



COLLEGE OF  
**OSTEOPATHIC MEDICINE**  
at the Cherokee Nation

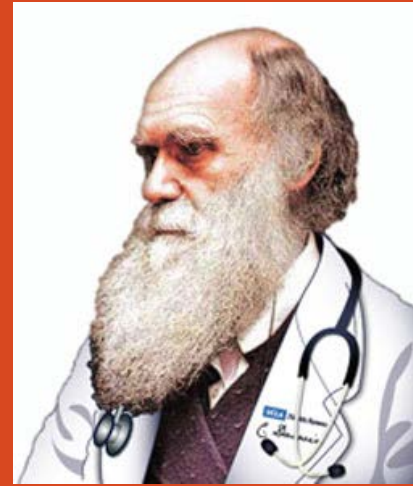
# A Primer on Evolutionary Medicine

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# A bit about me...

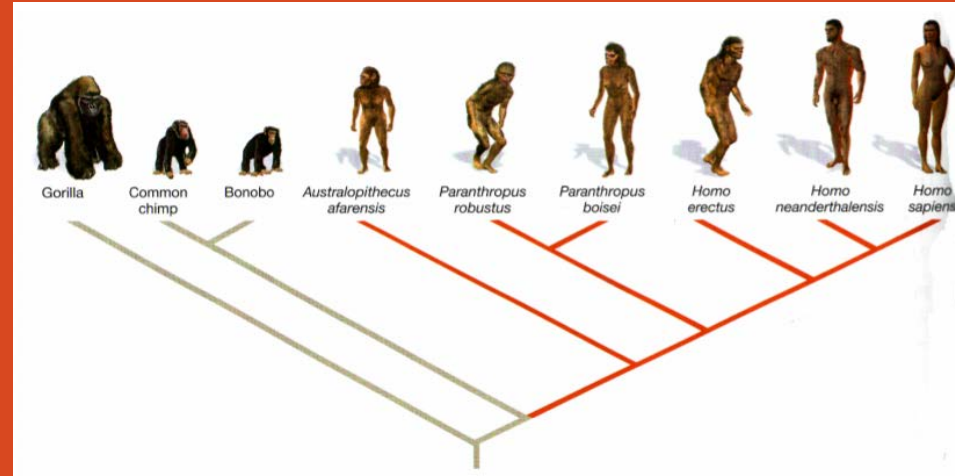
- ❖ Broadly trained in animal behavior and evolutionary ecology
  - BS in Wildlife Management and Biology (UWSP, '96)
  - MS in Conservation Biology (CMU, '00)
  - PhD in Zoology (OSU, '05)
- ❖ Taught courses at NWOSU in Alva for 14 years
- ❖ I think of myself (still) as an integrative biologist



<https://www.evmed.ucla.edu/wp-content/uploads/sites/88/2016/06/DrDarwinb.jpg>

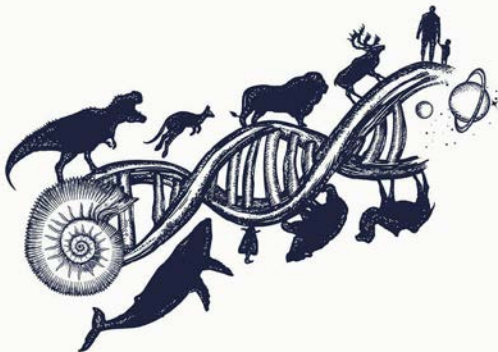
# Today's plan

- ❖ What is evolutionary medicine?
- ❖ When did it start and who started it?
- ❖ When and where should students be exposed to it?
- ❖ How can it be applied (or is it relevant)?
- ❖ Where do we go from here?



# What is evolutionary medicine?

- ❖ Let's start with what it isn't ...
  - A replacement for evidence-based western biomedicine
  - A method of practice or a source for recommended treatments
  - Laboratory research with model organisms



<https://geneticliteracyproject.org/wp-content/uploads/2018/07/evolution-species-natural-selection-221210617.jpg>

# What is evolutionary medicine?

“An interdisciplinary field at the intersection of evolutionary biology, medicine, public health, and other health professions, evolutionary medicine applies the insights of evolutionary biology to improve our understanding of disease and health. Evolution, like physics and chemistry, is a basic science with implications for all of life.” - ISEMPH website

I'd take it a step further -- Ev Med is a two-way street

# When did it start and who started it?

- ❖ Ca. 180-ish AD - *On Anatomical Procedures* by Galen
- ❖ 1859 - *On the Origin of Species* by Darwin
- ❖ 1996 - *Why We Get Sick: The New Science of Darwinian Medicine* by Nesse and Williams
  
- ❖ 2007 - *Evolutionary Medicine and Health* by Trevathan et al.
- ❖ 2019 - *The Oxford Handbook of Evolutionary Medicine* by Brune and Schiefenhovel



# When and where should students be exposed to it?

- ❖ Everywhere, always!
- ❖ K-12 science education - juxtaposition of evolution and medicine makes science relevant (and fun!)
- ❖ University - Human-centered gen ed biology AND majors courses
- ❖ Medical school prerequisites and the MCAT
- ❖ Medical School curriculum (It's a hill I will die on!)
- ❖ CME

# How can it be applied (or is it relevant)?

- ❖ Ev Med is not just academic
- ❖ Generates hypotheses that can be tested with RCTs for a number of different specialties

- Family Medicine

- Ob/Gyn

- Ortho

- Pediatrics

- Gastroenterology

- Psychiatry



# How can it be applied (or is it relevant)?

- ❖ Family medicine
  - Evolutionary mismatch narratives in diabetes education (Basile et al. 2021)
  - Testosterone injections for “men’s health” (Gray et al. 2002)



# How can it be applied (or is it relevant)?

## ❖ Ob/Gyn

- Squatting during childbirth and social assistance (Rosenberg and Trevathan 2014)
- Presence of post-menopausal females promote maternal health (Gemmill and Catalano 2017)

# How can it be applied (or is it relevant)?

## ❖ Orthopedics

- Spondylolysis is a result of adaptation for bipedalism (Plomp et al. 2020)
- Hallux vulgus is not just from bad shoes! It stems from the abducent condition of our ancestors great toe (Tamer and Simpson 2017)



# How can it be applied (or is it relevant)?

## ❖ Pediatrics

- Co-sleeping can reduce night terrors in children (Boyden et al. 2018)

## ❖ Gastroenterology

- Human-helminth co-adaptation may explain IBS (Lee and Maizels 2014)



# How can it be applied (or is it relevant)?

## ❖ Psychiatry

- *Just read Good Reasons for Bad Feelings by Nesse!*
- Anxiety is an adaptive response gone haywire (Nesse 2019)



# Important Evolutionary Concepts

Fourteen core principles (Grunspan et al. 2018)

1. Two types of explanations
2. Evolutionary processes are important in understanding disease
3. Natural selection maximizes reproductive success
4. Sexual selection shapes traits that affect health risk
5. Constraints prevent optimality



# Important Evolutionary Concepts

Fourteen core principles (Grunspan et al. 2018)

6. Trade-offs happen!
7. Life history traits are affected by evolution and affect health
8. Selection occurs at every level of the biological hierarchy
9. Phylogenetics can shed light on diseases and disease processes
10. Co-evolution influences health



# Important Evolutionary Concepts

Fourteen core principles (Grunspan et al. 2018)

11. Phenotypic plasticity affects health and disease (ITGE)

12. S/S are defenses (which can go awry)

13. Disease can result from environmental mismatch

14. Culture influences human evolution that can affect health  
and disease





# Where do we go from here?

- ❖ Get evolution into the MCAT
- ❖ Require evolution as a prerequisite along with the other foundational sciences (physics and chemistry)
- ❖ Include it as part of the Med school curriculum
  - It promotes higher level thinking (Graves et al. 2016)

# Where do we go from here?

- ❖ Hire some evolutionary biologists to the faculty
- ❖ Grant DO/PhDs in Evolutionary Medicine
- ❖ Create departments of Evolutionary Medicine
- ❖ Make it part of CME

# EvMed and the Osteopathic Philosophy

- ❖ The body is a unit; the person is a unit of mind, body, and spirit
  - Body unity is an evolved property of humans
  - The environment has shaped each of these (individually and together)



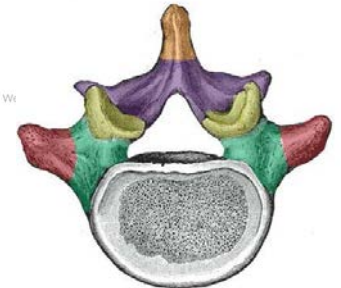
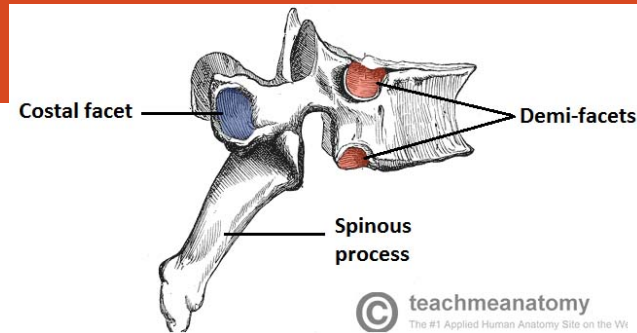
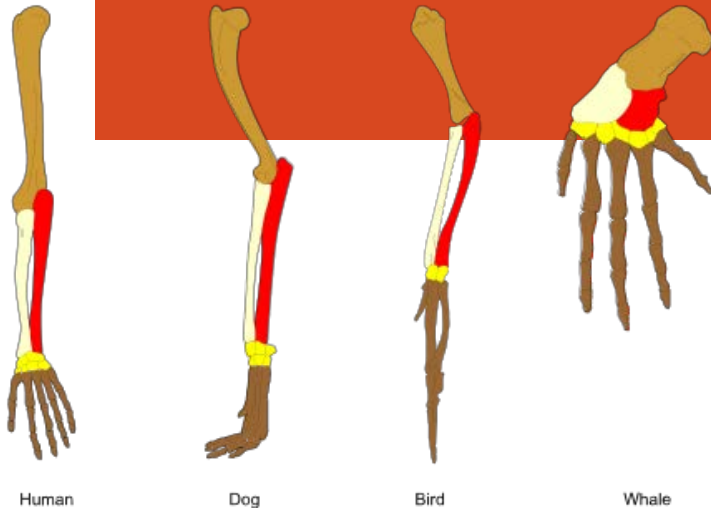
# EvMed and the Osteopathic Philosophy

- ❖ The body is capable of self-regulation, self-healing, and health maintenance
  - This capability is a direct response to the environment
  - Health is not the prime driver of evolutionary change



# EvMed and the Osteopathic Philosophy

- ❖ Structure and function are reciprocally related
  - This **MUST** be due to natural selection, there is no other scientific explanation



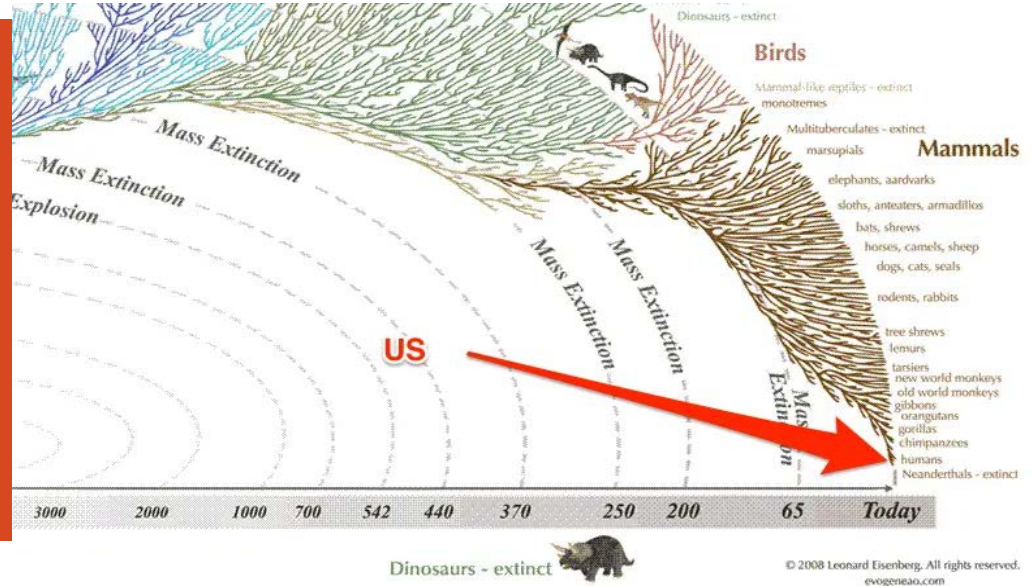
# EvMed and the Osteopathic Philosophy

- ❖ Rational treatment is based upon an understanding of the basic principles of body unity, self-regulation, and the interrelationship of structure and function
  - Treatments based on reason suggest the use of an evolutionary lens when confronting the maladies of a body created by evolutionary forces and assaulted by evolved pathogens



# Thank you!

## What questions do you have?



<https://i.insider.com/555e06af7fcb676e048b45a5?width=1000&format=jpeg&auto=webp>



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