



## Primati primitivi

**Arboricoli nella foresta**

**Mangiano insetti, frutta**

**Movimento fine (reaching-grasping) guidato dalla visione:**

involuzione del sistema olfattivo

sviluppo visione frontale (tridimensionale)

evoluzione del sistema visivo

pollice opponente

dita coperte da unghie



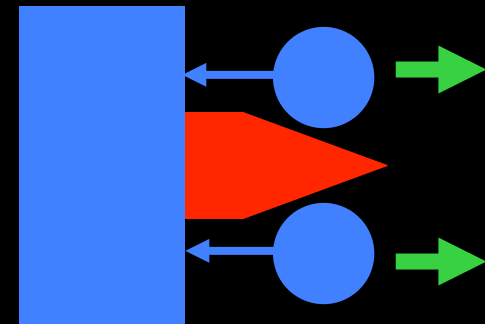
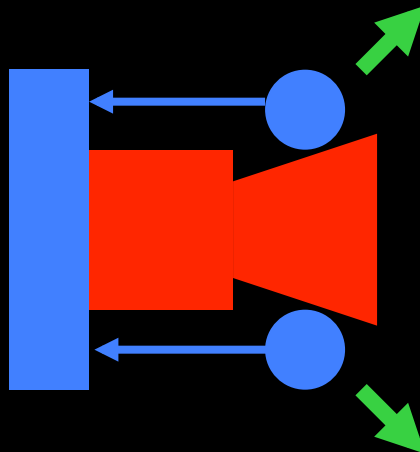
**Inizialmente notturni, poi diurni (vita nella savana)**

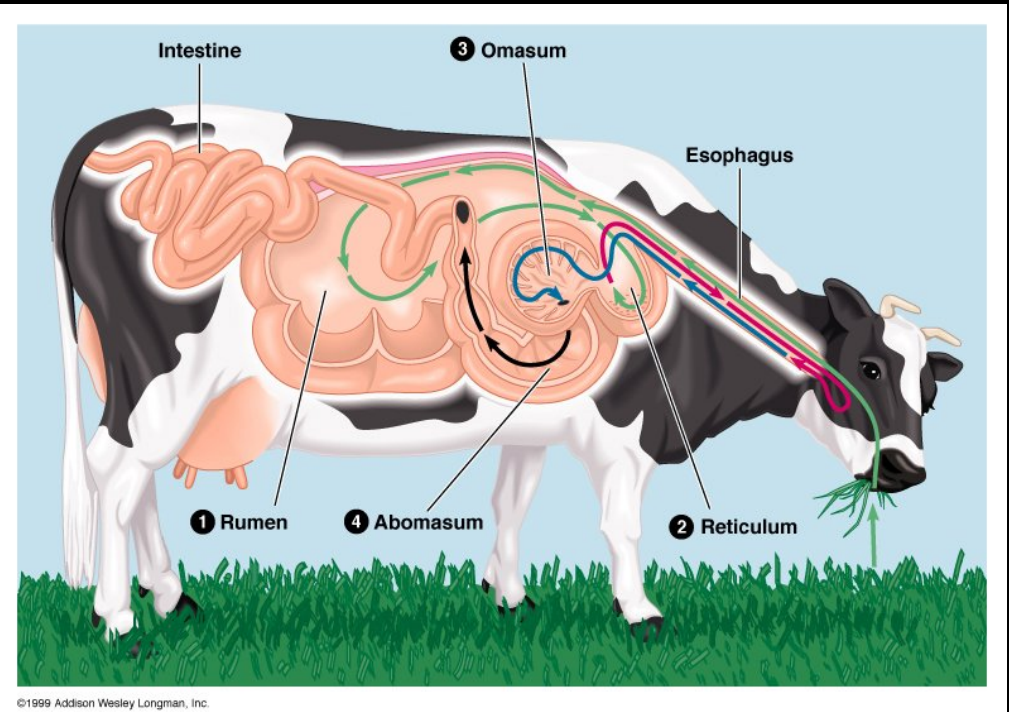
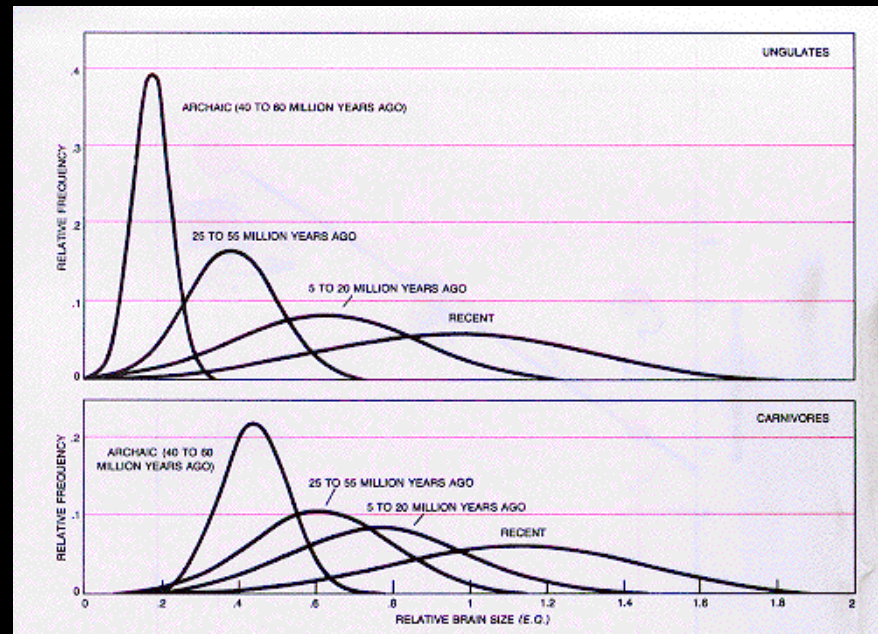
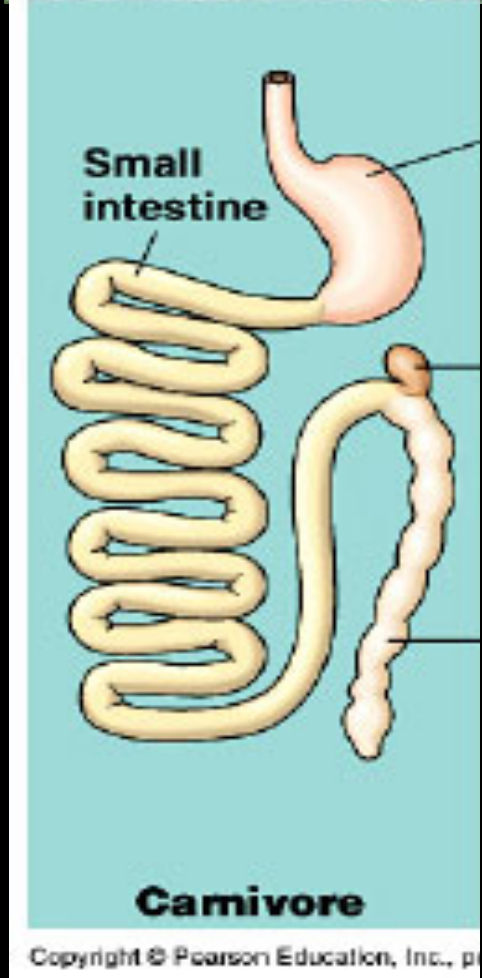
visione foveale, predominanza dei coni (acuità)

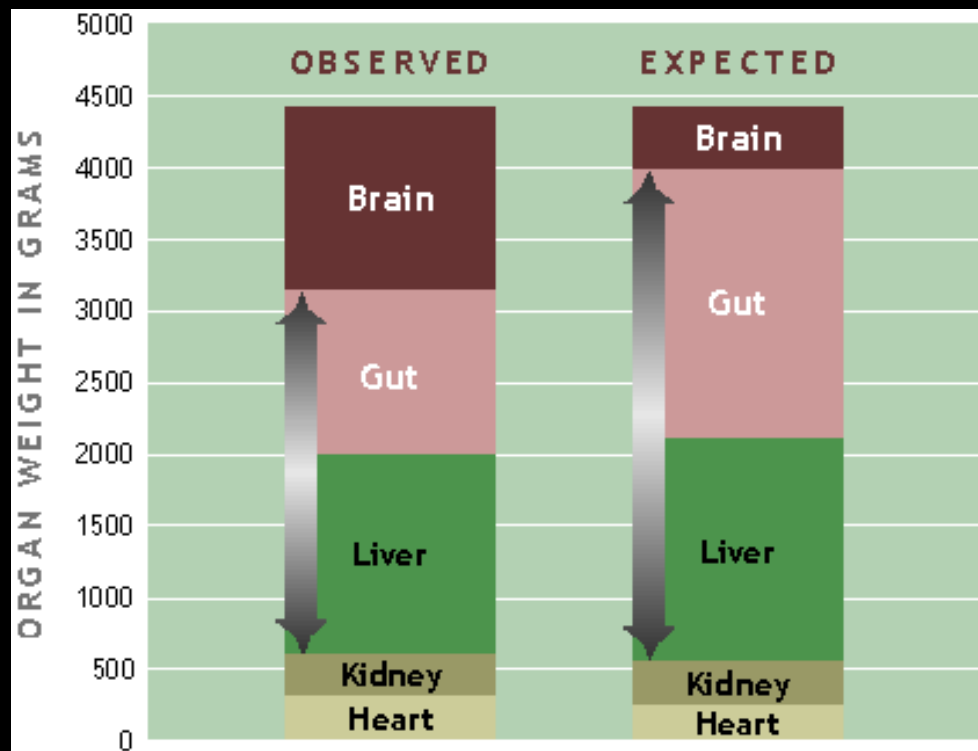
visione cromatica (dicromatica poi tricromatica)

**Vita diurna: sviluppo attività sociali (protezione, ricerca del cibo)**

**Sistema olfattivo**  
**Sistema visivo**

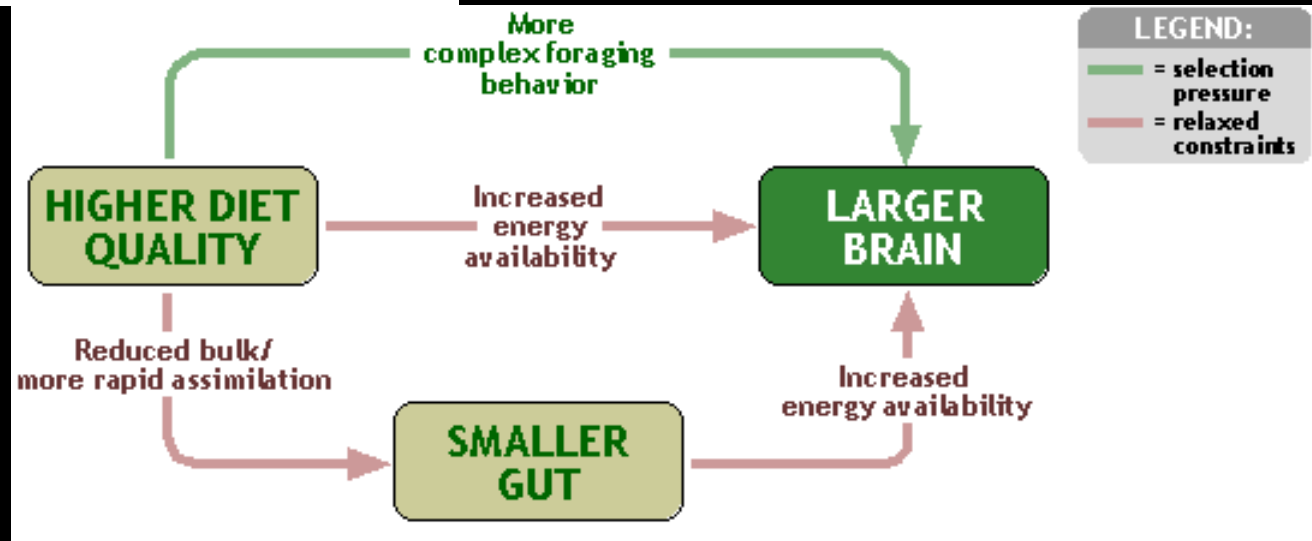






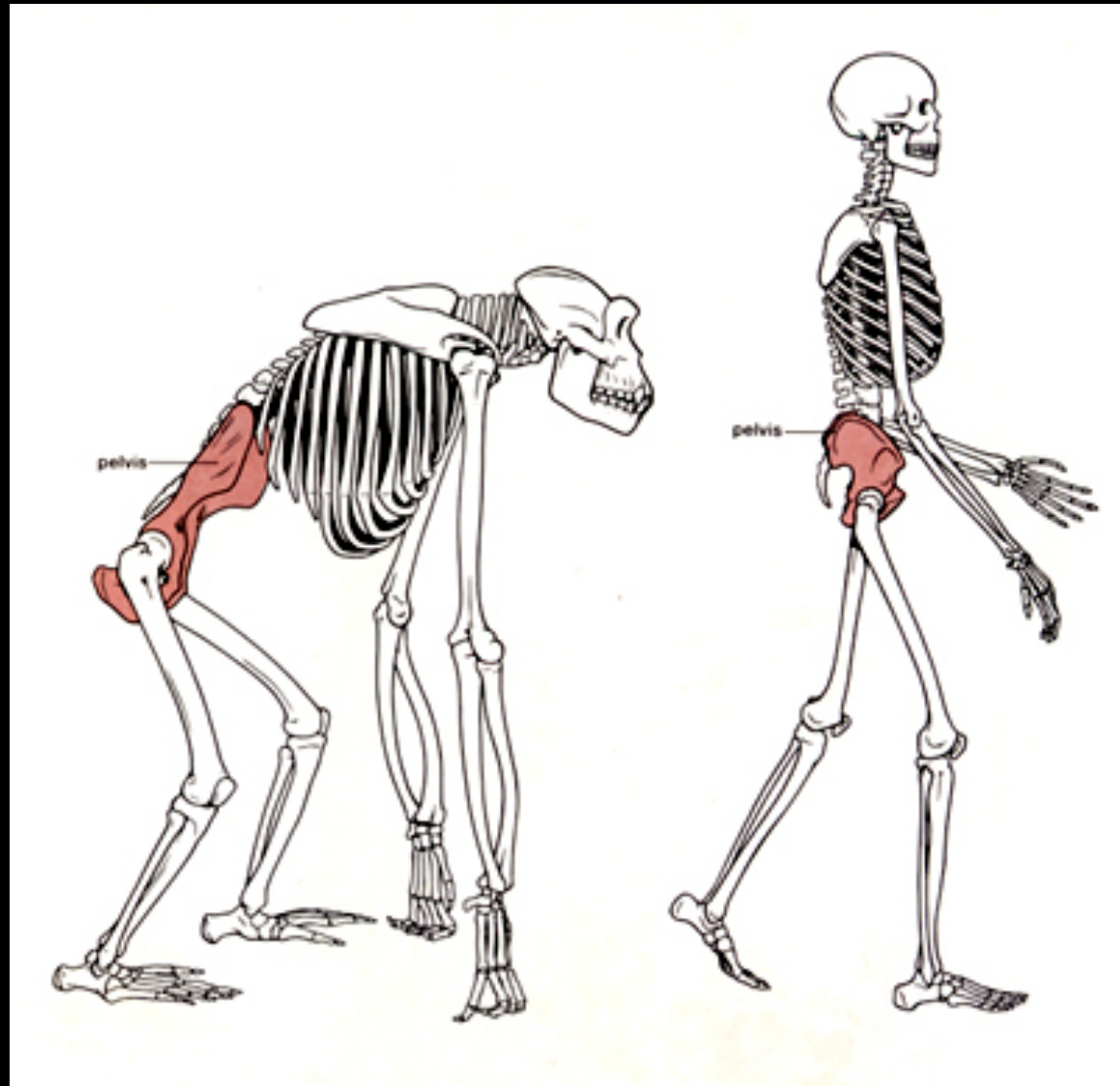
Observed and expected organ masses for a "standard" 65-kg human.

## Una nuova dieta



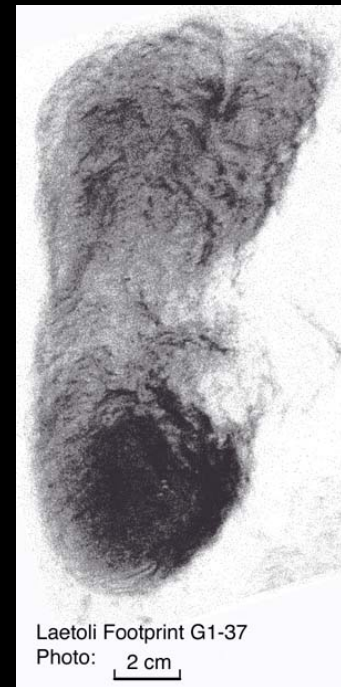
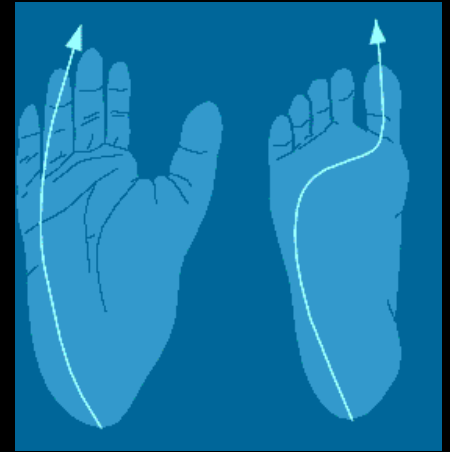


# bipedismo

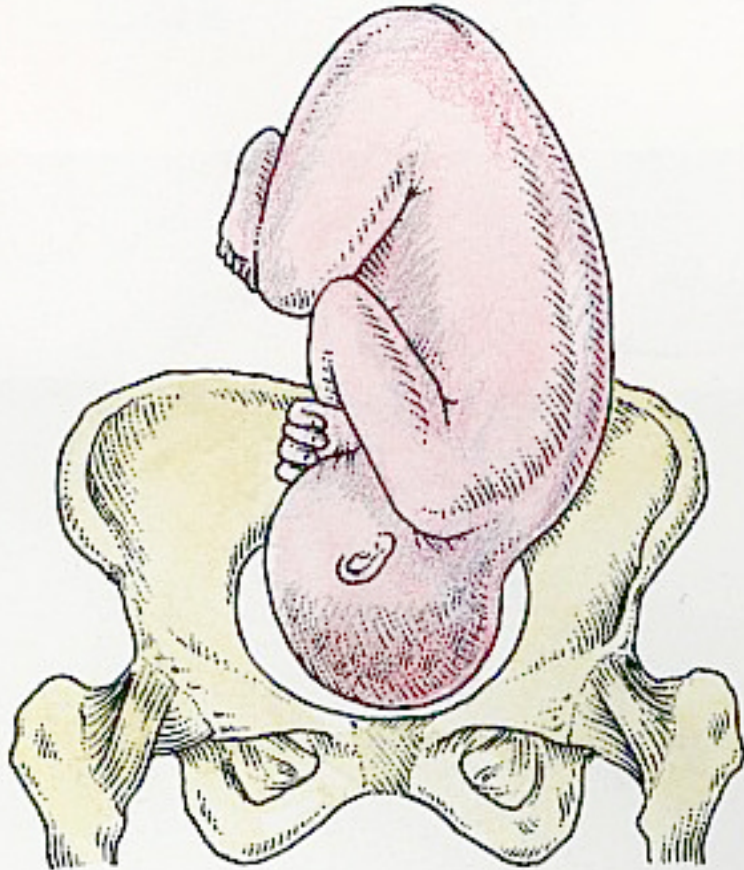


**Il bipedismo ha senso solo se gli arti liberati dal compito di sostenere il corpo assumono una nuova funzione**

# Laetoli footprints







Skull clearance  
at birth

Brain size  
at birth

Adult  
brain size



128 cc



390 cc



162 cc  
(estimate)



415 cc

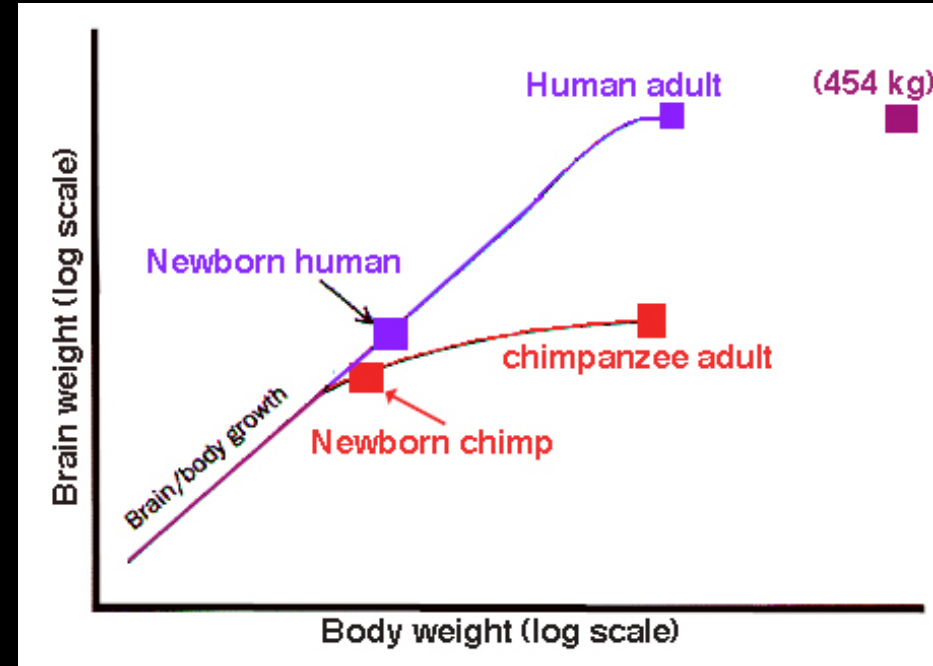
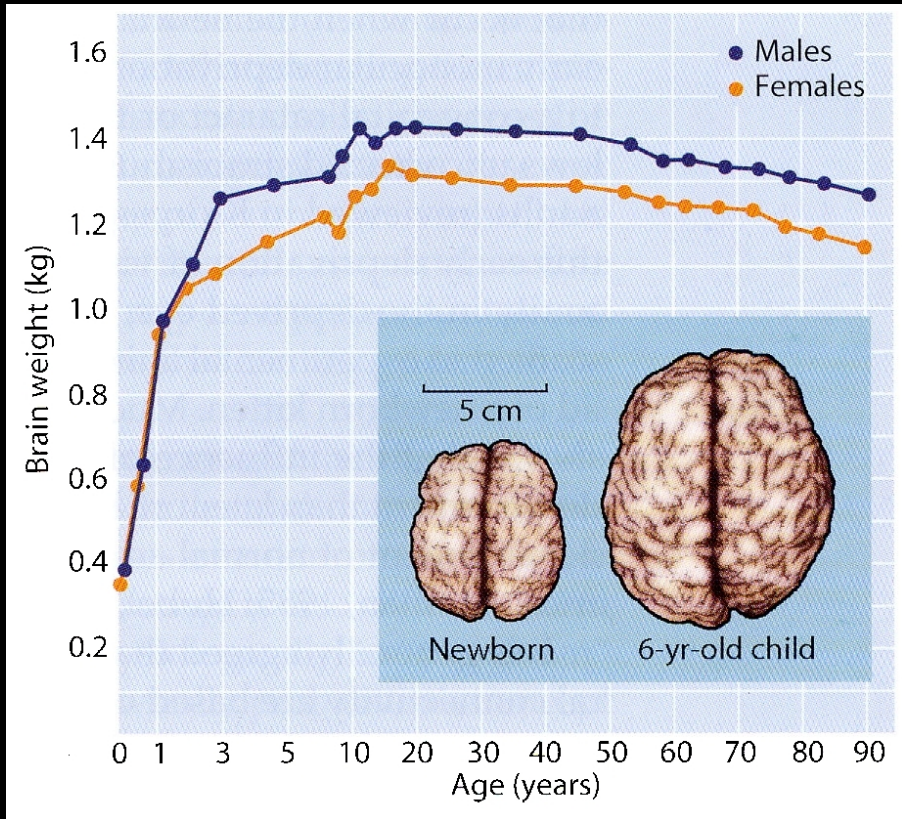


384 cc



1,350 cc



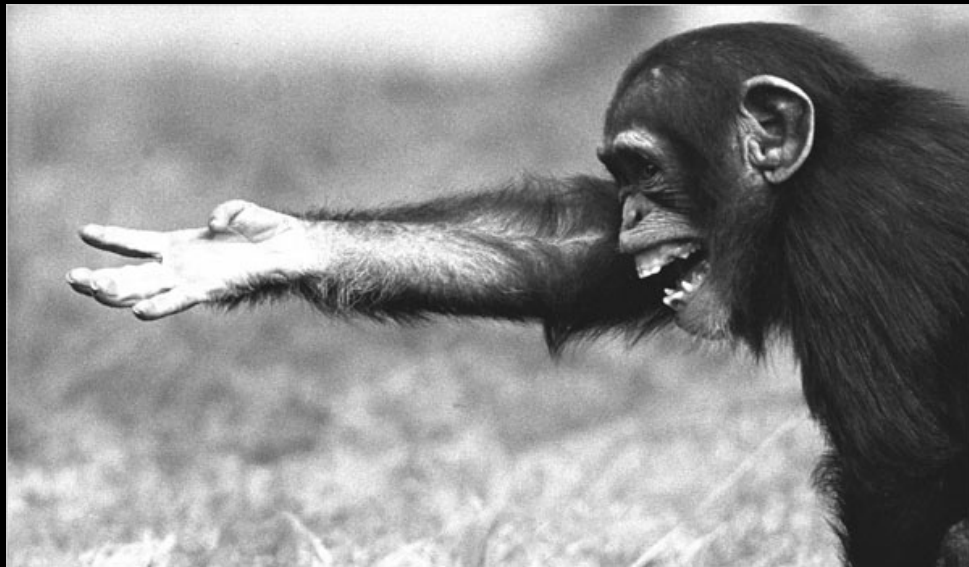


**Il bipedismo lascia le mani libere**

**Le mani libere permettono**

**La produzione di strumenti**

**La comunicazione gestuale**



# Comparison of Primate Hands



**bipedismo**



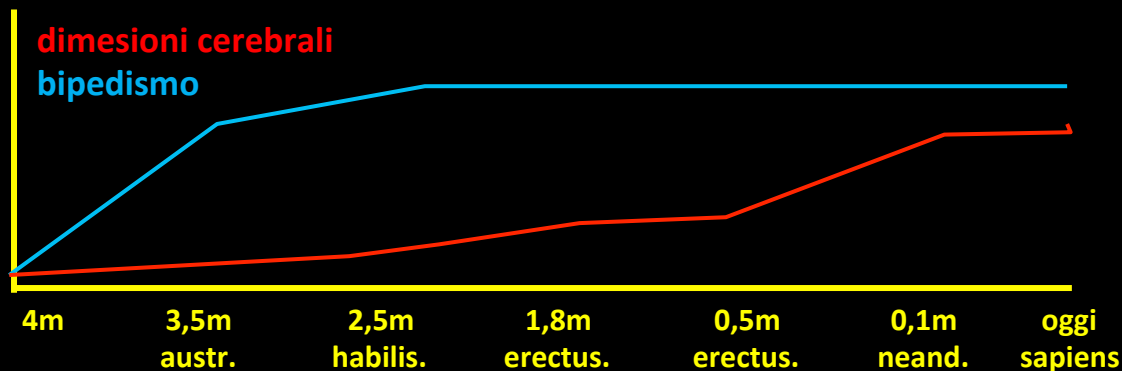
**mani libere**



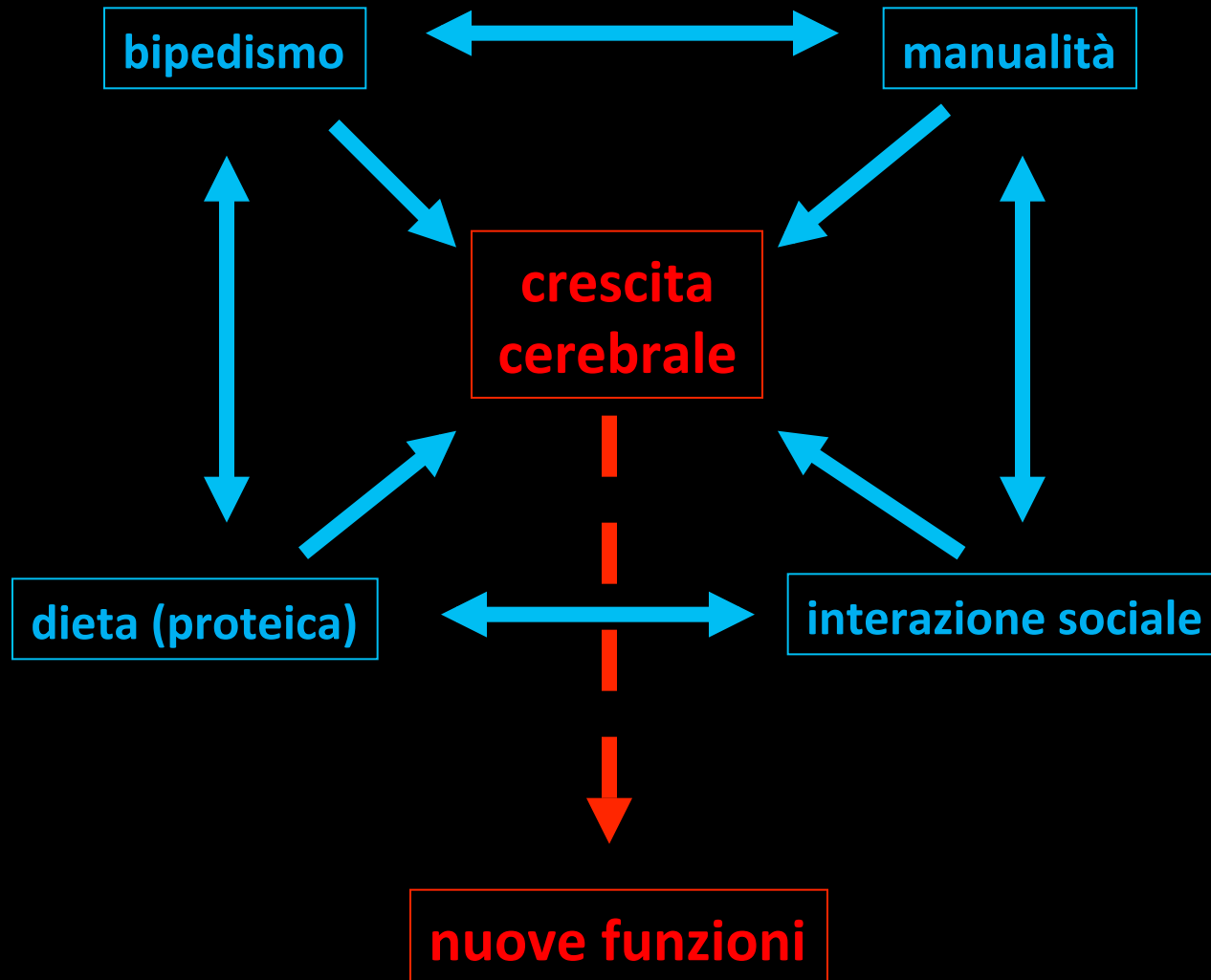
**controllo motorio**



**crescita cerebrale**

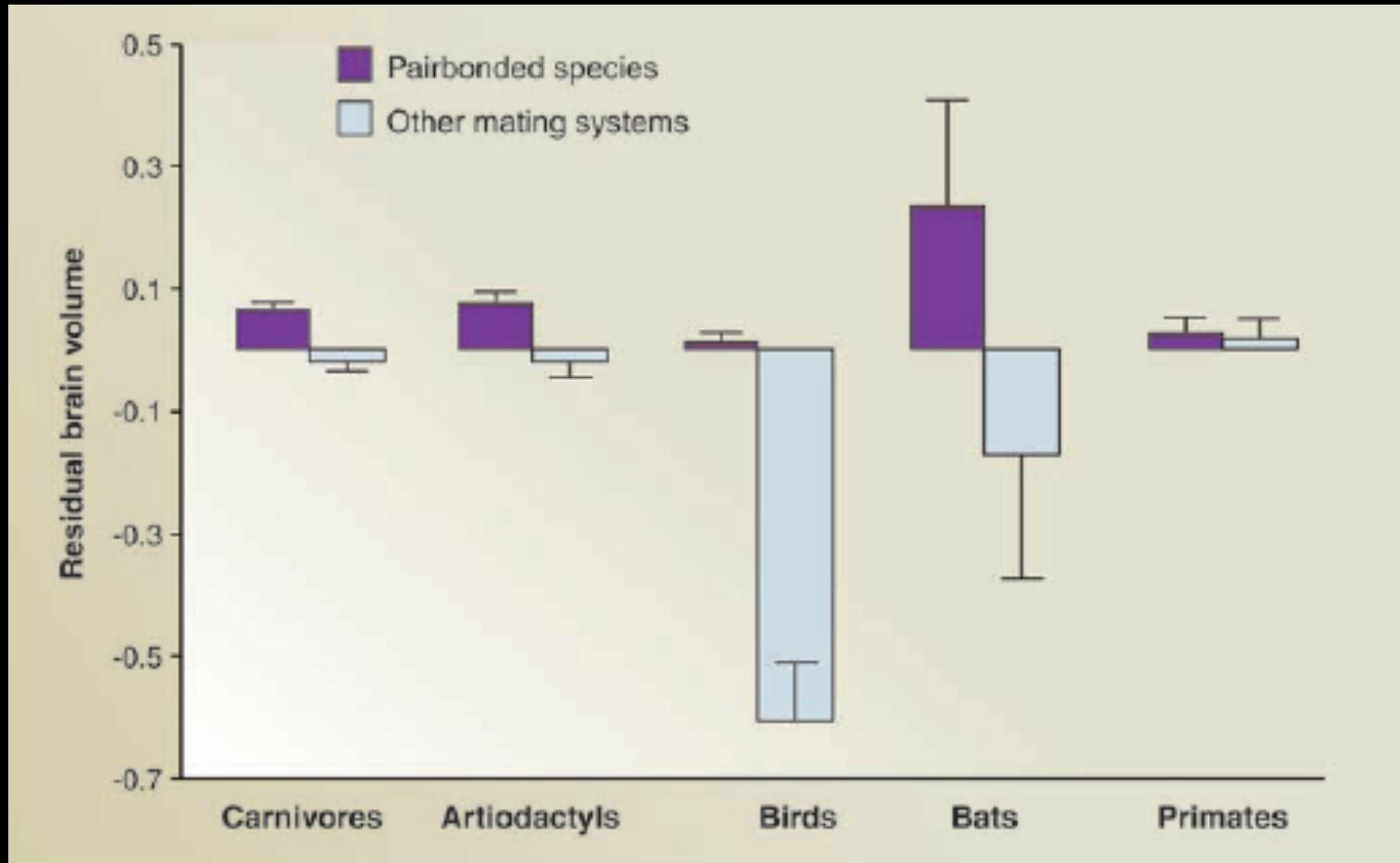




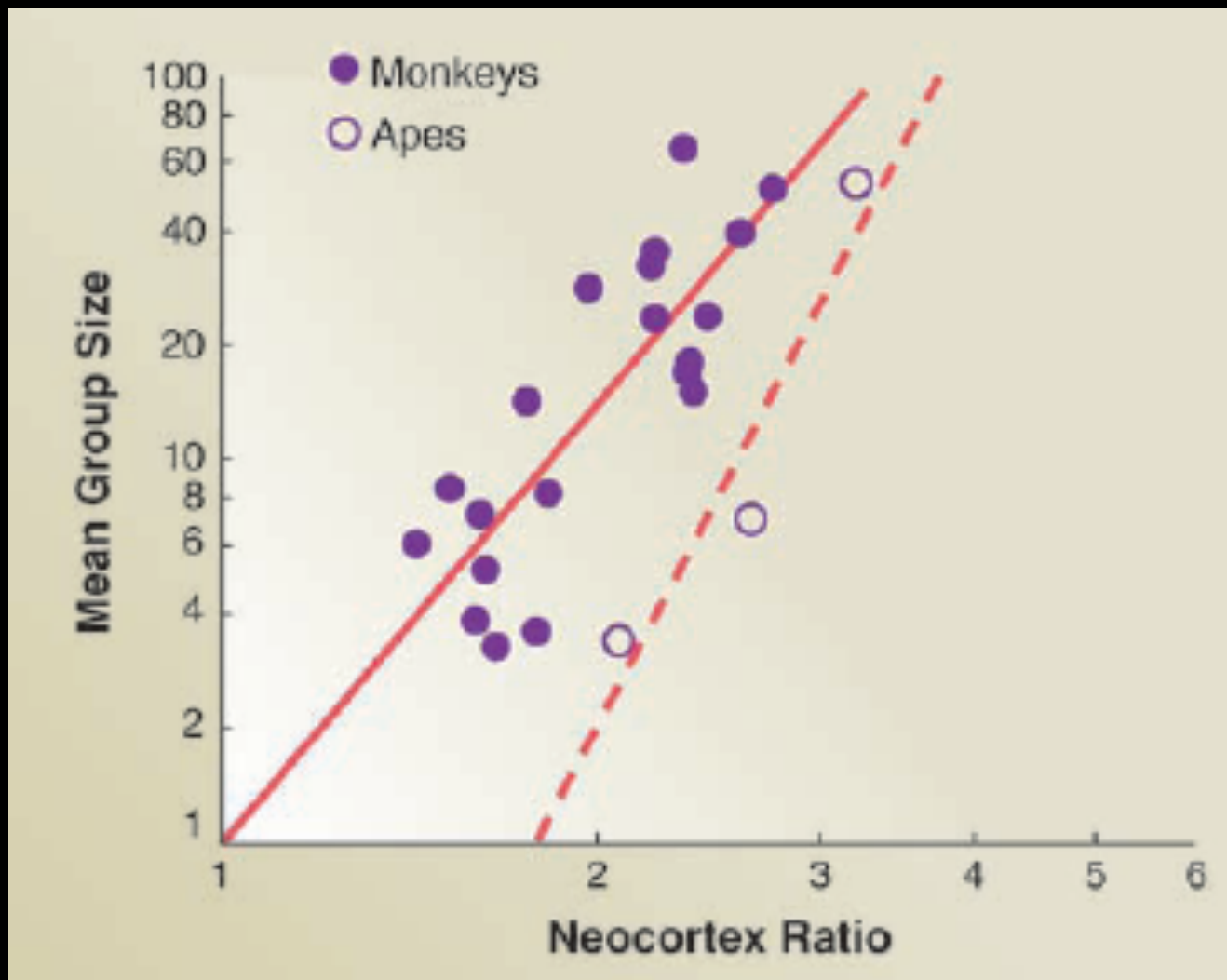


**fine dell'evoluzione biologica, inizio dell'evoluzione culturale**

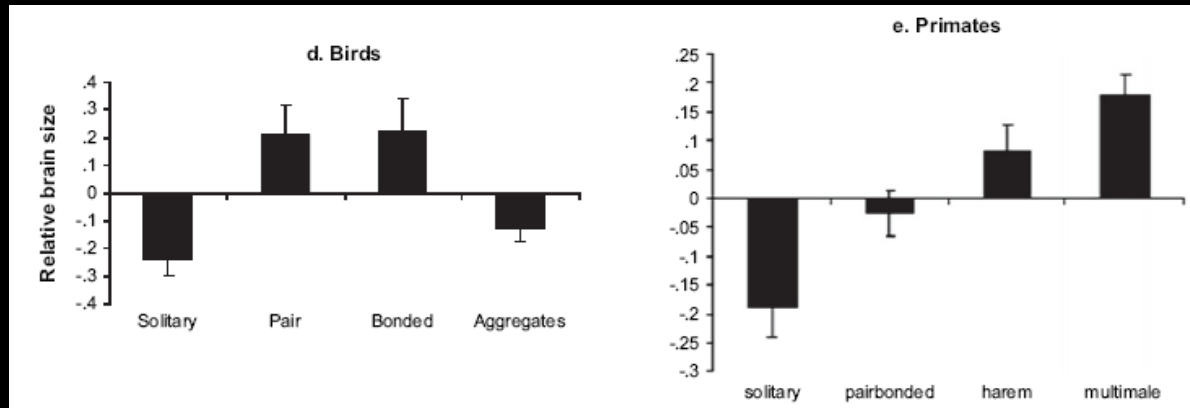
# Dimensione cerebrale e modalità di accoppiamento



## Dimensione cerebrale e dimensione del gruppo sociale

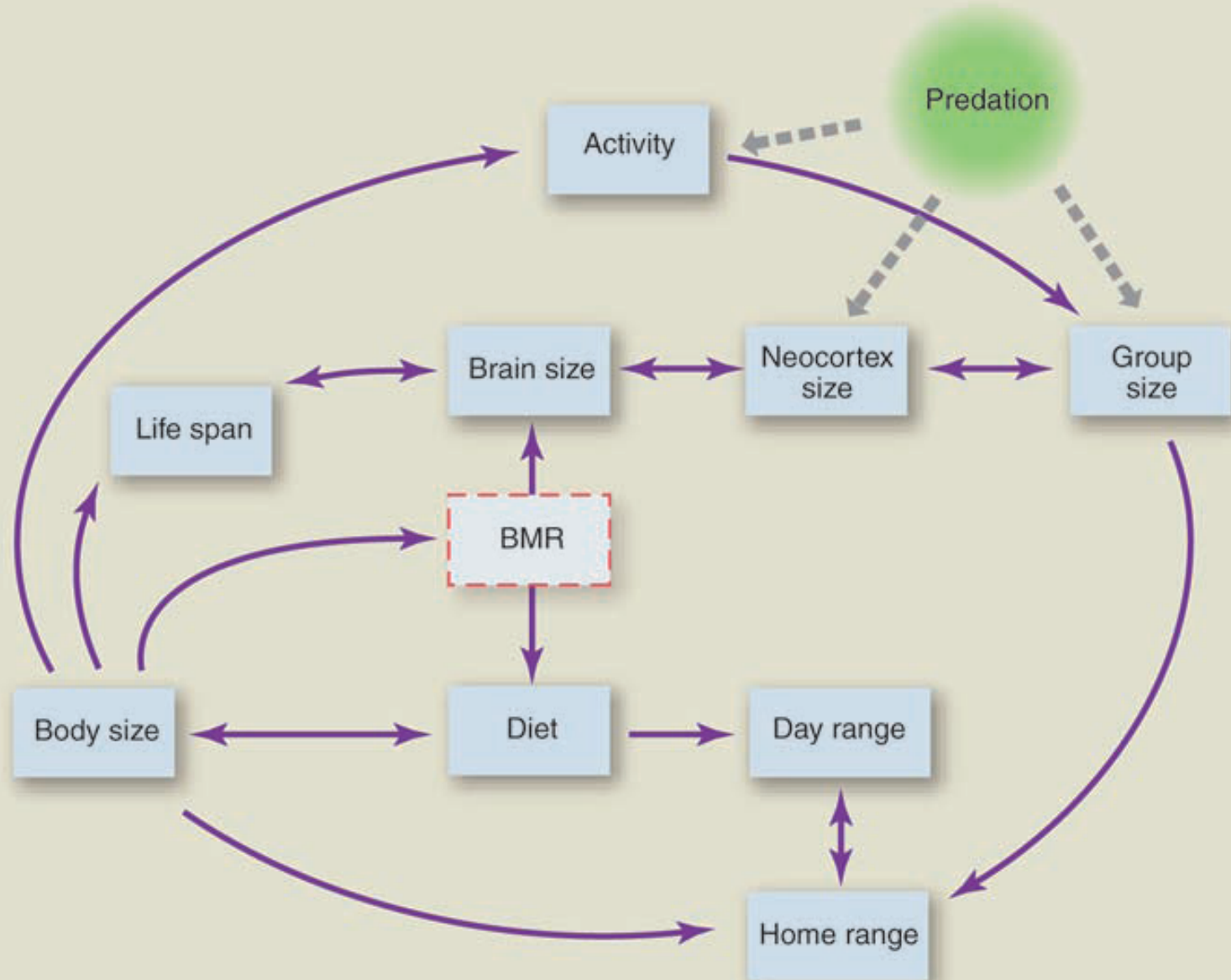




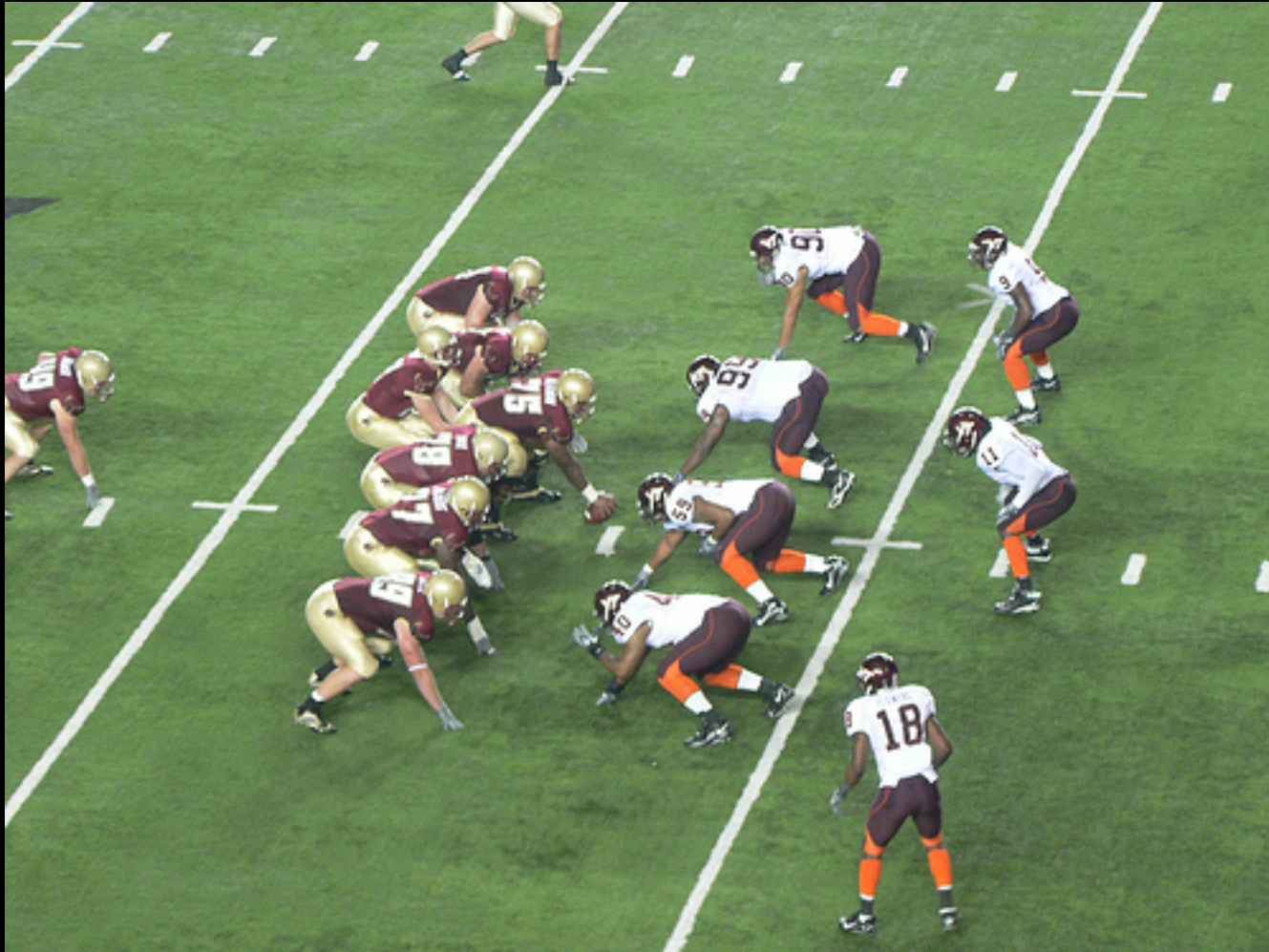


**Uccelli/mammiferi** = relazione *qualitativa* fra dimensione cerebrale e modalità di accoppiamento

**Primati** = relazione *quantitativa* fra dimensione cerebrale e dimensione del gruppo sociale

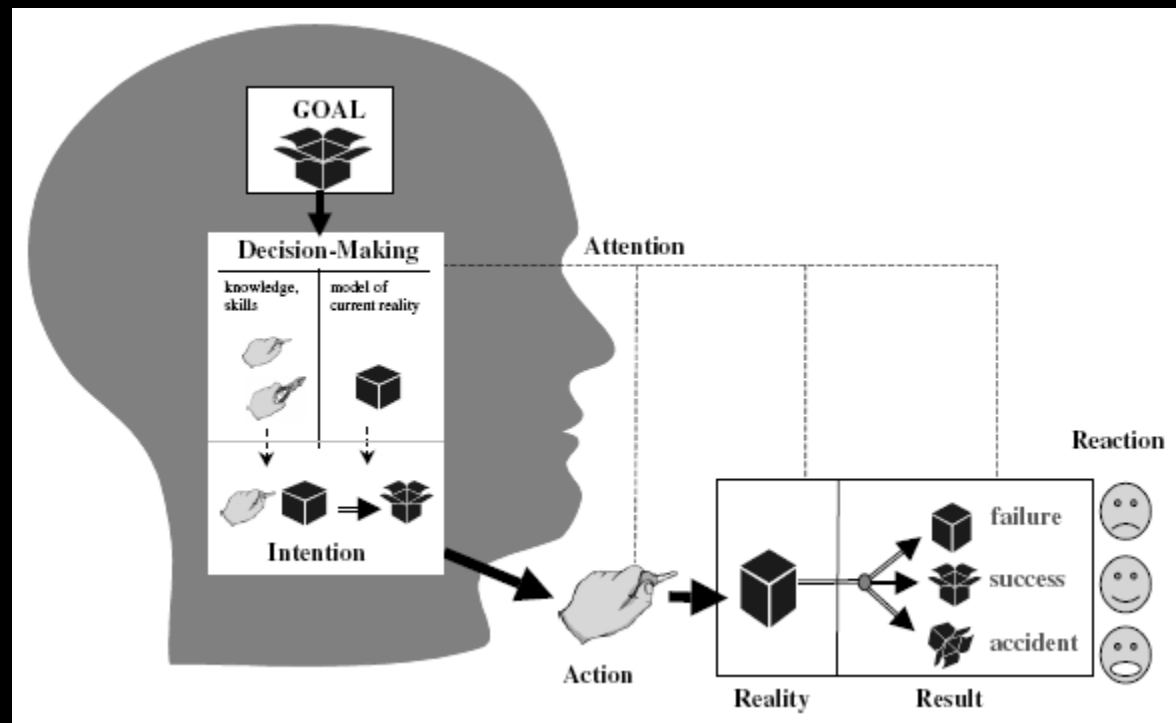


# Interazione sociale: competizione vs cooperazione



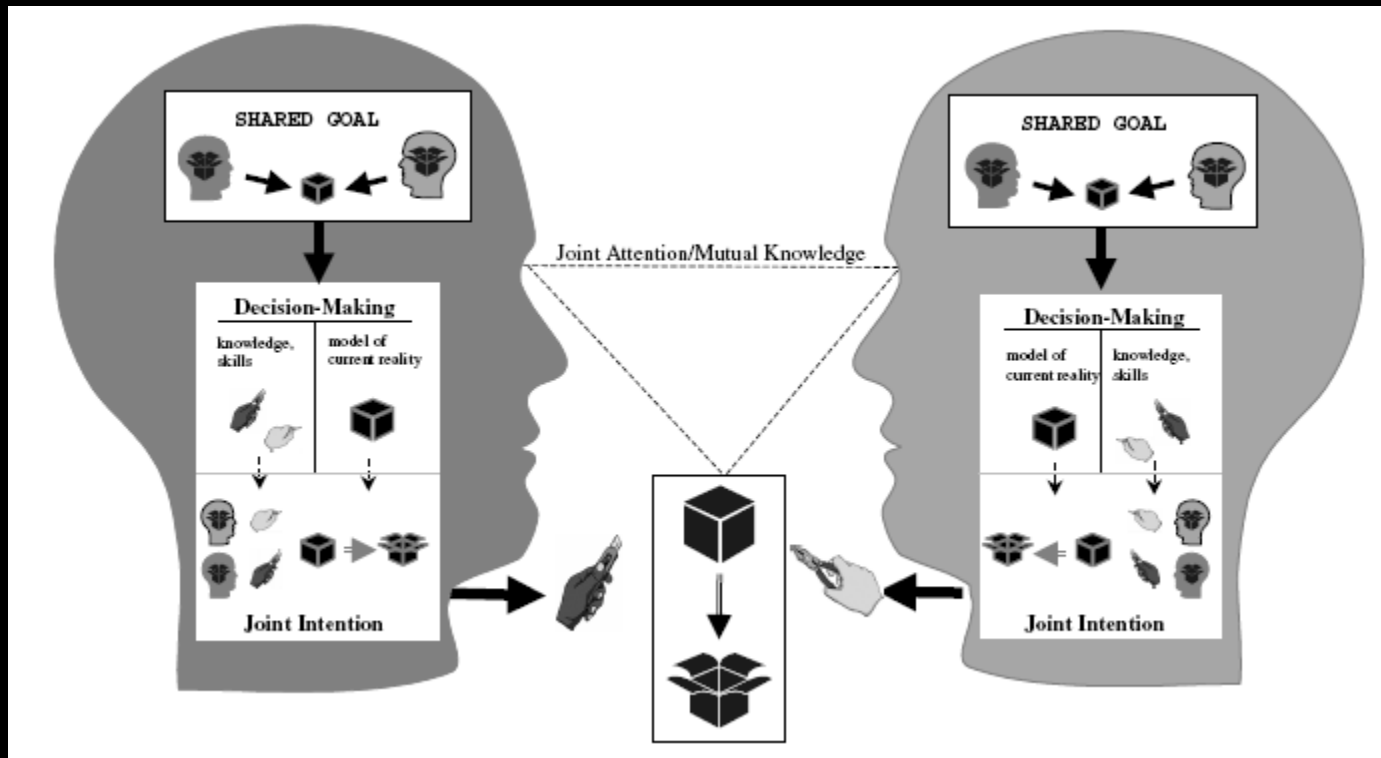


# Intenzionalità e pianificazione



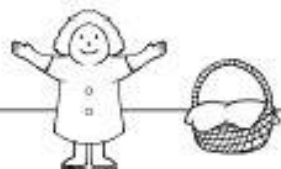
# intenzionalità condivisa

## pianificazione collaborativa

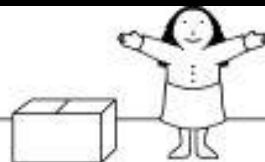




**So quel che pensi: la teoria della mente**



This is Sally.



This is Ann.



Sally has a ball. She puts it into her basket.



Sally goes out for a walk.  
Ann takes the ball out of the basket.

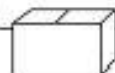


Ann then puts the ball in the box.

Now Sally comes back.

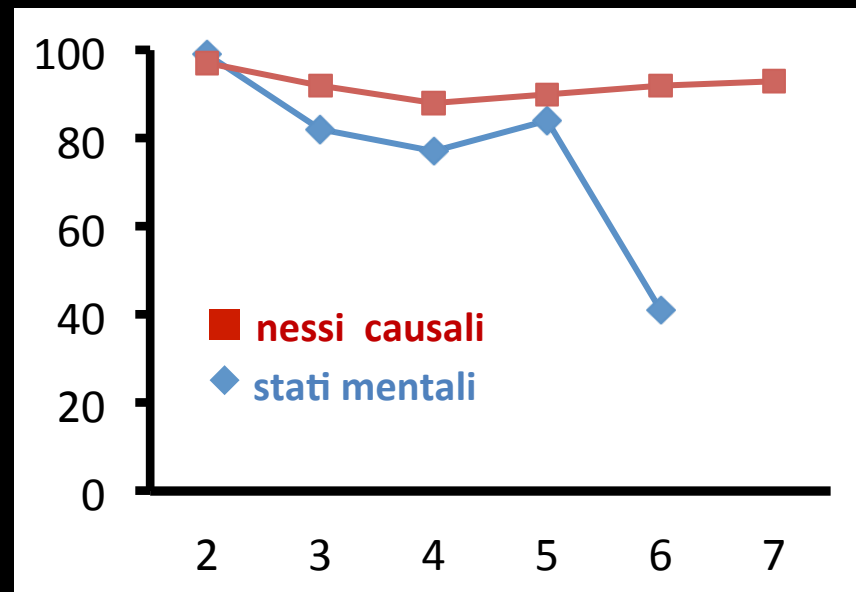
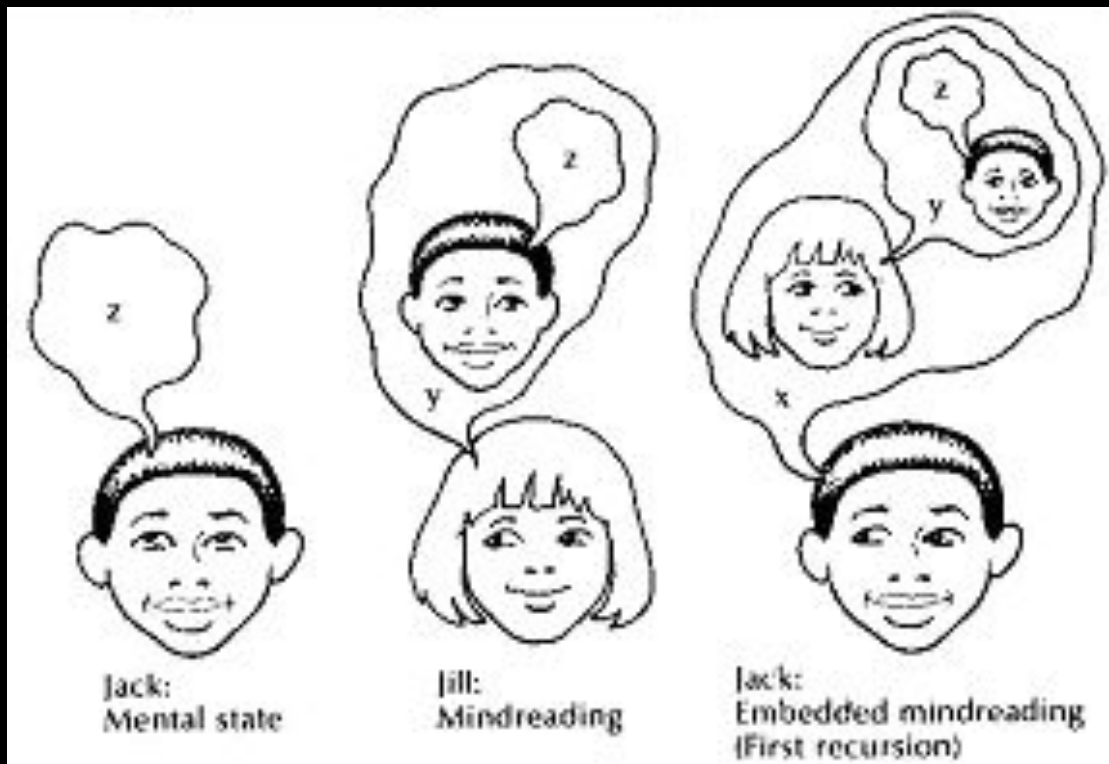


She wants to play with the ball.



Where will Sally look for the ball?







**Shakespeare vuole (1)  
che il pubblico comprenda (2)  
che Iago agisce (3)  
in modo che Otello creda (4)  
che Desdemona lo tradisce (5) con Cassio**



**Aiutare** gli altri a raggiungere il proprio scopo  
(agendo in loro favore)

**Condividere** le risorse con gli altri

**Informare** gli altri su fatti o cose di loro interesse



# Aiutare gli altri a raggiungere il proprio scopo (agendo in loro favore)

Out-of-reach



A person accidentally drops an object on the floor and unsuccessfully reaches for it.

Physical Obstacle



A person wants to put a pile of books into a cabinet, but she cannot open the closed doors because her hands are full.

Wrong Means



An object drops through a hole into a box and the person unsuccessfully tries to grasp it through the small hole, ignorant of a flap on the side of the box.



## Condividere le risorse con gli altri



**Informare** gli altri su fatti o cose di loro interesse



Of course humans are not cooperating angels; they also put their heads together to do all kinds of heinous deeds. But such deeds are not usually done to those inside *the group*. Indeed, recent evolutionary models have demonstrated what politicians have long known: the best way to motivate people to collaborate is to identify an enemy and charge that *they* threaten *us*. The remarkable human capacity for cooperation therefore seems to have evolved mainly for interaction within the local group: Such group mindedness in cooperation is, perhaps ironically, a major cause of strife and suffering in the world today. The solution – more easily described than attained – is to find new ways to define the group

*Michael Tomasello (2009)*