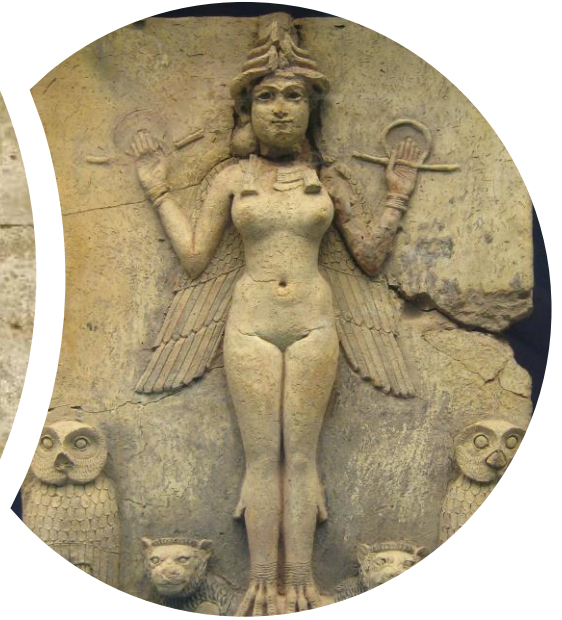
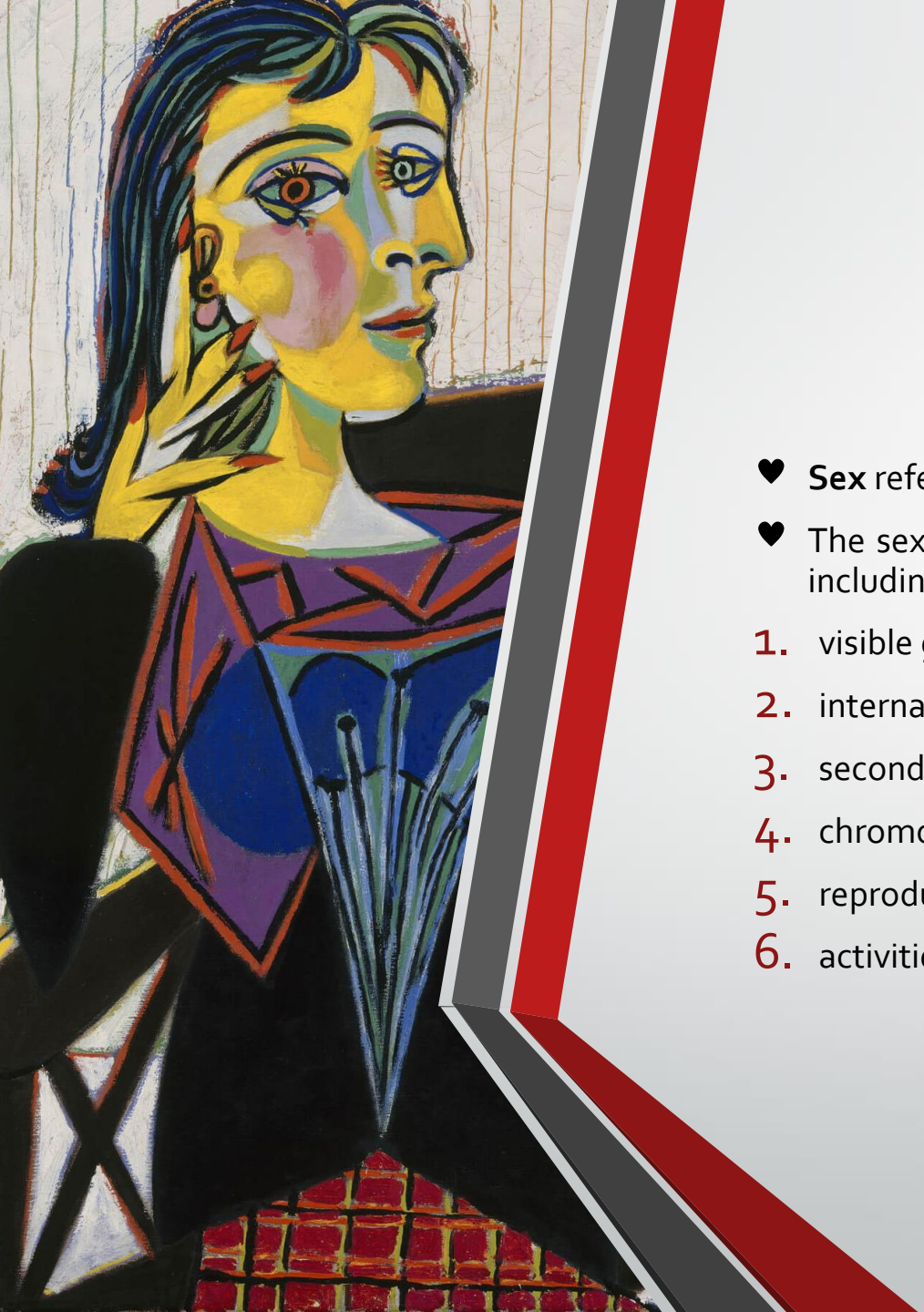


Human Sexuality





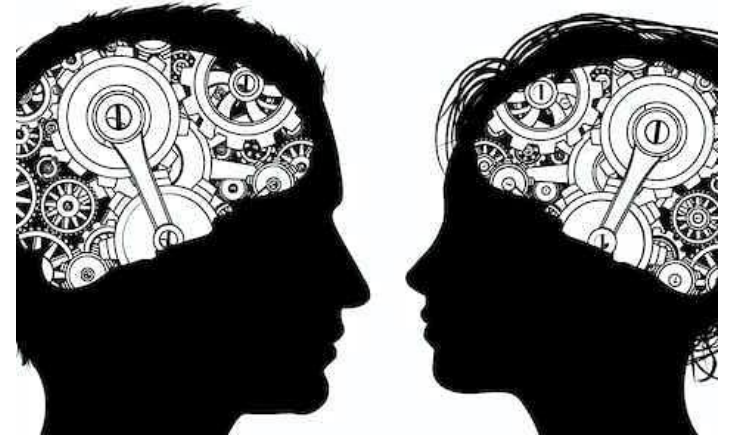


Sex, Gender & Sexuality

- ♥ Sex refers to the biological categories of M & F (& other categories)
- ♥ The sex of a person is determined by an examination of biological & anatomical features, including (but not limited to):
 1. visible genitalia (e.g., penis, testes, vagina)
 2. internal sex organs (e.g., ovaries, uterus)
 3. secondary sex characteristics (e.g., breasts, facial hair),
 4. chromosomes (XX for females, XY for males, & other possibilities)
 5. reproductive capabilities (including menstruation)
 6. activities of growth hormones, particularly testosterone & estrogen

Sex, Gender & Sexuality

- ♥ It may seem as though nature divides humans neatly into females & males, but not only...
- ♥ hormonal influences can produce results different from the ways that people typically develop
- ♥ Hormonal influences shape the development of sex organs over time & can stimulate the emergence of secondary sex characteristics associated with the other sex

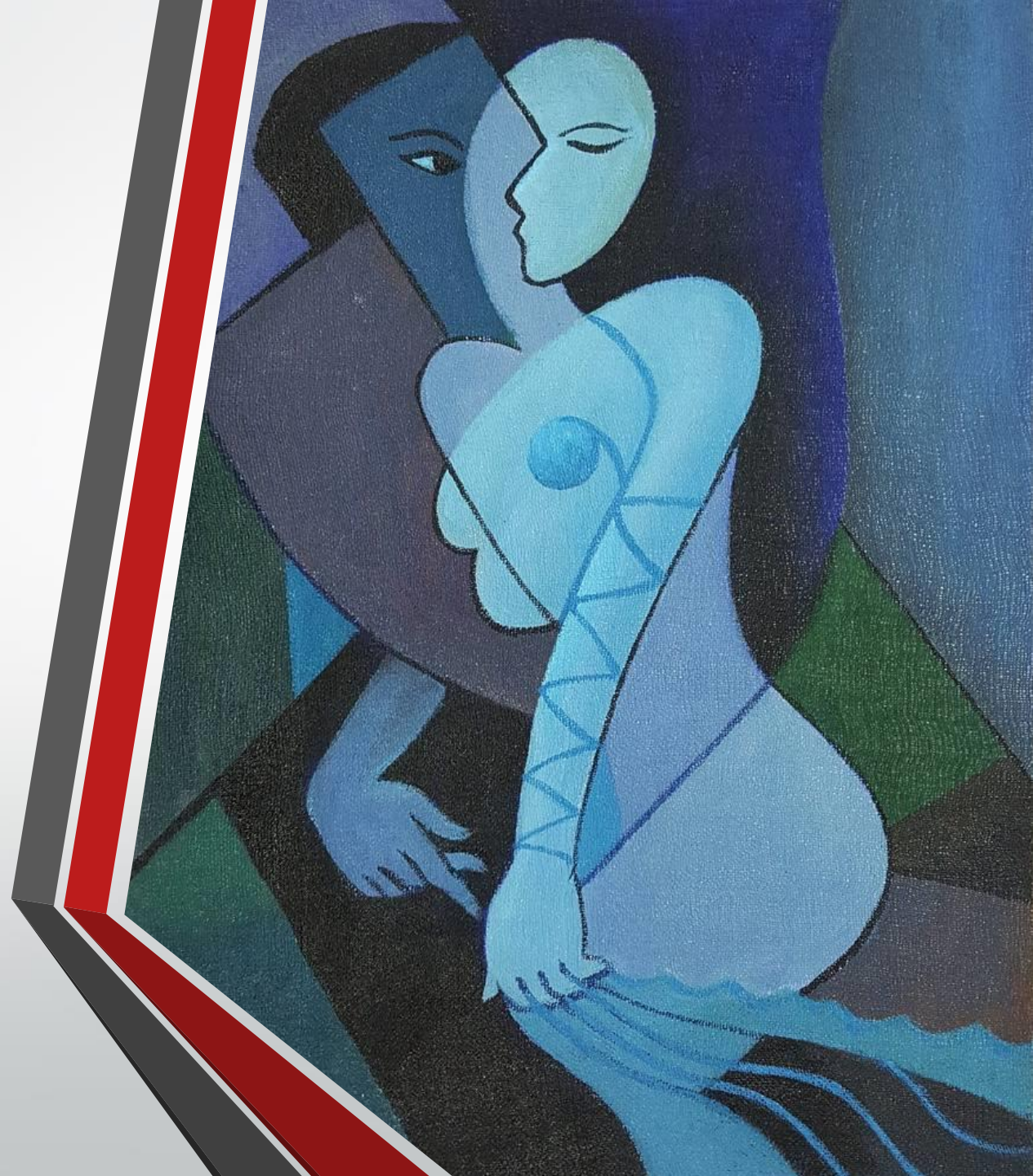


Sex, Gender & Sexuality

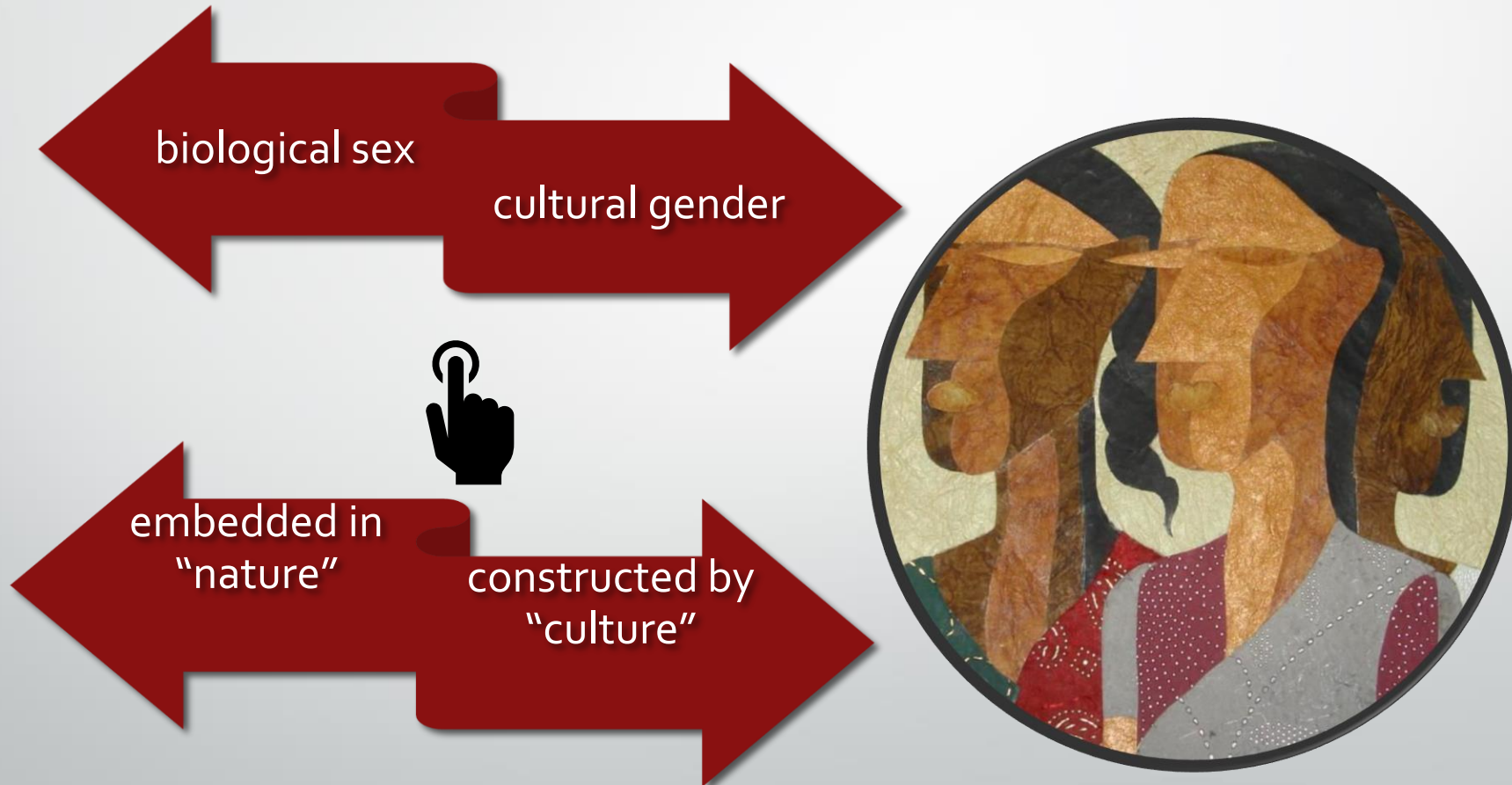
- ♥ **sex** : based on biology

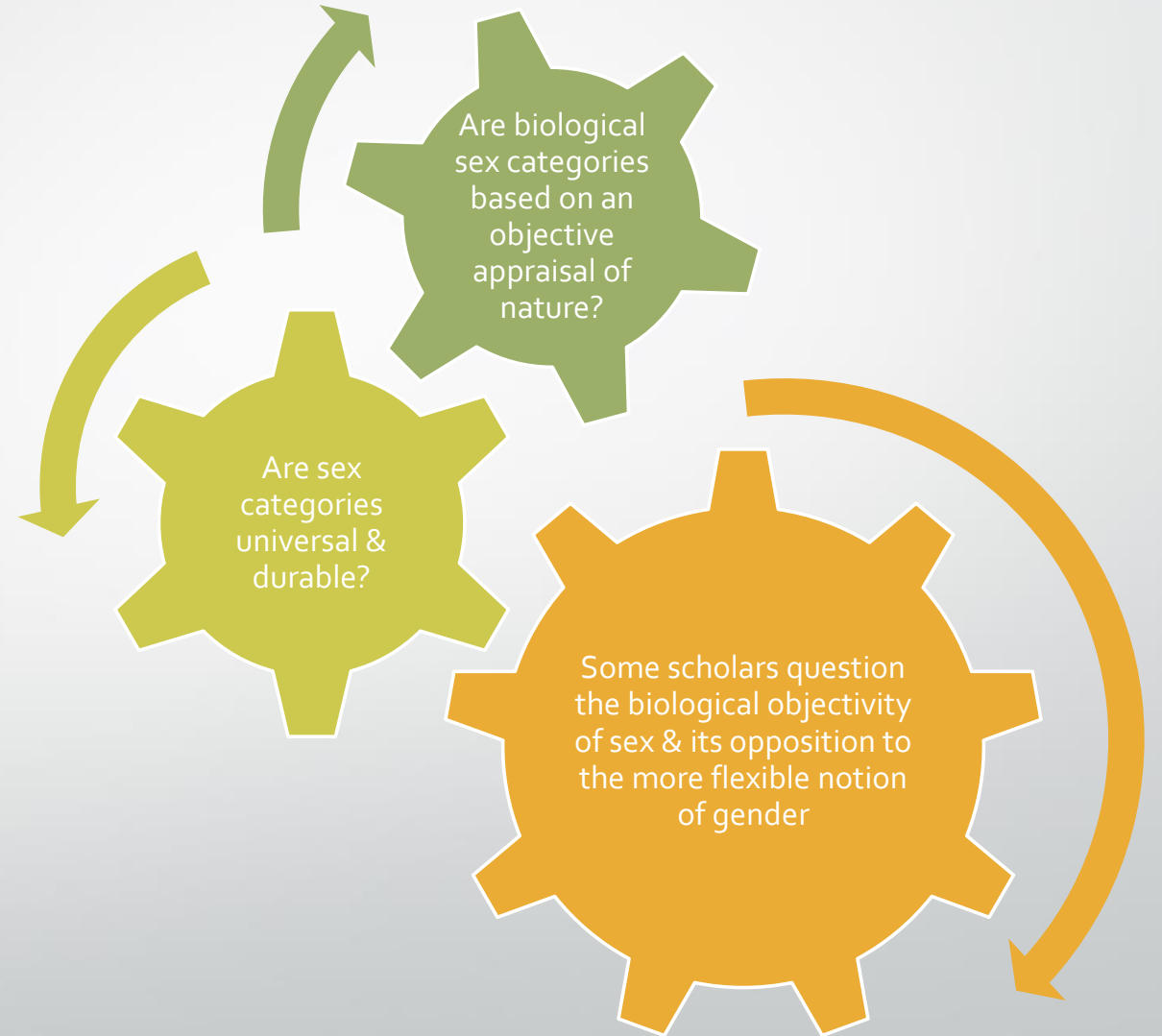
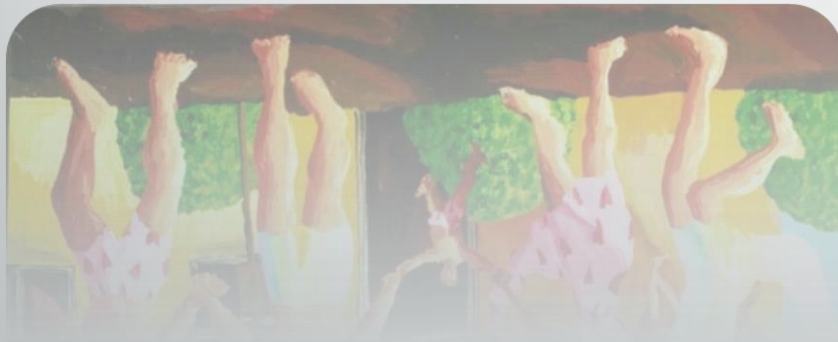
- ♥ **gender** : developed by social scientists to refer to cultural roles based on these biological categories

- ♥ The cultural roles of gender assign certain
 1. behaviors
 2. relationships
 3. responsibilities
 4. rights differently to people of different genders



Sex, Gender : distinguished from one another

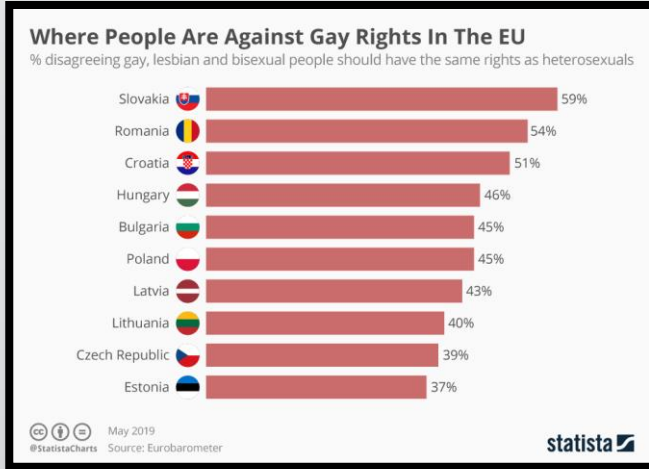




Sex, Gender & Sexuality

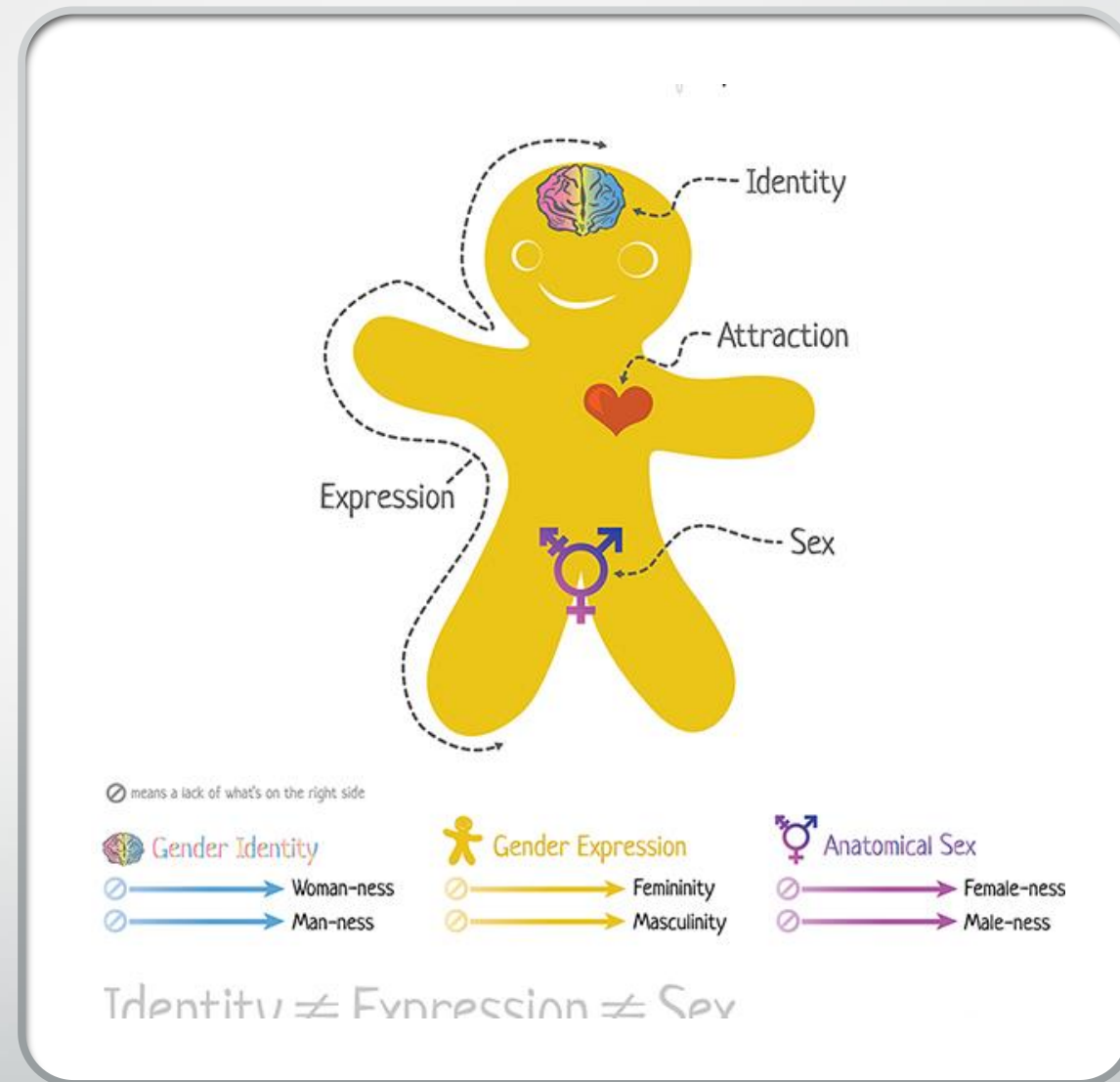
- ♥ **Sexuality:** refers to erotic thoughts, desires, practices & the sociocultural identities associated with them
- ♥ The complex ways in which people experience their own bodies & perceive their own gender contribute to the physical behaviors they engage in to achieve pleasure, intimacy, &/or reproduction
- ♥ This complex of thoughts, desires, & behaviors constitutes a person's sexuality





- **Some** cultures have very strict cultural norms regarding sexual practices, **while** others are more flexible
- **Some** cultures confer a distinctive identity on people who practice a particular form of sexuality, **while** others allow a person to engage in an array of sexual practices without adopting a distinctive identity associated with those practices

Gender & Sexuality of whole persons



(credit: "Genderbread Person v4" by Sam Killermann/Wikimedia Commons, Public Domain)

Multifaceted topic



To understand human sexuality, one must understand its

Discussions of sexuality should include information about:

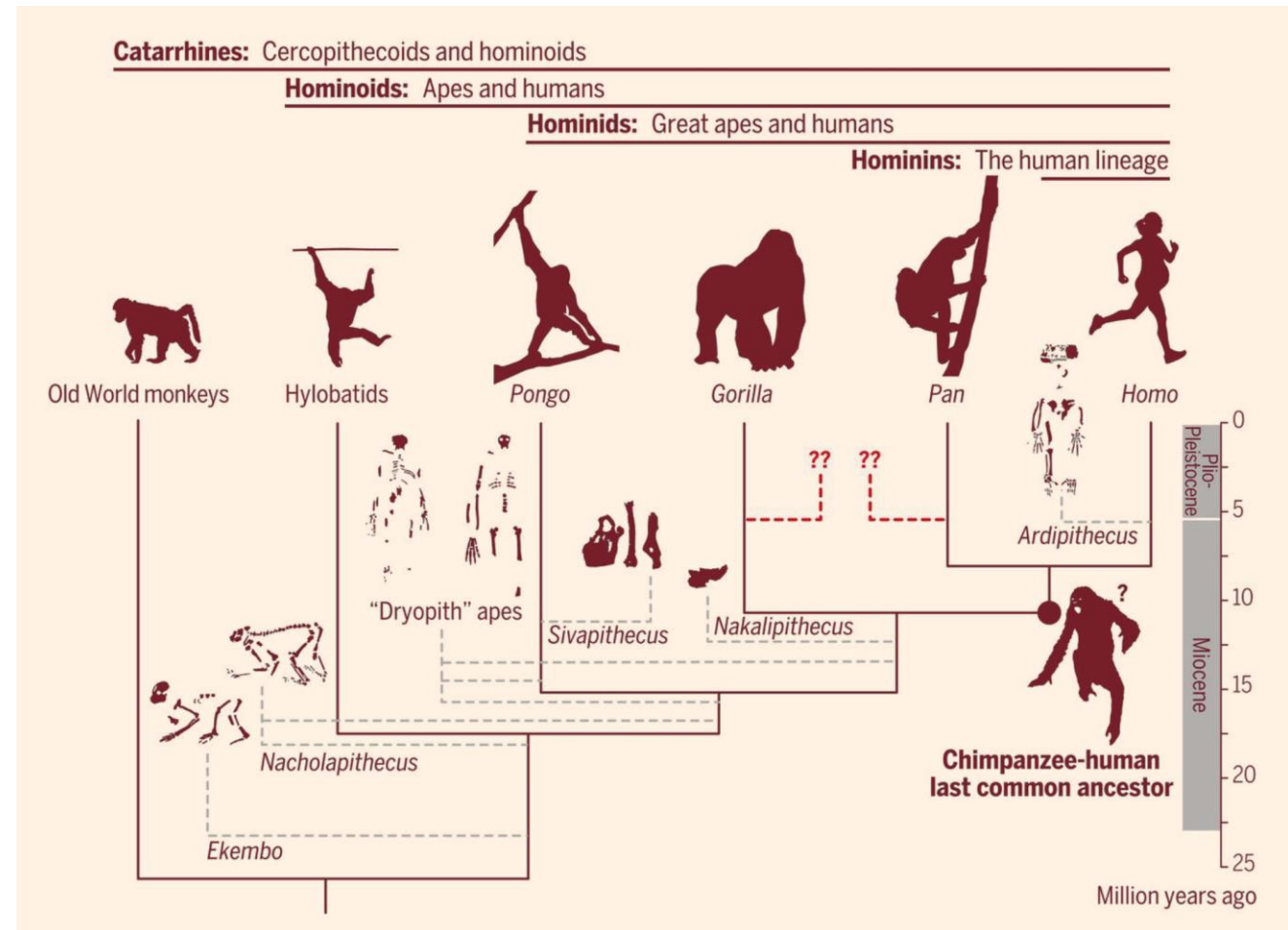
- ♥ anatomy
- ♥ physiology
- ♥ gender roles
- ♥ sexual identity
- ♥ love
- ♥ interpersonal relationships
- ♥ social/cultural factors as revealed in community standards & laws
- ♥ moral/spiritual/religious effects on sexuality

On the program today

1. The Evolutionary History of Human Sexuality
2. Primate (Human and nonhuman) Sex Differences: Behavior & biology
3. Modern Human Male Anatomy & Physiology
4. Modern Human Female Anatomy & Physiology
5. Development of the Male & Female Reproductive Systems
6. Development of the Sexual Organs in the Embryo & Fetus
7. Further Sexual Development Occurs at Puberty
8. Sexuality through the Life Stages
9. Fertilization
10. Pregnancy & Childbirth
11. Evidence from
 1. Archaeology: cases studies
 2. Bioanthropology: methods & application
 3. Paleopathology: Syphilis



The Evolutionary History of Human Sexuality



overview of non-human primate evolution & ancestral relations



The Evolutionary History of Human Sexuality

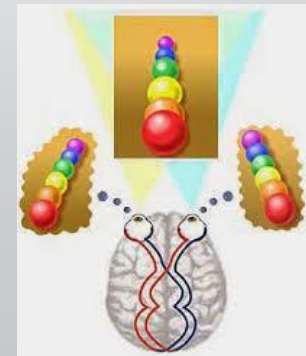
1. Human arboreal & terrestrial **adaptations** → development of the:

- ✓ grasping hand
- ✓ stereoscopic vision
- ✓ grooming



consequences for modern sexual behavior

2. **Importance** of touch, feeling, & vision = important components in sexual attraction



The Evolutionary History of Human Sexuality



3. Importance of the social group for human survival

4. Concept of **bonding** in human

*the establishment of a relationship or link with someone based on **shared feelings, interests, or experiences***

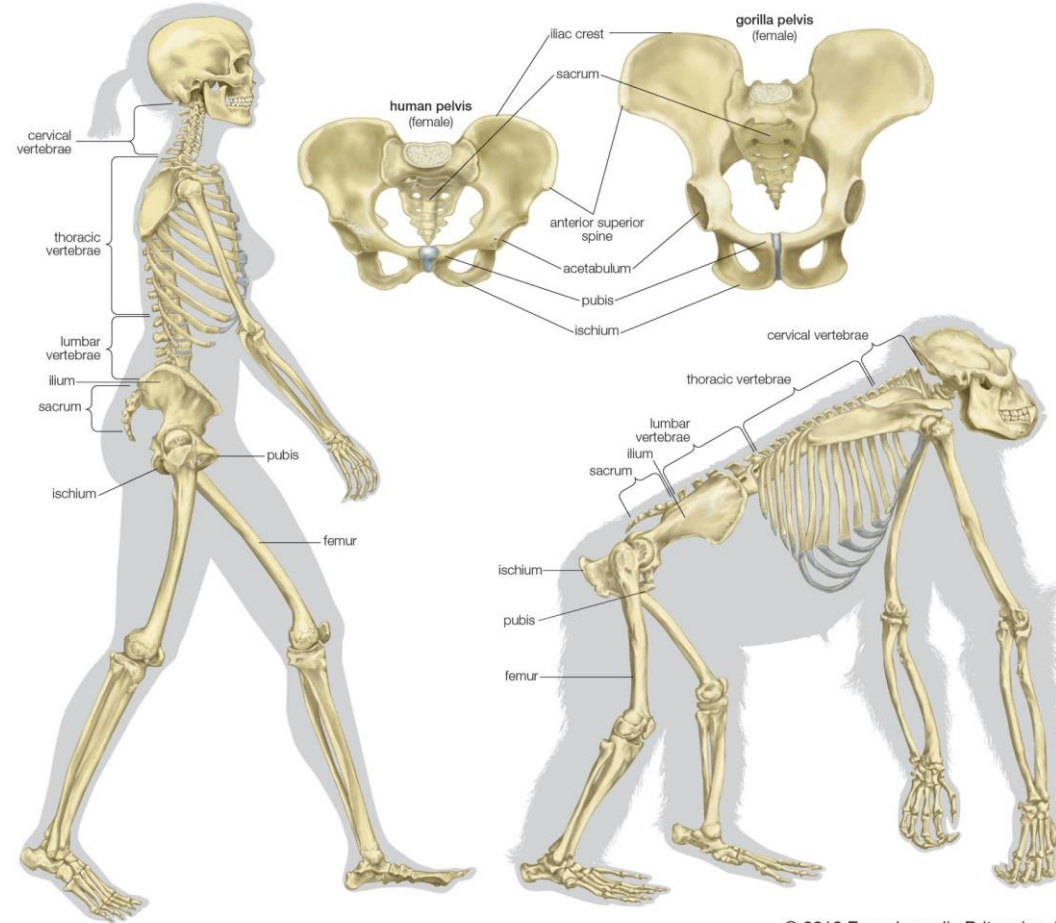


The Evolutionary History of Human Sexuality

5. **Bipedalism** also had a profound impact on the evolution of human sexuality & reproduction.

it had a consequence for:

- ✓ evolution of the hand
- ✓ manipulation of tools
- ✓ elaboration of the motor areas of the brain
- ✓ memory & thinking



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The development of lifelong social relationships or attachments is a **hominid characteristic** that reflects continuities from our non-human primate heritage.

Evidence from Biological Anthropology



Primate Sex Differences: Behavior

1950 most primatologists believed that:

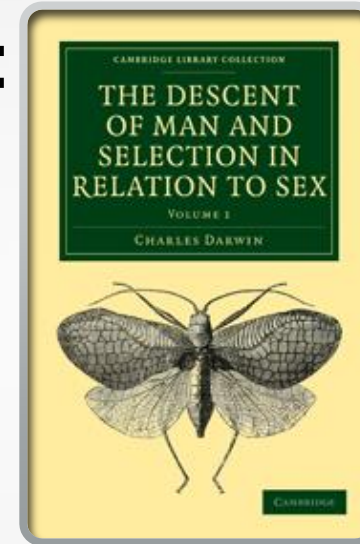
- ♂ **males** were the public actors in primate social life, while **females** were passive, marginal figures
- ♂ **males** constantly competed against one another for dominance in a rigid group hierarchy, while **females** were more narrowly interested in raising young



(Fedigan & Fedigan 1989)

Primate Sex Differences: Behavior

Description of the total social organization of primates in terms of **male competition** = **Charles Darwin's notion**



Males

- must be assertive & dominant
- forced to compete for the opportunity to mate with females

Females

- shaped by evolution to choose the strongest male to mate with
- then concern themselves exclusively with nurturing their offspring to adulthood

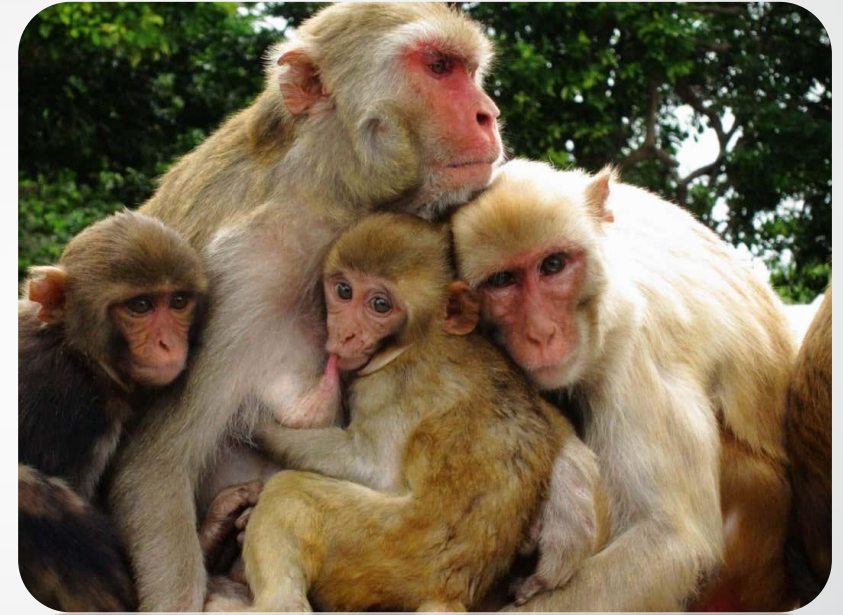
Primate Sex Differences: Behavior

By the **1980s**, new studies, new results about primate social organization:

1. most primate groups are essentially composed of related **F + M** as temporary members who often move between groups
2. The **heart of primate** society is not a set of competitive **M** but a set of closely bonded **mothers & their young**
3. **F** are not marginal figures but **central actors** in most social life
4. The glue that holds most primate groups together is not male competition but **F kinship & solidarity**



Primate Sex Differences: Behavior



- 🐒 A **complex** social organization with both **M** & **F** actively strategizing for desirable resources, roles & relationships
- 🐒 **cooperation rather than competition**

Males

- friendliness with females may be a much better reproductive strategy than fighting with other males

Females

- often sexually assertive & highly competitive
- actively exercise their preference to mate with certain male "friends" rather than aggressive or dominant males

Primate Sex Differences: Behavior

- ♂♂ both are competitive
- ♂♀ both are cooperative
- ♂♀ both are central actors in primate social life



equally important to social life

Primate Sex Differences: Biology



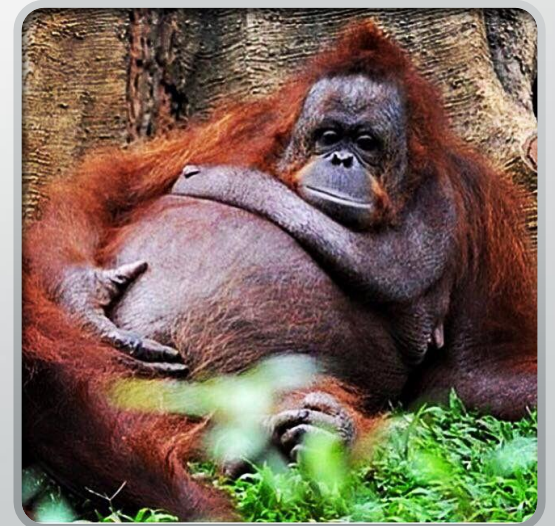
What about the **biological differences** & their link to behavioral differences?

Primate Sex Differences: Biology

The anatomy differs in two main respects:

1. adult F

- bear offspring
- often pregnant or nursing for most of their adult lives
- devote more time & resources to care of young than **M**
- juvenile **F** pay more attention to babies in the group than do juvenile males



Primate Sex Differences: Biology

The anatomy differs in two main respects

2. M primates

- slightly bigger than F/ this difference itself is quite variable:

M & F gibbons nearly the same

M gorillas twice the size of **F**

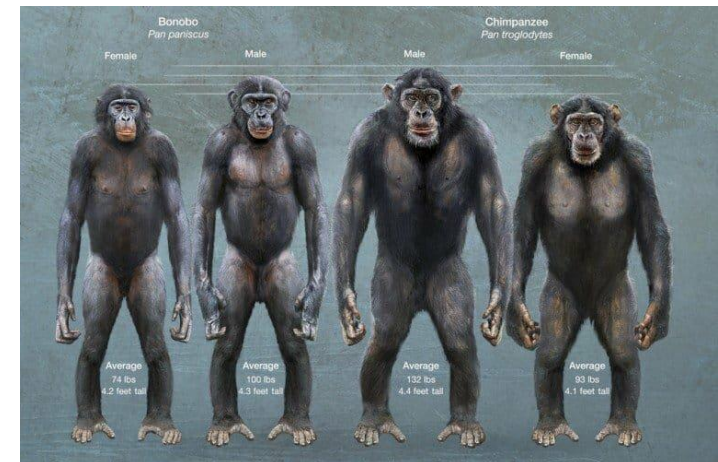
F chimpanzees about 75% the size of **M**

Human F about 90% the size of **M**

human sexual dimorphism closer to gibbons than chimpanzees



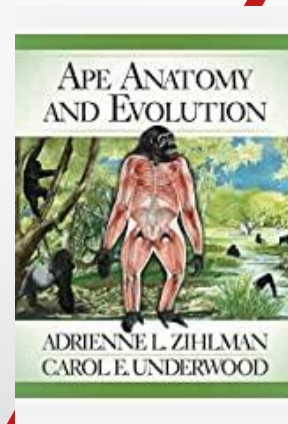
Andrea Rubenstein



Primate Sex Differences: Sexual dimorphism

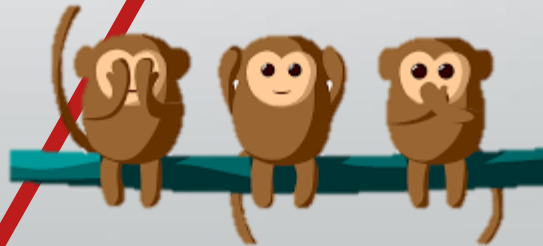
Some researchers suggest that a high level of sexual dimorphism is associated with:

1. strong **M** dominance
2. rigid hierarchy
3. **M** competition for mating with **F**

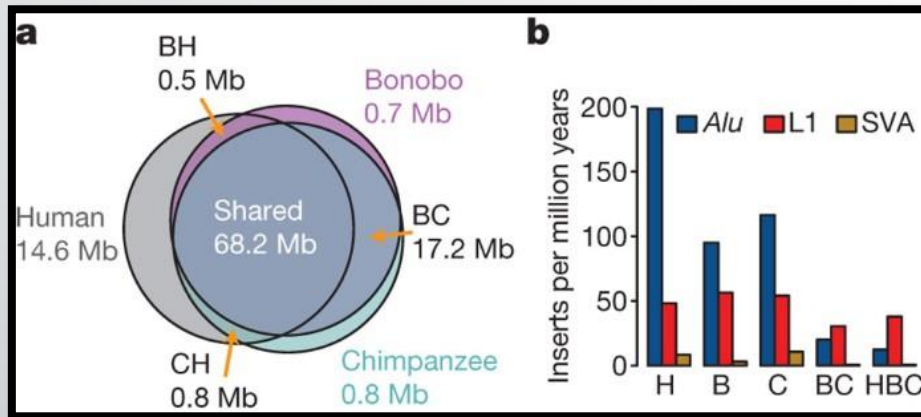


Others:

1. **no** simple **correlation** between anatomy & behavioral expression, within or between species
2. each species features a unique "**mosaic**" of sex differences involving anatomy & behavior
3. no clear commonality that might predict what is "natural" for humans



Primate Sex Differences



- 🐒 closest primate to us are
- 🐒 sharing 99% of their DNA with us
- 🐒 each exhibits very different gender-related behaviors



Human Sex Differences

as primate research, research on **human biological sex/gender differences** has been considerably slanted by the gender bias of the (often male) researchers

Euro-American intellectual tradition; scholars have argued that women's biological constitution makes them:

1. unfit to vote
2. go to college
3. compete in the job market
4. hold political office



Human Sex Differences

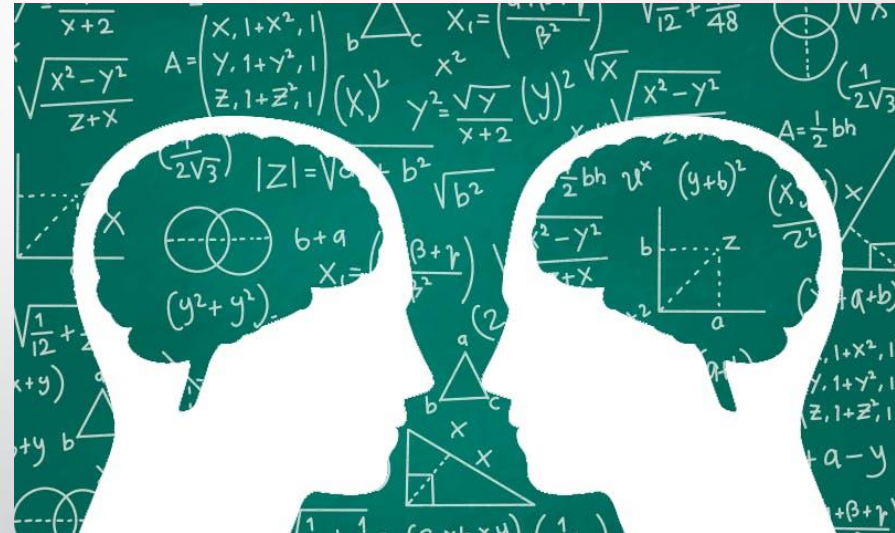
Then the different cognitive abilities

Males

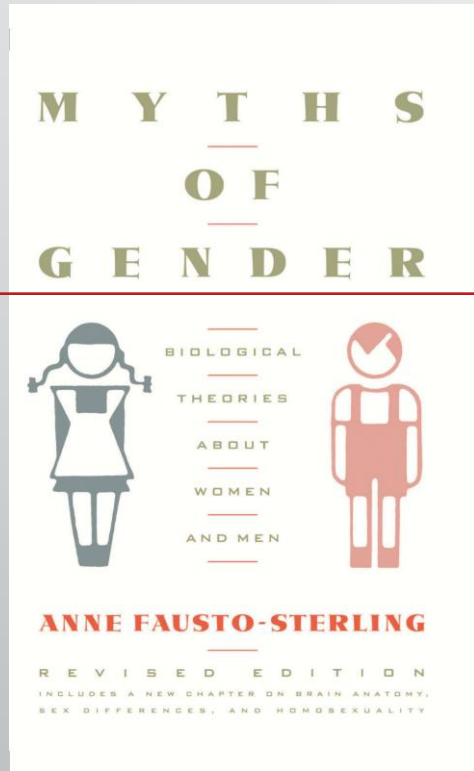
- better at math & spatial relationships
- more aggressive

Females

- better at language skills
- more emotional



Human Sex Differences



Males

- Spatial abilities



Females

- Verbal abilities

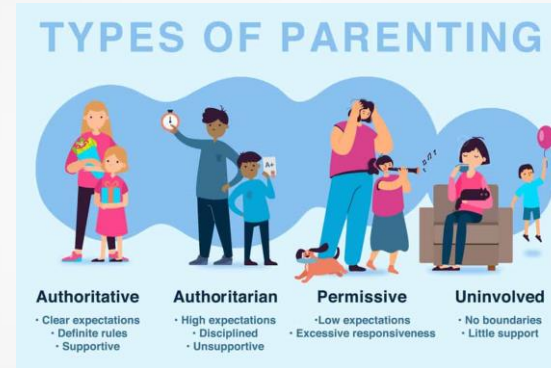


1992: a massive review of research on cognitive & behavioral sex/gender differences in humans

a very small difference
no statistically significant

only about 5% can be attributed to gender
→ 95 % of the differences are due to other factors (i.e., educational opportunities)

Human Sex Differences: Biology & Behavior



not necessarily rooted in biological sex differences

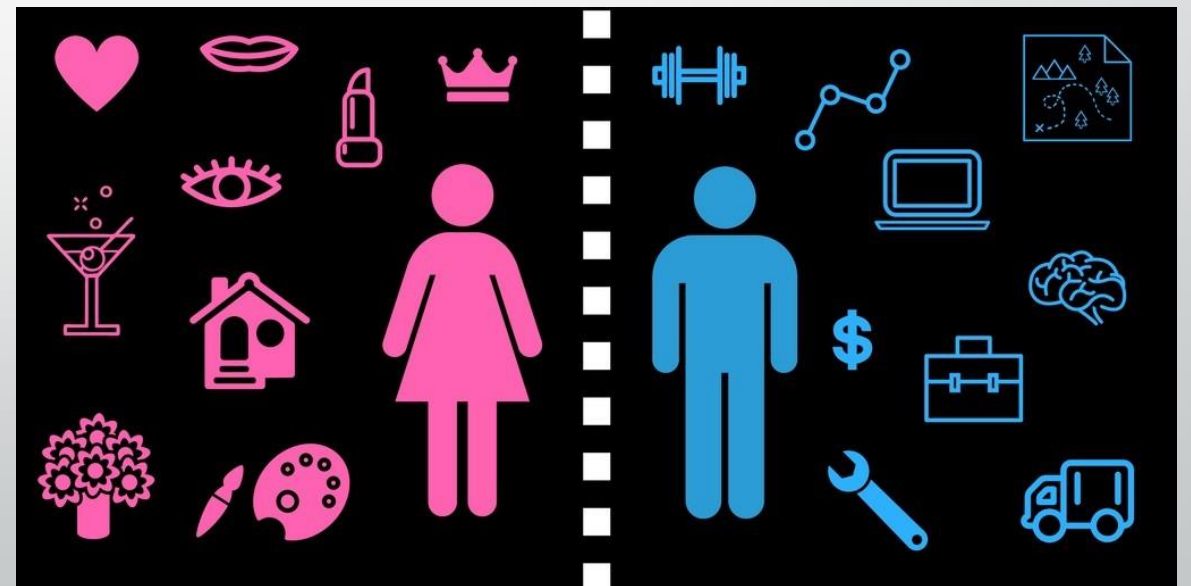
Parenting styles

forms of play

gender roles—all elements of culture—



may shape the data more than biology



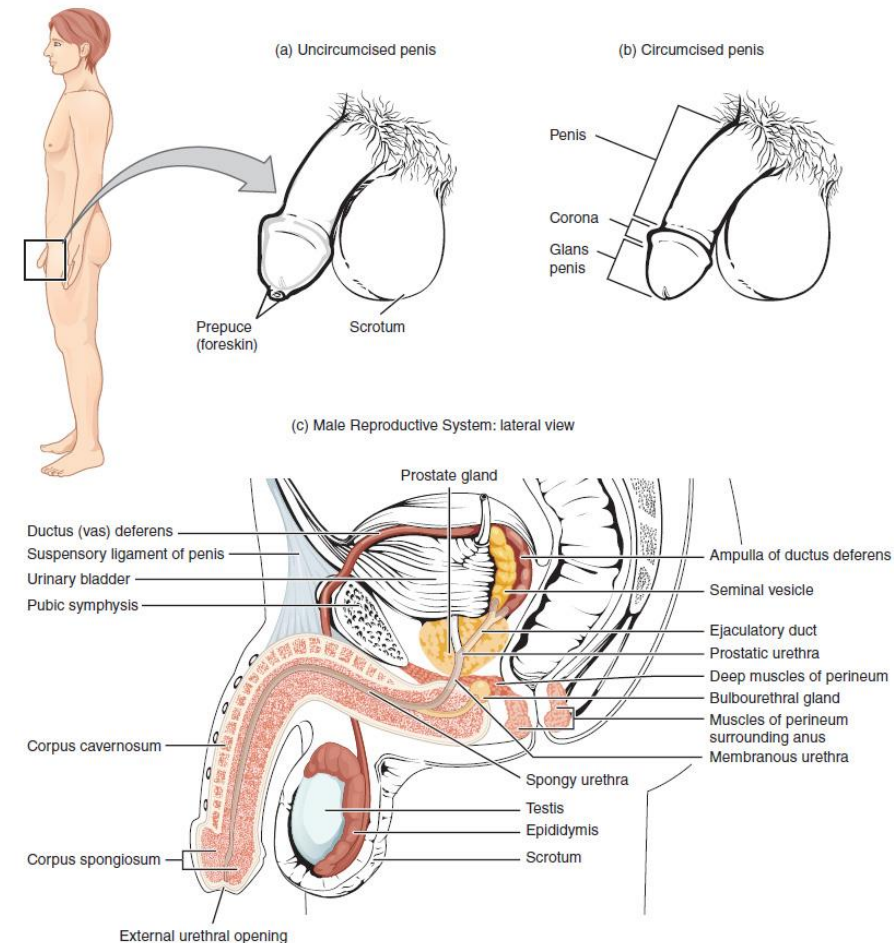
As with bonobos & chimpanzees,
humans are **biologically quite flexible**, allowing for
a diverse array of forms of gender & sexuality



Modern Human **Male** Anatomy & Physiology

The male reproductive system:

- ♂ functions to produce sperm & transfer them to the female reproductive tract
- ♂ The paired testes are a crucial component : they produce both sperm & androgens
- ♂ the most important male & androgen is testosterone
- ♂ Several accessory organs & ducts aid the process of sperm maturation & transport the sperm & other seminal components to the penis, which delivers sperm to the F reproductive tract



The structures of the male reproductive system include the testes, the epididymides, the penis, & the ducts & gl&s that produce & carry semen. Sperm exit the scrotum through the ductus deferens, which is bundled in the spermatic cord. The seminal vesicles & prostate gl& add fluids to the sperm to create semen.

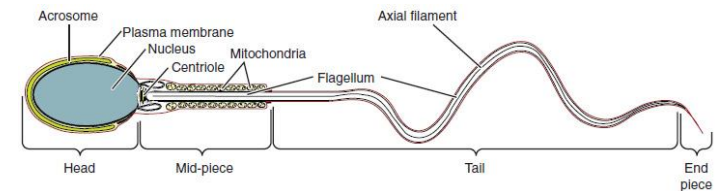
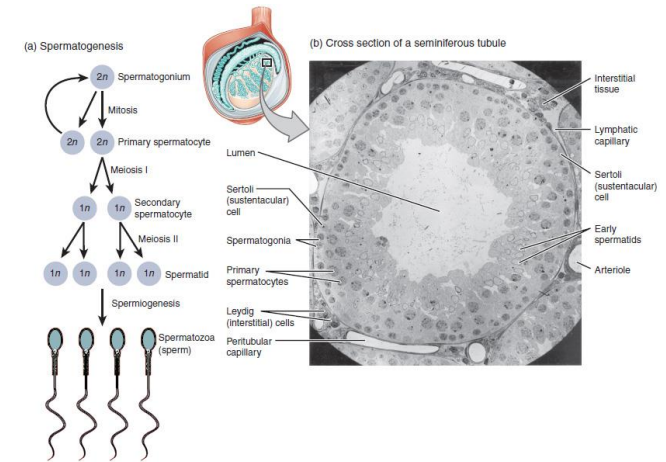


Modern Human **Male** Anatomy & Physiology

Spermatogenesis:

the production of sperm, occurs within the seminiferous tubules that make up most of the testis

- ♂ It begins with mitotic division of spermatogonia (**stem cells**) to produce primary spermatocytes that undergo the two divisions of meiosis to become secondary spermatocytes, then the haploid spermatids
- ♂ During spermiogenesis, spermatids are transformed into spermatozoa (**formed sperm**)
- ♂ Upon release from the seminiferous tubules, sperm are moved to the epididymis where they continue to mature

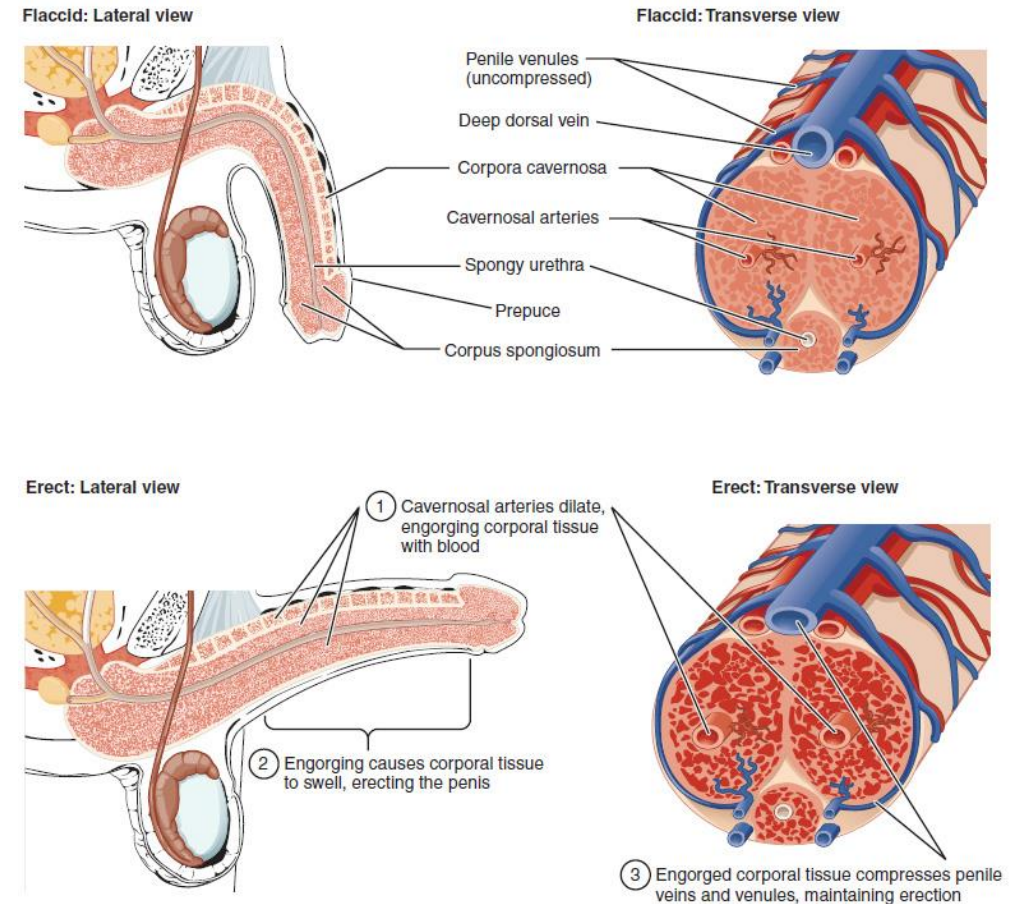


- Sperm cells are divided into**
1. *head, containing DNA*
 2. *mid-piece, containing mitochondria*
 3. *tail, providing motility*



Modern Human **Male** Anatomy & Physiology

- ♂ **Penis** is the male organ of copulation
- ♂ Columns of erectile tissue called the corpora cavernosa & corpus spongiosum fill with blood when sexual arousal activates vasodilatation in the blood vessels of the penis
- ♂ **Testosterone** regulates & maintains the sex organs & sex drive & induces the physical changes of puberty
- ♂ **Interplay** between the testes & the endocrine system precisely control the production of testosterone with a negative feedback loop

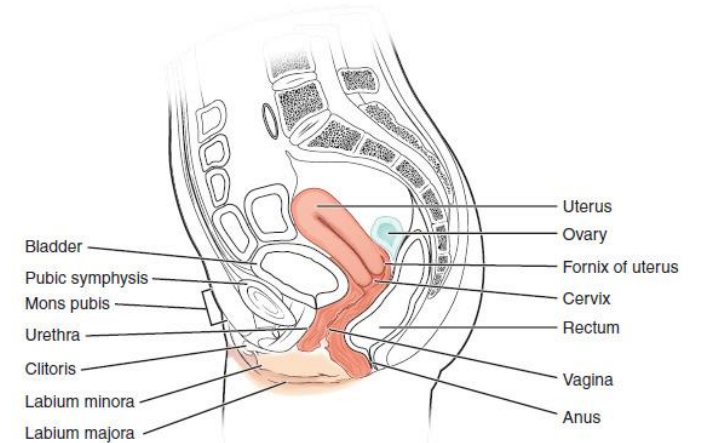




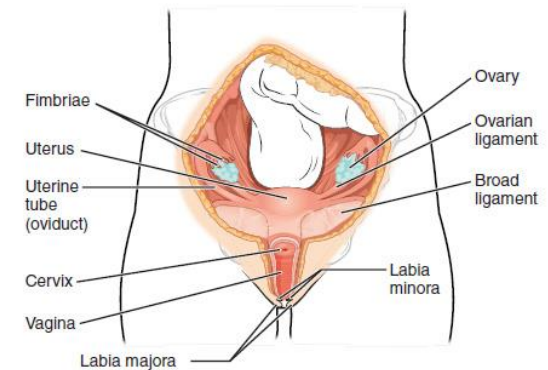
Modern Human **Female** Anatomy & Physiology

The female reproductive system:

- ♀ Functions to produce gametes & reproductive hormones
- ♀ Has the additional task of
 - ♀ supporting the developing fetus
 - ♀ delivering it to the outside world
- ♀ Located primarily inside the pelvic cavity
- ♀ Ovaries are the female gonads & oocyte are the gamete they produce



(a) Human female reproductive system: lateral view

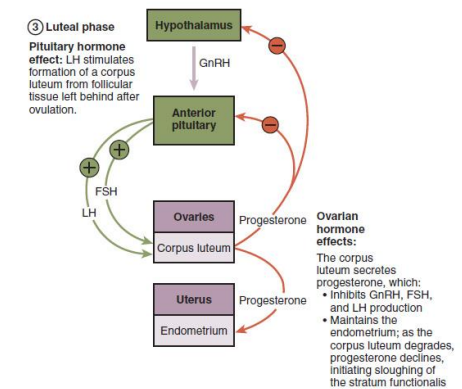
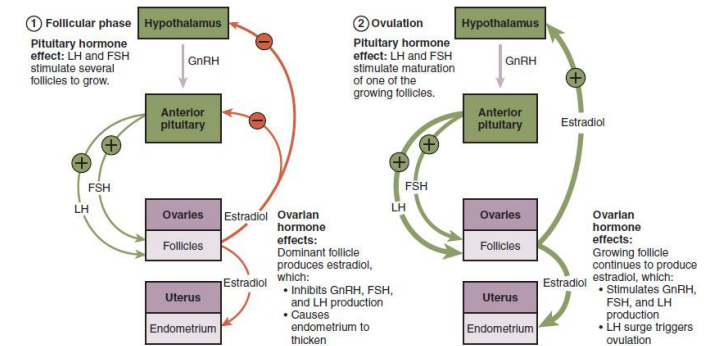


(b) Human female reproductive system: anterior view



Modern Human **Female** Anatomy & Physiology

- ♀ Ovaries produce oocytes in a process called oogenesis
- ♀ Completed only in an oocyte that has been penetrated by a sperm
- ♀ In the ovary, an oocyte surrounded by supporting cells is called a follicle
- ♀ Early tertiary follicles with their fluid-filled antrum will be stimulated by an increase in FSH, a gonadotropin produced by the anterior pituitary, to grow in the 28-day ovarian cycle
- ♀ Supporting granulosa & theca cells in the growing follicles produce estrogens, until the level of estrogen in the bloodstream is high enough that it triggers negative feedback at the hypothalamus & pituitary





Modern Human **Female** Anatomy & Physiology

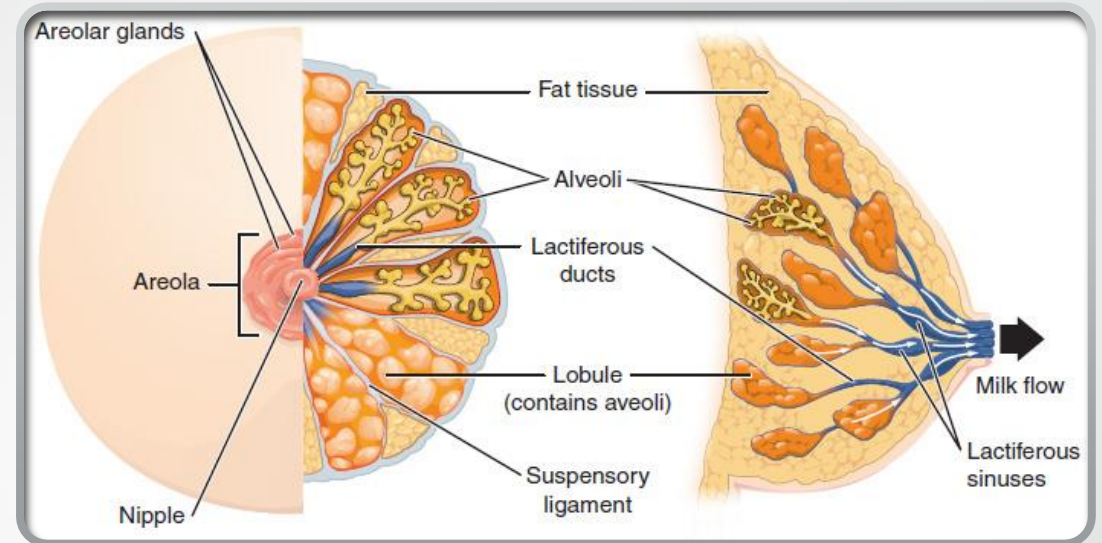
♀ The uterus has

- ♀ **3 regions:** fundus, body & cervix
- ♀ **3 layers:** outer perimetrium, muscular myometrium & inner endometrium
- ♀ The endometrium responds to estrogen released by the follicles during the menstrual cycle & grows thicker with an increase in blood vessels in preparation for pregnancy.
- ♀ If the egg is not fertilized, no signal is sent to extend the life of the corpus luteum, & it degrades, stopping progesterone production.
- ♀ This decline in progesterone results in the sloughing of the inner portion of the endometrium in a process called menses, or menstruation.



Modern Human **Female** Anatomy & Physiology

- Breasts are **accessory sexual organs** that are utilized after the birth of a child to produce milk in a process called lactation
- Birth control pills provide constant levels of estrogen & progesterone to negatively feed back on the hypothalamus & pituitary, & suppress the release of FSH & LH, which inhibits ovulation & prevents pregnancy



Development of the Male & Female Reproductive Systems

- Development of the reproductive systems begins soon after fertilization of the egg
- With primordial gonads beginning to develop approximately one month after conception
- Reproductive development continues in utero
- Little change between infancy & puberty



Development of the Sexual Organs in the Embryo & Fetus

- XX F are considered the “**fundamental**” sex—that is, without much chemical prompting, all fertilized eggs would develop into F.
- XX To become a **M**, an individual must be exposed to the cascade of factors initiated by a single gene on the **M Y chromosome**.
- XX This is called the **SRY (Sex-determining Region of the Y chromosome)**. Because F do not have a Y chromosome, they do not have the SRY gene. Without a functional SRY gene, an individual will be F.



Development of the Sexual Organs in the Embryo & Fetus

- ✎ In both **M & F** embryos, the same group of cells has the potential to develop into either the **M or F** gonads; this tissue is considered bipotential.
- ✎ The **SRY** gene actively recruits other genes that begin to develop the testes & suppresses genes that are important in F development.
- ✎ As part of this **SRY**-prompted cascade, germ cells in the bipotential gonads differentiate into spermatogonia.
- ✎ **Without SRY**, different genes are expressed, oogonia form, & primordial follicles develop in the primitive ovary.



Development of the Sexual Organs in the Embryo & Fetus

- Soon after the formation of the testis, the Leydig cells begin to secrete testosterone.
- Testosterone can influence tissues that are bipotential to become **M** reproductive structures.



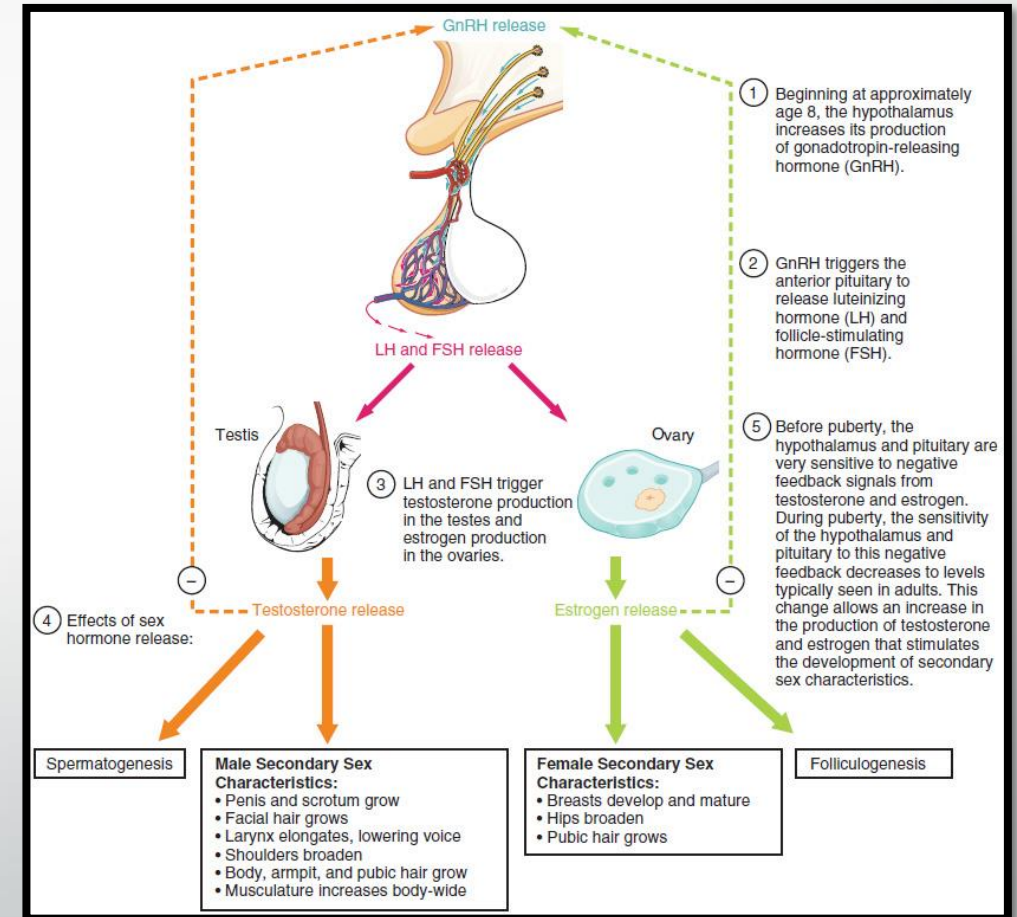
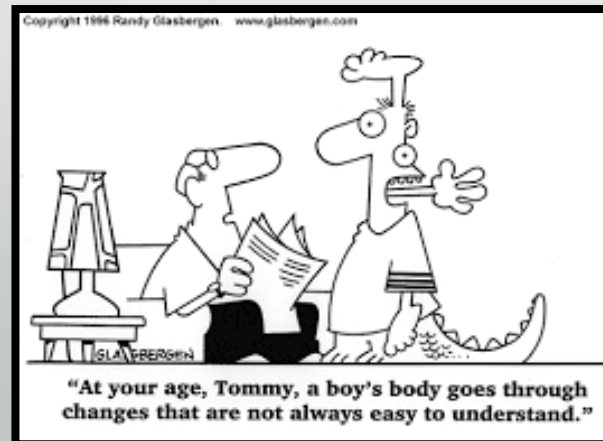
Development of the Sexual Organs in the Embryo & Fetus

- Not all tissues in the reproductive tract are bipotential.
- The internal reproductive structures form from one of two rudimentary duct systems in the embryo.
- For proper reproductive function in the adult, one set of these ducts must develop properly, & the other must degrade.
- In **M**, secretions from sustentacular cells trigger a degradation of the female duct, called the Müllerian duct.
- At the same time, testosterone secretion stimulates growth of the male tract, the Wolffian duct.
- Without such sustentacular cell secretion, the Müllerian duct will develop; without testosterone, the Wolffian duct will degrade.
- Thus, the developing offspring will be female.



Further Sexual Development Occurs at Puberty

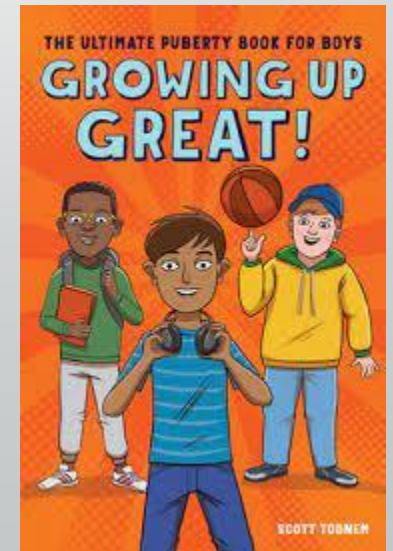
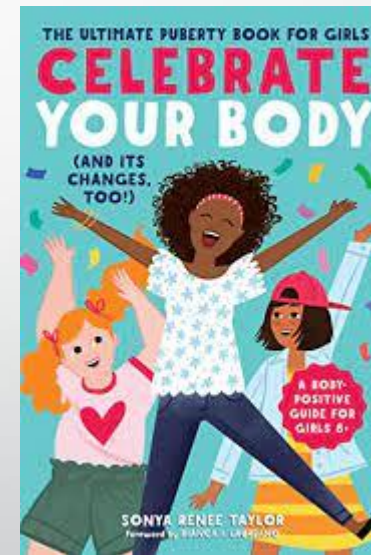
- 👤 *is the stage of development at which individuals become sexually mature*
- 👤 *outcomes of puberty for boys & girls are very different, but the hormonal control of the process is very similar*
- 👤 *though the timing of these events varies between individuals, the sequence of changes that occur is predictable for **M & F** adolescents*



During puberty, the release of LH & FSH from the anterior pituitary stimulates the gonads to produce sex hormones in both male & female adolescents.

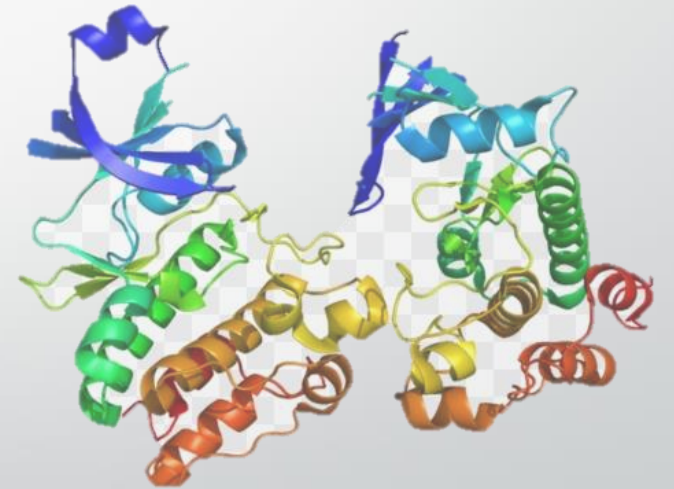
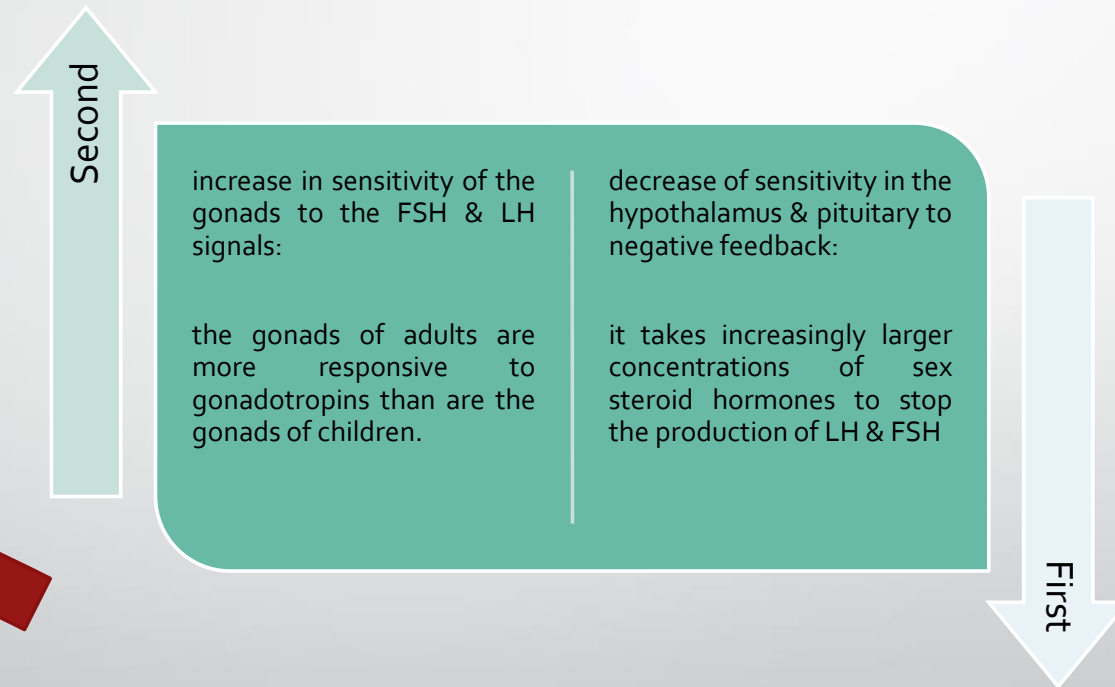
Further Sexual Development Occurs at Puberty

- first changes around the age of 8 or 9 when the production of LH becomes detectable
- The release of LH occurs primarily at night during sleep & precedes the physical changes of puberty by several years
- In pre-pubertal children, the sensitivity of the negative feedback system in the hypothalamus & pituitary is very high
- very low concentrations of androgens or estrogens will negatively feed back onto the hypothalamus & pituitary, keeping the production of GnRH, LH, & FSH low



Further Sexual Development Occurs at Puberty

As an individual approaches puberty, 2 changes in **sensitivity** occur:



the levels of LH & FSH slowly increase & → to the enlargement & maturation of the gonads → to secretion of higher levels of sex hormones & the initiation of spermatogenesis & folliculogenesis.

Further Sexual Development Occurs at Puberty

In addition to age, **multiple factors** can affect the age of onset of puberty

1. genetics
2. environment
3. psychological stress
4. nutrition

historical data demonstrate the **effect of better & more consistent nutrition** on the **age of menarche** in girls

17 years of age in **1860**

12.75 years in **1960**, until today.



Signs of Puberty in **girls**



Male	Female
Increased larynx size & deepening of the voice	Deposition of fat, predominantly in breasts & hips
Increased muscular development	Breast development
Growth of facial, axillary, & pubic hair, & increased growth of body hair	Broadening of the pelvis & growth of axillary & pubic hair

Puberty in Girls : What to expect

BODY SHAPE & HAIR GROWTH

ZITS

SWEAT & BODY ODOUR

BREASTS AND BRAS

PERIODS

www.HowToTellYourChild.com

Signs of Puberty in **Boys**



Male	Female
Increased larynx size & deepening of the voice	Deposition of fat, predominantly in breasts & hips
Increased muscular development	Breast development
Growth of facial, axillary, & pubic hair, & increased growth of body hair	Broadening of the pelvis & growth of axillary & pubic hair

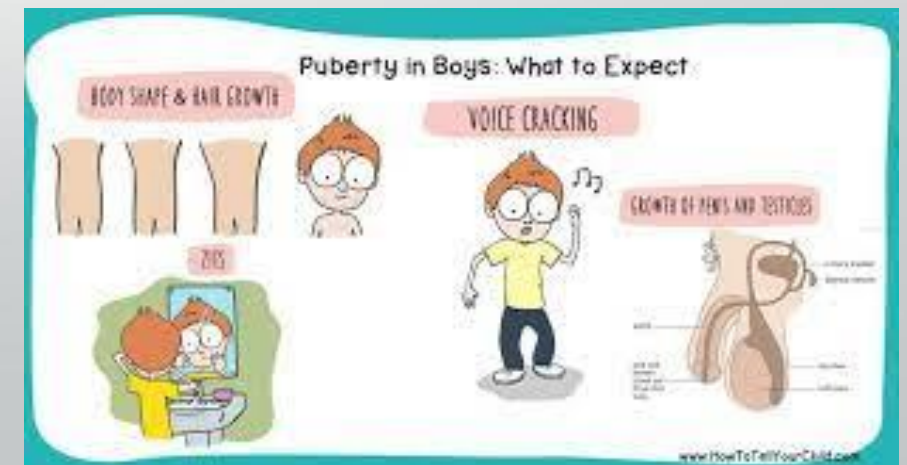


TABLE 3. Life course perspective on human sexuality

Life course stage	Key adaptive and physiological processes	Key patterns of sexuality
Perinatal	Early organizing effects on brain and differentiation of primary reproductive characteristics	Sex-specific developmental trajectories begin to unfold Sex-specific and plastic mechanisms orient toward social stimuli to enhance survival
Early Childhood	Dependency on mothers and other caregivers for social and energetic support	Interest in own and others' genitals, including auto-stimulation Some degree of sex differentiation in social behavior
Middle Childhood	Greater independence and interaction with other adults and juveniles	Expanded distinctions in sex differentiation, with females more oriented toward caregiving contexts and males more oriented toward physical play Increasing frequency of sex play, especially for males, in same-sex and between-sex pair-bonding contexts
Puberty and Adolescence	A second phase of organizing effects of steroid hormones on the brain, and development of secondary sexual characteristics	Shift into potential reproductive realm Females tend to be 1-2 years ahead of males Marking transition toward social, economic, and political activities conducive to reproductive success, with female transitions highlighting aspects of fertility and male transitions highlight social achievement Increased frequency of intercourse, but also quite variable by individual, sex, population
Adulthood	Age-related changes in reproductive physiology Subtle physiological changes across the ovulatory cycle and dramatic changes across the reproductive cycle	Age-related changes in sexuality during adulthood can be related to reproductive partnerships Cyclical female shifts across the ovarian cycle have at best subtle influences on sexuality, whereas shifts across pregnancy and postpartum phases have pronounced impacts on female sexuality Male sexuality is typically intertwined with that of a long-term partner, although sex differences in desire are amplified during late pregnancy and early postpartum
Senescence	Age-related declines in reproductive function, including decreases in sex steroids	The menopausal transition in women is associated with some declines in sexual function Measures of sexual behavior decline with advancing age in both women and men, although in sex- and context-specific ways

Gray 2013

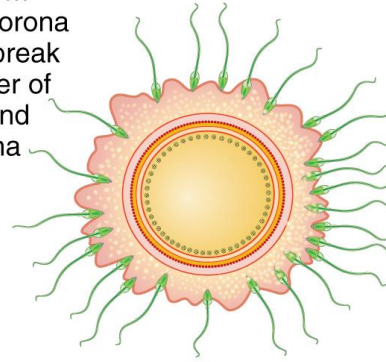
Sexuality through the Life Stages



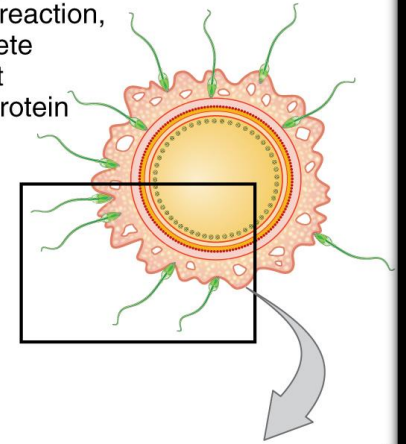
Fertilization

- ‡ Occurs when a sperm & an oocyte (egg) combine & their nuclei fuse
- ‡ Because each of these reproductive cells is a haploid cell containing half of the genetic material needed to form a human being, their combination forms a diploid cell
- ‡ This new single cell, called a zygote, contains all of the genetic material needed to form a human—half from the mother & half from the father

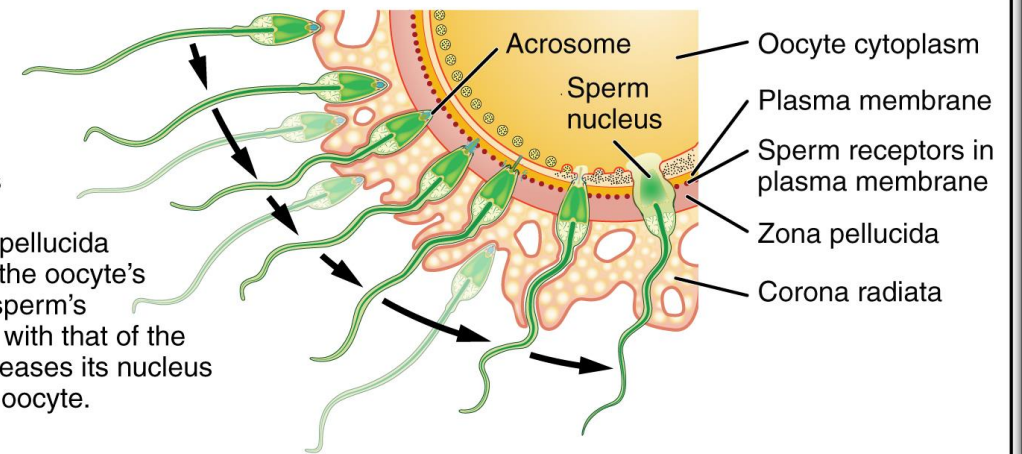
① Hundreds of sperm attracted to the corona radiata begin to break through the barrier of granulosa cells and approach the zona pellucida.



② Contact with the zona pellucida triggers the acrosome reaction, causing sperm to secrete digestive enzymes that break down the glycoprotein membrane of the zona pellucida and help to expose the oocyte's plasma membrane.

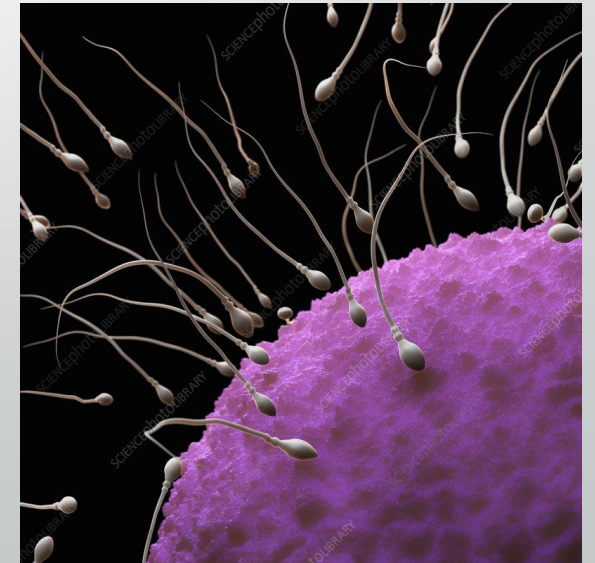
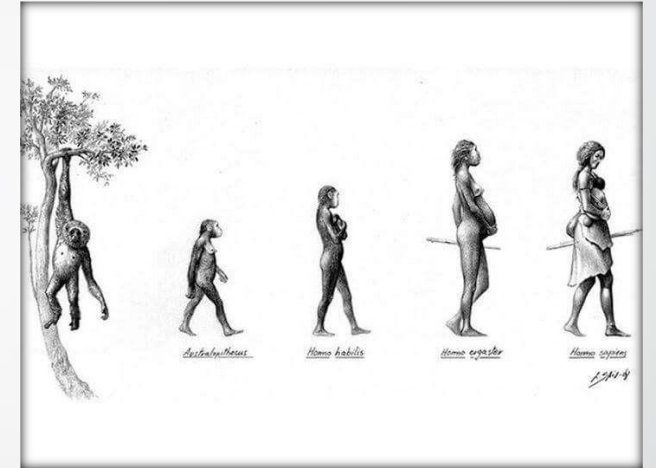


③ A single sperm succeeds in burrowing through the corona radiata and zona pellucida and making contact with the oocyte's plasma membrane. The sperm's plasma membrane fuses with that of the oocyte and the sperm releases its nucleus into the cytoplasm of the oocyte.



Fertilization

- ‡ Hundreds of millions of sperm deposited in the vagina travel toward the oocyte, but only a few hundred actually reach it.
- ‡ The number of sperm that reach the oocyte is greatly reduced because of conditions within the female reproductive tract.
- ‡ Many sperm are overcome by the acidity of the vagina, others are blocked by mucus in the cervix, whereas others are attacked by phagocytic leukocytes in the uterus.
- ‡ Those sperm that do survive undergo a change in response to those conditions.
- ‡ They go through the process of capacitation, which improves their motility & alters the membrane surrounding the acrosome, the cap-like structure in the head of a sperm that contains the digestive enzymes needed for it to attach to & penetrate the oocyte.



Pregnancy & Childbirth

- As biological, psychological, & cultural phenomena
- Comprised of an integration of physical, socio-cultural, & psycho-emotional variables
- Pregnancy & birth physiologically normal as a part of the hominid life cycle // reproduction is culturally managed



Pregnancy & Childbirth

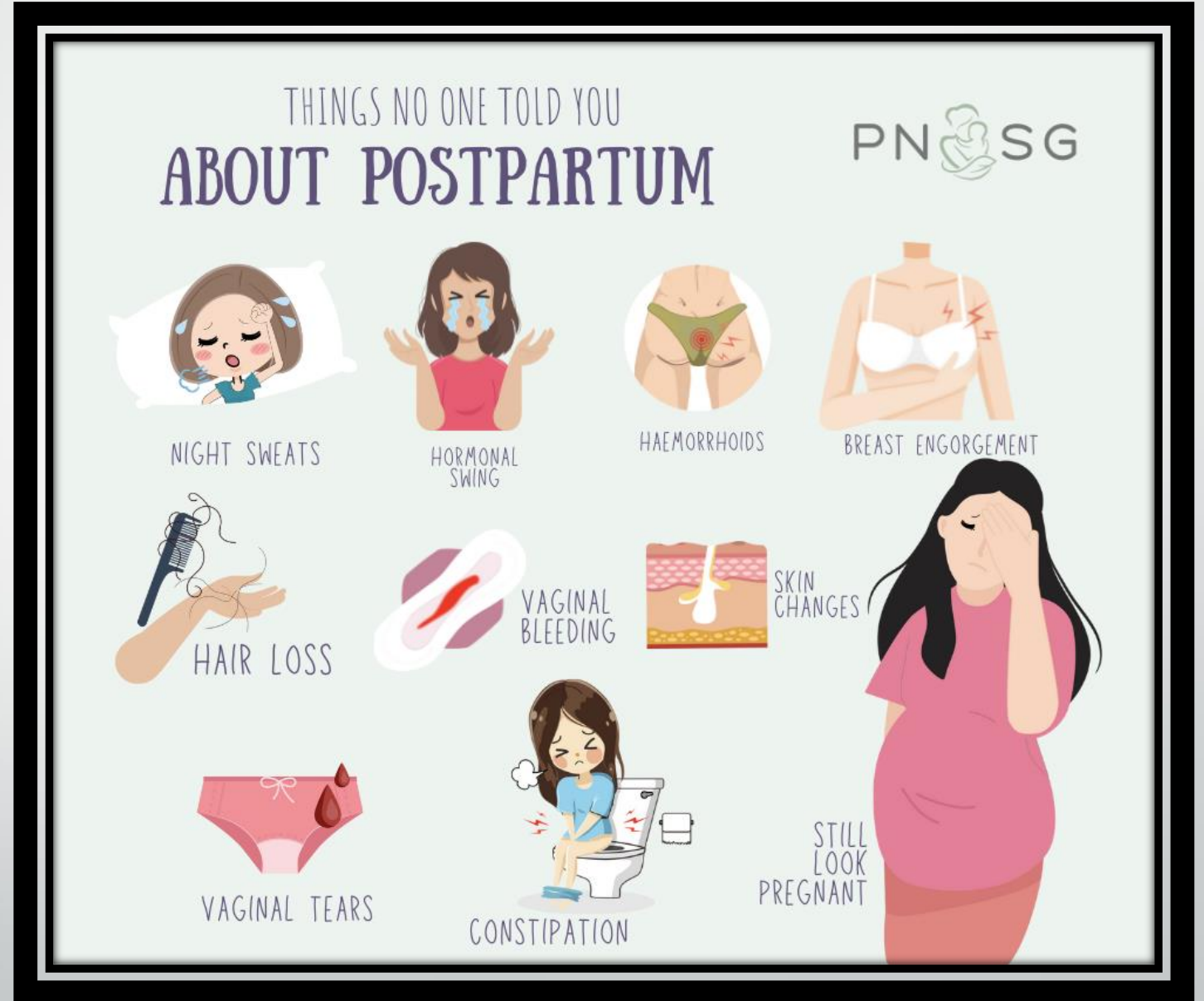
- Fetal development & the impact that health & lifestyle have on the overall experience
- Birth process is a normal physiological event in which problems may develop for the fetus, mother, or both
- Labor is generally depicted as a 3 or 4 process depending on the medical text used
- There are two general models developed as the cultural response to pregnancy:
 1. interventionist
 2. non-interventionist



Pregnancy & Childbirth

postpartum period,

A bio-social event, extends from the birth of the baby until the woman resumes her full pre-pregnancy roles & new status in the society as a mother & adult.

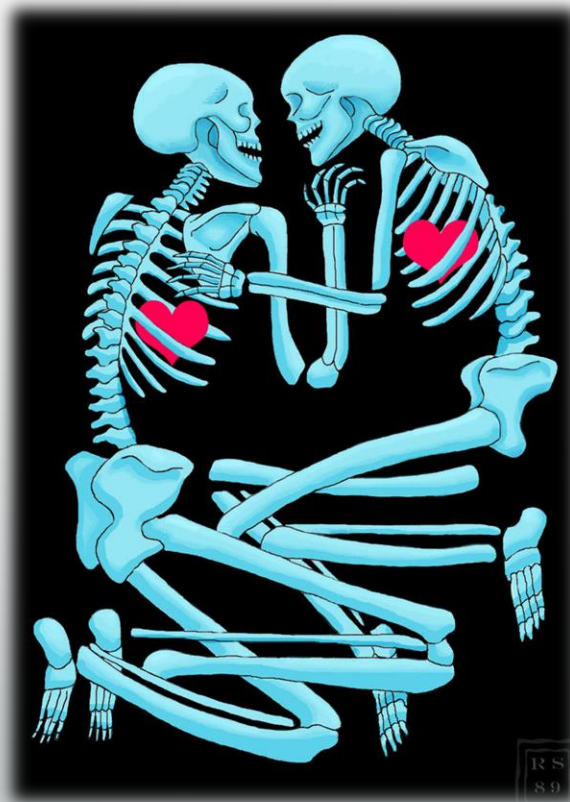


Evidences in archaeology



Lovers of Valdaro

Italy, Neolithic
A man & a woman



Lovers of Modena

Italy, 4th-6th Century CE

First presumed to be a man & a woman

both male: DNA using protein from tooth enamel



So called Warrior burials

Russia, 19th century
a wooden sarcophagus
presumed to be a boy, DNA : it's a girl!

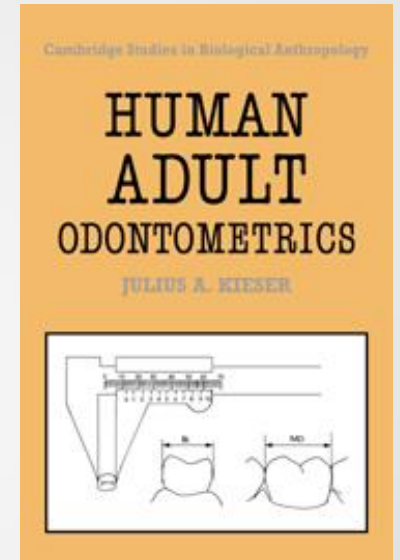
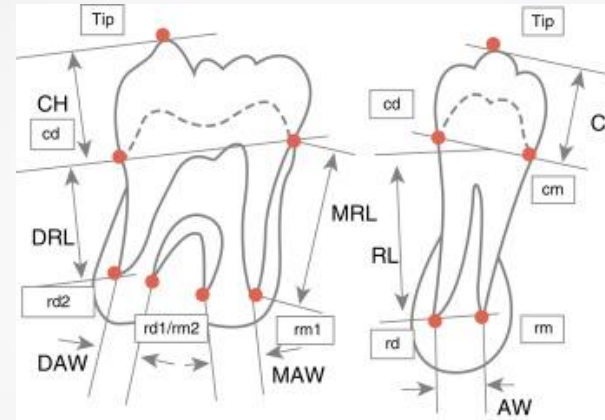


Evidences in bioanthropology



Odontometry

- 🦷 Tooth measurements
- 🦷 Most common indicators:
 - Tooth height
 - Mesiodistal diameter
 - Buccolingual diameter
 - Crown module
- 🦷 Used for age & sex estimation



Entheseal changes (EC)

The morphological alterations to entheses (muscle, tendon, & ligament attachment sites on bone) that occur as an adaptive response to biomechanical stress

- analysis of bony changes at sites of insertion of muscle & ligaments
- Development of several methodological approaches for the analysis of human skeletal remains from (different contexts & chronologies) all aimed at inferring behavior

Crubézy, 1988;
Hawkey & Merbs, 1995;
Al Oumaoui et al., 2004;
Mariotti et al., 2004;
Galtés et al., 2006;
Villotte, 2006

Recently, researchers have questioned the validity of this approach & its correlation with past human lifestyles

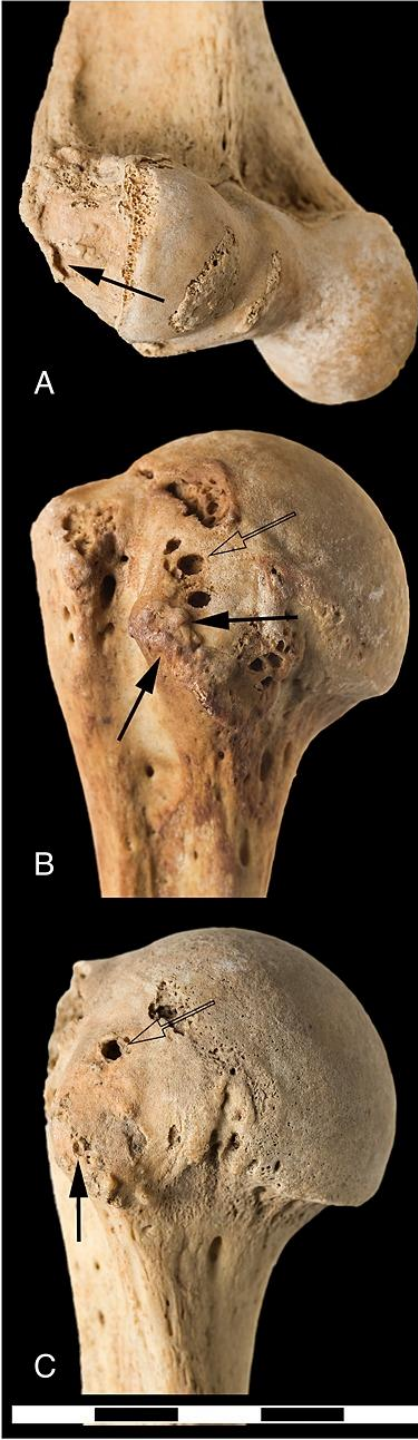
Jurmain, 1999; Weiss, 2003



Method for coding Enthesopathies

Villotte *et al.* 2010. Enthesopathies as Occupational Stress Markers: Evidence From the Upper Limb. *AJPA*. 142. 224-34.

- a visual method of studying fibrocartilaginous enthesopathies of the upper limb
- applied to 367 males died between (18th-20th centuries), from 4 European identified skeletal collections:
 1. the Christ Church Spitalfields Collection,
 2. the identified skeletal collection of the anthropological museum of the University of Coimbra,
 3. the Sassari & Bologna collections of the museum of Anthropology,
 4. University of Bologna.

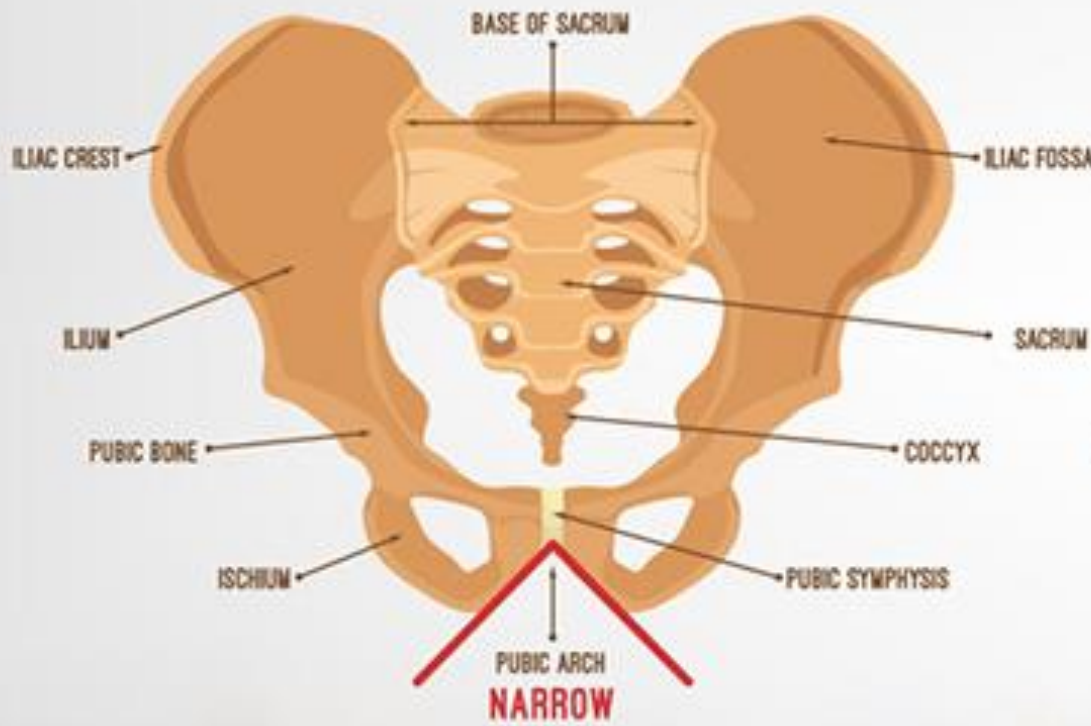


Results of the method

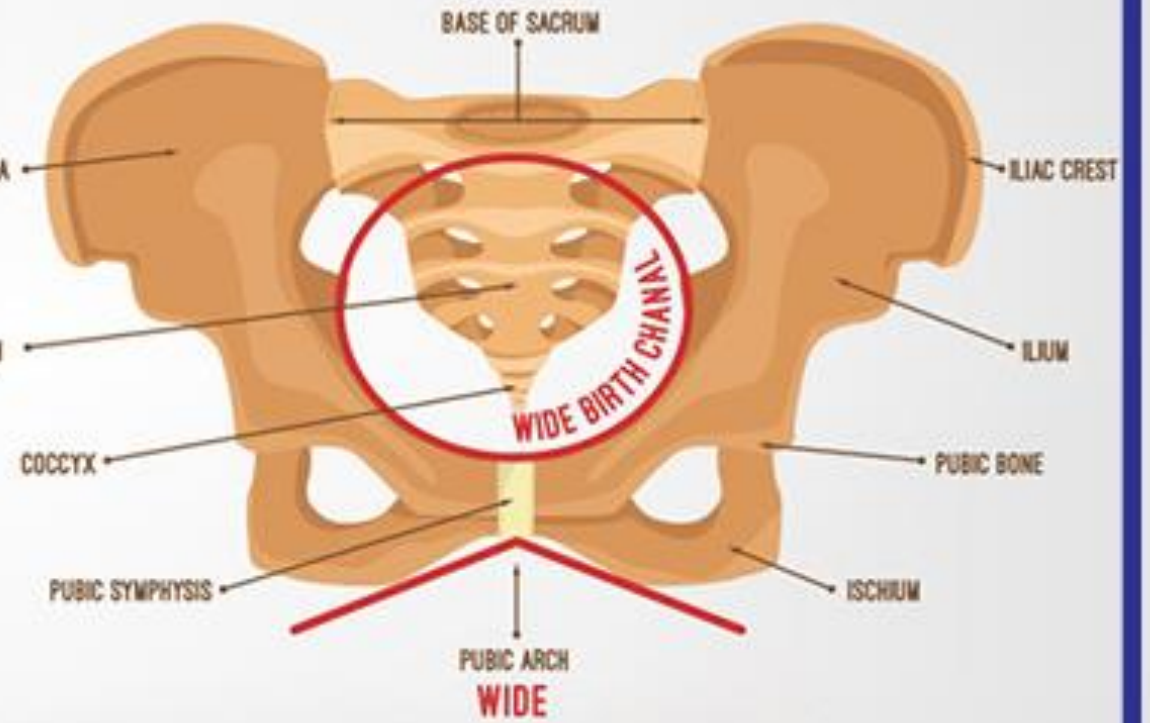
- established a strong link between enthesopathies & physical activity
- **M** with occupations involving heavy manual tasks have significantly (P-value < 0.001) more lesions of the upper limbs than nonmanual & light manual workers
- probability increases with age & is higher for the right side compared with the left



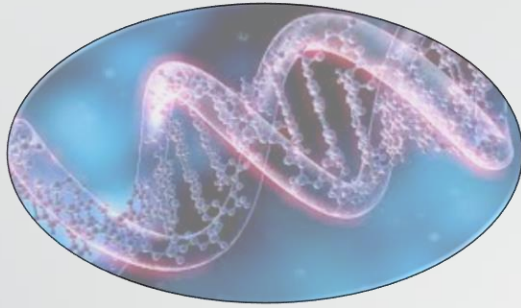
- enthesopathies can be used to reconstruct past lifestyles of populations if bioanthropologists:
 1. pay attention to the choice of entheses in their studies
 2. use appropriate methods.



MALE PELVIC GIRDLE

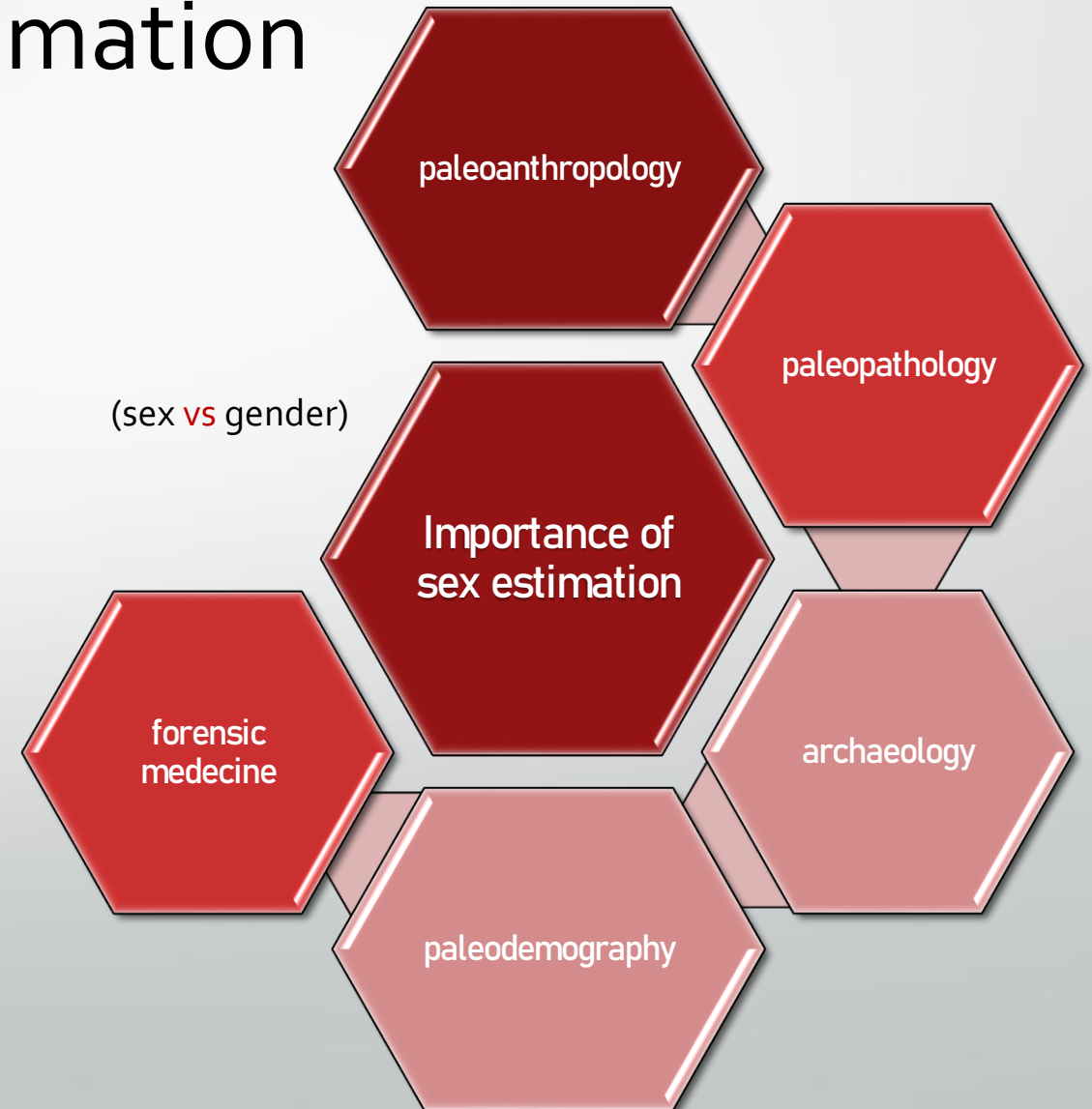


FEMALE PELVIC GIRDLE



Sex Estimation

- genetic (DNA)
- civil status (Birth certificate, records)
- somatic (body, skeleton)



Sex Estimation



Good

80%

Presence



Bad

95%

Absence

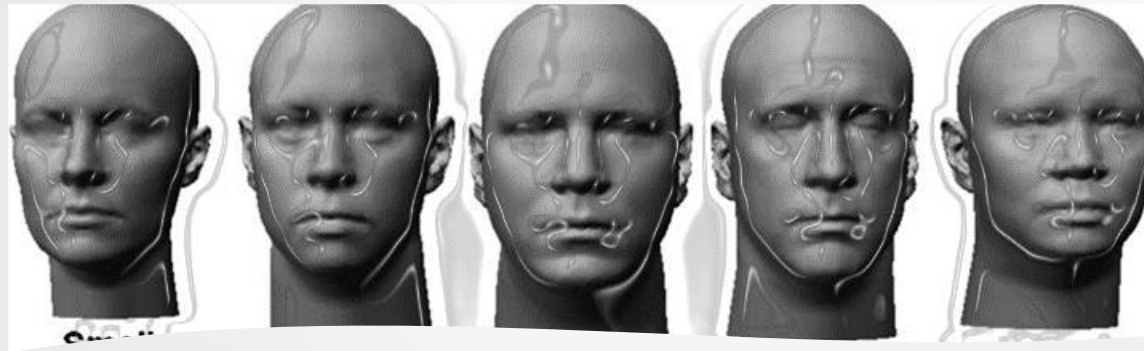
SKULL **VS** PELVIC

Preservation

Precision

Population specificity

1. Morphological methods



focus on shape

Difficult to learn, based on *Eyeballing*

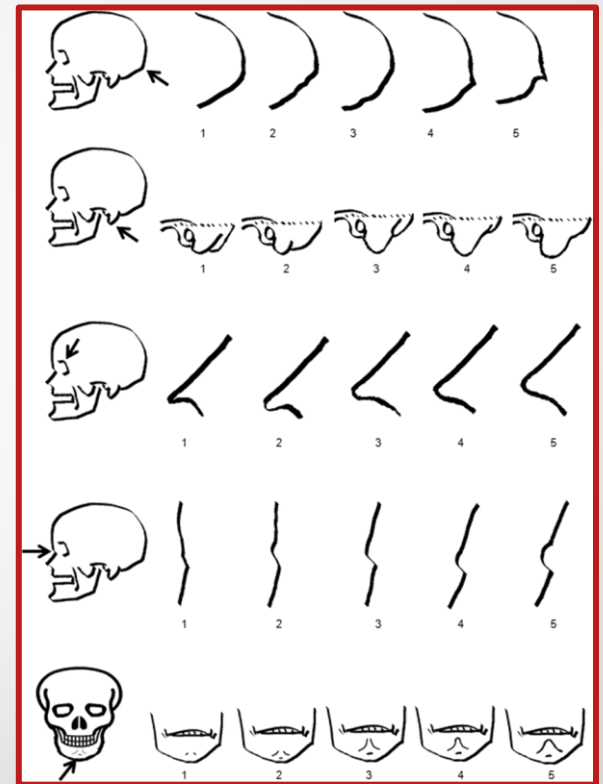
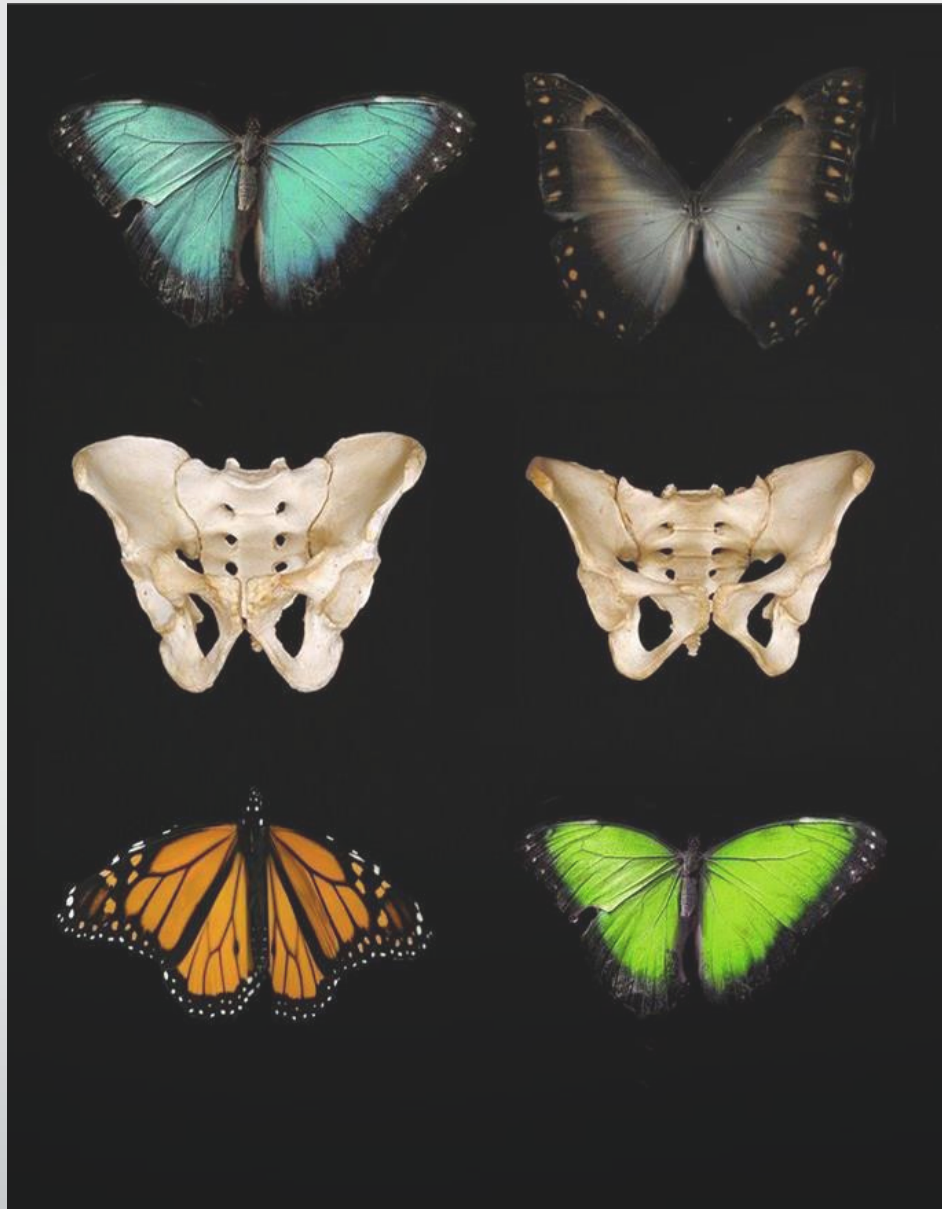
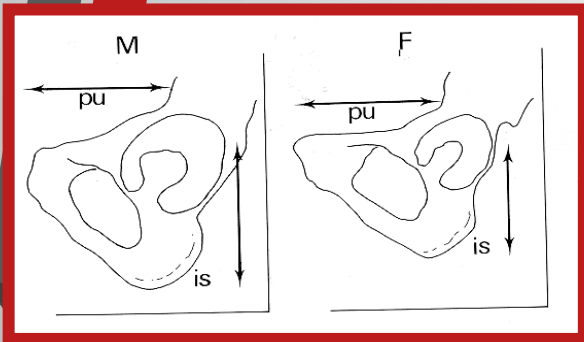
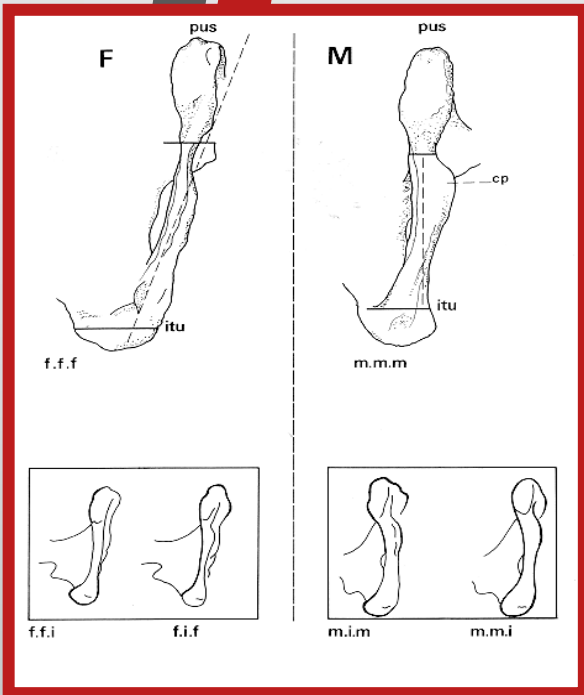


obvious morphological differences allowing optimal separation of the sexes & no need of specific tools &/or softwares

'Based on eye balling'

- If formation is not obvious
- experience becomes an essential component
- observer must develop a sense of what is relatively large or small, angled or curved, wide or narrow
- Intra- & inter-observer repeatability + statistical analyses are problematical
- difficult to assign a degree of confidence with which the estimate has been made





Standard for scoring cranial traits (Buikstra & Ubelaker 1994)

A method for visual determination of sex, using the human hip bone (Bruzek 2002)



2. Metrics methods

- taking measurements based on osteological landmarks
- evaluation of a single measurement or index of two or numerous measurements (complex multivariate methods)



2. Metrics methods



well-defined measurements
less potential for inter- & intra observer errors

DSP: Diagnose Sexuelle Probabiliste

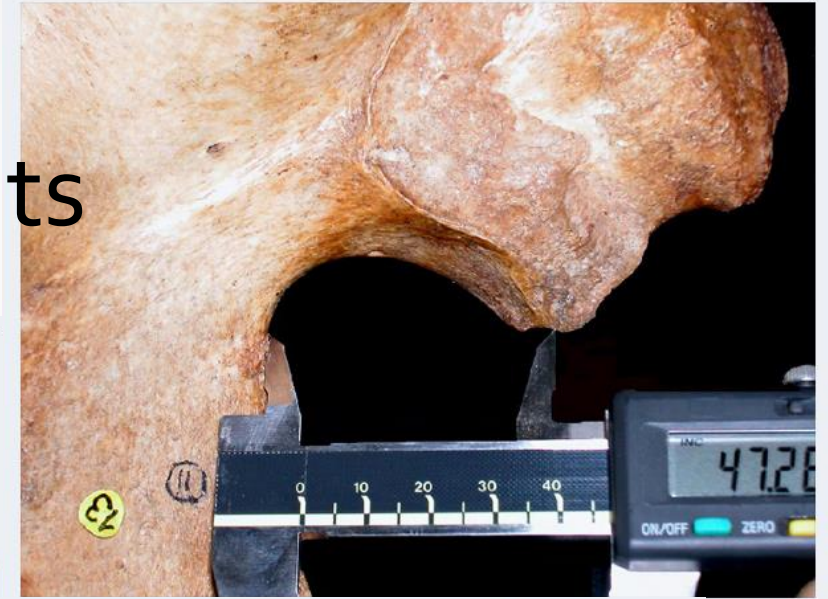
Reference data: Murail P, Bruzek J, Houët F, Cunha E. 2005. DSP: A tool for probabilistic sex diagnosis using worldwide variability in hip-bone measurements. *Bulletins et mémoires de la Société d'Anthropologie de Paris*. 17 (3-4), 167-176

- ✓ disregarded visual traits
- ✓ focused on hip-bone measurements, which eliminates the problem of long-time training & reduces the errors of inter-observation
- ✓ based on any combination of at least 4 variables among the 10 proposed (to minimize the problem of bone preservation)
- ✓ These variables cover all the parts of the hip-bone

10 Measurements

Depth of the great sciatic notch

Distance from the postero-inferior iliac spine (defined as the point of intersection between the auricular surface and the configuration of hip bone, it is easier to use small arms of sliding caliper (M 15.1 - Bräuer, 1988).



Acetabulo-symphyseal pubic length

Minimum distance from the superior and medial point of the pubic symphysis to the nearest point on the acetabulum



DSP: Diagnose Sexuelle Probabiliste

- ✓ Instead of dealing with a population-specific discriminant value, computed, for each specimen, the probability of its being M or F, which implies a statistical decision-making process when determining sex
- ✓ built a database using a very large reference sample of hip-bones from 4 continents (actual sex is known) (to take into account the entire variability of sexual dimorphism among modern humans)



The general principle of sex determination is to compute each specimen's individual probability of being M or F, by comparing its measurements to the worldwide hip-bone database

The screenshot shows the DSP web application interface. On the left is a dark sidebar with navigation links: 'About', 'Manual', and 'Data Analysis'. The main content area is divided into three sections:

- Case-by-case input:** A grid of input fields for various measurements: PUM (70.985), SPU (27.015), DCOX (205.06), IIMT (42.545), ISMM (106.575), SCOX (153.62), SS (70.49), SA (74.505), SIS (37.355), and VEAC (53.59).
- Multiple Inputs:** A section with a link to download a template and an 'Upload' box containing a 'Browse...' button and the text 'No file selected'.
- Results for single individual:** A table showing the following data:

DF	DM	PF	PM	Estimate
4.13	4.13	0.50	0.50	Undetermined

At the bottom, a taskbar shows two open files: 'template.xlsx' and 'farmers.jpg'. A 'Show all' button is located in the bottom right corner.

AutoSave template - Protected View Search (Alt+Q) Arwa Kharobi AK

File Home Insert Page Layout Formulas Data Review View Help

PROTECTED VIEW Be careful – files from the Internet can contain viruses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing

A1 PUM

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	PUM	SPU	DCOX	IIMT	ISM	SCOX	SS	SA	SIS	VEAC									
2	NA	NA	203.5	59	NA	NA	69	74	35	57.5									
3	82	24	205	40	106	163	73.5	81.5	36	54									
4	NA	NA	189.5	49	101	148	66	66.5	36	46.5									
5	NA	NA	NA	50	NA	NA	NA	NA	37	46.5									
6	NA	NA	192	57	NA	157	73	78	35	54									
7	NA	NA	214	NA	NA	NA	74.5	78.5	41.5	61									
8	NA	NA	NA	NA	NA	NA	66	76.5	NA	NA									
9	NA	NA	183	44	98	NA	67	79	32	54									
10	NA	NA	NA	NA	NA	NA	72	67	37	56									
11	69	22	193	52	99	142	67	76	34	52									
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template.csv

Ready 100%

Evidences in paleopathology



SYPHILIS

- a chronic bacterial infection
- transmitted through sexual contact
- caused by a type of bacteria known as *Treponema pallidum*



STAGES OF SYPHILIS

Table 1. Stages, Time Course, and Manifestations of Syphilis

<i>Stage</i>	<i>Time</i>	<i>Manifestations</i>	
		<i>Common</i>	<i>Uncommon</i>
Primary	10 to 90 days	Chancere	Local lymphadenopathy
Secondary	1 to 3 months	Arthralgia, condylomata lata, fatigue, generalized lymphadenopathy, headache, maculopapular/papulosquamous exanthema, myalgia, pharyngitis	Annular syphilis, iritis, pustular syphilis, pyrexia, syphilitic alopecia, ulceronodular syphilis
Early latent	After primary or secondary stages, 1 year or less of no symptoms	None	None
Late latent	More than 1 year of no symptoms	None	None
Tertiary	Months to years	Late neurosyphilis*	Cardiovascular syphilis, gummatous syphilis

*—Neurosyphilis may occur at any stage of infection.

Information from reference 5.

SYPHILIS ON THE BONES

- 75% of changes found in nasal, vault & tibia/fibula bones
- **Cranial vault:**
 - caries sicca (characteristic)
 - clustered pits
 - bone destruction (gumma)
 - bone formation around gumma
 - outer table, frontal bone first



SYPHILIS ON THE BONES

Post-cranial:

Lower leg bones-destruction/formation of bone; periostitis, osteitis, osteomyelitis (non-gummatous)

Charcot joints (neurological damage)

Aortic aneurysm (weakness in blood vessel that erodes spine)?

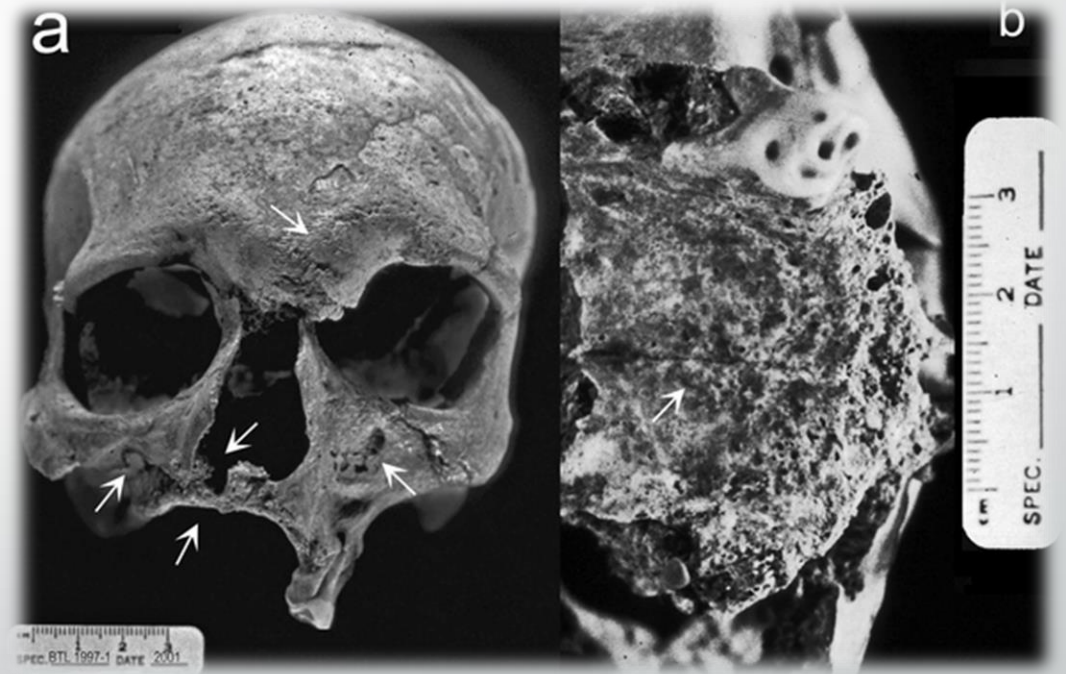


SYPHILIS ON THE BONES

1. Facial changes of leprosy & tuberculosis
2. Lower leg bones: periostitis, osteitis & osteomyelitis
3. Paget's disease of bone (osteitis deformans)
4. Cranial lesions: metastatic carcinoma, multiple myeloma



Paget's disease vs syphilis

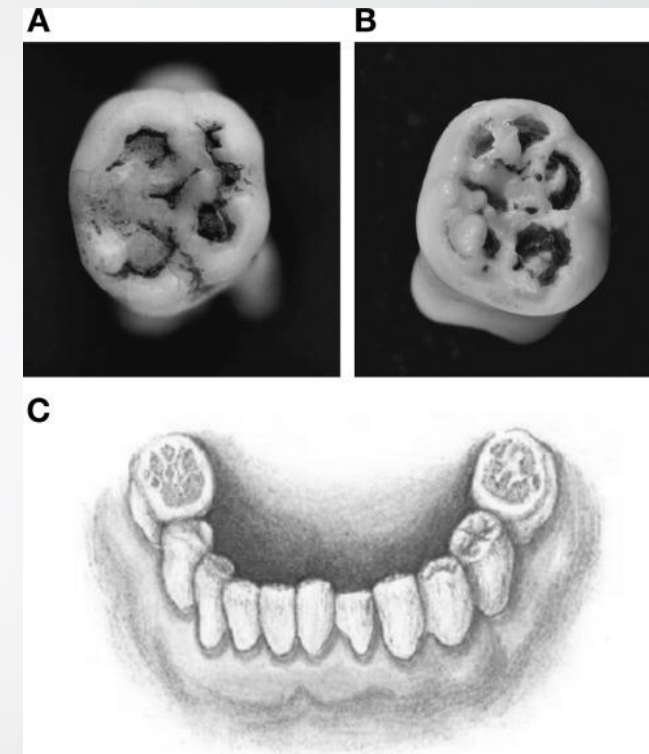
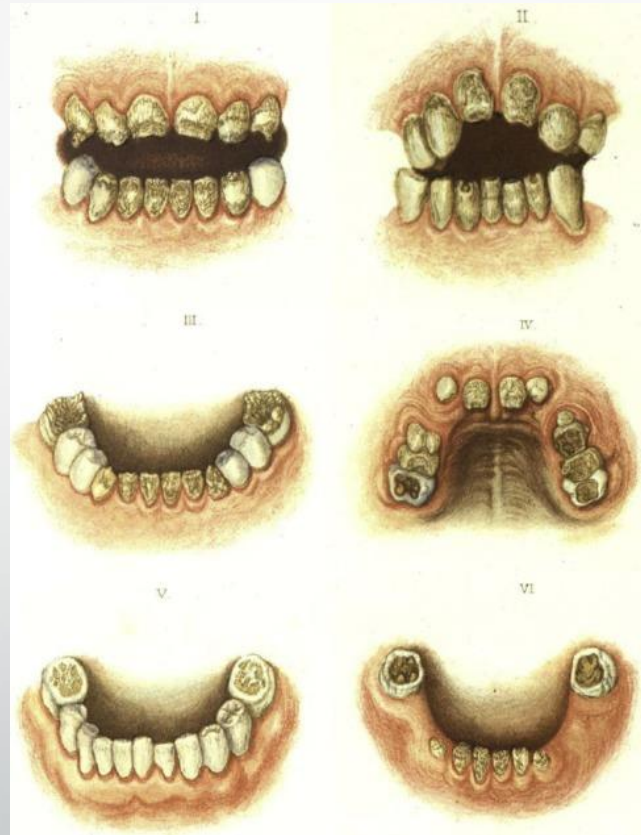


Leprosy

CONGENITAL SYPHILIS

Dental defects:

1. Hutchinson's incisors
2. Mulberry molars
3. Moon/Fournier molars



CONGENITAL SYPHILIS

A chronic infectious disease

Caused by a spirochete (*Treponema pallidum*)

Acquired by the fetus in the uterus before birth

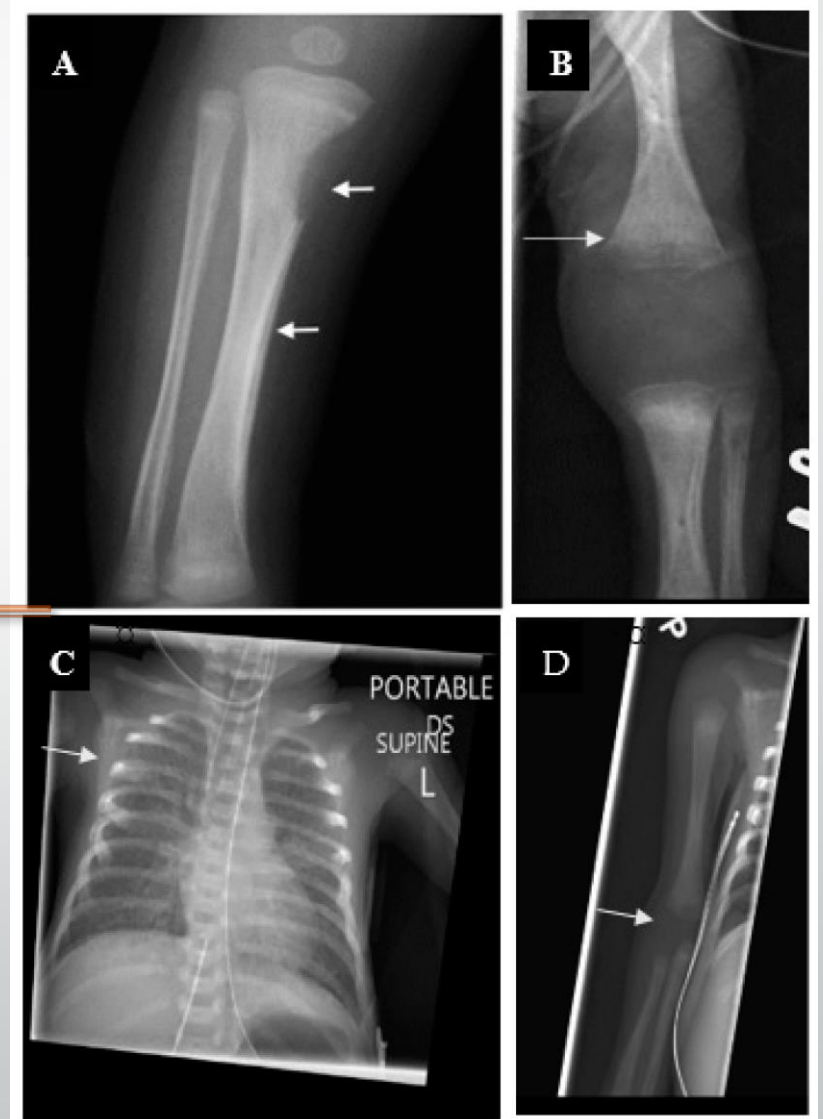
80% From the mother

High mortality, No treatment

Symptoms after several weeks, months or years after birth

Skeletal manifestations:

1. Periostitis-distal femur/proximal tibia
2. Osteitis
3. Osteomyelitis
4. Osteochondritis
5. Wimberger's sign (medial tibial metaphyseal loss)
6. Dactylitis

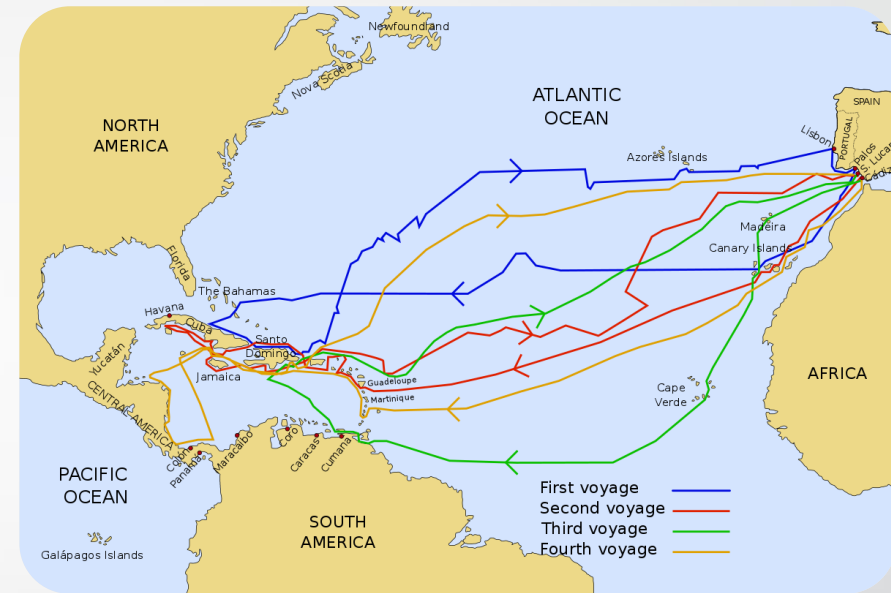


HISTORY OF SYPHILIS

'Continues to be one of the most contentious issues in science' (Ortner 2003)

Different Hypotheses:

1. Columbian theory: a New World disease brought back by Columbus
2. Pre-Columbian theory: present in Europe before the arrival of Europeans in the Americas
3. Combination theory: Present in both Old world & New world pre-Columbus



NOT JUST COLUMBUS

Home > News > Press Releases > 2020 > Syphilis May Have Spread Through Europe Before Columbus

Syphilis May Have Spread Through Europe Before Columbus

Press release University of Zurich

AUGUST 13, 2020

Columbus brought syphilis to Europe – or did he? A recent study conducted at the University of Zurich now indicates that Europeans could already have been infected with this sexually transmitted disease before the 15th century. In addition, researchers have discovered a hitherto unknown pathogen causing a related disease. The predecessor of syphilis and its related diseases could be over 2,500 years old.



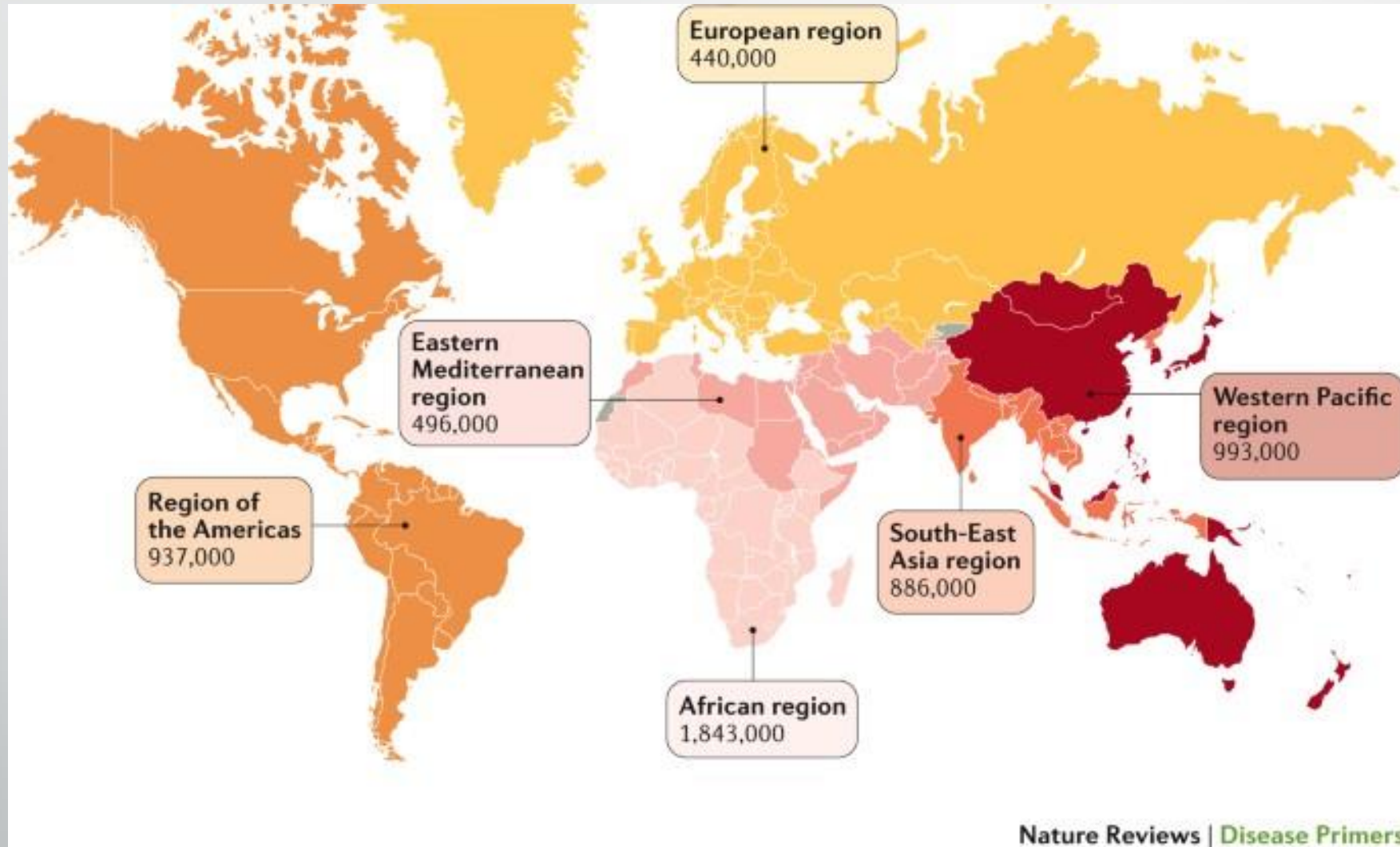
Petrous part of the skull of a perinatal infant (PD28) proved an exceptional source for treponemal DNA

Syphilis is a sexually transmitted disease – and while commonly dismissed due to the availability of modern treatments, it is in fact spreading at an alarming rate: Over the last decades, more than 10 million people around the world have been infected with the syphilis subspecies *pallidum* of the *Treponema pallidum* bacteria. Other treponematoses, such as yaws and bejel, are caused by other subspecies of *Treponema pallidum*. The origins of syphilis, which wreaked havoc in Europe from the late 15th to the 18th century, are still unclear. The most popular hypothesis so far holds Christopher Columbus and his sailors liable for bringing the disease to Europe from the New World.

Yaws already widespread in Europe



Lesions in the skull of a Finnish individual showed signs of treponemal infection © Kati Salo



HISTORICAL TREATMENT

No effective treatments but a number of remedies

Expel the foreign, disease-causing substance from the body:
(blood-letting, laxative use, & baths in wine & herbs or olive oil)

Use of mercury during the 16th cent:

- rubbing it on the skin
- applying a plaster
- by mouth
- 'Fumigation' method



An artificial nose from the 17–18th cen



