



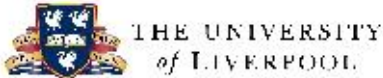
# *Is Religion Adaptive?*

Integrating cognition and function

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Institute of Cognitive &  
Evolutionary Anthropology  
University of Oxford



# Two Evolutionary Questions about Religion

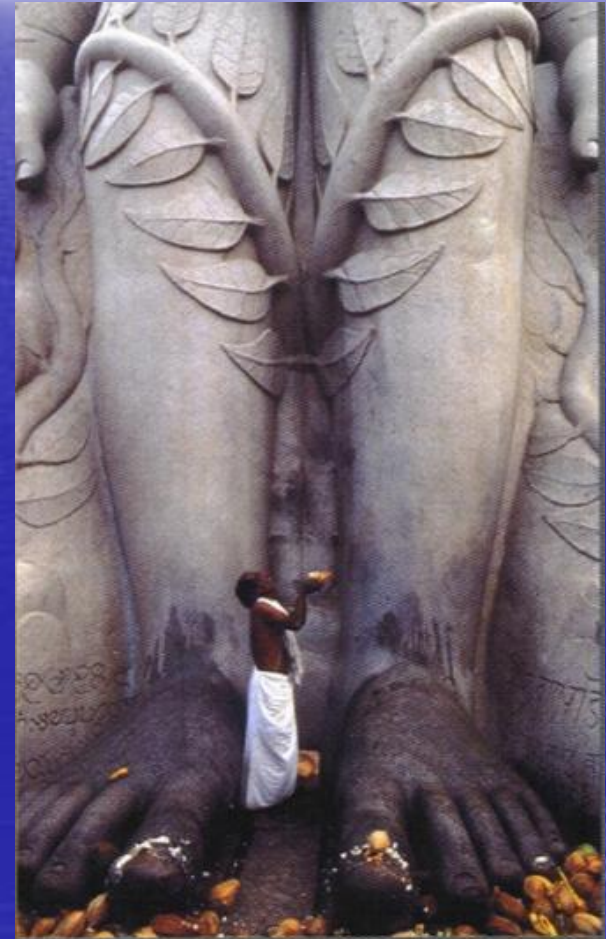
Nothing as costly as religion could possibly be a maladaptation or a mere by-product

- What does [did] religion do for us?
- Why did religion [apparently] evolve only in humans?



# Four [Traditional] Functions for Religion

- gives coherence to a complex world [Freud]
- psychological wellbeing
- social bonding [Durkheim]
- enforces conformity  
[moral codes] [Marx]



# Does Religion Benefit You?

Frequent claims that religion has no adaptive benefits at the individual level notwithstanding...

Compared to others, actively religious people:

- live longer
- are more content/happier
- are less stressed
- suffer fewer psychological problems
- recover faster from surgery

[Data from extensive sociological and epidemiological studies in past decade]

**BUT, even if none of these was true....**

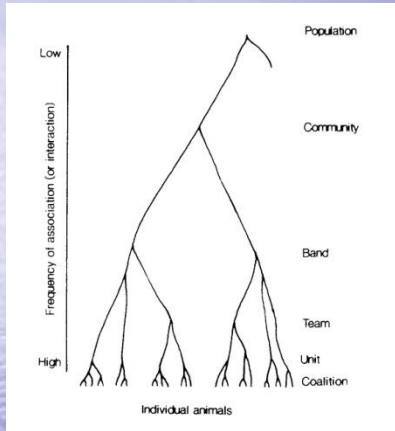


# The World of Multilevel Selection

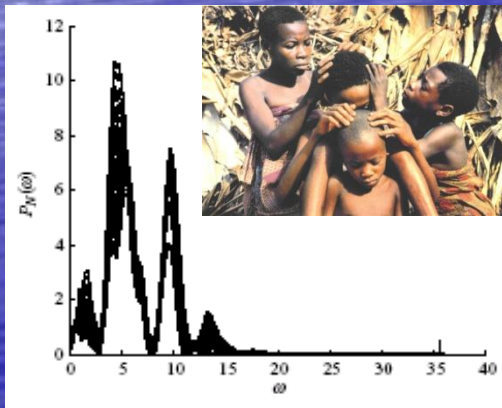
- Multi-level social systems are common in mammals
- When sociality involves an implicit social contract....

Fitness accrues at the level of the individual, but through benefits generated by the group

- It requires a more subtle understanding of fitness – Hamilton’s original concept [neighbour-modulated fitnesses]
- This is NOT group selection



Old World monkeys

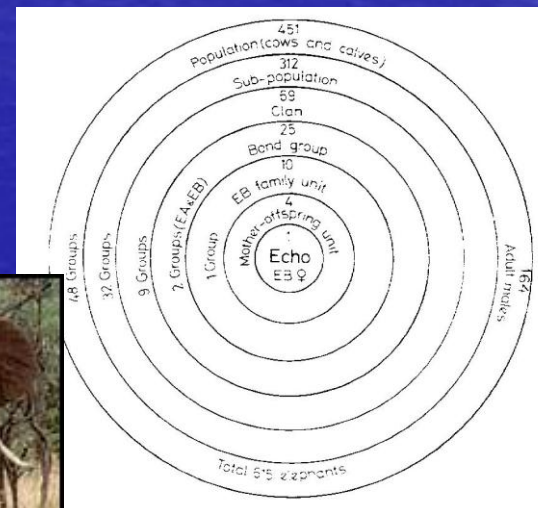


Human social networks scale hierarchically



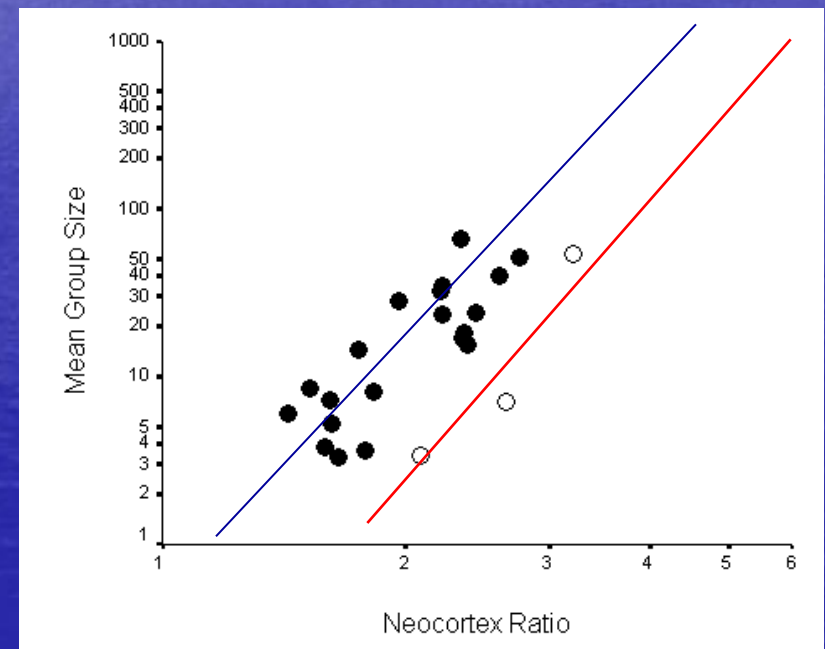
Feral goats on Rum

Elephants at Amboseli



# Back To The Beginning....

- Social Brain Hypothesis
- An explanation for the evolution of large brains in primates
- Evidence: group size [and many aspects of “smart” behaviour] are a function of neocortex volume



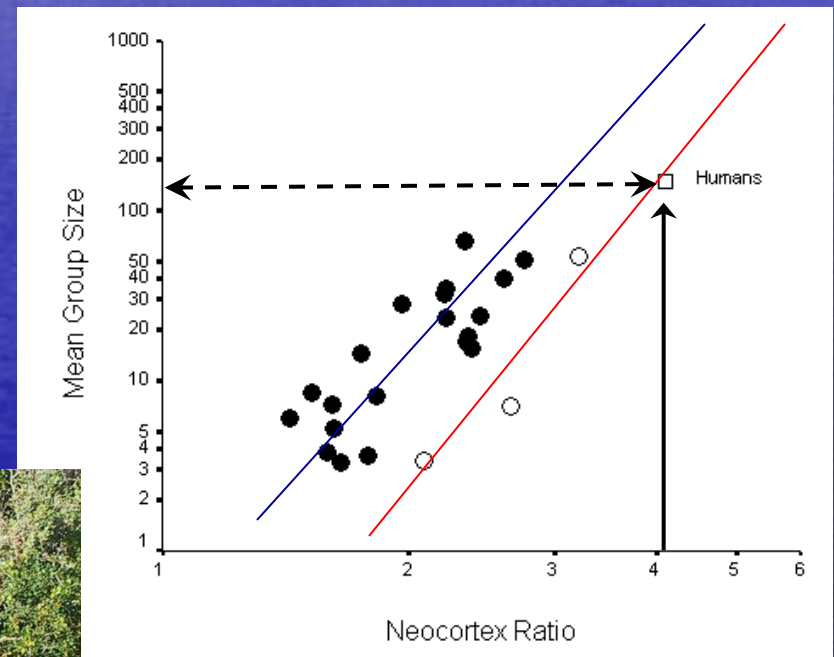
Dunbar 1992, 1998

Neocortex ratio = neocortex vol/rest of brain  
[i.e. “thinking” part of brain]



# Humans and the Social Brain

- Predicted group size for humans is  $\sim 150$   
[Dunbar's Number]



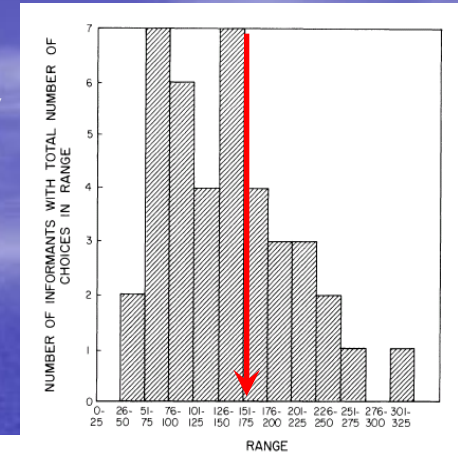
...BUT primate societies are very intimate

# Human Social Groups

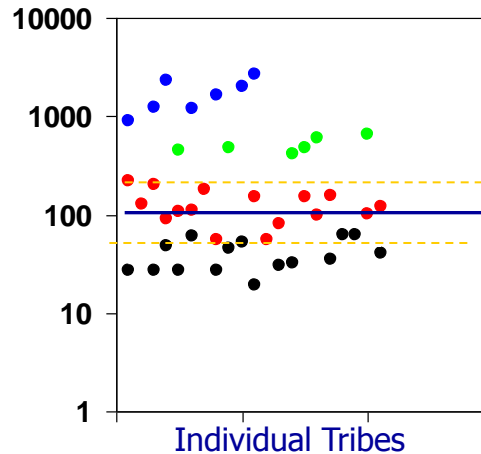
All these have mean sizes of 100-200

## "Reverse" Small World Experiments

Killworth et al (1984)



Neolithic villages 6500 BC	150-200
Modern armies (company)	180
Hutterite communities	107
'Nebraska' Amish parishes	113
business organisation	<200
ideal church congregations	<200
Doomsday Book villages	150
C18th English villages	160
GoreTex Inc's structure	150
Research sub-disciplines	100-200



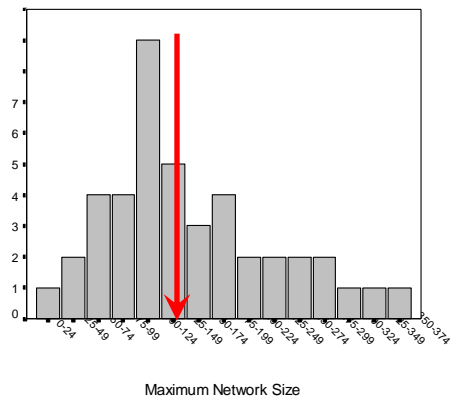
## Hunter-Gatherer Societies

Dunbar (1993)

Small world experiments	134
Hunter-Gatherer communities	148
Xmas card networks	154

## Xmas Card Networks

Hill & Dunbar (2003)

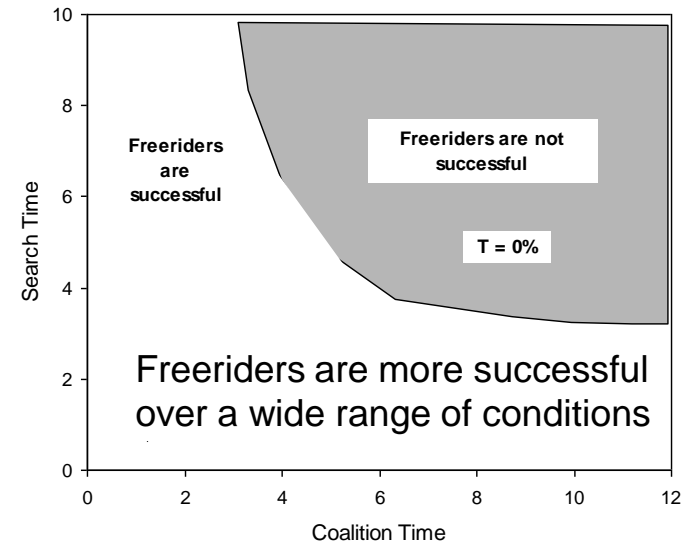




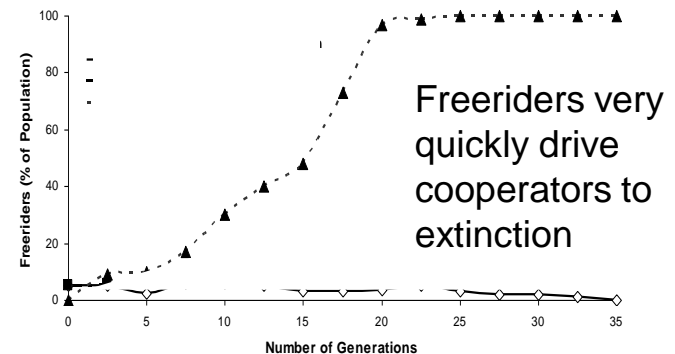
# The Freerider Problem

- All primate societies are based on an implicit social contract [cooperation]
- All such systems are susceptible to freeriders
- Dispersed social systems are especially susceptible
- Punishment [*stick*] has attracted most attention...
- **BUT it's only as effective as the detection rate**
- Voluntary commitment [*carrot*] is much more effective

Enquist & Leimar (1993)



Nettle & Dunbar (1997)

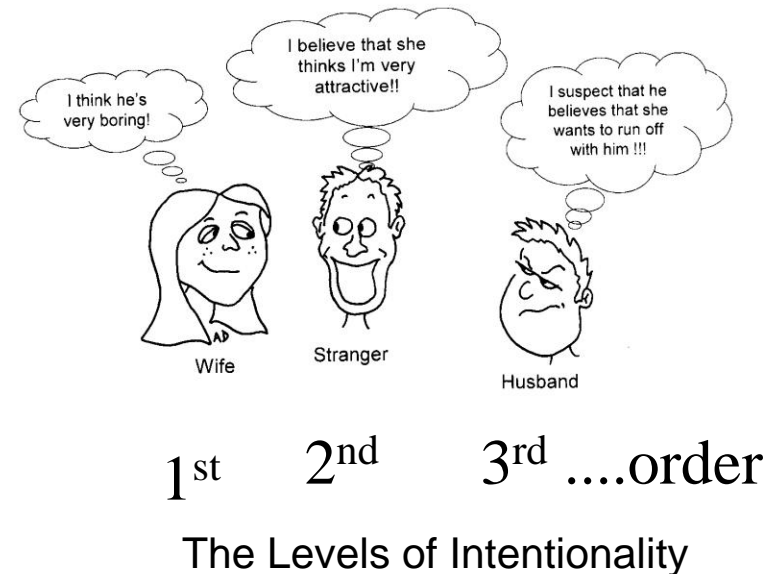


# The Twin Pincers of Primate Sociality



- The intensity of intimacy

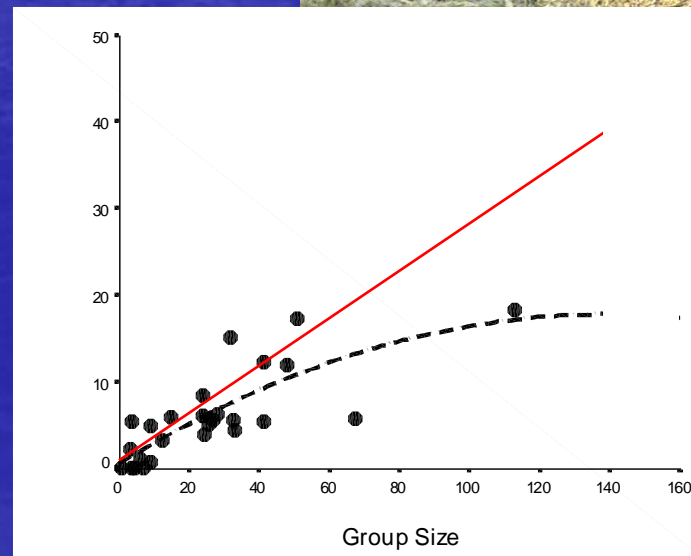
- Mentalising [understanding other's minds]





# The Intensity of Intimacy

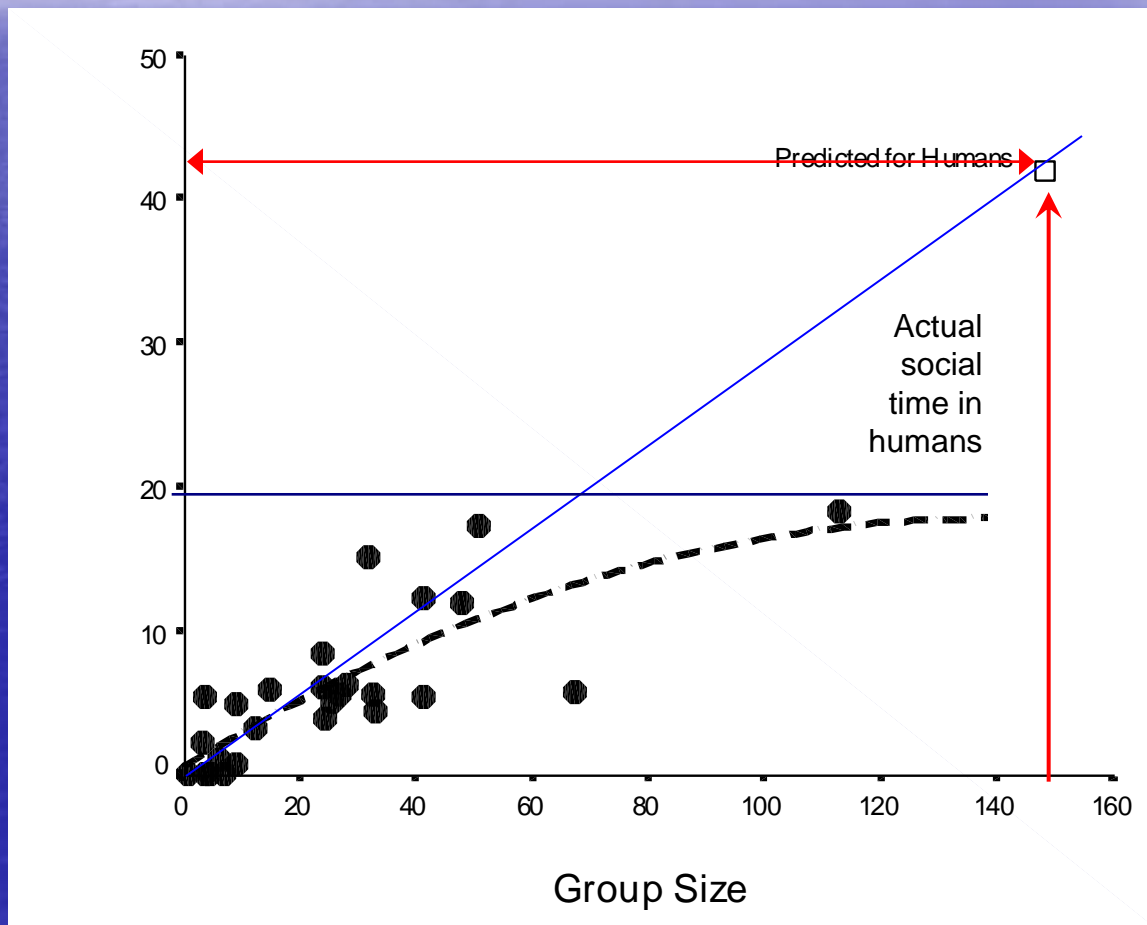
- Social bonding primate-style
- Intimacy influences trust and obligation
- Grooming increases with group size
- Grooming releases endorphins and creates an opiate "high"



Mean grooming time vs mean group size for individual primate species

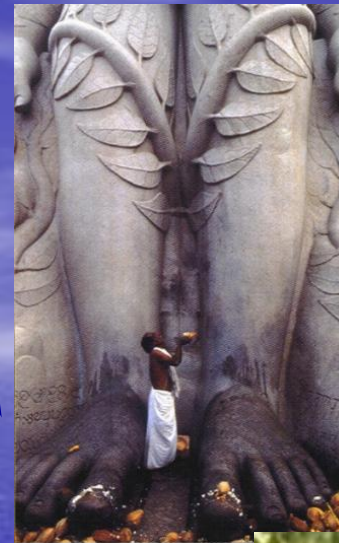
# Grooming Time in Humans?

- Grooming as the bonding agent in primates
- Grooming time is a linear function of group size





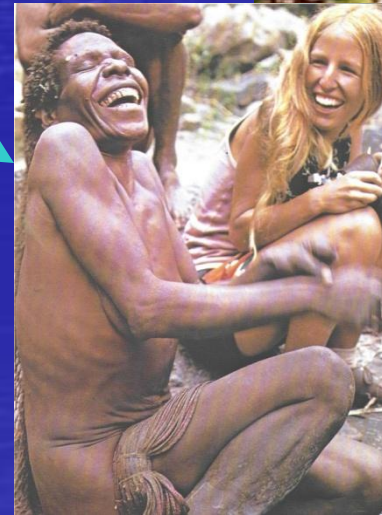
# Three Ways to Bridge the Gap?



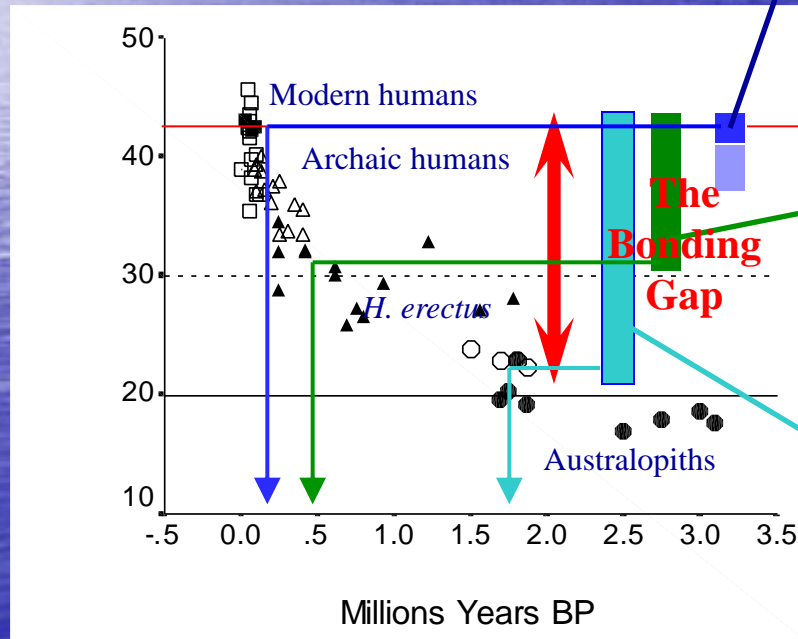
Religion and its rituals



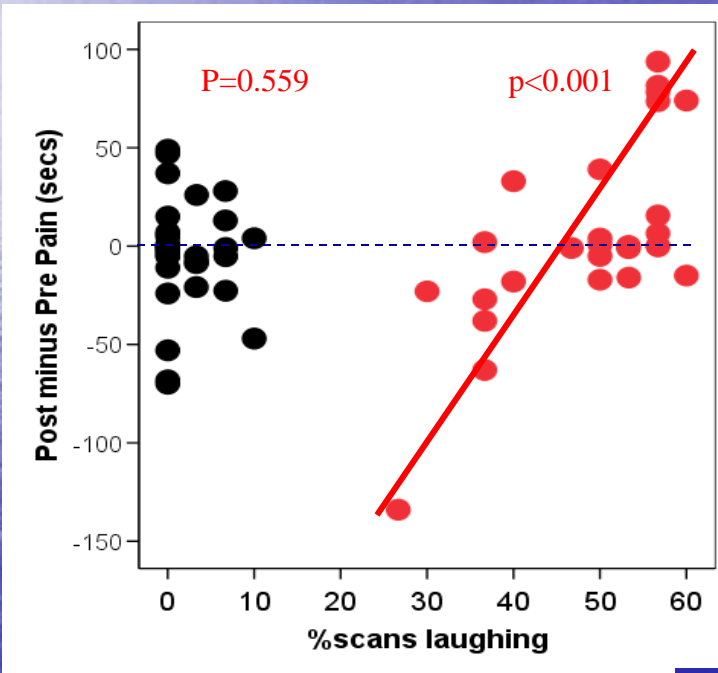
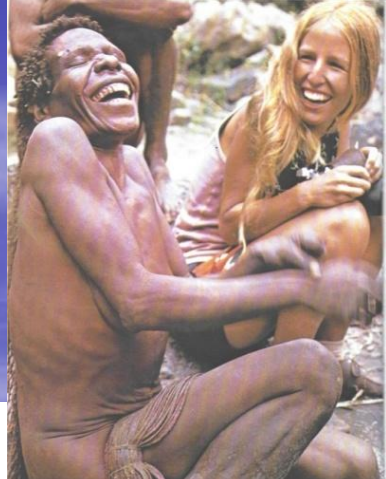
Singing and dancing



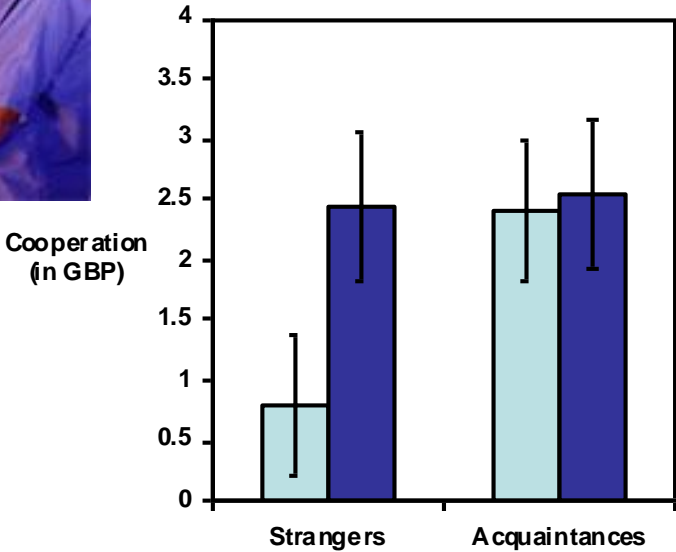
Laughter  
a cross-cultural trait  
shared with chimpanzees



# Laughter... the Best Medicine?



In a Public Good Game

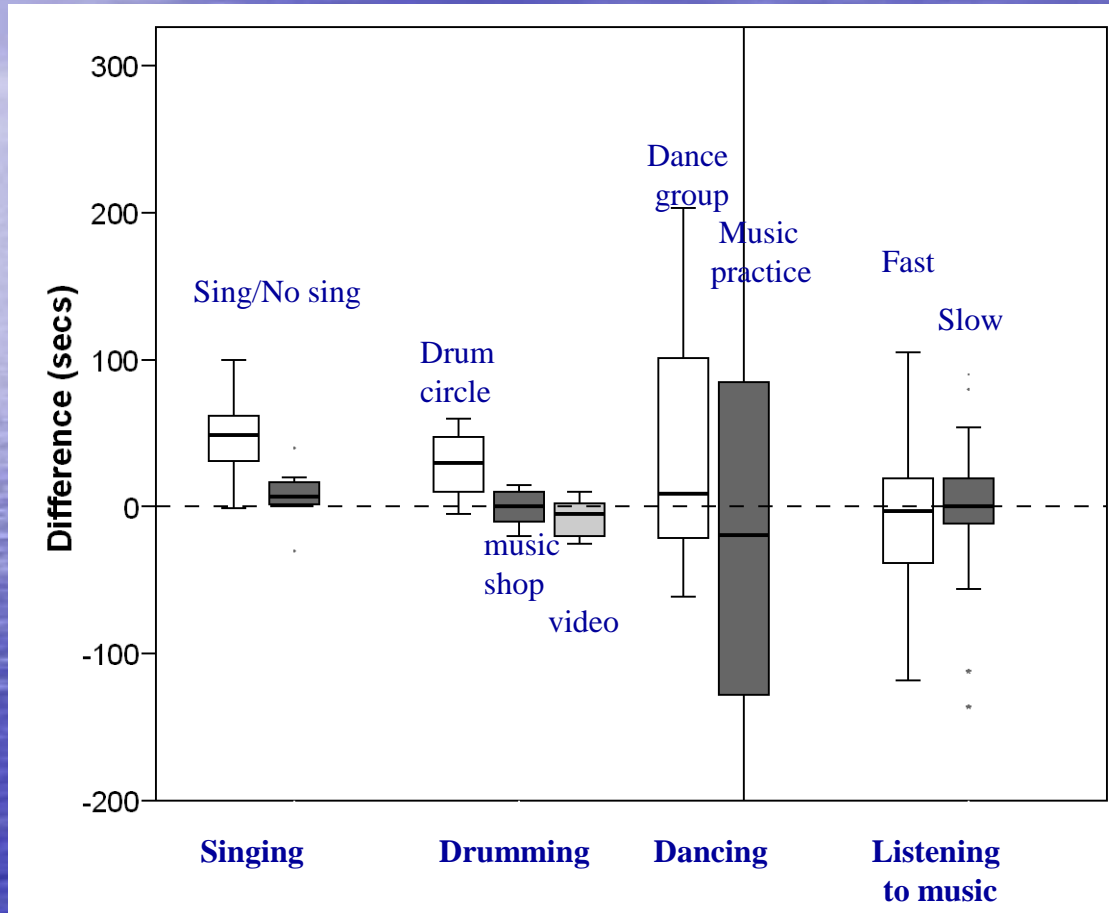
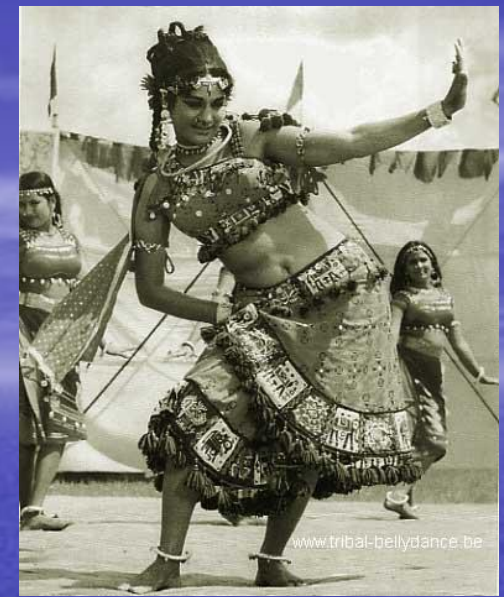


Ss were more generous to strangers  
(but not “friends”)  
after watching a comedy video

**Procedure:**  
pain test – video/activity – pain re-test



# Musical Endorphins



Musical performance facilitates endorphin release, but listening to music does not

**Procedure:**  
pain test – activity – pain re-test

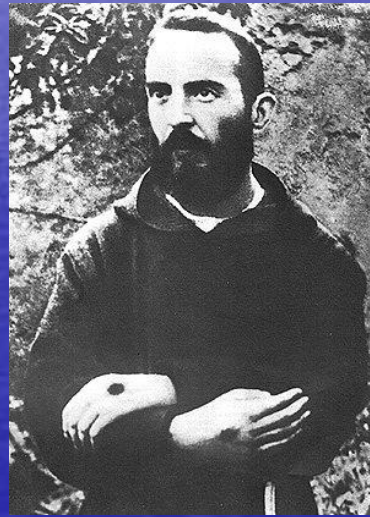
Dunbar, Kaskatis, MacDonald & Barra (submitted)

# An Opium for the Masses?

Religious practices  
are often well suited  
to stimulate  
endorphins



Medieval flagellants



Stigmata of  
Padre Pio

Whirling dervish



Ecstatic states:  
⇒ make you relaxed  
⇒ enhance sense of  
communality



# So, why not get your kicks on your own?

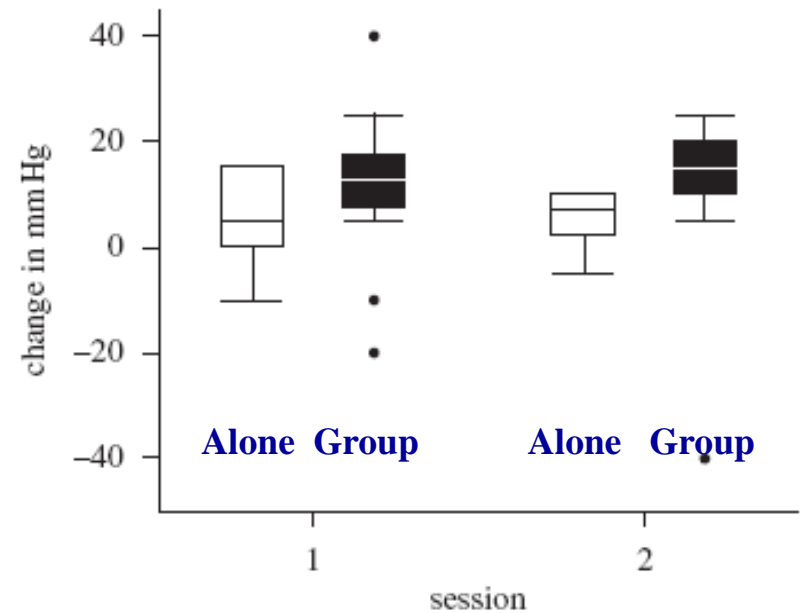
....because creating a sense of “bondingness” [commitment to community and prosociality] requires doing it together [i.e. interacting]!



# Synchony Ramps up the Endorphins



Change in pain threshold  
before and after 45 mins  
rowing work-out on  
ergometers in the gym:  
Alone vs in a virtual boat



Cohen et al  
(2008)



# Why Does Religion Have This Effect?

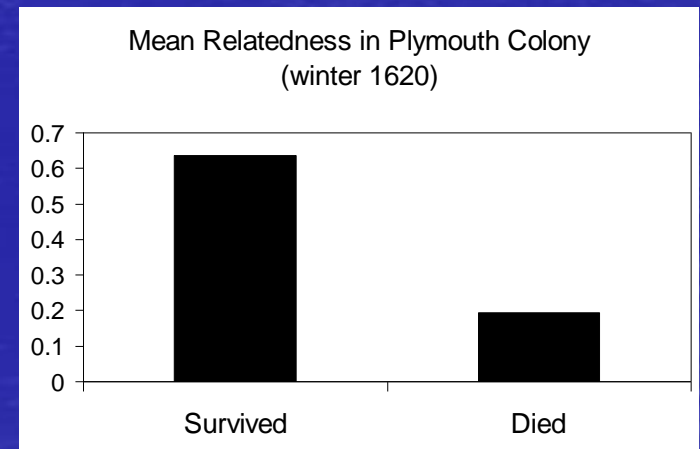
There are two likely mechanisms:

- direct influence of endorphins [endorphins seem to “tune” the immune system]
- sense of belonging and communality acting directly OR indirectly through support from network members

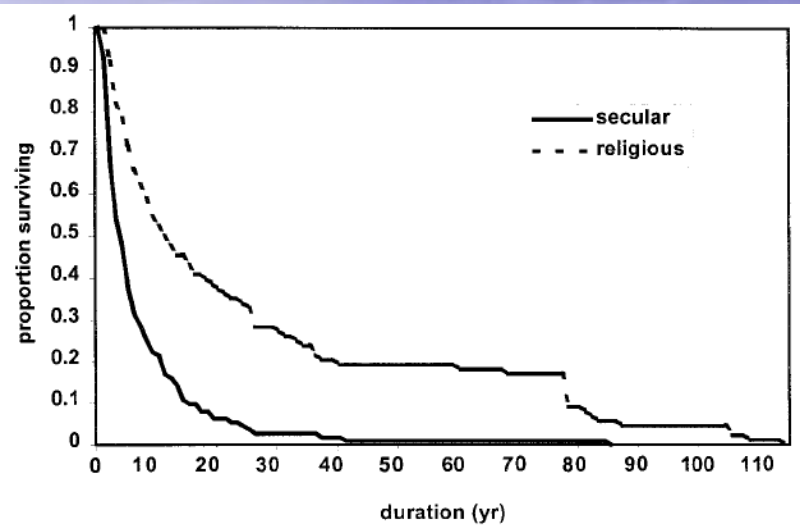
... being a member of a large kinship group reduces

(1) illness rates in children [Newcastle and Trinidad]

(2) death rates in adults [the *Mayflower* colonists in 1620 and the Donner Party of 1846]

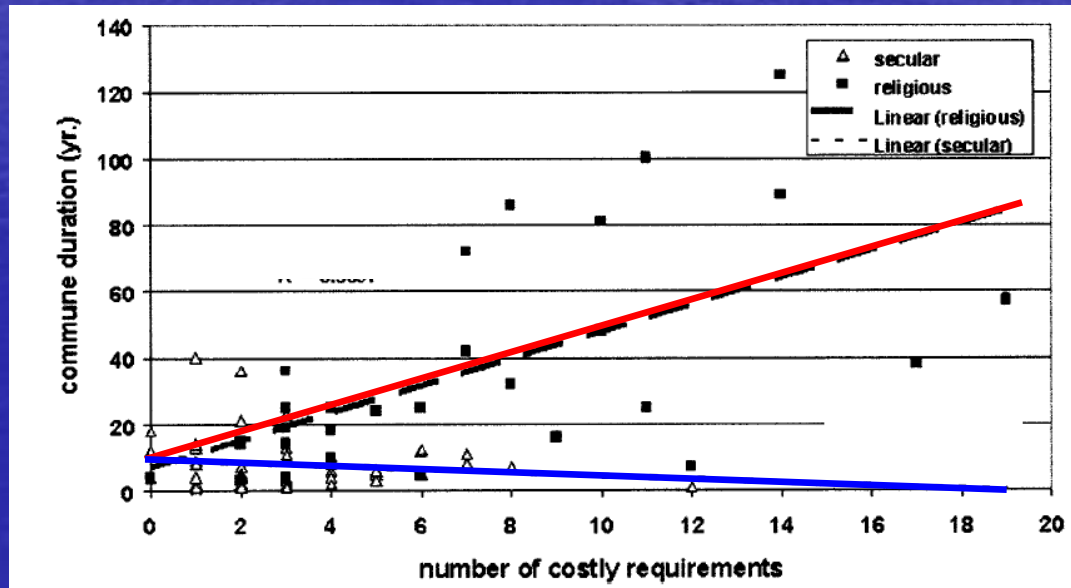


# The Transcendental Edge...?



C19th US utopian cults

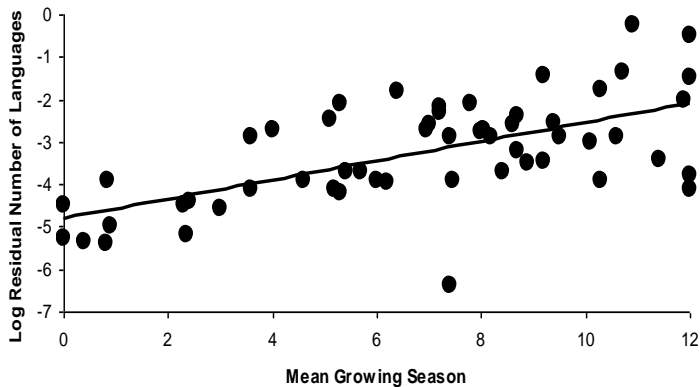
Religious cults last longer than secular ones



Something about a transcendental dimension raises commitment to the project

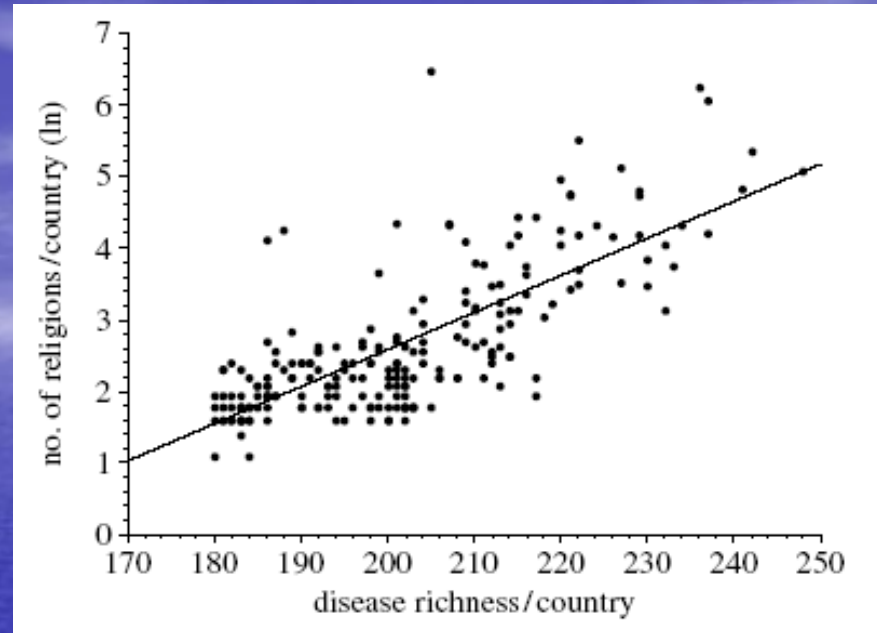


# The Ecology of Community Size

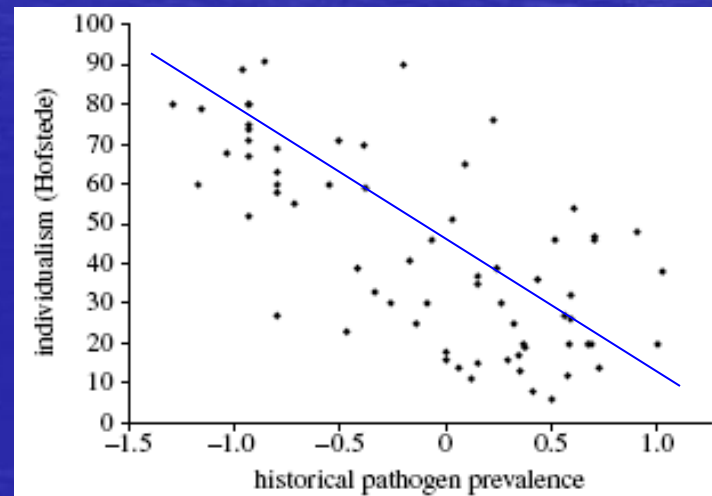


Nettle (1999)

- Small communities in the Tropics, larger ones at higher latitudes
- Religion density and collectivism are a function of disease prevalence [aka latitude]



Fincher & Thornhill (2008)

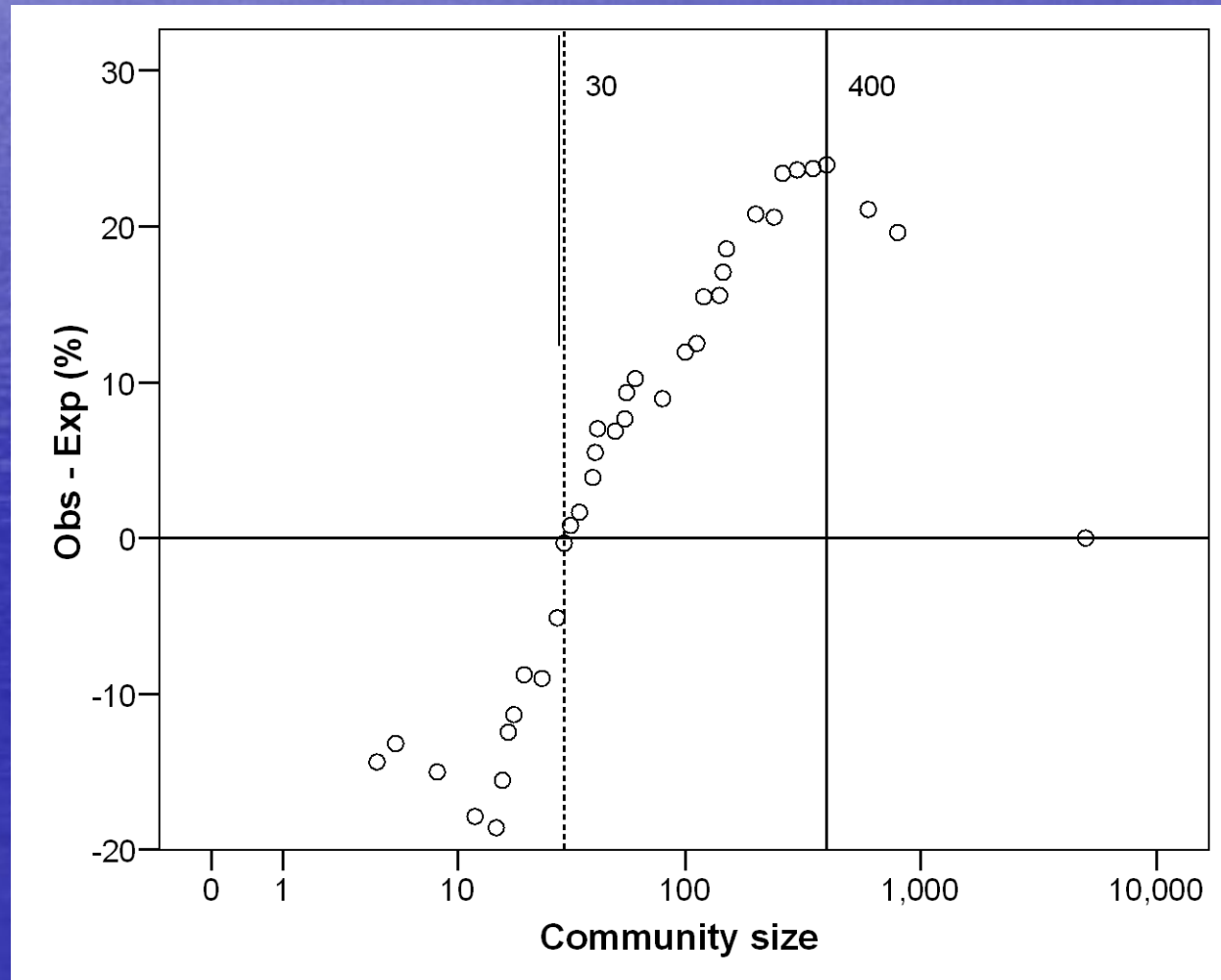


Fincher et al (2008)

# Cults are a Small-Scale Phenomenon

- Foundation size for C19th US utopian cults
- Against expectation (scale-free effect from Zipf's Law),  $N < 30$  is uncommon, and  $150 > N > 400$  is the most common

Dunbar & Sosis (in prep)

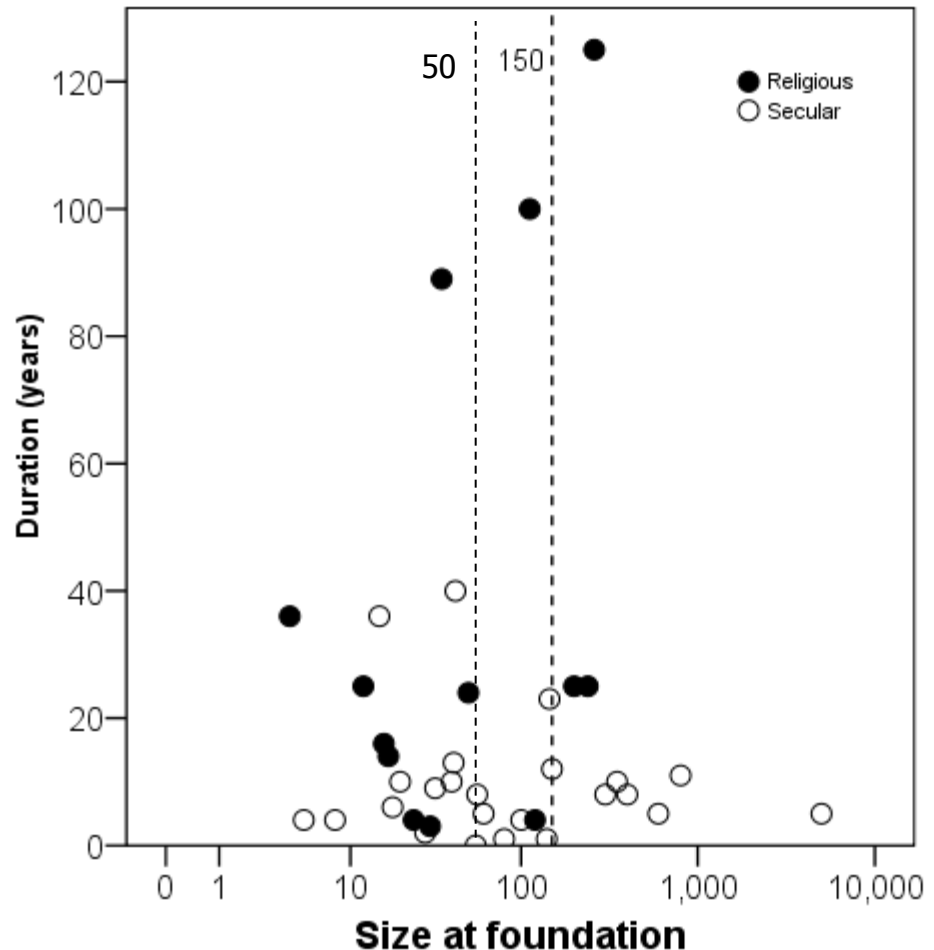




# Is There an Optimal Cult Size?

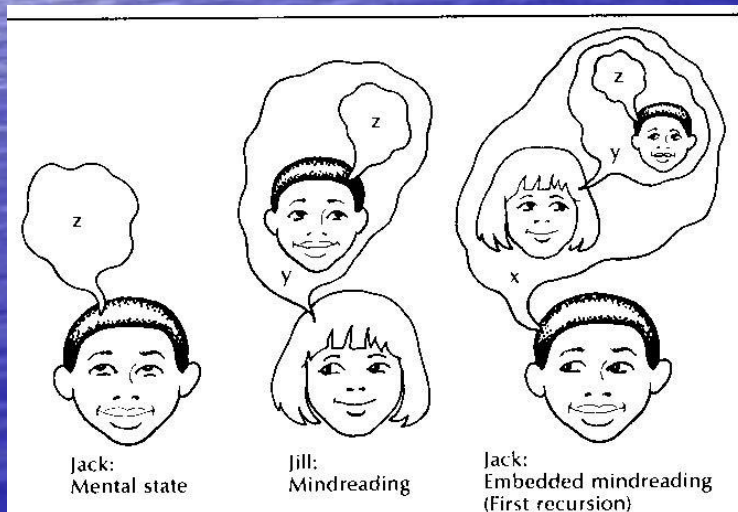
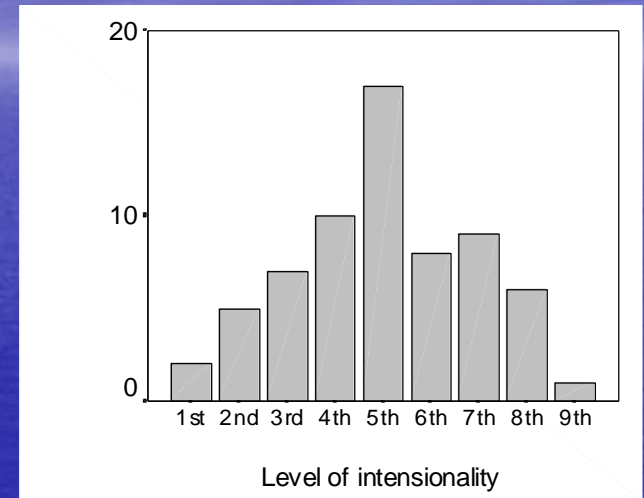
- Very small and very large foundations don't survive well
- Optimum size  $\sim 150$
- For secular communes, optimal size may even be smaller ( $\sim 50$ )

Dunbar & Sosis (in prep)



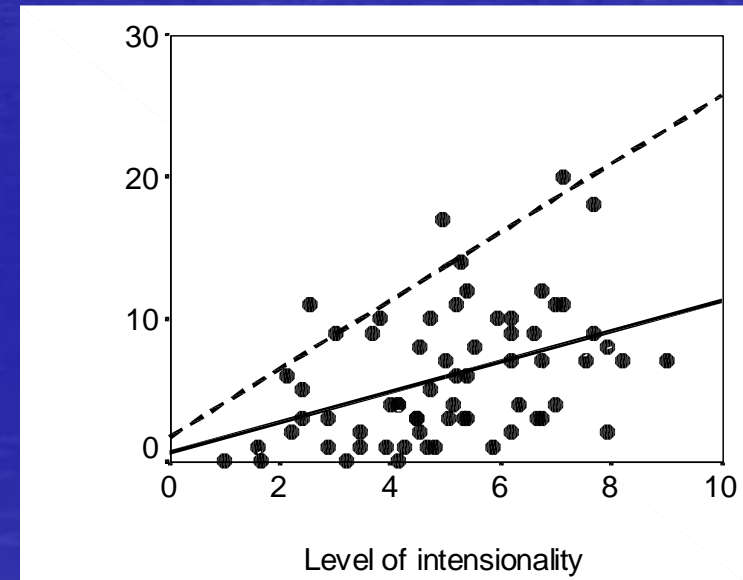
# The Role of Social Cognition

- Intentionality as a reflexively hierarchical sequence of belief states
- ...that may be very costly in information processing terms



Kindermann et al  
(1998)

Stiller & Dunbar  
(2007)





# Religion at the Limits of Cognition...?

- Belief as a personal phenomenon

"I believe that God wants us to act with righteous intent"

[3]

- Belief as a social phenomenon

"I intend that you believe that God wants us to act with righteous intent"

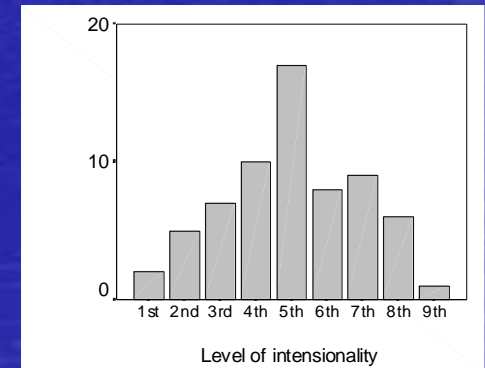
[4]

.... BUT why should you care?

- Belief as a communal phenomenon:

"I intend that you understand that we believe that God wants us to act with righteous intent"

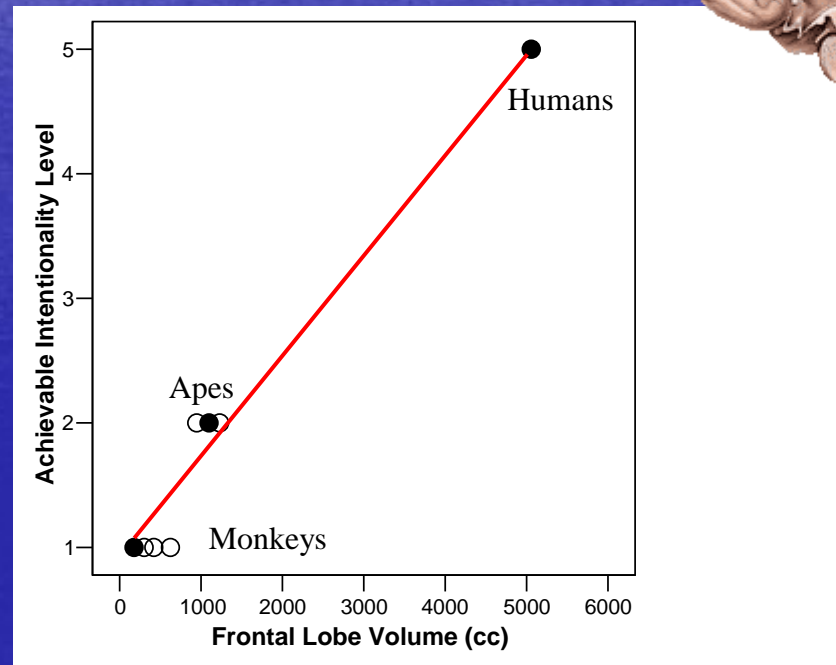
[5]



# Why is Religion Unique to Humans?



- If achievable level of intentionality really is determined by capacity of frontal lobe...
- ...only humans have sufficient capacity for 5<sup>th</sup> order

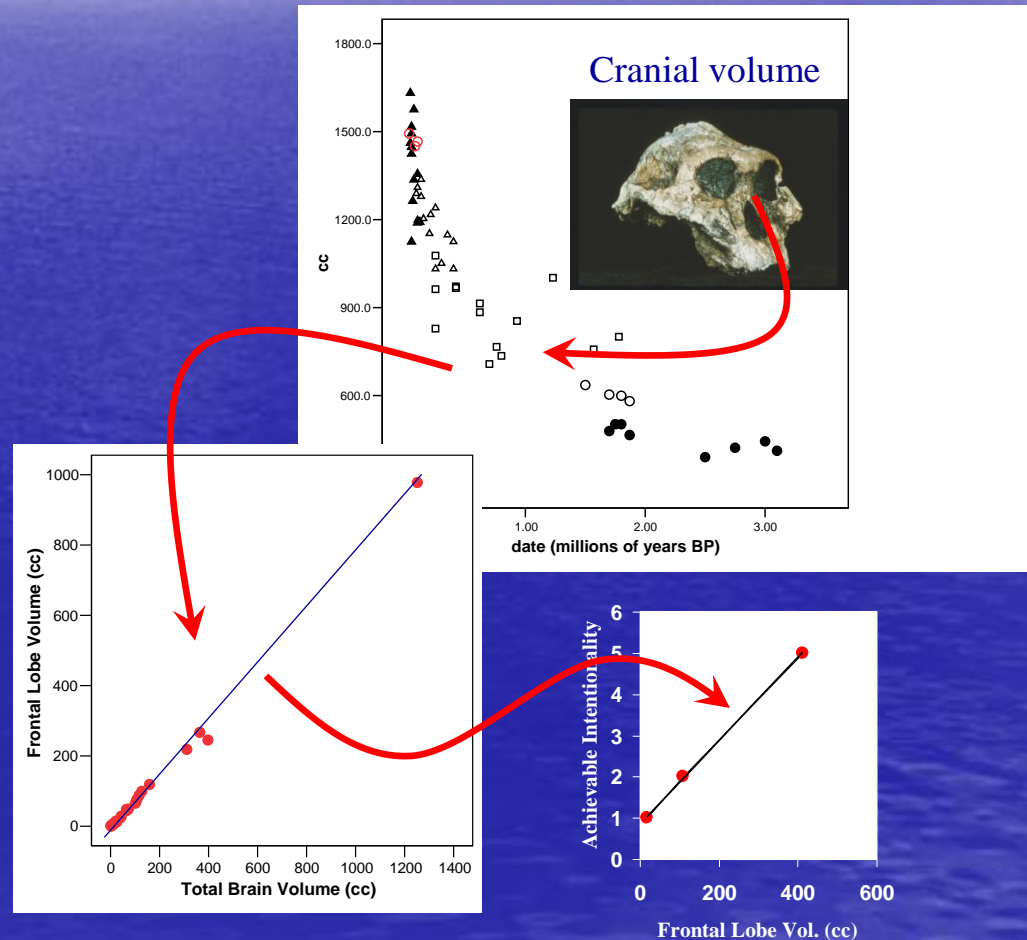




# Can We Date the Origins of Religion?

- Maybe....
- If we can estimate frontal lobe volume from cranial capacity...

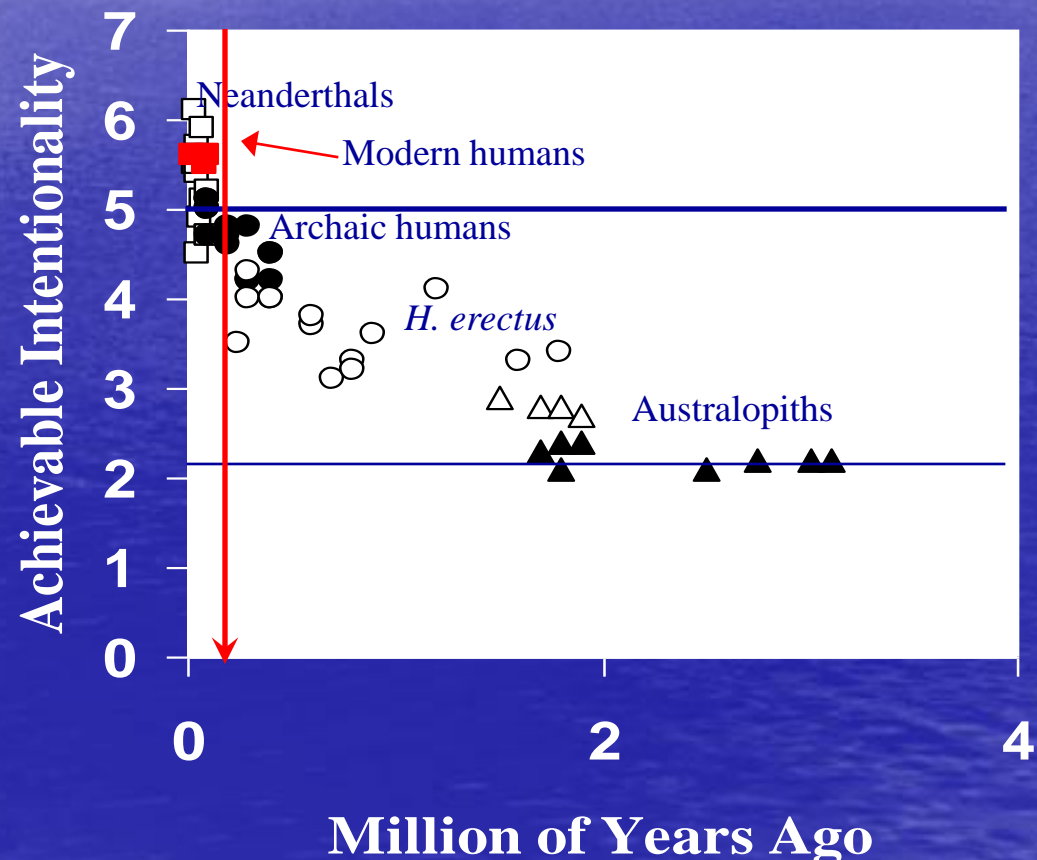
...then we can estimate achievable level of intentionality



# Dating the Origins of Religion

- Sufficient frontal lobe volume appears very late
- ... not earlier than the appearance of *Homo sapiens*

[Don't get too excited about the Neanderthals]





# Conclusions

- Social contract societies risk collapse from freeriding unless mechanisms are in place to enforce social cohesion
- In primates, this involves both cognitive and psychopharmacological mechanisms
- Voluntary commitment [*carrot*] works better than punishment [*stick*]
- Religion and ritual seem to function in just these ways
- Religion is: a small scale phenomenon,  
very susceptible to fragmentation  
well designed to reinforce  
in-group/out-group effects  
[Durkheim was basically right]
- Other benefits are by-products
- Religion may be a very recent evolutionary phenomenon

