
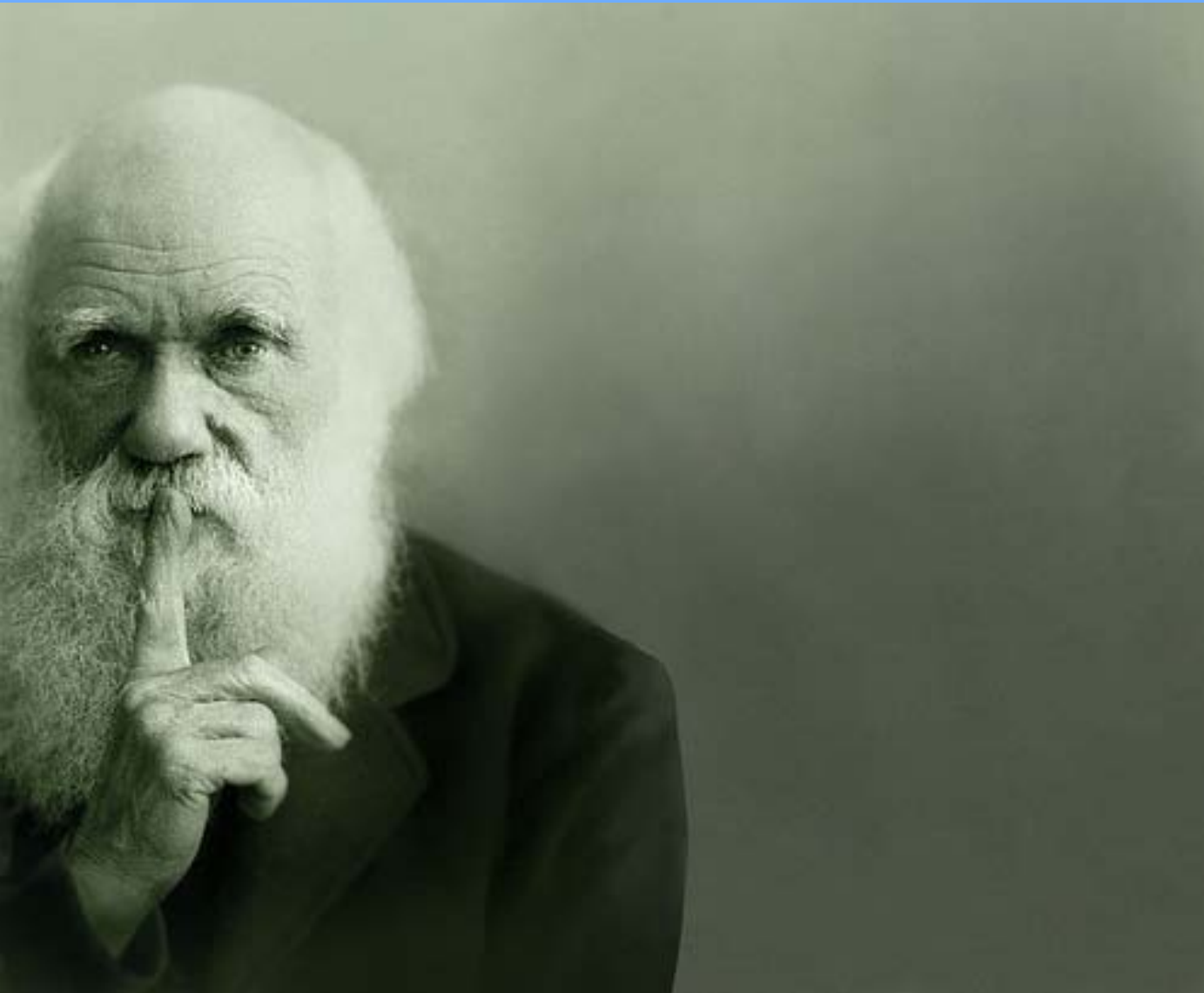


*SOCIAL COOPERATION, NICHE
CONSTRUCTION, AND THE
CORE ROLE OF
INTERGENERATIONAL BONDING IN
HUMAN EVOLUTION*

AGUSTÍN FUENTES
UNIVERSITY OF NOTRE DAME



COMPLEXITY IN EVOLUTIONARY THEORY HELPS THINK ABOUT HUMAN EVOLUTION



<http://www.nhm.ac.uk/visit-us/whats-on/darwin/>



EMERGING PERSPECTIVES

- *PHENOTYPIC PLASTICITY*
- DEVELOPMENTAL SYSTEMS THEORY
- *NICHE CONSTRUCTION*
- *MULTI-INHERITANCE PERSPECTIVE*
- BIOCULTURAL APPROACHES



PLASTICITY AS NORMATIVE

- DEVELOPMENTAL PLASTICITY
- PHENOTYPIC PLASTICITY: “THE PRODUCTION OF MULTIPLE PHENOTYPES FROM A SINGLE GENOTYPE, DEPENDING ON ENVIRONMENTAL CONDITIONS”
- EXPRESSION OF PHENOTYPIC PLASTICITY VIA CHANGES IN BEHAVIOR, PHYSIOLOGY, MORPHOLOGY, GROWTH, LIFE HISTORY, AND DEMOGRAPHY
- PLASTICITY CAN OCCUR IN BOTH INDIVIDUALLY AND INTER-GENERATIONAL CONTEXTS



EVOLUTION IN FOUR DIMENSIONS

- GENETIC, EPIGENETIC, BEHAVIORAL, SYMBOLIC INHERITANCES
- THERE IS MORE TO HEREDITY THAN GENES
- SOME HEREDITARY VARIATIONS ARE NONRANDOM IN ORIGIN
- SOME ACQUIRED INFORMATION IS INHERITED
- EVOLUTIONARY CHANGE CAN RESULT FROM INSTRUCTION AS WELL AS SELECTION



NICHE CONSTRUCTION

- NICHE CONSTRUCTION IS THE BUILDING AND DESTROYING OF NICHES BY ORGANISMS AND THE SYNERGISTIC INTERACTIONS BETWEEN ORGANISMS AND ENVIRONMENTS
- IMPACTS/ALTERS ENERGY FLOWS IN ECOSYSTEMS THROUGH ECOSYSTEM ENGINEERING
- DEMONSTRATES THAT ORGANISMS MODIFY THEIR, AND OTHER, ORGANISMS' SELECTIVE ENVIRONMENTS
- CREATES AN ECOLOGICAL INHERITANCE
- *IN ADDITION TO NATURAL SELECTION* CONTRIBUTES TO CHANGES OVER TIME



NICHE CONSTRUCTION: WHY SHOULD WE CARE?

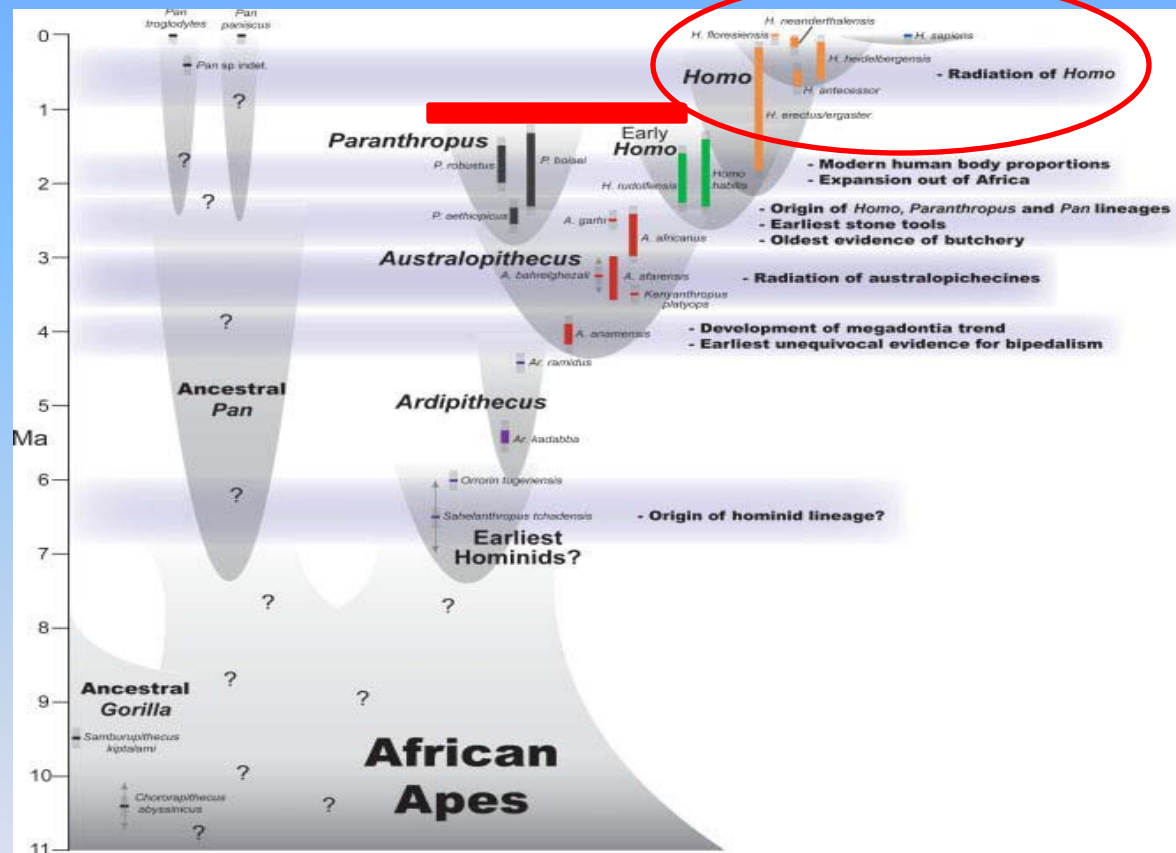
- NICHE CONSTRUCTION AS A CORE EVOLUTIONARY PROCESS AND THE ROLE OF SOCIAL AND ECOLOGICAL INHERITANCE AS IT RELATES TO INTERGENERATIONAL INTERACTIONS AND RELATIONSHIPS



HUMAN EVOLUTION...

- *HUMAN BEHAVIORAL EVOLUTION MUST BE SEEN AS A SYSTEM EVOLVING, NOT SINGLE TRAITS*
- *NICHE CONSTRUCTION IS A CORE FACTOR IN HUMAN BEHAVIORAL EVOLUTION*
- *ECOLOGICAL AND SOCIAL INHERITANCE ARE CORE TO HUMAN BEHAVIORAL ACTION AND CHANGE.*
- *ENHANCED COMMUNICATION AND SYMBOL ARE CENTRAL*
- *FEEDBACK RATHER THAN LINEAR MODELS ARE CENTRAL*
- *MUST CONSIDER THE POTENTIAL IMPACTS OF DIVERSE BIOLOGICAL AND SOCIAL/CULTURAL PROCESSES IN BEHAVIORAL AND EVOLUTIONARY CHANGE*
- *MUST INCLUDE A SPECIFIC ROLE FOR FLEXIBILITY AND PLASTICITY IN BEHAVIOR AND DEVELOPMENT AS A BASELINE*

WE NEED TO FIND SOME WAY TO EXPLAIN WHY HOMO TOOK OFF AND THE REST WENT EXTINCT



LEGEND:



Solid bars represent documented time ranges for specimens attributed to generally recognized taxa. Dashed grey lines at both ends reflect uncertainty in actual ranges, as it is unlikely that first and last occurrences are currently documented.

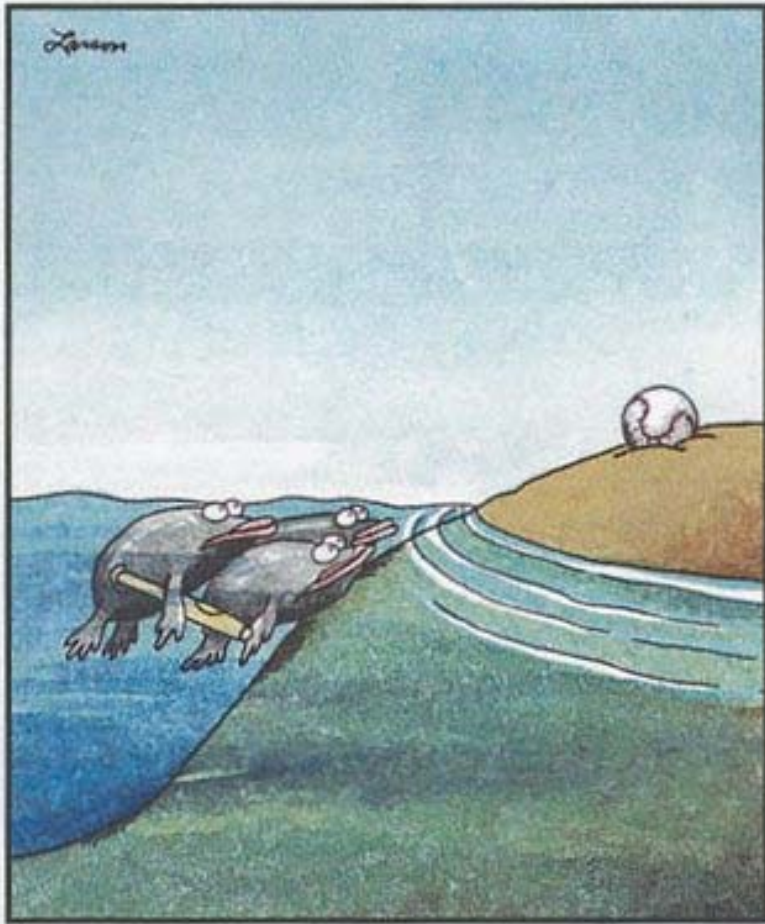
Significant uncertainty in constraining the age(s) of specimens of particular taxa

Schematic representation of patterns of major phylogenetic groups in the hominid fossil record, arranged to depict potential phenotypic variability resulting from dispersal(s) into variable environments.

Approximate intervals during which major evolutionary innovations and events in hominid evolution occurred, based on the known fossil record

From Kingston 2007

TAKING A MORE CAREFUL LOOK AT INTRAGROUP BEHAVIOR ...

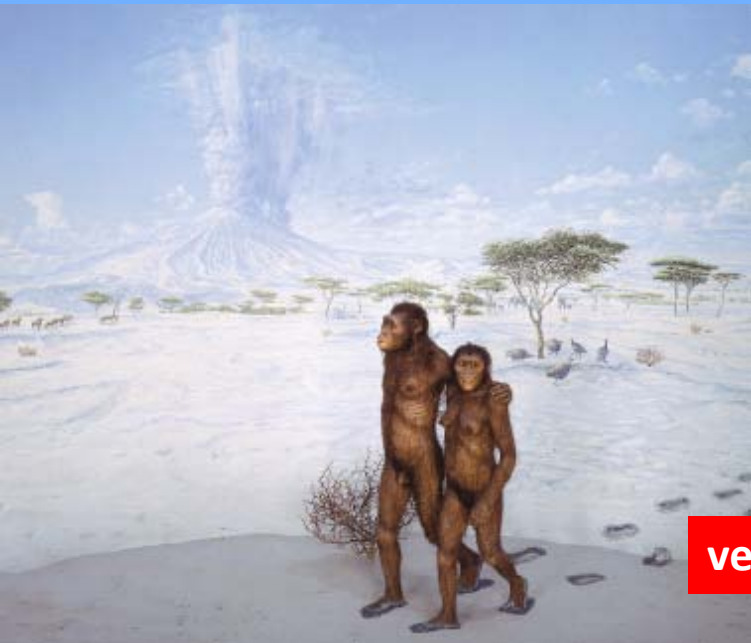


Great moments in evolution

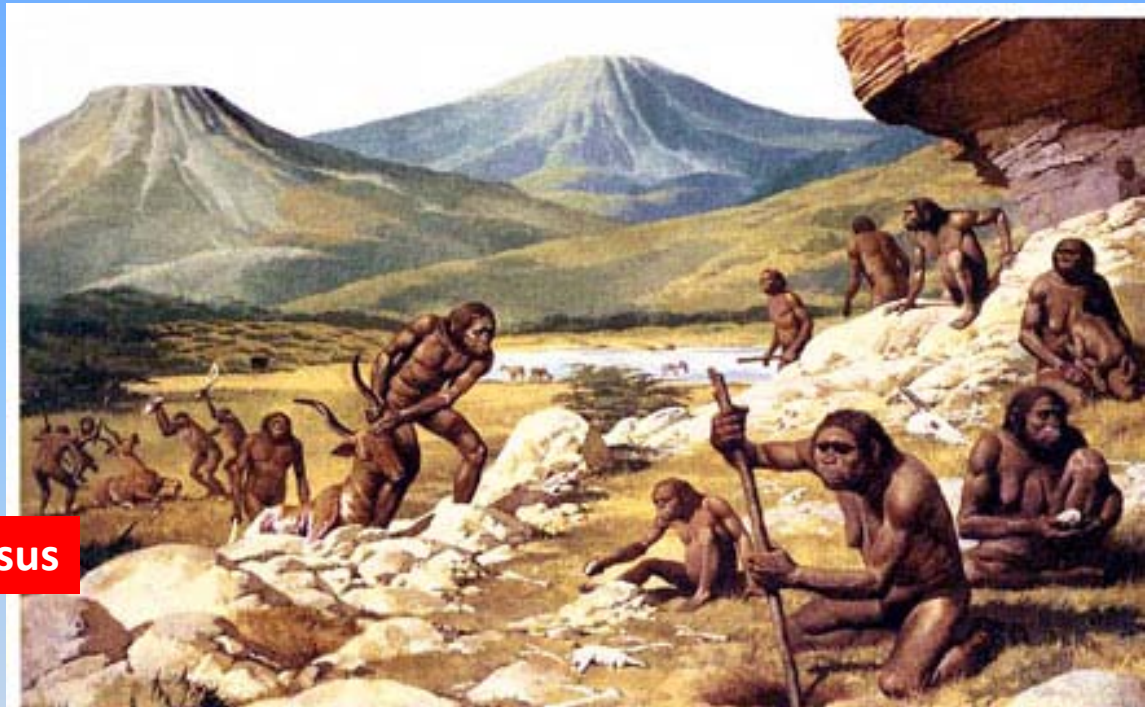


"Matthews ... we're getting another one of those strange 'aw blah es span yol' sounds."

MORE SPECIFICALLY...



versus



HOW DO WE THINK ABOUT SOCIAL ORGANIZATION AND SOCIAL GROUPS IN HUMAN ANCESTORS?

THE “EURO-PAIR” IS NOT THE BASAL UNIT OF HUMAN SOCIAL ORGANIZATION...WE NEED TO ENVISION SOCIAL GROUP, AND ALL OF ITS MEMBERS, AS NEXUS OF HUMAN EVOLUTION

THE EVOLUTION OF MAN AND WOMAN THE GENUS HOMO

H. HABILIS

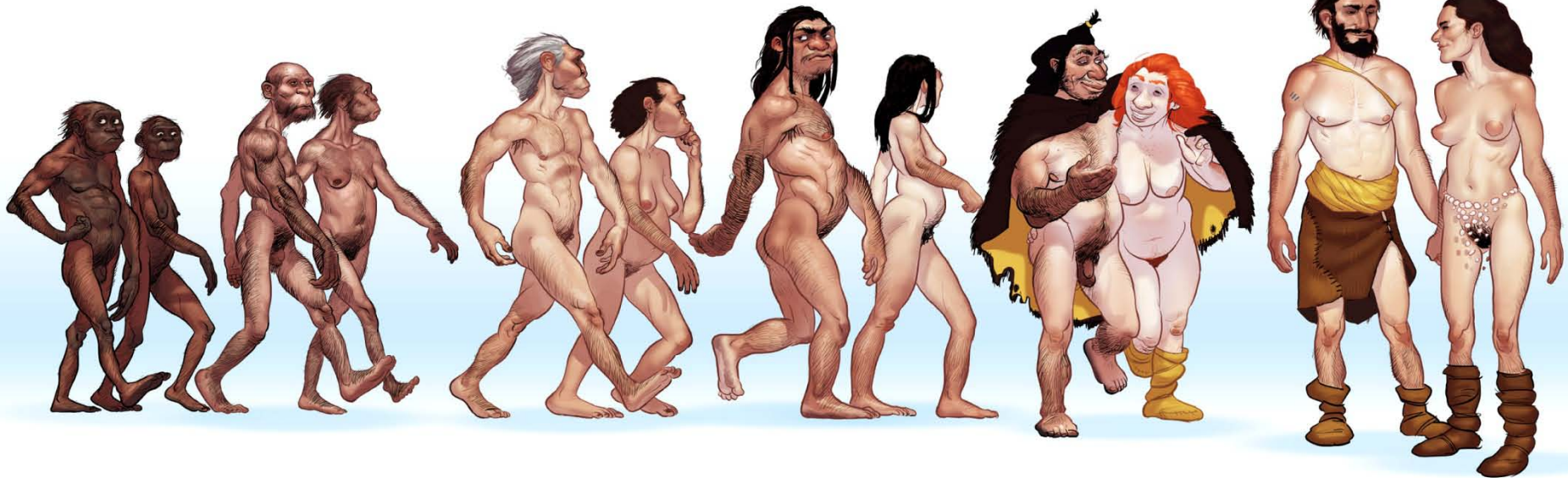
H. RUDOLFENSIS

H. ERECTUS

H. HIEDELBERGENSIS

H. NEANDERTHALENSIS

H. SAPIENS (ARCHAIC)



Art by Tom Rhodes

INTERGENERATIONAL RELATIONSHIPS IN THE CONTEXT OF HUMAN EVOLUTION

- (HRDY, VAN SCHAIK AND BURKART)
COOPERATIVE BREEDING
- (LAMB, HEWLETT, FOUTS, GRAY)
MALE CARE AND
COMPLEX PARENTING
- (GETTLER) MALE CARRYING
- (MCKENNA, BALL, TREVATHAN)
SLEEP, CHILDCARE, AND
CHILD DEVELOPMENT



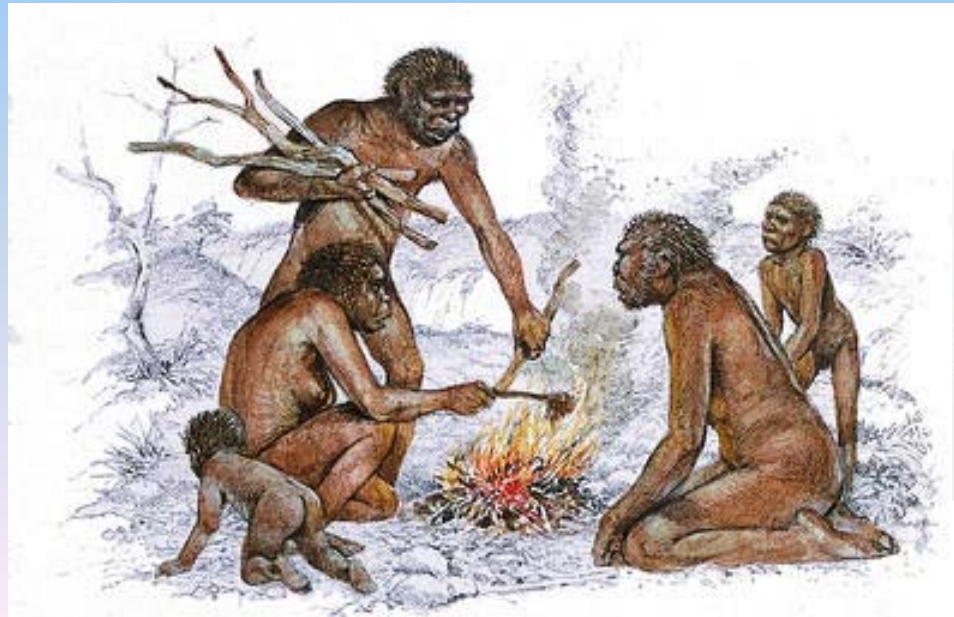
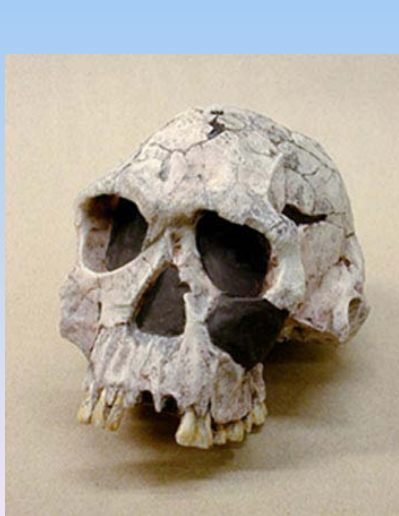


COOPERATION IN HUMAN EVOLUTION

- (GINTIS & FEHR) COOPERATION AS NORM
- (FUENTES ET AL.) COOPERATION AND NICHE CONSTRUCTION
- (SUSSMAN AND HART) PREDATION AND COOPERATION
- (OKA AND FUENTES, HORAN ET AL.) TRADE ROUTES AND “OUT COOPERATING” NEANDERTHALS

NICHE CONSTRUCTION

- AN INCREASING BRAIN SIZE AND AN EXTENDED PERIOD OF, AND EFFORT IN, CHILD CARE IN THE GENUS *HOMO* DURING THE PLEISTOCENE LEAD TO:
 - MORE COOPERATIVE INTERACTIONS BETWEEN GROUP MEMBERS, ACROSS GENERATIONS
 - AN ASSOCIATED INCREASE IN COMMUNICATIVE COMPLEXITY,
 - INCREASED EFFECTIVENESS AT AVOIDING PREDATION,
 - AND AN EXPANSION OF THE TYPES AND PATTERNS OF HABITAT EXPLOITED.



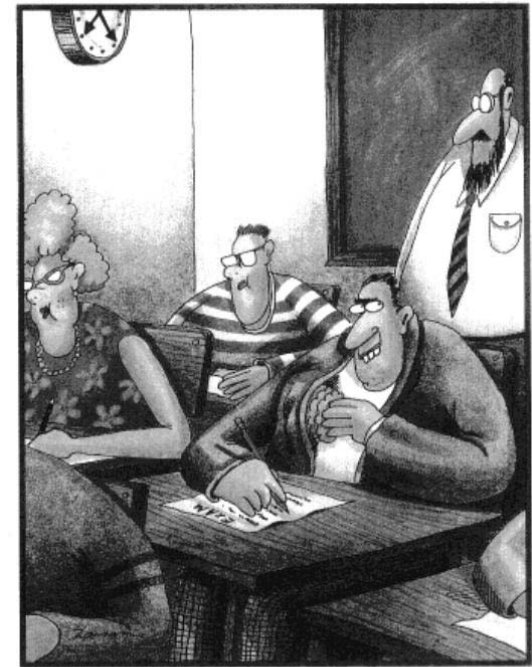
NICHE CONSTRUCTION

- AS *HOMO* BECAME MORE COSTLY, PREDATORS SHIFTED EMPHASIS TO EASIER PREY, REDUCING THE OVERALL SELECTIVE PRESSURE OF PREDATION (FUENTES ET AL. 2010).
- *HOMO* EXPERIENCED INCREASED OPPORTUNITY FOR SOCIAL INTERACTIONS, RANGE EXPLORATION, AND TESTING A VARIETY OF NOVEL FORAGING OPPORTUNITIES, ALL OF WHICH DEMANDED—AND FED BACK INTO—AN EMERGING HIGHER COGNITIVE FUNCTIONING.



NICHE CONSTRUCTION

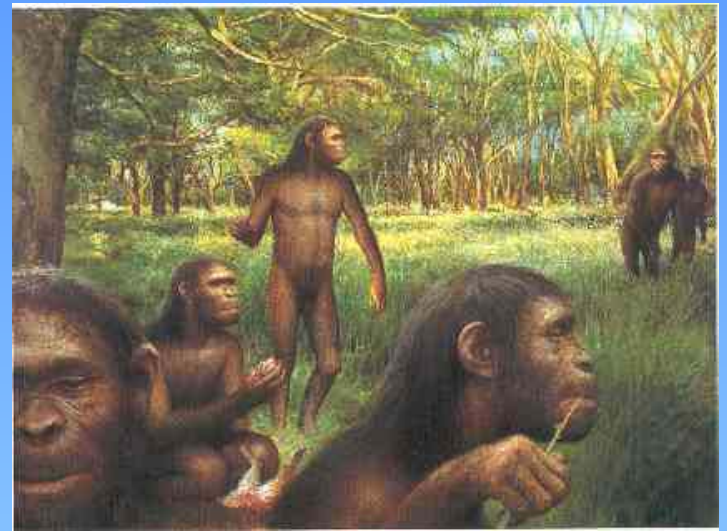
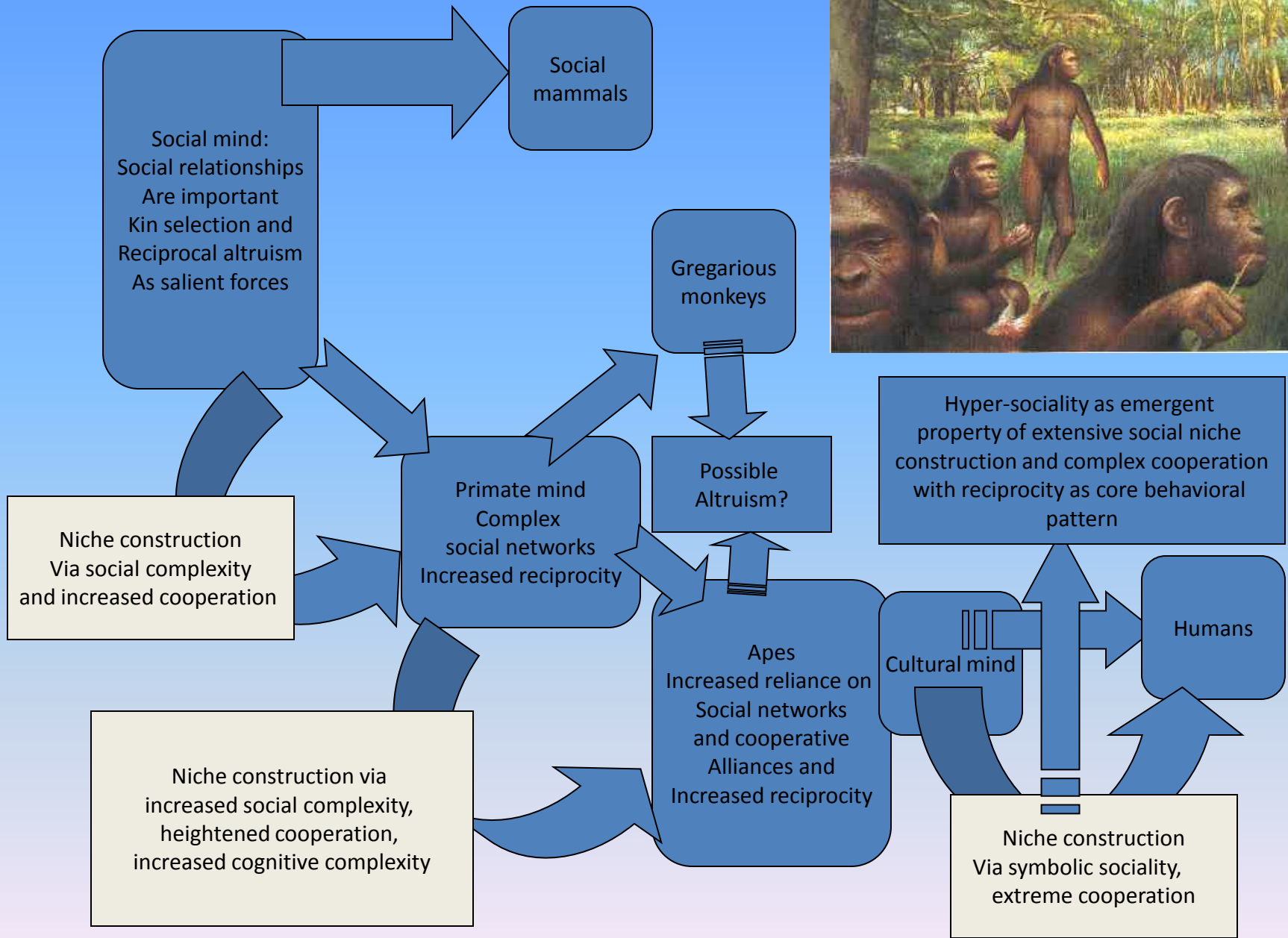
- HERITABLE COMPONENTS OF HUMAN NICHE CONSTRUCTION:
 - TOOL USE
 - FIRE USE?
 - INCREASED INFANT SURVIVORSHIP
 - INCREASED INFORMATION TRANSFERENCE VIA MORE-COMPLEX COMMUNICATION PATTERNS
- ...ALL TIED TO AN EVOLVING HOMININ COGNITION, WHICH FACILITATED SUCCESS IN A DIVERSE ARRAY OF ENVIRONMENTS.



Midway through the exam, Allen pulls out a bigger brain.

CONNECTING THE DOTS

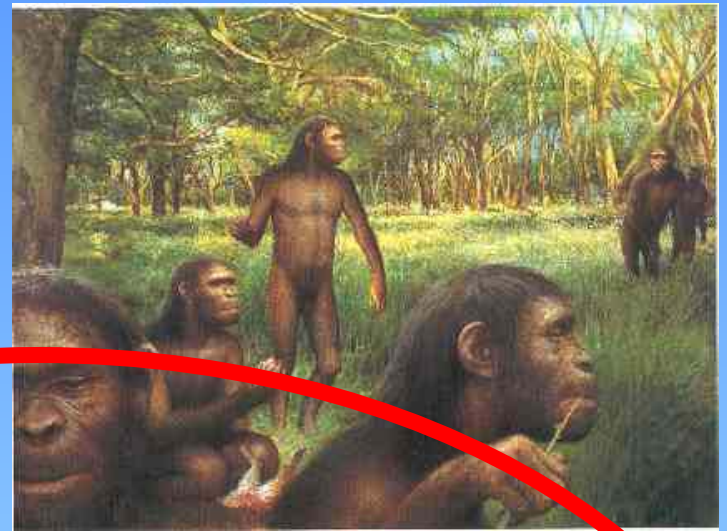
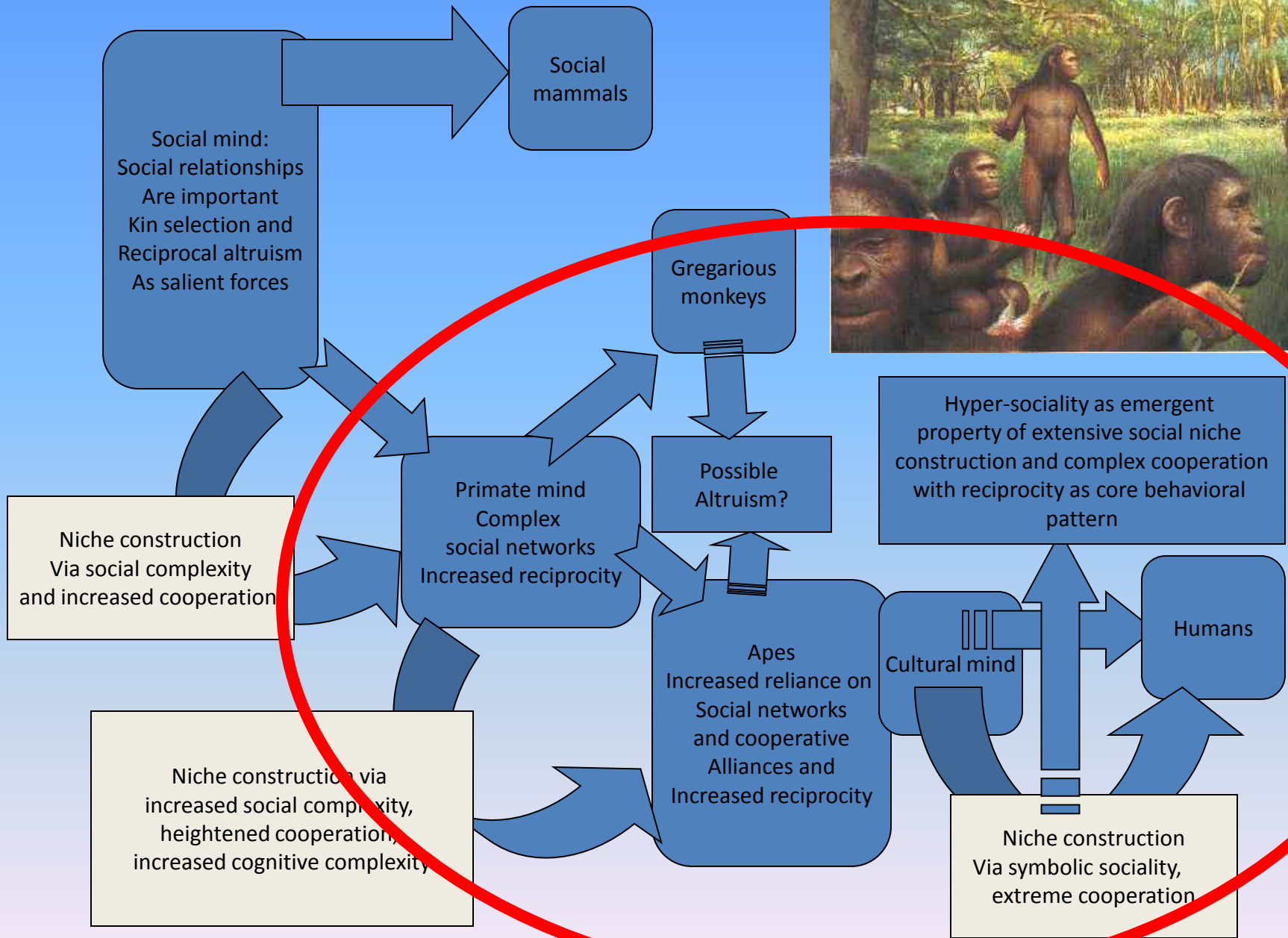
- A MODEL OF INTEGRATED COOPERATION AS A COMPONENT OF THE HUMAN NICHE- ONE OF THE REASONS *HOMO* IS SUCCESSFUL
 - THE ROLE OF CHILDREN AND CHILD “CARE”: COSTS AND PAYOFFS
 - SOCIAL NICHE OF ALLOPARENTING
 - ECOLOGICAL AND SOCIAL INHERITANCE
 - MULTI-GENERATIONAL COOPERATION



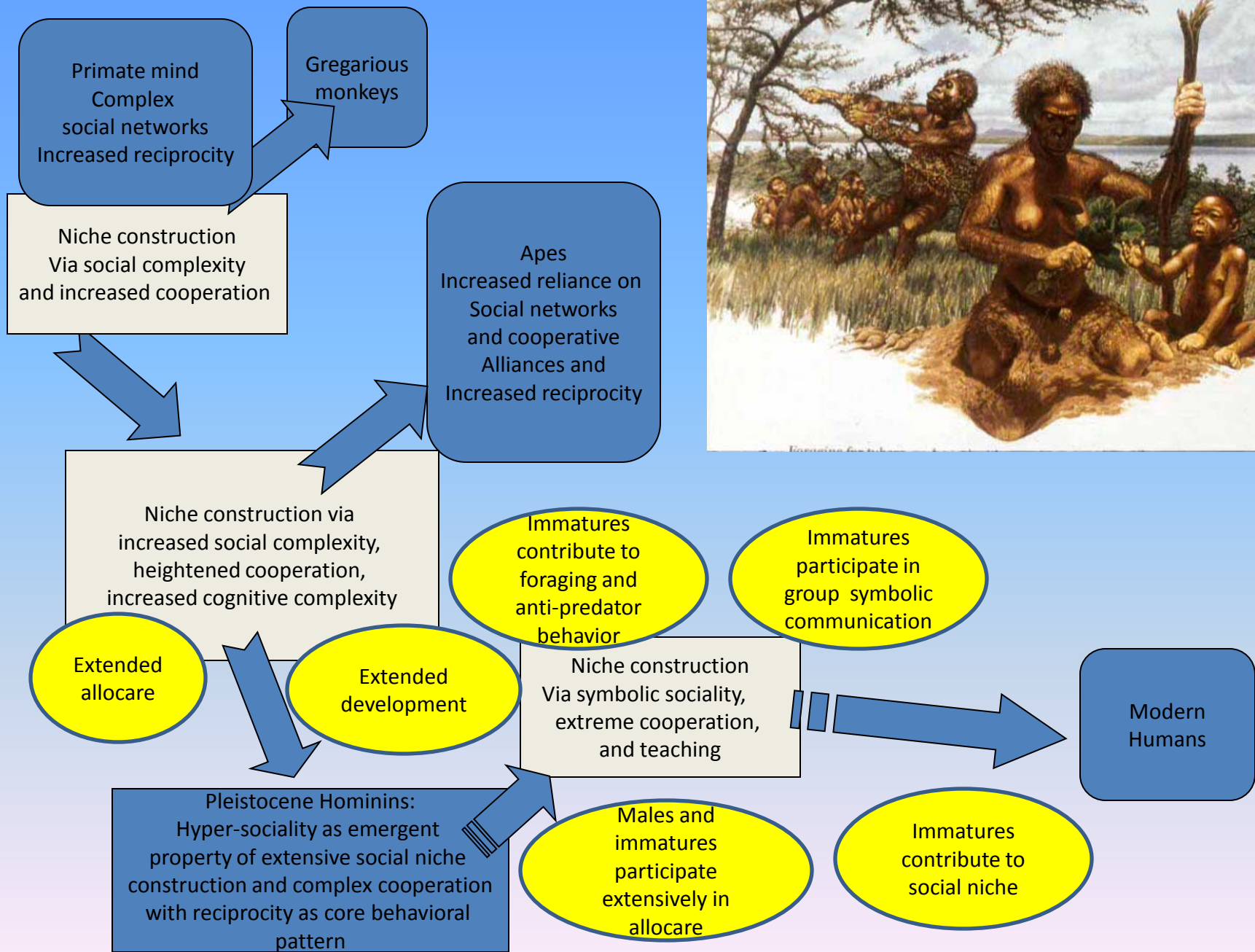
From Fuentes and MacKinnon in press

IMMATURES AS PART OF THE GROUP

- ALLOCARE
- FORAGING
- SOCIAL NETWORK
- TOOL CONSTRUCTION AND LEARNING
- SOCIAL AND ECOLOGICAL
INHERITANCE→TEACHING



From Fuentes and MacKinnon in press



ANY EVIDENCE FOR THIS?

- FOSSILS
- HUMANS AND PRIMATE BEHAVIOR
- MIRROR NEURONS AND ENDOCRINE PHYSIOLOGY AS MECHANISMS?



Children are integral as part of the human evolution

This means we need to think about past and present intergenerational relationships as part of the human evolutionary trajectory and consider them when modeling what it means to be human

Thanks to

- Darcia Narvaez
- Participants in this symposium
- College of Arts and Letters, University of Notre Dame