

Evolutionary Psychology, Behavioral Genetics, and Leadership

Academy of Management
Professional Development Workshop

Richard D. Arvey
Stephen M. Colarelli
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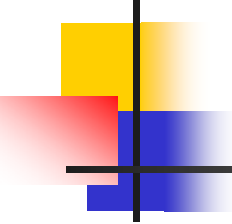
Part 1: Evolutionary Psychology (Colarelli)

Part 2: Behavioral Genetics (Arvey)



Workshop Objectives

- Understand the definitions of both evolutionary psychology and behavior genetics and the differences and similarities between the two approaches.
- Identify the major theories and research in behavioral genetics and evolutionary psychology that are related to leadership.
- Examine practical implications of behavioral genetics and evolutionary psychology for the selection, development, and management of leaders.
- Understand the statistical methodologies used to model genetic influences.



Your Interests & Background

- Graduate students & junior faculty
- More senior faculty
- Practitioners



Part 1

Evolutionary Psychology and Leadership

- Evolutionary Psychology – Basic concepts
- Evolutionary Psychology and Leadership
- This Presentation is available on:
www.chsbs.cmich.edu/stephen_colarelli/
 - click on “workshops”



What is Evolutionary Psychology (EP)?

- EP is a meta-theory, or perspective, that views human behavior and mental processes as products of evolution, just as our physical characteristics are products of evolution. EP is the application of the theory of evolution by natural selection to human behavior, cognition, and emotion.



Intellectual Chronology of EP

- Darwin (1859, 1872)
- Brief foray in early 20th century (e.g., James, Baldwin)
- The Dark Years: 1920 to 1980
- Ethology (1950s Lorenz, Tinbergen)
- George Williams (1964) and “adaptations”
- Hamilton and Trivers (1960s, 1970s)
- Ghiselin (1973) coined the term EP
- E. O. Wilson's *Sociobiology* (1978)
- Daley and Wilson's *Homicide* (1988)
- Barkow, Tooby and Cosmides' *The Adapted Mind* (1992)
- Handbooks of EP (Crawford & Krebs, 1998; Buss, 2005)



The Dark Years: 1920 to 1980s

Psychology and much of social science were dominated by the Standard Social Science Model (SSSM)

- Human nature is unique among all species in that human nature alone is shaped primarily by experience.
 - “Give me a dozen healthy infants...and my own specified world to bring them up in, and I’ll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief...” [Watson, 1924, p. 104]
- Biological constraints on human behavior are relatively unimportant.
 - “The degree to which males and females are expected to behave differently, are treated differently, or valued differently, has little to do with *sex* (biology) and everything to do with *gender* (learned beliefs).” [Indvik, 2004, p. 266]
- Learning operates by one or a very small number of general-purpose (learning) mechanisms.
- The job of psychology is to discover how culture and experience, operating by means of the general purpose learning mechanisms, produce variation in human behavior.



Assumptions of EP

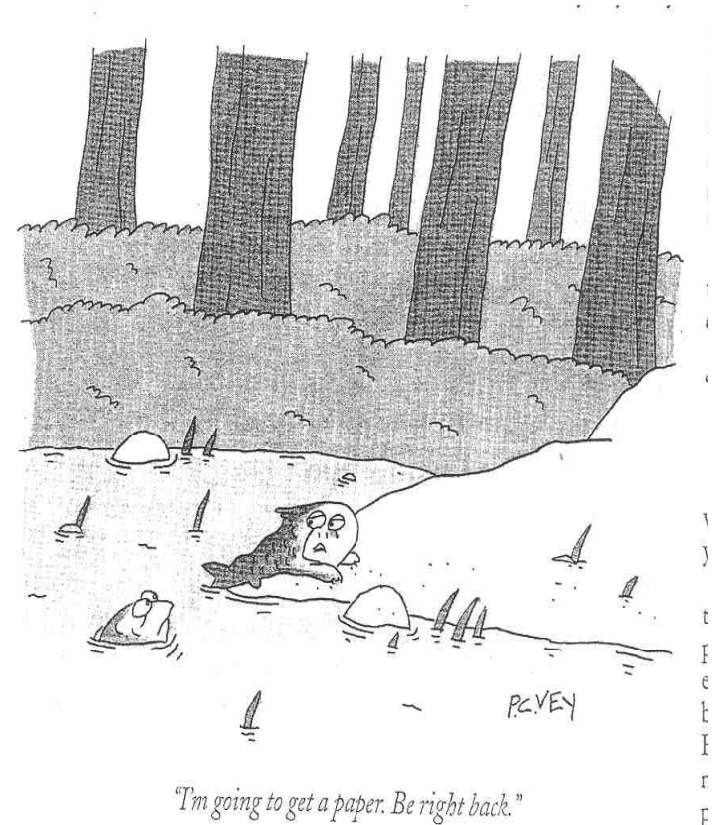
All Species Have a Nature

- The nature of every species, including Homo Sapiens, is a result of evolution by natural selection
 - Characteristic behaviors and preferences
 - Social life
 - Sex differences (and similarities)
 - Mating
 - Rearing young
 - Making a living



Human Nature is the Product of Evolution by Natural Selection over Deep Time

- Over the long term, organisms retain traits (adaptations) that contribute to **survival and reproduction**.
 - The ability of a population to expand is infinite, but the ability of any environment to support populations is always finite.
 - Organisms within populations vary, and this variation affects the ability of individuals to survive and reproduce.
 - These variations are transmitted from parents to offspring.



Human Nature is also a Product of Sexual Selection

- Random variation and retention of traits that make an organism *attractive to the opposite sex*.
- Women faced problems of protection and resources for offspring...
 - Therefore, women evolved preferences for men who are competitive, have high status, and possess ample resources.
- Men faced problem of deciding which women to pursue and mate with—which ones would be most likely to become pregnant
 - Men evolved preferences for women with a youthful appearance and hour glass figure.



Human Nature is Adapted to the Pleistocene Environment

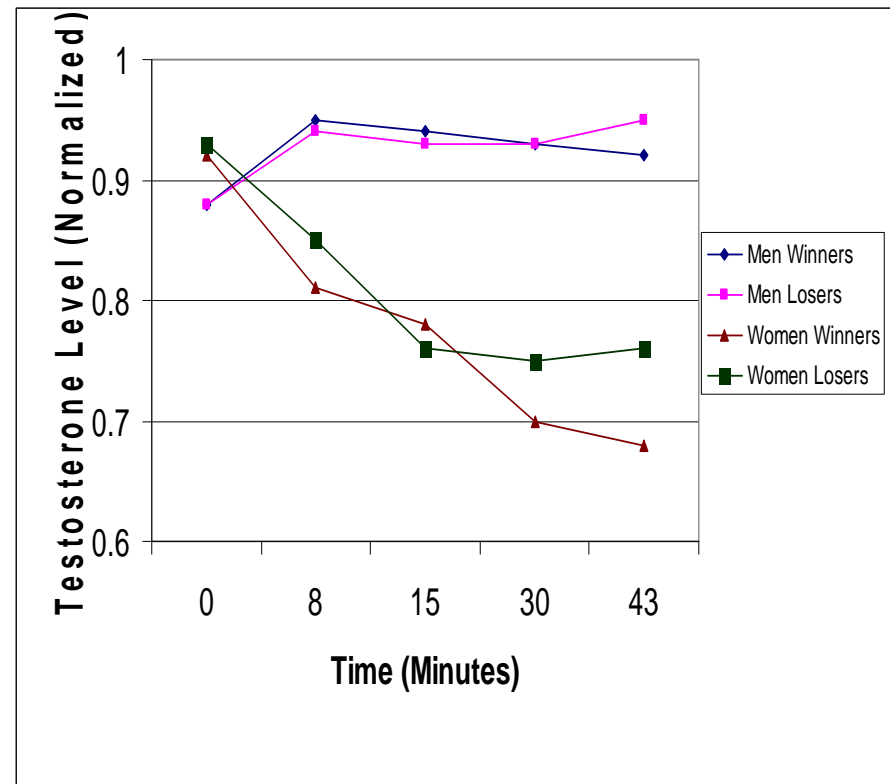
- Human nature was forged primarily during the Pleistocene era:
- The environment of evolutionary adaptation (EEA).
 - Hunter-gatherer bands of about 150 people
 - On the savannah of African continent
 - Patchy resources

| | | | | |
|--|--|---|--|---|
| Ardupithecus Ramidus 5.8 m.y.a. | | Forest dweller | | |
| Australopithecus Anamensis 4.2 - 3.9 m.y.a. | | First human ancestors to live on the savannah | | |
| Australopithecus Afarensis 3.9 - 3.0 m.y.a. | | Lived in small family groups | | |
| Australopithecus Africanus 3 - 2 m.y.a. | 420 to 500 cc | Lived in small family groups | Vegetarian, along with some meat, probably obtained by scavenging | |
| Homo Habilis "handy man" 2.4 - 1.5 m.y.a. | 500 to 800 cc | Small groups banded together for protection and efficiency | Followed food sources, and set up camp as needed, hunted game and/or scavenged | Started to use stone tools regularly, created by splitting pebble (Oldowan tradition) |
| Homo Erectus "upright man" 1.8 m.y.a - 300,000 y.a. | 750 to 1225 cc | First hunter, began to cook their food consistently | Made and controlled fire stone axes and knives (Acheulean stone tools) | |
| Homo Archaic 500,000 y.a. | 1200 cc | Earliest evidence of purpose-built shelters - wooden huts | | |
| Homo Neanderthalensis 30,000 - 30,000 y.a. | 1450 cc | Buried their dead | Hunters | Stone-tipped spears, bone needles, bone fish hooks, sewed their clothes from animal skins, warm boots |
| Homo Sapiens Sapiens "wise man" 195,000 y.a. | 1350 cc | Well constructed huts with central hearths for fires | Bow and arrows, Bone and antlers to make tools, artistic tools (clothing, engraving, carving, musical instruments) | |
| 50,000 y.a. | THE GREAT LEAP FORWARD Humans start to evolve at a much faster speed | | | |
| 10,000 y.a. | First villages | Agriculture develops and spreads | Domestication of dogs | |
| 5,500 y.a. | Bronze age begins | Metal working and smelting copper and tin for weapons/tools | | |
| 5,000 y.a. | First known writing | | | |
| 4,000 through 3,500 y.a. | First civilization developed in Mesopotamia | | | |

Biological Constraints on Human Behavior are Important

- “Biology keeps culture on a leash” E.O. Wilson
- E.g., Sex differences in T levels relating to competition and aggression

Mean normalized testosterone level over time, by sex and outcome during video game competition.



■ (Mazur, Susman, & Edelbrock, 1997)



Learning and behavior operate by many complex “psychological mechanisms,” adaptations

- Adaptations in the brain and endocrine system evolved during the EEA.
- Adaptations are heritable
- Psychological mechanisms are problem-specific.
 - Solve the problem of maintaining electrolyte function → preference for salt
 - Solve the problem of choosing a mate who is likely to get pregnant → male preference for youthful women
 - Solve the problems of group locomotion, coordination, and conflict management → leaders emerge in all human groups
- Humans have many mechanisms.
- The specificity, complexity, and large numbers of psychological mechanisms give humans behavioral flexibility.



An important task of EP is to identify psychological mechanisms and understand how they interact with the environment

Tinbergen's Four Levels of Explanations of Behavior

Evolutionary ("Why" questions)

■ Ultimate

- Problems in ancient past that lead to the evolution of particular adaptations
 - Patchy food resources in savannah → group defense of territory, mobility, coordination → leadership

■ Phylogeny

- Species-specific
 - Leadership in species that face similar environments and problems
 - Chimpanzees, wild horses, wolves, humans

Proximate ("What" and "How" questions)

■ Ontogeny

- Developmental influences (environment over time, genes)
 - Exposure to leadership role models, opportunities to exercise leadership
 - Behavioral Genetics.
 - Genes X environment → behavioral propensities
 - Height, good looks, athleticism, extroversion, reactions of peers and teachers → leadership

■ Proximate

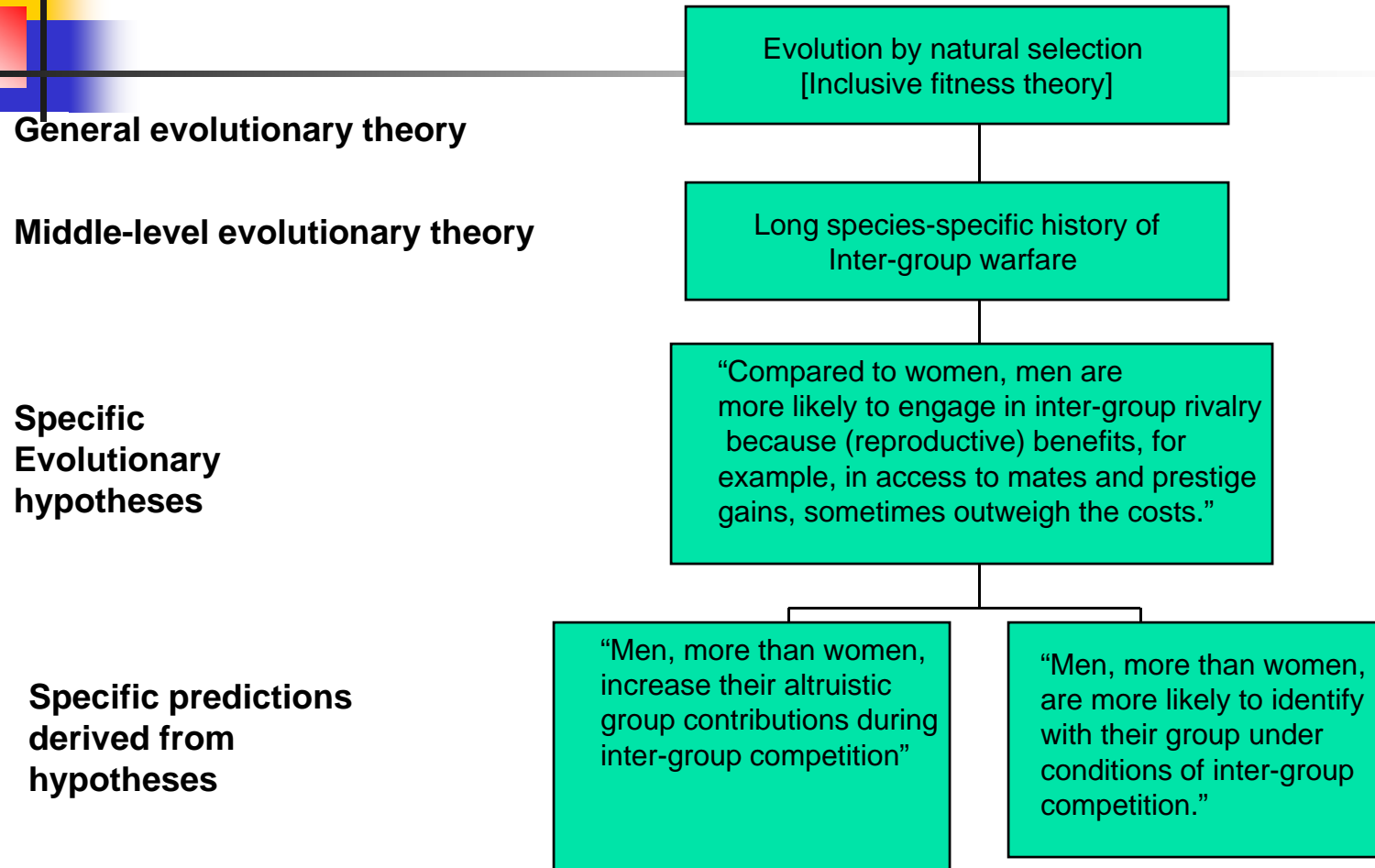
- Immediate, causal mechanisms
 - Psychological mechanisms
 - Resource holding potential (RHP): decision module to assess one's abilities in comparison to others
 - Leader-follower schemas
 - Physiological mechanisms
 - Serotonin level → at ease with people



Common Criticisms of EP

- Theoretically suspect—“just so” stories; Non-experimental
- Can't verify time-based assumptions (e.g., characteristics of ancestral environment)
- Accepts status quo and hence moral wrongs in status quo
- Genetic Determinism (billiard ball cause & effect)

The Interplay between Theory and Research in EP: Levels of Evolutionary Analysis





Time Machines

- Referential Models
 - HG societies
 - Our primate cousins
- Molecular genetics
 - Evolution of lice and dating the origins of clothing
 - Diaspora of Homo Sapiens out of Africa



Is EP is a Veiled Rationale for Accepting the Status Quo?

- Naturalistic fallacy (“is” implies “ought”)
 - “Is” does not imply “ought”
- Early social Darwinists had it wrong
 - Fitness does not mean overall or social superiority
 - Fitness means reproductive fitness
- Who is more fit from a Darwinian sense?
 - Your grandmother or Oprah
 - You mom or Carly Fiorina



The Myth of Genetic Determinism

- Complex causality
 - genes x environment
- Culture, training, and socialization are important, but
 - Biology constrains learning
 - E. g., Mineka's experiments on "instinctual" fear of snakes
- Interventions are most effective when they are based on accurate models



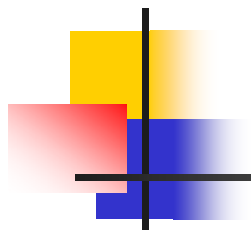
Leadership and EP: Overview

- Models of Human Nature and Interventions
- The Evolution of Leadership (ultimate causes)
- Psychological & Biological Mechanisms related to Leadership
- Some Implications & Future Directions

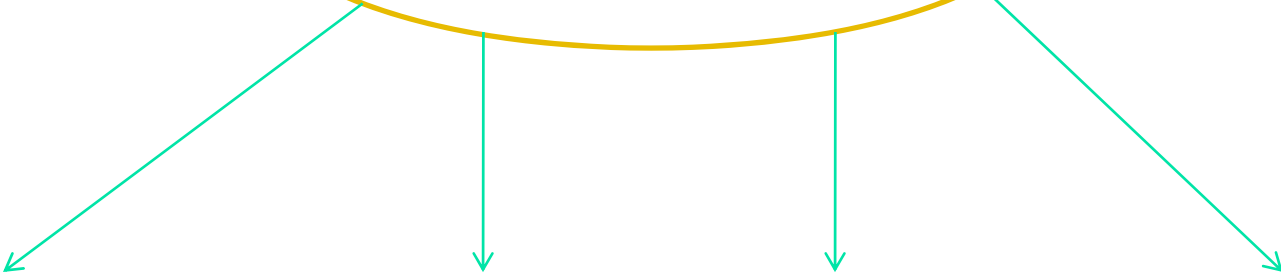


Models of Human Nature: Understanding and Interventions

- Why do we study Leadership, Management and Organizations?
- Understanding & Interventions
- The quality of our understanding has a significant influence on the effectiveness of our interventions
 - By better understanding the functions and mechanisms in leadership, we are better able to:
 - Develop effective leader behavior
 - Select good leaders



Models of Human Nature



Leadership

Organizational
Architecture

HR Practices

Marketing &
Products



Better Understanding; Better interventions

- Mosquito Control
 - Female mosquitoes tend to lay their eggs only in water with optimal amounts of fatty acids and methyl esters.
 - More effective mosquito control by tweaking levels fatty acids and methyl esters in water
- ACL injuries in women athletes:
 - Understanding biological basis for differences → Different training regime that accounts for physiological differences between men and women



EP's Relevance and Possible Contributions to Leadership

- Tinbergen's four levels of explanation of behavior give us an additional framework thinking about and understanding leadership
 - The evolution of leadership – ultimate causes
 - What were the pressures that lead to psychological mechanisms to that give humans a predilection to:
 - Engage in leadership
 - Follow leaders
 - Thinking about ultimate causes helps to generate hypotheses about additional ontogenetic and proximate mechanisms influencing leadership
 - Heritable physiological and psychological traits and mechanisms (hormones, neuro-transmitters, hard-wired decision rules)
 - Looking at leadership among non-humans and in non-industrial societies and in different species may...
 - Help us better understand how context (bonobos vs. chimps) and physiology (hyenas) influences leadership
 - Sensitize us to additional behavioral variables (e.g., coalitions)



The Evolution of Leadership in among Humans

- Conditions in the EEA and human physiology gave rise to **Group** living species
 - Climate change → pushed ancestors out of rain forest to savannah → Patchy resources → group size increases to occupy and defend territory
 - Big game hunting, high protein diet
 - Coordination, locomotion
 - Larger brain: group size, longer infancy
 - Delayed maturation of infants, more child care → more paternal investment → protein, defense
 - Female preference for dominant males



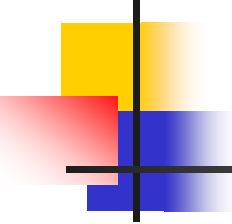
Living in Hunter-gatherer Groups on the Savannah Required

- Hence, some early functions of leadership:
 - Group Locomotion
 - Coordination
 - Group problem-solving and Goal setting
 - Conflict resolution



Natural and Sexual Selection: Some Psychological and Physiological Mechanisms of Leadership

- The motivation to lead
- Physiological correlates of leadership



Sex and (Male) Leadership Motivation

- Women prefer high-ranking males; therefore, males compete for rank
 - Sex differences in parental investment and fitness variance: women invest more and have a narrower fitness variance, therefore...
 - “Men woo, women choose”
 - Male-male competition: Men’s existence is high-stakes competition for leaving a genetic legacy
 - Being at top of pecking order allows greater access to resources and mating opportunities
 - Strong, positive correlations between
 - Male rank/status and number of wives and offspring in traditional societies (Betzig, 1986)
 - Male rank/status and mating success (extra-pair copulations, serial monogamy) in modern societies (Perusse, 1993)



Obsession with Rank

- A male chimpanzee in his prime organizes his whole life around the issues of rank. His attempts to achieve and then maintain alpha status are cunning, persistent, energetic, and time-consuming. They affect whom he travels with, whom he grooms, where he glances, how often he scratches, where he goes, and what time he gets up in the morning. (Wrangham & Peterson, 1998)
- “We [humans] come into the world equipped with a nervous system that worries about rank.” (Robert Frank, 1985)
 - **Top Business Schools**
 - **Most cited articles (and authors)**
 - **America’s Best Colleges 2007**
 - **Fortune 500**
 - **Forbes’ list of Wealthiest individuals**
 - **Journal rankings by Impact Factor**
 - **College Football Ranking Comparison**
 - **The Billboard 200**
 - **The World’s Billionaires**

Reproductive Benefits to Men of High Rank



Novelist Tom Clancy says "I do" to his bride, Alexandra.

What do They Have in Common?



- Jack Welch
- Nelson Mandela
- Rudi Giuliani
- Famous leaders
- Older men
- Young wives
- Many wives (all on 3rd wife)



Evolved Physiological Mechanisms Associated with Leadership

- Testosterone
- Serotonin
- Height
- Facial features
- Voice quality



Testosterone Level

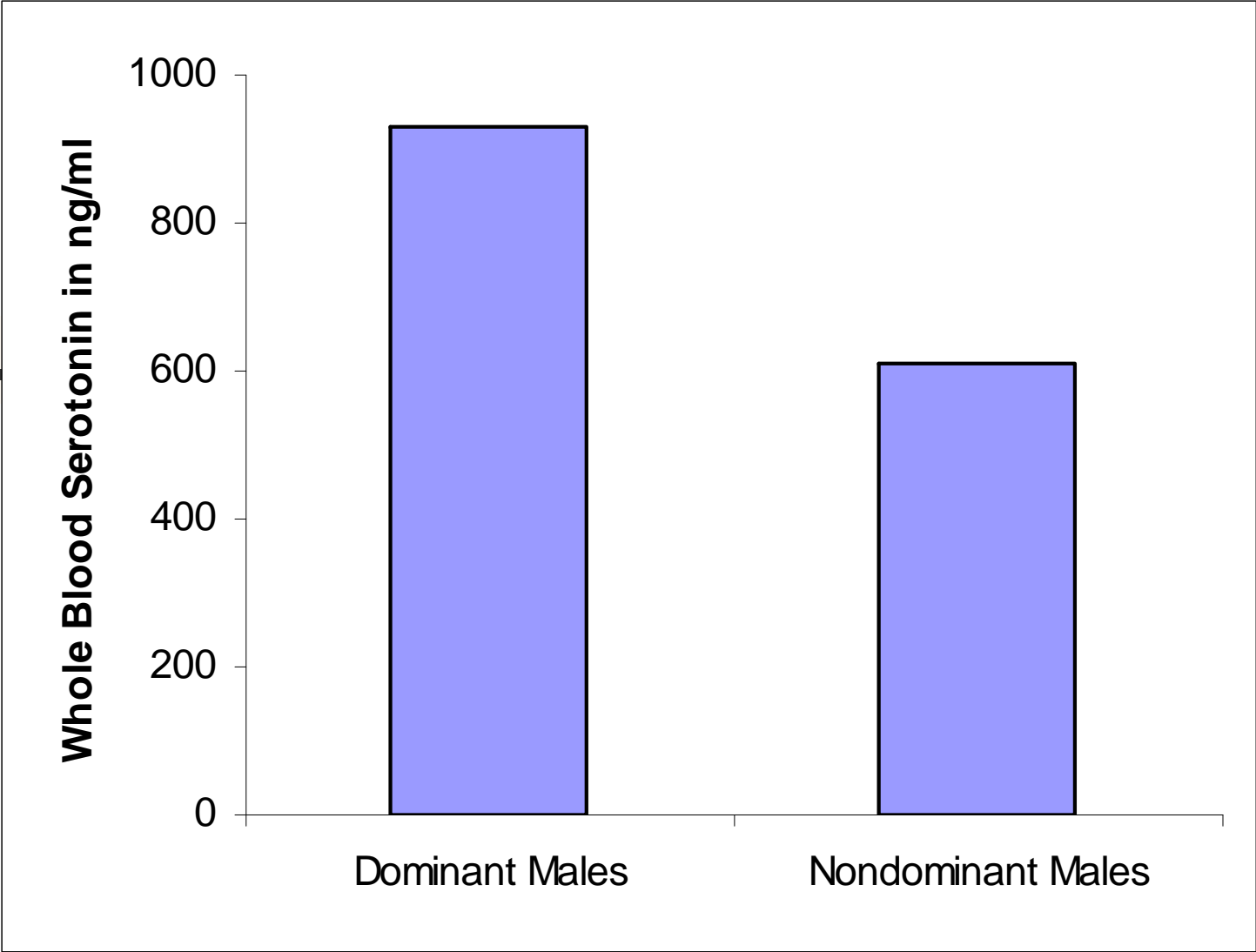
- Competition for top position
 - Testosterone fuels competitiveness
 - T levels and Entrepreneurship
- Optimal level depends on context
 - Ancestral environments; wild west
 - Probably higher levels where aggression and physical dominance were more important
 - Modern organizations – premium on knowledge and social skills
 - Moderate T level is optimal
 - Studies show that, in the present time, high T men occupy lowest rungs on SES ladder; moderate T men the highest rungs



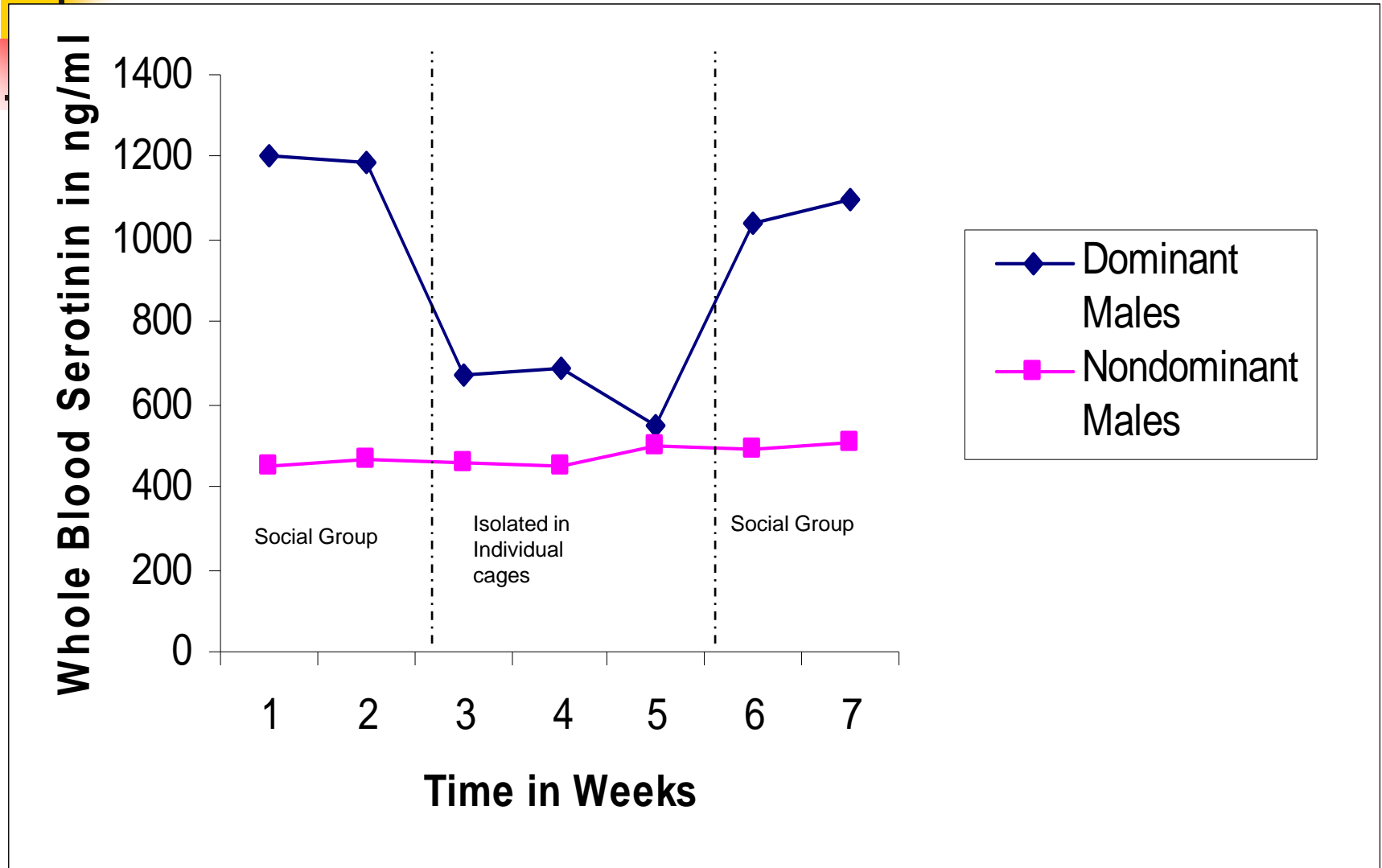
Serotonin Levels

- Leaders (monkeys and college fraternity presidents) have higher S levels than followers
- At ease socially (more approach behavior)
- Calmer behavior in problem solving situations
 - Dominant chimps → more deliberate when approaching novel situations
- Conflict management, high serotonin levels → calmer demeanor

Whole blood serotonin levels in dominant and non-dominant males in stable multi-male, mixed-sex groups (from McGuire, et al. 1983)



Whole blood serotonin levels for dominant and nondominant males while members of social groups, during isolation, and following their return to their social groups (from McGuire, et al. 1983)





Prozac and Dominance

- Experiments where serotonin levels were altered with Prozac.
 - In leaderless all-male groups, monkeys that received Prozac emerged as alpha males.



Height and Leadership

- **Height** (a heuristic for dominance)
 - **US Presidents** (Young & French, 1996, 1998)
 - Taller presidents were perceived as more competent
 - Taller candidates won all but 3 elections between 1948 and 1994
 - **Career outcomes** (Judge & Cable, 2004)
 - Earnings, promotions, leader emergence



Tone of Voice

- People perceive lower, masculine voice as more dominant
- Men in dominant positions lower their voice pitch
- Men in subordinate positions raise their voice pitch (Puts, et al., 2006)



Masculine Face



Which person is the more competent?



Facial Features

- Politicians with masculine facial features (large & square jaw, angular face, larger nose, smaller eyes, low forehead)...
- Are rated as “more competent” than those with baby-faced features
 - Won 70% of recent Senate races in US (Todorov, et al., 2005)



EP and Female Leadership

- Females are leaders among a number of group-living non-human species:
 - Bonobos
 - Wild horses
 - Antelope
 - Hyenas
- Where EP can help
 - Understanding and intervention
 - Draw attention to sex differences in adaptations relevant to leadership and leadership contexts
 - Career management strategies

Leadership and Organizational Architecture



- The Mis-Match Hypothesis
 - Our biological and psychological make-up is still adapted to the stone age way of life, which is very different from the modern, western environment. Therefore, we are *mismatched* – psychologically and biologically – to the modern environment.
- Humans will perform better and be more satisfied when modern environments are designed with our stone-age adaptations in mind.



Leaders' Role in Organizational Design

- Design organizations so they are more compatible with human nature
 - Maximum organizational unit size of 150 people
 - Light, exercise, greenery
 - Accommodate mothers with young children
 - Opportunities for interaction and gossip
 - Fair exchange
 - Relatively egalitarian social structures
 - Reverse dominance hierarchy [*Hierarchy in the Forest* (Boehm, 1999)]



Managing leaders

- Ultimate motivation
 - Self-interest → resources & status (esp. with men)
 - Reproductive interests
 - *Despotism and Differential Reproduction*; Perusse
- Leader ambition for rank, resources, and status can cause problems if not managed adequately
 - Personal vs. organizational interests
- Deal realistically with leader motivations
 - Avoid cult of leader
- Selection
 - Humility, *Good to Great*
- The hierarchy problem
 - Hunter-gatherer societies vs. agricultural and beyond
- Checks and balances
- Double check to avoid relying too much on leader heuristics among followers



Future Directions

- Leader (follower) neuro-physiology
 - Loss in status competition → depression
 - Sex differences
- Neuro-imaging leaders/leadership situations
 - Effective vs. ineffective leaders/ age/ sex/ different situations and problems
- Leader stereotype modules mitigate against selecting or good leaders emerging
- Look more deeply into genetics