



BIOLOGICAL SEX & GENDER IN STUDIES OF HUMAN SKELETAL REMAINS

DR ARWA KHAROBI

BIOLOGICAL SEX VS. GENDER

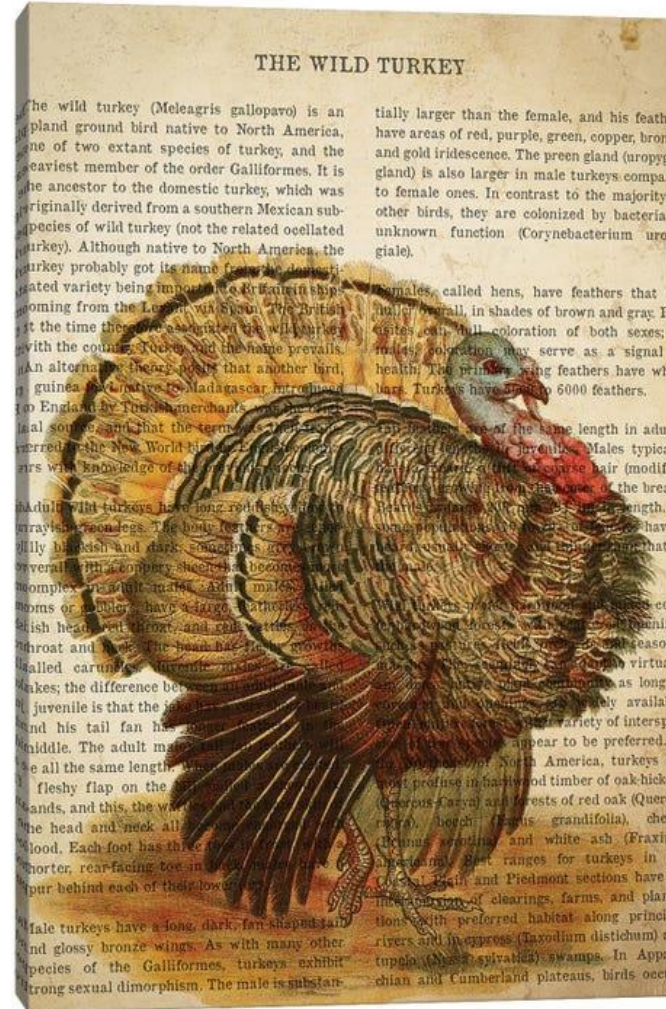
ACCORDING TO THE WORLD HEALTH ORGANISATION

- **BIOLOGICAL Sex:** THE DIFFERENT BIOLOGICAL & PHYSIOLOGICAL CHARACTERISTICS OF MALES & FEMALES (I.E. REPRODUCTIVE ORGANS, CHROMOSOMES, HORMONES ETC)
- **GENDER:** THE SOCIAL CONSTRUCTED CHARACTERISTICS OF WOMEN & MEN (I.E. NORMS, ROLES, RELATIONSHIP OF AND BETWEEN GROUPS OF WOMEN AND MEN. IT VARIES FROM SOCIETY TO SOCIETY AND CAN BE CHANGED)

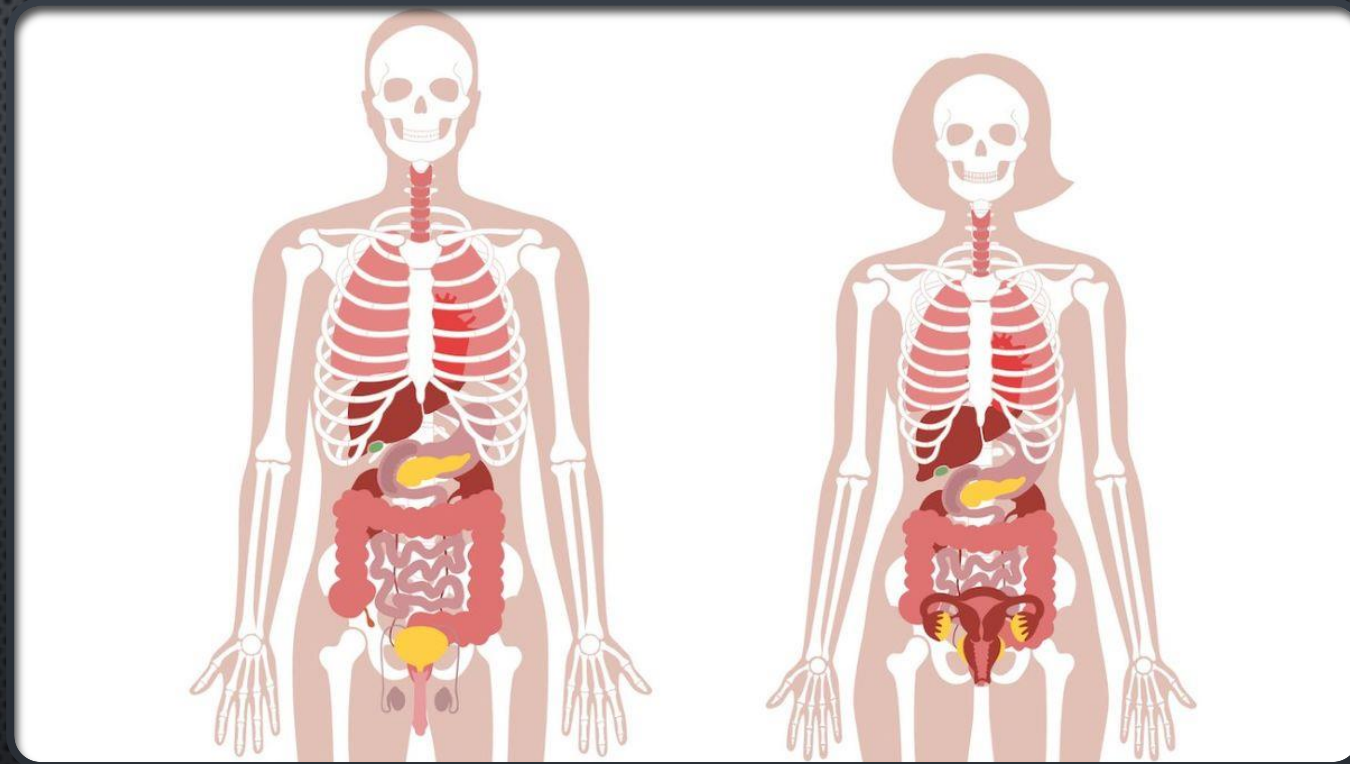
In human osteology it is estimated the biological sex!

I. SEXUAL DIMORPHISM

DIFFERENCES BETWEEN MALES AND FEMALES INCLUDE ALL FEATURES RELATED TO REPRODUCTIVE ROLE, NOTABLY THE ENDOCRINE (HORMONAL) SYSTEM AND THEIR PHYSICAL, PHYSIOLOGICAL EFFECTS.



I. SEXUAL DIMORPHISM



DEVELOPMENT OF THE MALE & FEMALE REPRODUCTIVE SYSTEMS

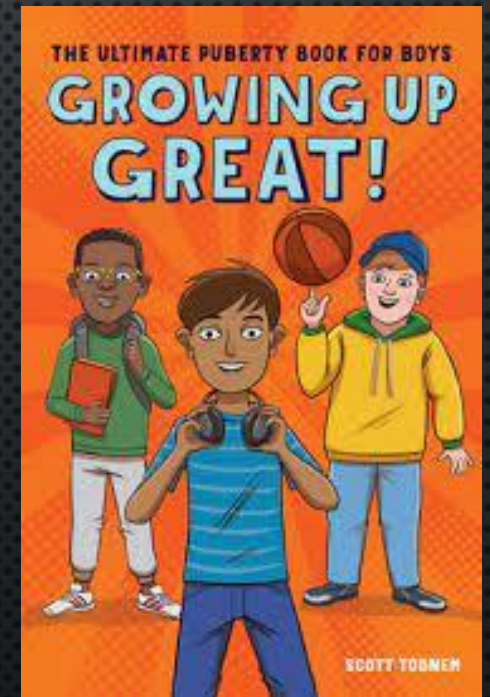
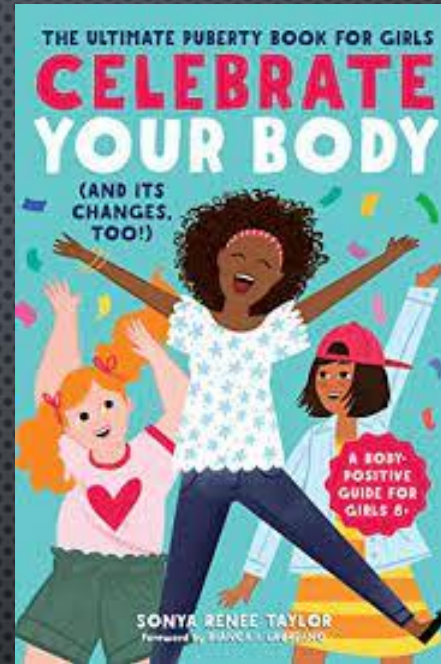


FETUS

- 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

CHILDHOOD

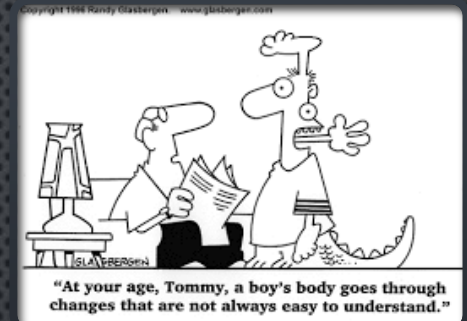
THE DIFFERENCES BEGIN TO ACCENTUATE
BUT STILL SOFT



FURTHER SEXUAL DEVELOPMENT OCCURS AT PUBERTY

18-20 years: well-marked differences

The sexual estimation is more accurate after the individual hits maturity



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

I. SEXUAL DIMORPHISM

In general:

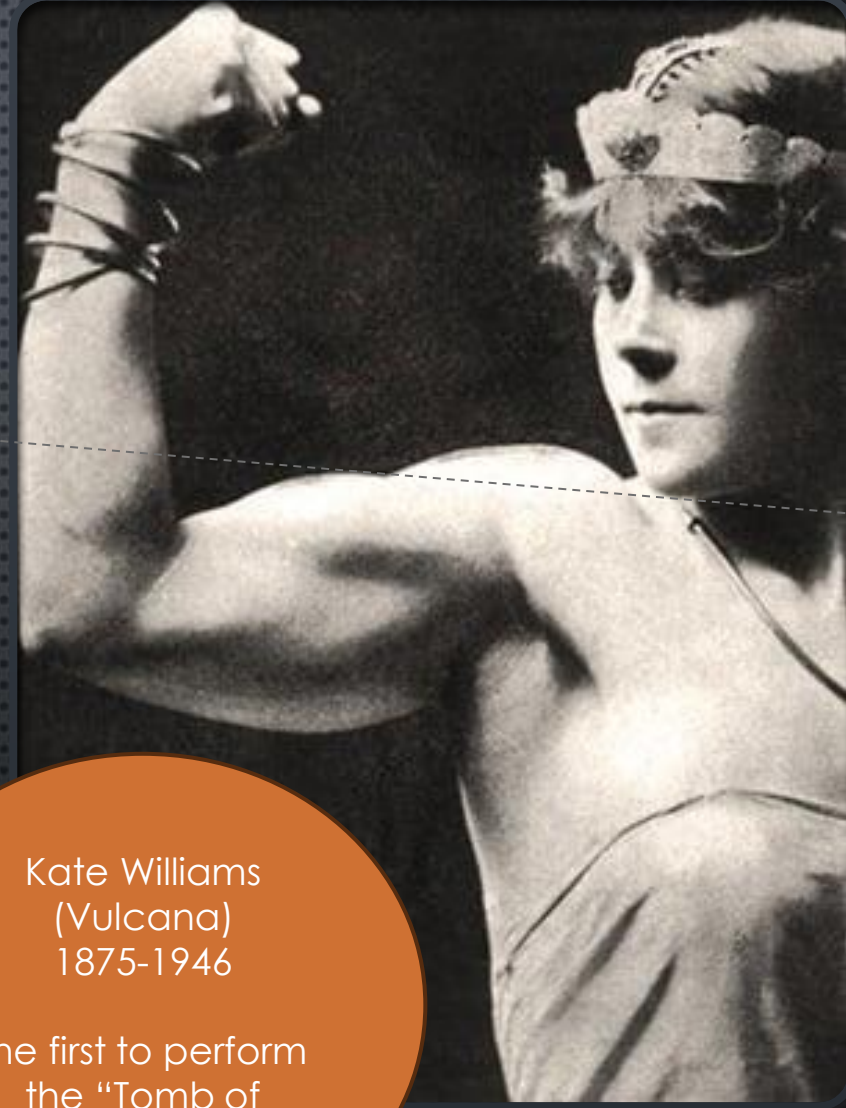
gracile & smaller

heavier & bigger



- IMPORTANT TO CONSIDER MORPHOLOGICAL VARIATION
- EACH INDIVIDUAL MAY HAVE MIXED CHARACTERISES (DUE TO THE BIOLOGY OF THE PERSON OR BECAUSE OF THE INTERACTION WITH THE ENVIRONMENT)

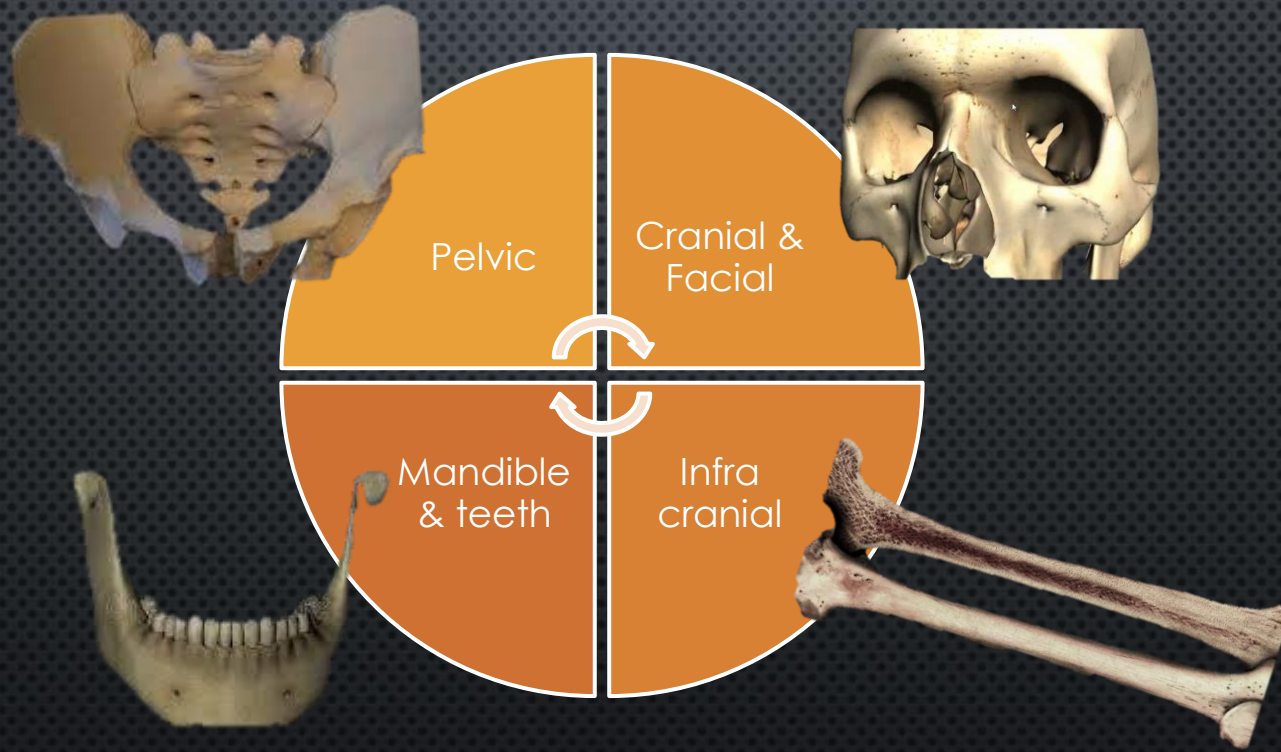
WOMAN ++ SPORT # MAN WITH NO EXERCISE



Kate Williams
(Vulcana)
1875-1946

the first to perform
the "Tomb of
Hercules" stunt.

I. SEXUAL DIMORPHISM



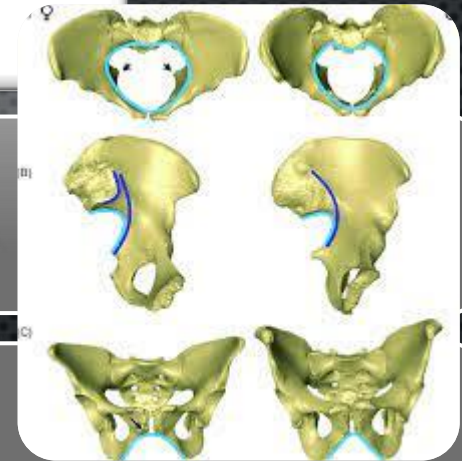
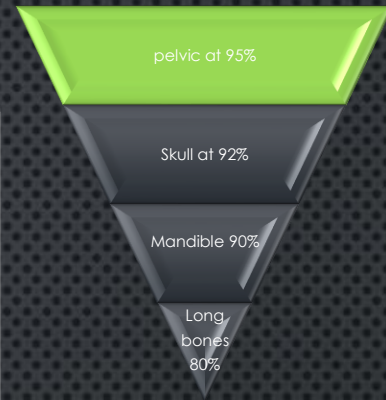
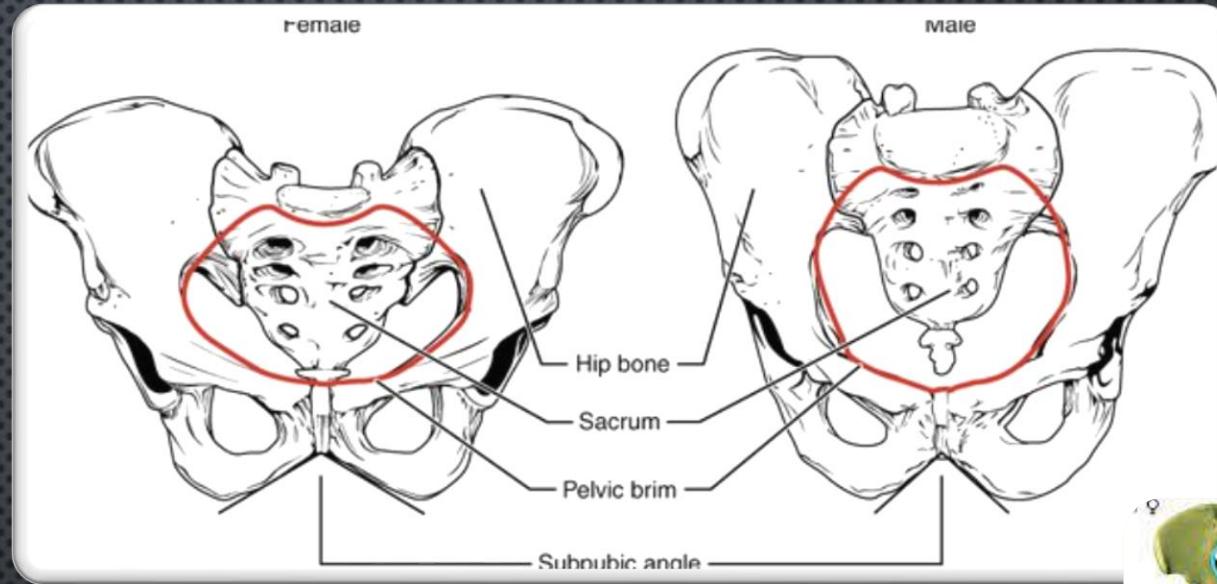
MORE DIMORPHIC BONES THAN OTHER!

ACCURACY OF SEX DETERMINATION



Krongman & Iscan 1986

1. PELVIC



Females: a wider subpubic angle & a broader pelvic inlet
Males: pelvis generally narrower & more robust

The greater sciatic notch wider in **females** & narrower in **males**

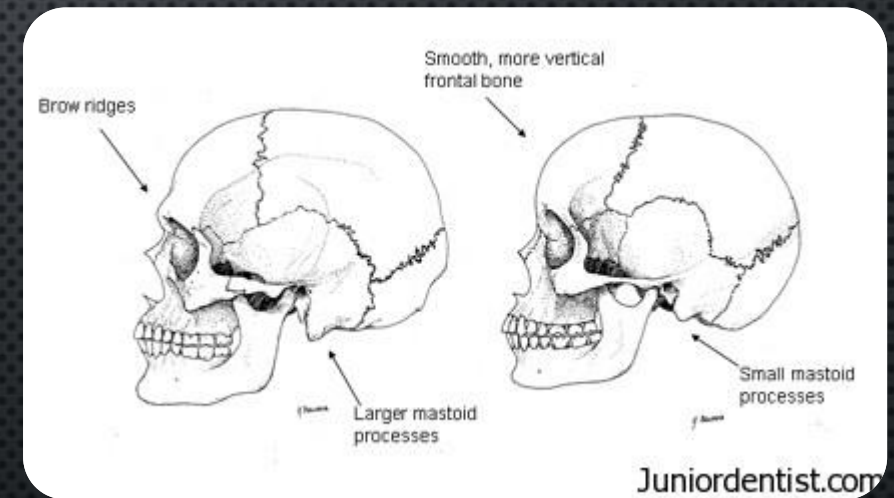
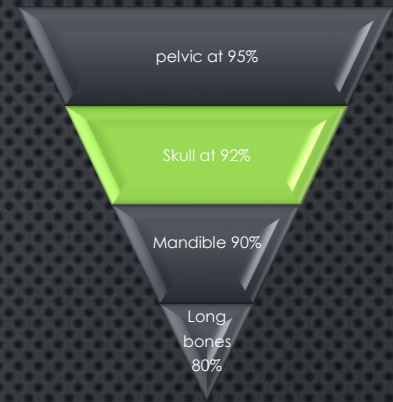
Ventral arc & subpubic angle, exhibits differences between **males** & **females**

2. CRANIAL & FACIAL FEATURES

MALES (COMPARED TO **FEMALES**) MAY HAVE:

- MORE PROMINENT BROW RIDGES
- LARGER MASTOID PROCESSES
- LARGER SKULL SIZES

REFLECTING DIFFERENCES IN MUSCLE ATTACHMENT POINTS



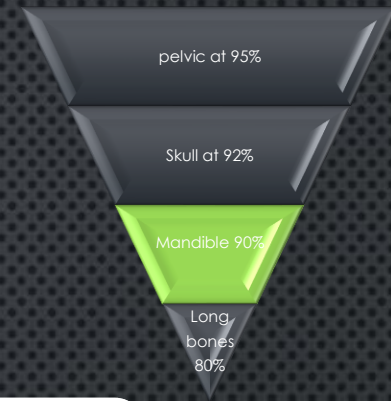
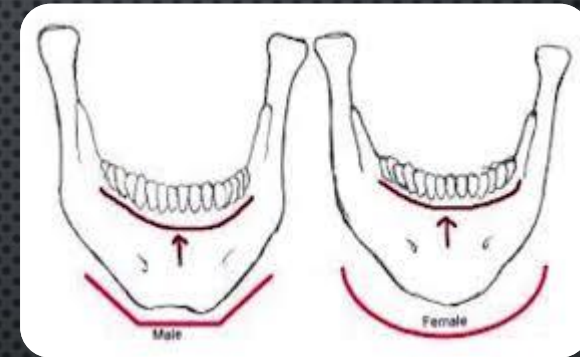
3. MANDIBLE & TEETH

MALES

- MORE ROBUST
- SQUARE-SHAPED MANDIBLE

FEMALES

- MORE GRACILE
- ROUNDED MANDIBLE



MALES OFTEN HAVING LARGER & MORE ROBUST TEETH COMPARED TO FEMALES



4. INFRA CRANIAL FEATURES

MALES: LONGER & MORE ROBUST LONG BONES

DIFFERENCES BELIEVED TO BE INFLUENCED BY THE NEED FOR GREATER MUSCLE MASS & STRENGTH IN MALES

MALES: BROADER CHEST & SHOULDERS

FEMALES: NARROWER CHEST & SHOULDERS

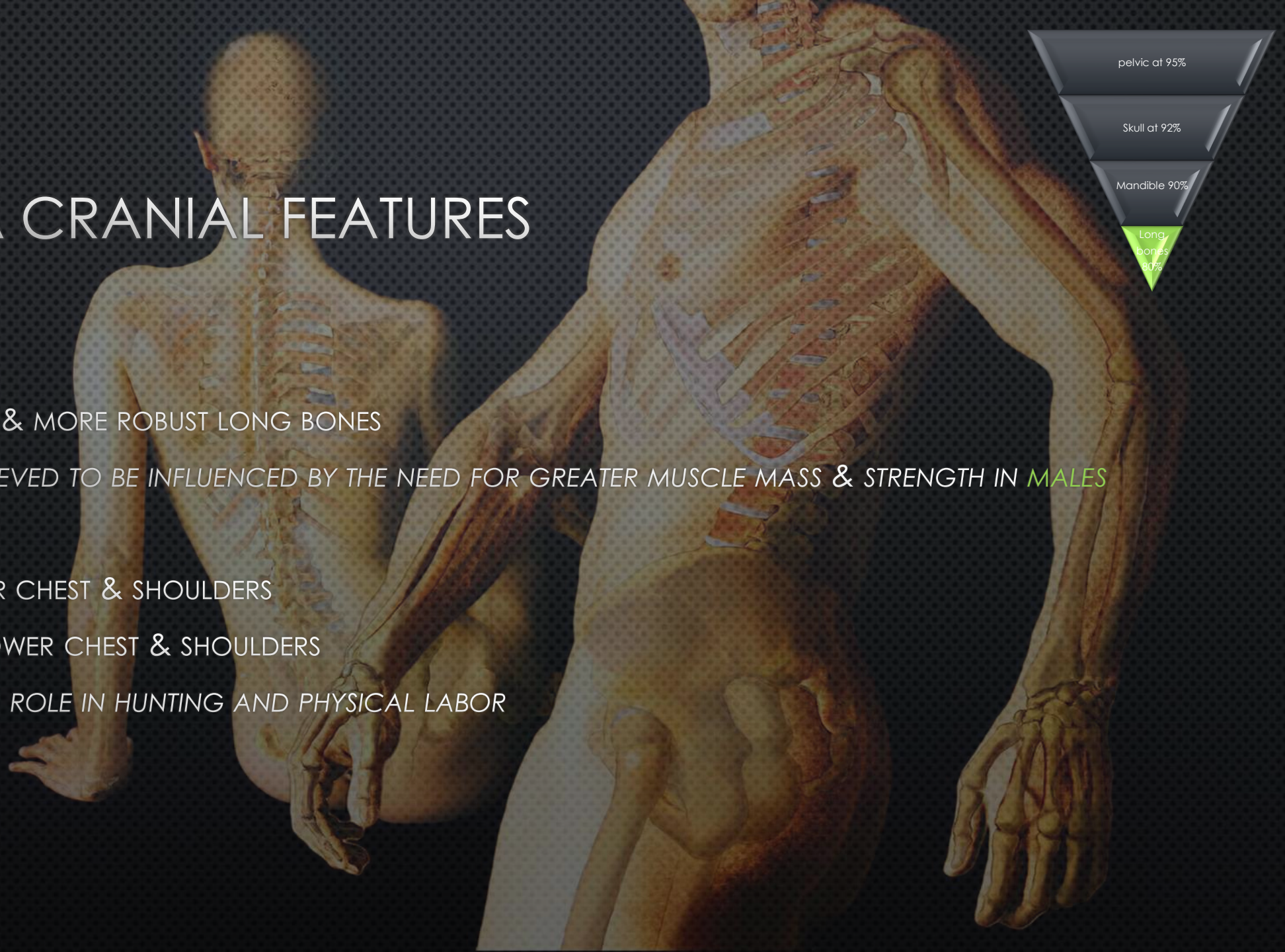
REFLECTING THEIR ROLE IN HUNTING AND PHYSICAL LABOR

pelvic at 95%

Skull at 92%

Mandible 90%

Long bones
80%



TO ANALYSE THESE BONES



1

• Osteometric

2

• Morphological

3

• Geometric Morphometrics

4

• 3D

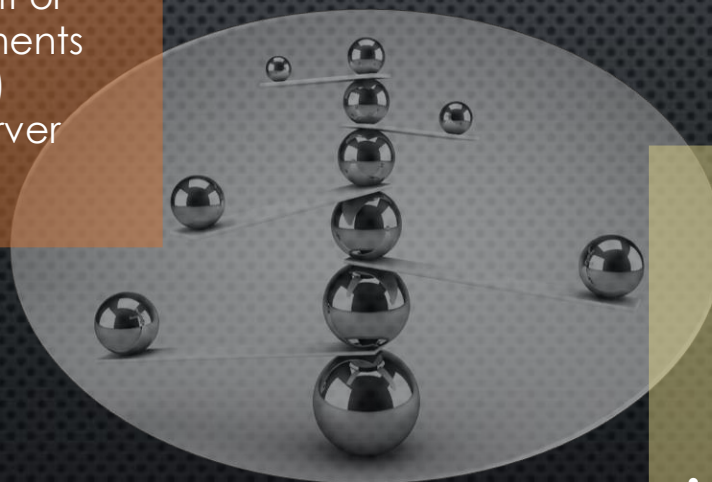
5

• Molecular

MORPHOLOGICAL VS OSTEOMETRIC

Osteometric

- based on measures
- taking measurements based on osteological landmarks
- evaluation of a single measurement or index of two or numerous measurements (complex multivariate methods)
- less potential for inter- & intra observer errors



Morphological

- focus on shape
- obvious morphological differences
- allowing optimal separation of the sexes
 - Macroscopic observations
- no need of specific tools and/or softwares
- Difficult to learn, based on *Eyeballing*

EYEBALLING

If formation is not obvious

experience becomes an essential component

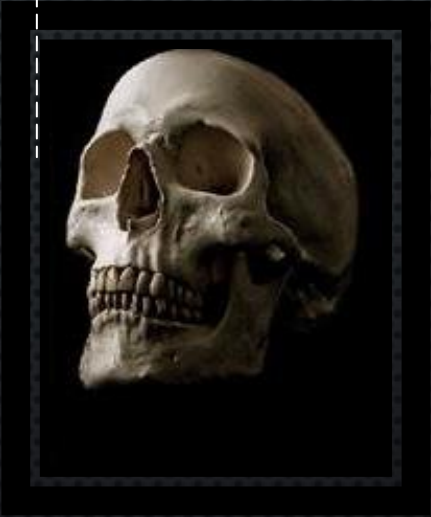
observer must develop a sense of what is relatively large or small, angled or curved, wide or narrow

Intra- & inter-observer repeatability + statistical analyses are problematical

difficult to assign a degree of confidence with which the estimate has been made



SEX ESTIMATION METHODS



SKULL VS PELVIC

Preservation

Good

Bad

Precision

80%

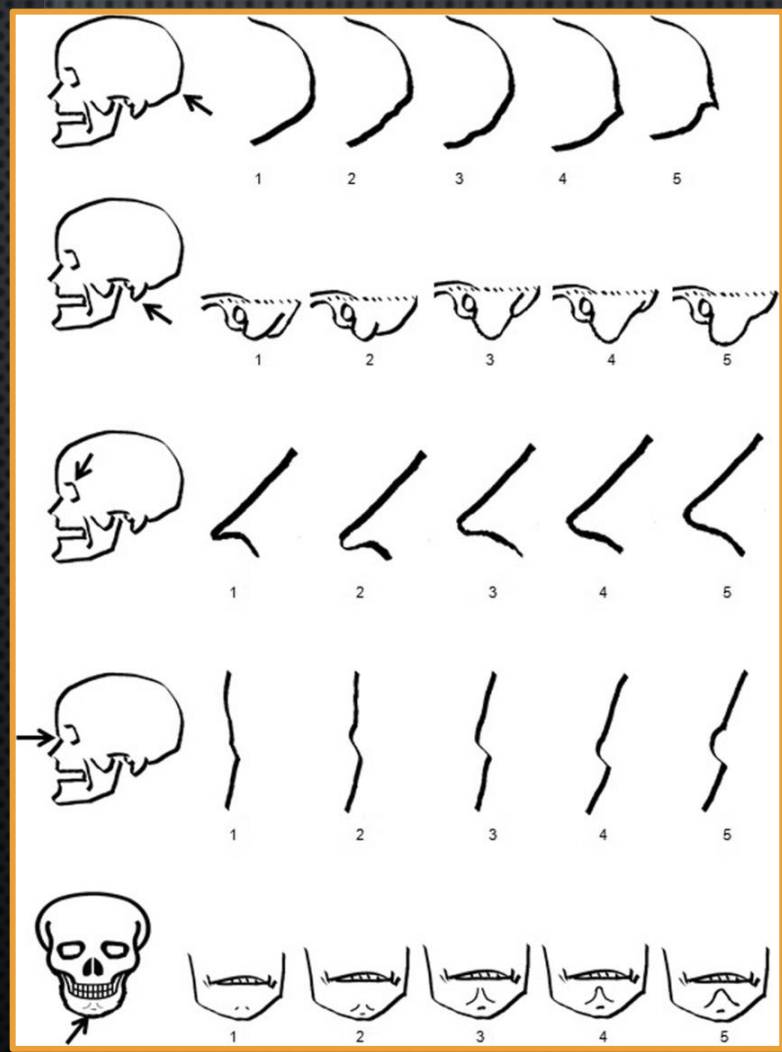
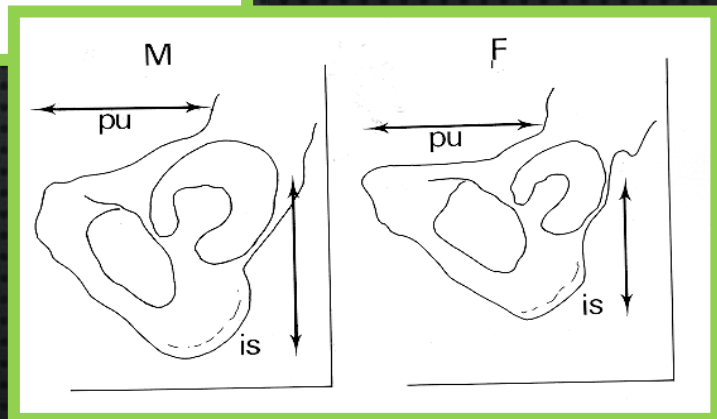
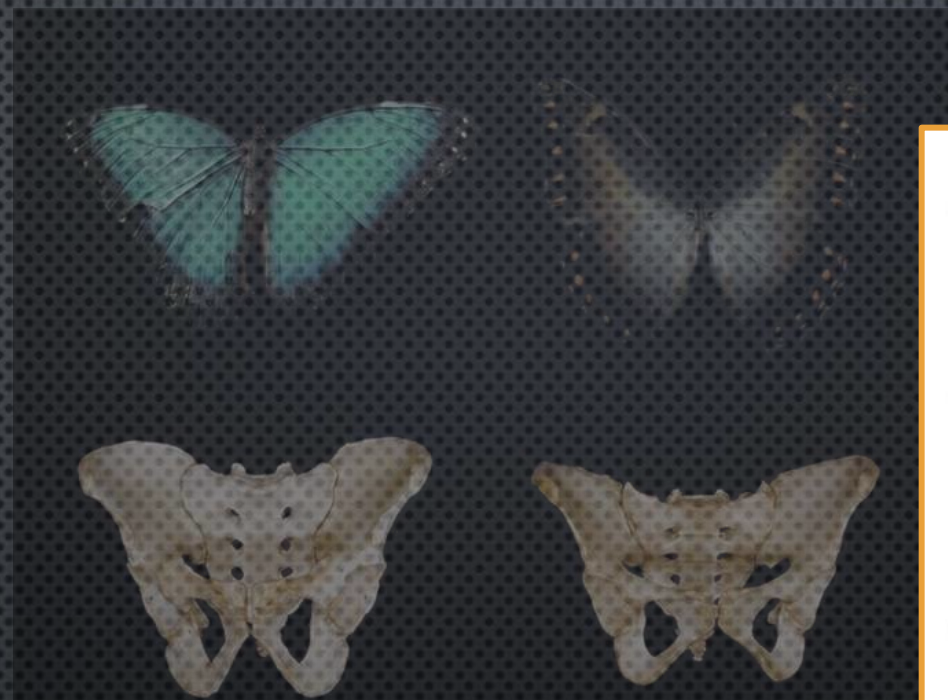
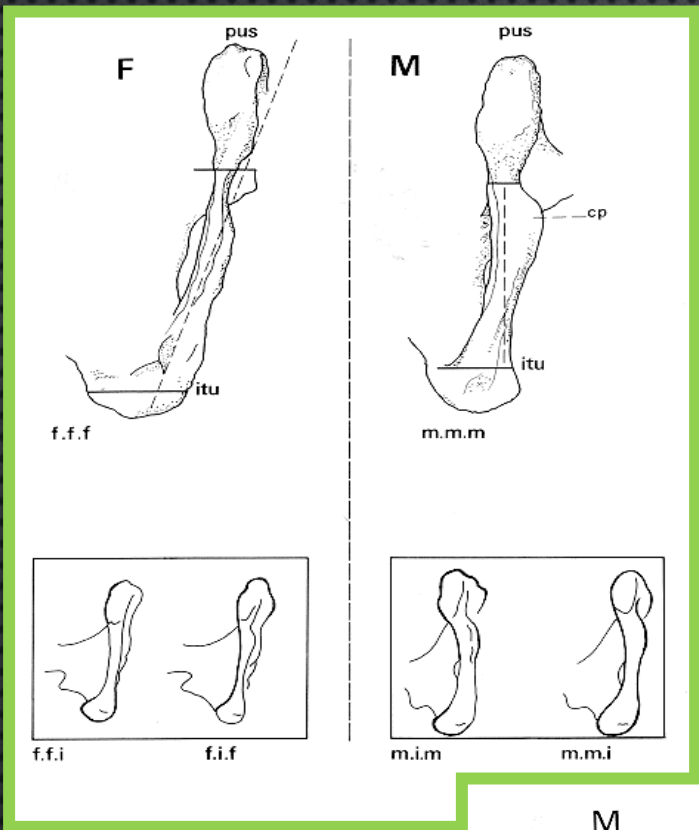
95%

Population specificity

Presence

Absence





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

Standard for scoring cranial traits (Buikstra & Ubelaker 1994)

DSP IS THE MOST RELIABLE METRIC METHOD ON PELVIC SO FAR!

DIAGNOSE SEXUELLE PROBABILISTE DSP

MURAIL ET AL. 2005

[HTTPS://OSTEOMICS.COM/DSP/](https://osteomics.com/dsp/)

DSP 2

BRUZEK ET AL. 2017

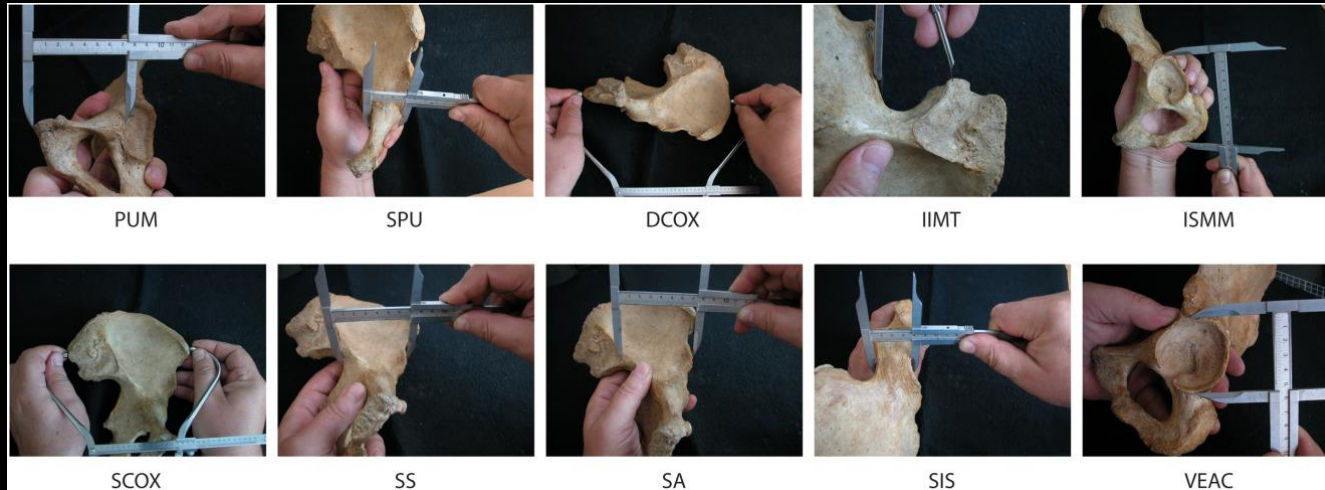
[10.1002/AJPA.23282](https://doi.org/10.1002/AJPA.23282)



DSP: A TOOL FOR PROBABILISTIC SEX DIAGNOSIS USING WORLDWIDE VARIABILITY IN HIP-BONE MEASUREMENTS

- DISREGARDED VISUAL TRAITS
- FOCUSED ON HIP-BONE MEASUREMENTS
- 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 TAKE INTO ACCOUNT THE ENTIRE VARIABILITY OF SEXUAL DIMORPHISM AMONG MODERN HUMANS

SEX ESTIMATION METHODS



Read me first	DSP	Measurements	Range variation	Info										
Obs	Pum	Spu	Dcox	Iimt	Ismm	Scox	Ss	Sa	Sis	Veac	PF	PM	SEX	Status
specimen A		26.00	192...		96.00	142...	64.00	80.00	34.00	47.00	0.997	0.003	Female	✓ Computation successful
specimen B		28.00	212...	38.00	112...						0.02	0.98	Male	✓ Computation successful
specimen C		27.00	204...	42.50	108...		73.50	74.50			0.308	0.692	N/A	✓ Computation successful
spec. D (1)	73.00	25.00	194...			150...					0.999	0.001	Female	✓ Computation successful
spec. D (2)	69.00	25.00	194...			150...					0.984	0.016	Female	✓ Computation successful
13_56	72.50	36.30	238...	38.00	121...	165...	83.30	75.40	46.40	58.40	0	1	Male	✓ Computation successful
13_56_mod	69.90	34.20	231...	38.30	128...	167...	79.80	79.80	45.60	59.00	0	1	Male	✓ Computation successful
13_118	70.90	22.30	196...	52.00	97.10	154...	65.00	74.90	32.60	48.80	1	0	Female	✓ Computation successful
13_118_mod	70.00	20.50	193...	51.90	101...	149...	61.80	78.80	31.90	47.10	1	0	Female	✓ Computation successful
14_125	72.60	28.40	215...	36.00	112...	157...	77.20	70.00	39.80	57.10	0.001	0.999	Male	✓ Computation successful
14_125_mod	73.50	28.40	222...	36.20	112...	168...	75.80	73.40	38.90	53.70	0.001	0.999	Male	✓ Computation successful
14_160	71.80	19.70	193...	47.00	94.50	148...	65.00	71.00	30.90	47.30	1	0	Female	✓ Computation successful
14_160_mod	77.00	19.50	207...	45.70	101...	137...	63.70	67.10	30.50	50.60	1	0	Female	✓ Computation successful

GEOMETRIC MORPHOMETRICS

01

Shape-Based Analysis

involves the analysis of shape rather than traditional linear measurements.

+ captures spatial distribution of landmarks on bones

02

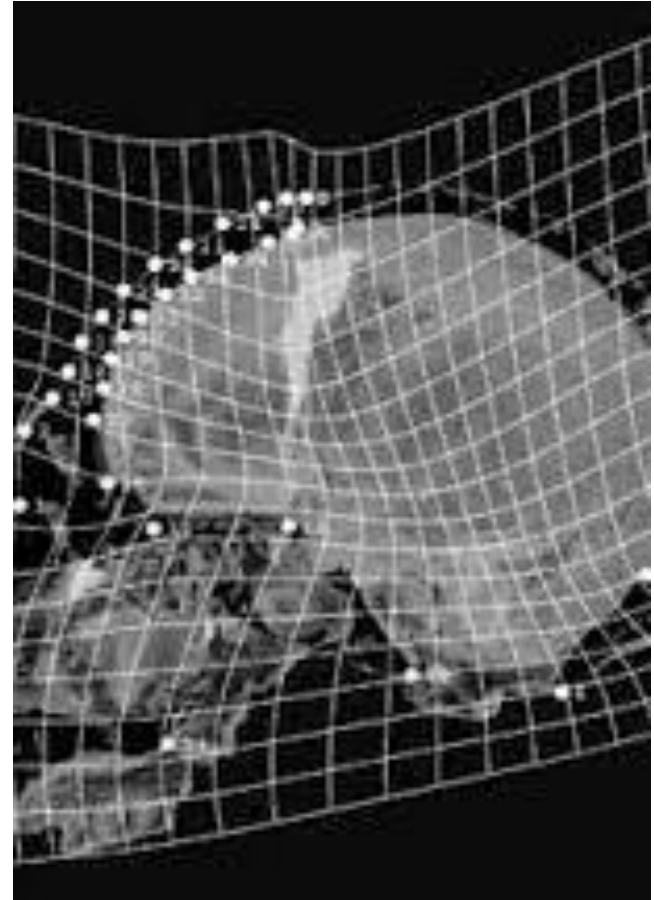
Landmark-Based Approach

place landmarks (anatomically meaningful points) on the skeletal elements. then are used to define the shape of the bone

03

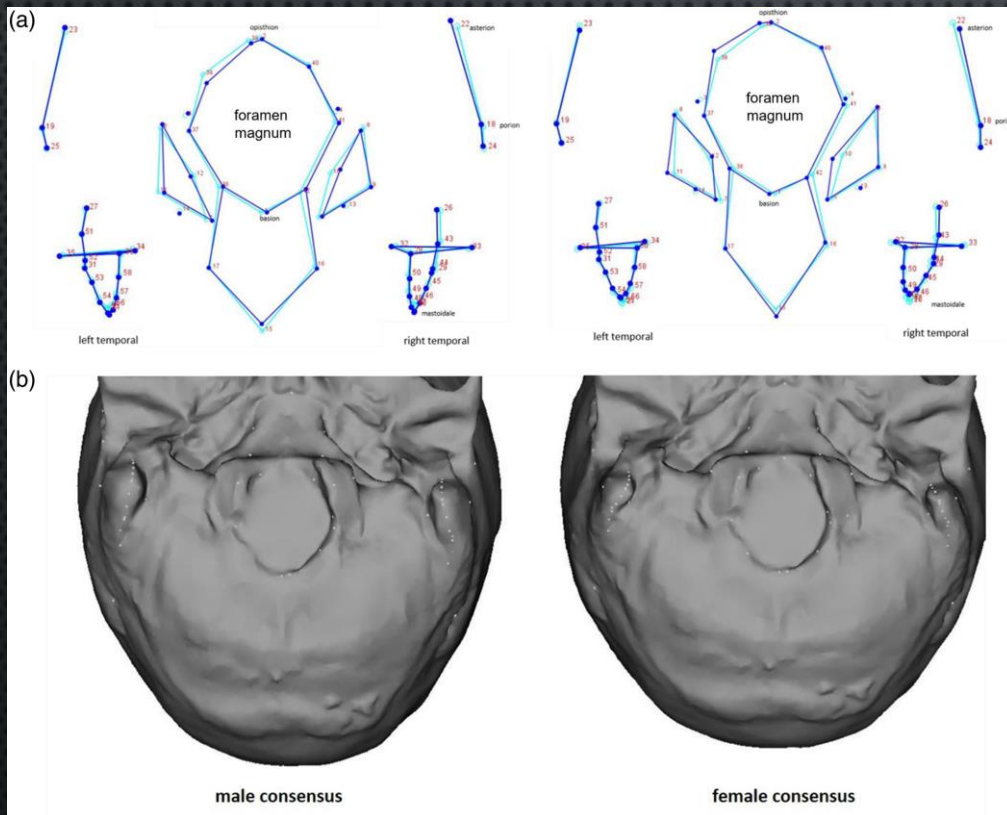
Semi-landmarks

In addition to fixed landmarks, semi-landmarks are often used to capture curves & surfaces on bones, ++more comprehensive shape analysis.



GEOMETRIC MORPHOMETRICS

The study confirms that GM analysis is an effective quantitative method for assessing the shape of dimorphic structures, even in complex, rounded regions like the mastoid.

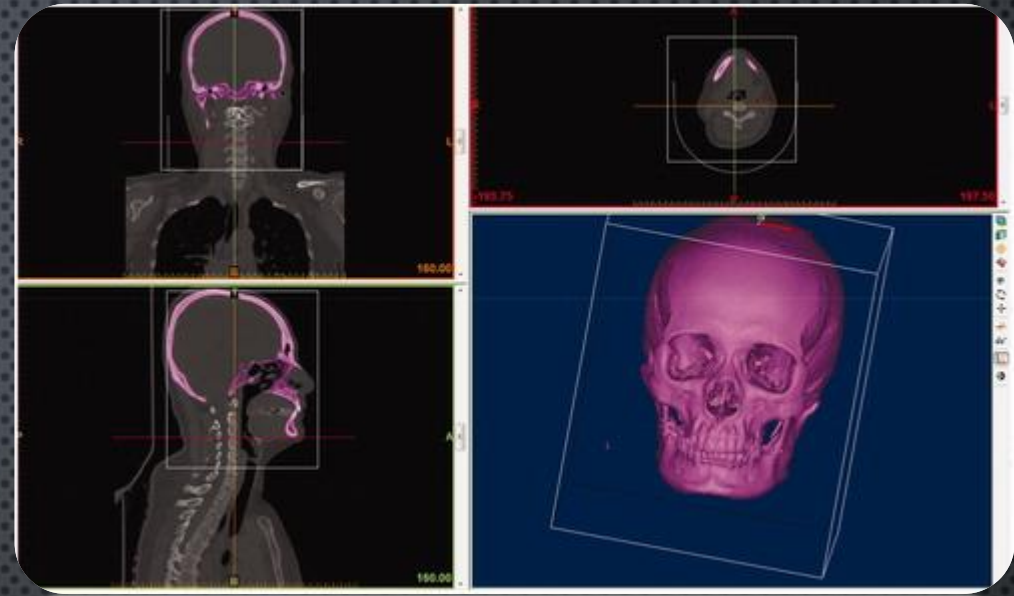


RESEARCH ARTICLE

Exploring sexual dimorphism of human occipital and temporal bones through geometric morphometrics in an identified Western-European sample

Alexandra Boucherie ✉, Tara Chapman, Daniel García-Martínez, Caroline Polet, Martine Vercauteren

THREE-DIMENSIONAL 3D METHODS



High Precision

in capturing the morphology & structure of bones ++ more accurate measurements & analysis.



Detailed Morphometric Analysis

including the measurement of complex 3D structures, which can reveal subtle differences in bone shape & size



Identification of Specific Dimorphic Patterns

reveal specific sexual dimorphism patterns that may not be easily discernible using traditional 2D methods

GM & 3D VS MACROSCOPIC

Statistical Analysis

involve complex statistical analyses providing a more objective & quantitative approach

Virtual Anthropology

enable the creation of virtual skeletal reconstructions, allowing examining bones from various angles & perspectives without physical manipulation

Reduced Need for Direct Bone Handling

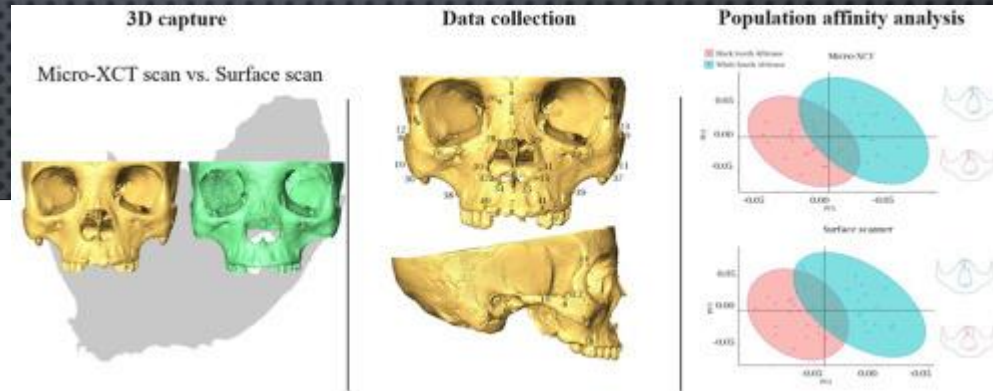
reduce the need for direct handling of fragile or valuable skeletal remains, which can be advantageous in preserving archaeological or forensic evidence.

THREE-DIMENSIONAL 3D METHODS



Forensic Imaging

Volume 34, September 2023, 200550



The accuracy of topographical and shape analysis using three-dimensional surface scanning compared to Micro-Computed Tomography

AF Ridel^a, N.P. Bothma^a, L. Liebenberg^a, AC Oettle^b, EN L'Abbe^a

THREE-DIMENSIONAL 3D METHODS



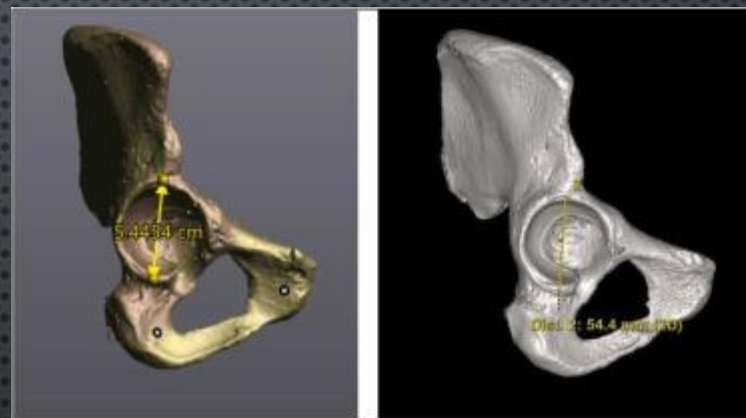
Forensic Science International

Volume 352, November 2023, 111813



Measuring pelvises in 3D surface scans and in MDCT generated virtual environment: Considerations for applications in the forensic context

[Claudine Abegg](#)^a, [Fatbardha Hoxha](#)^{b,c}, [Lorenzo Campana](#)^a, [Oguzhan Ekizoglu](#)^{c,d},
[Sami Schranz](#)^c, [Coraline Egger](#)^c, [Silke Grabherr](#)^{a,c}, [Marie Besse](#)^b,
[Negahnaz Moghaddam](#)^{a,e}





MOLECULAR METHODS

In cases of poor preservation or missing skeletal elements, previous methods may not be effective for sex diagnosis

Molecular Methods as a Solution

Genderplex PCR uses two different sized amelogenin targets, one STY target, & four X chromosomal STRs with short length amplicons.

Useful technique for sex estimation because it allows for parallel testing, enhancing the accuracy of the results

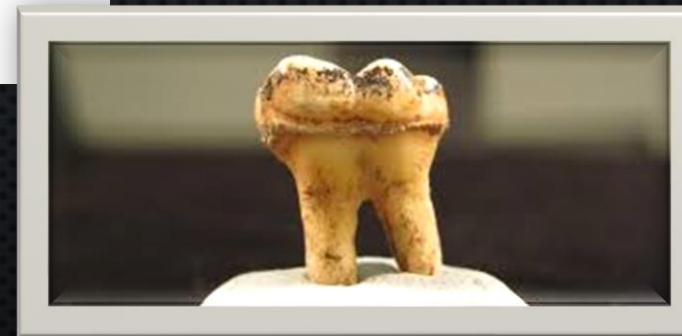
STUDIES EXAMPLES

- ✓ DNA extraction from dental pulp using Chelex method
- ✓ PCR amplification and Y-chromosomal loci typing
- ✓ Studying temperature effects on sex determination of teeth

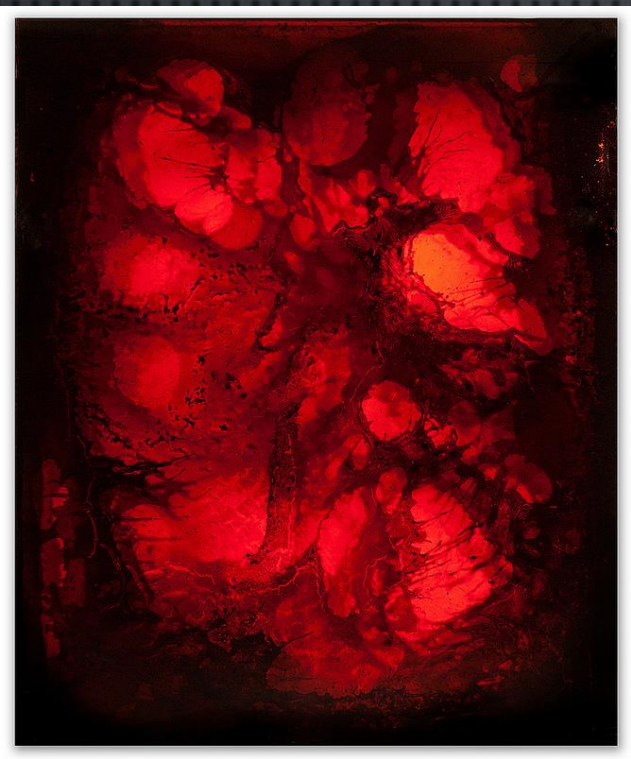
➤ [Am J Forensic Med Pathol. 2002 Sep;23\(3\):268-71. doi: 10.1097/00000433-200209000-00013.](#)

Chelating resin-based extraction of DNA from dental pulp and sex determination from incinerated teeth with Y-chromosomal alphoid repeat and short tandem repeats

Tsukasa Tsuchimochi ¹, Mineo Iwasa, Yoshitaka Maeno, Hiroyoshi Koyama, Hiroyuki Inoue, Ichiro Isobe, Ryoji Matoba, Motoo Yokoi, Masataka Nagao



STUDIES EXAMPLES



- ✓ Determined sex from blood & teeth
- ✓ Used PCR amplification of the alphoid satellite family
- ✓ Amplified X-specific (131 bp) & Y-specific (172 bp) sequences in **M**
 - ✓ Amplified Y-specific sequences in **F**

> *J Forensic Sci.* 1996 Sep;41(5):855-8.

Sex determination from blood and teeth by PCR amplification of the alphoid satellite family

Y Hanaoka ¹, K Minaguchi

STUDIES EXAMPLES

Prepared DNA from teeth using ultrasonication & PCR amplification
Achieved 100% success in determining individual sex

> [Forensic Sci Int. 2000 May 15;110\(2\):107-15. doi: 10.1016/s0379-0738\(00\)00155-9.](#)

A simple and cost-effective method for preparing DNA from the hard tooth tissue, and its use in polymerase chain reaction amplification of amelogenin gene segment for sex determination in an Indian population

A V Sivagami ¹, A R Rao, U Varshney



SEX DETERMINATION FROM THE ENAMEL PROTEIN

AMELOGENIN OR AMEL: A MAJOR MATRIX PROTEIN FOUND IN THE HUMAN ENAMEL

HAS A DIFFERENT SIGNATURE (OR SIZE & PATTERN OF THE NUCLEOTIDE SEQUENCE) IN M & F

FOR F AMELOGENIN IS LOCATED ON THE X CHROMOSOME


FOR M AMELOGENIN IS LOCATED ON THE Y CHROMOSOME

FEMALE HAS 2 IDENTICAL AMEL GENES

MALE HAS 2 DIFFERENT AMEL GENES


++ VERY SMALL SAMPLES NEEDED

Biological sex from dental enamel




Enamel
Dentine
Pulp

FEMALE

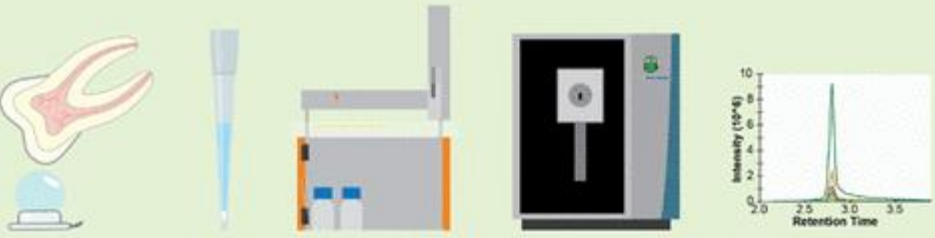


AMELX
AMELY

MALE



Workflow



Intensity (10⁴)

Retention Time

SEX ESTIMATION METHODS



- ✓ CIVIL STATUS (BIRTH CERTIFICATE, RECORDS)
- ✓ WRITTEN SOURCES
- ✓ HEADSTONES GRAVES
- ✓ GRAVES INSCRIPTIONS
- ✓ MUMMIFIED SKELETONS

forensic
medecine

paleoanthropology

paleopathology

Importance of
sex estimation

archaeology

paleodemography

CONCLUSIONS

Direct Methods More Reliable: Measurements taken directly on bones are considered more reliable and reproducible for sex estimation.

Geometric morphometric (GM) and Diagnose Sexuelle Probabiliste (DSP) methods are emerging as accurate & reliable techniques in forensic anthropology.

3D Methods Reveal Specific Dimorphism Patterns: Newer 3D methods are capable of revealing sexual dimorphism patterns not easily identified by traditional methods.

Research **continues** to focus on developing newer and improved methodologies for sex estimation to enhance accuracy in results....



III.
MISGENDERED
SKELETON
CHANGES

ONGOING SEXUAL REVOLUTION IN ARCHAEOLOGY



For decades, archaeologists have had to rely on grave goods & the shape of bones to tell :a man or a woman?

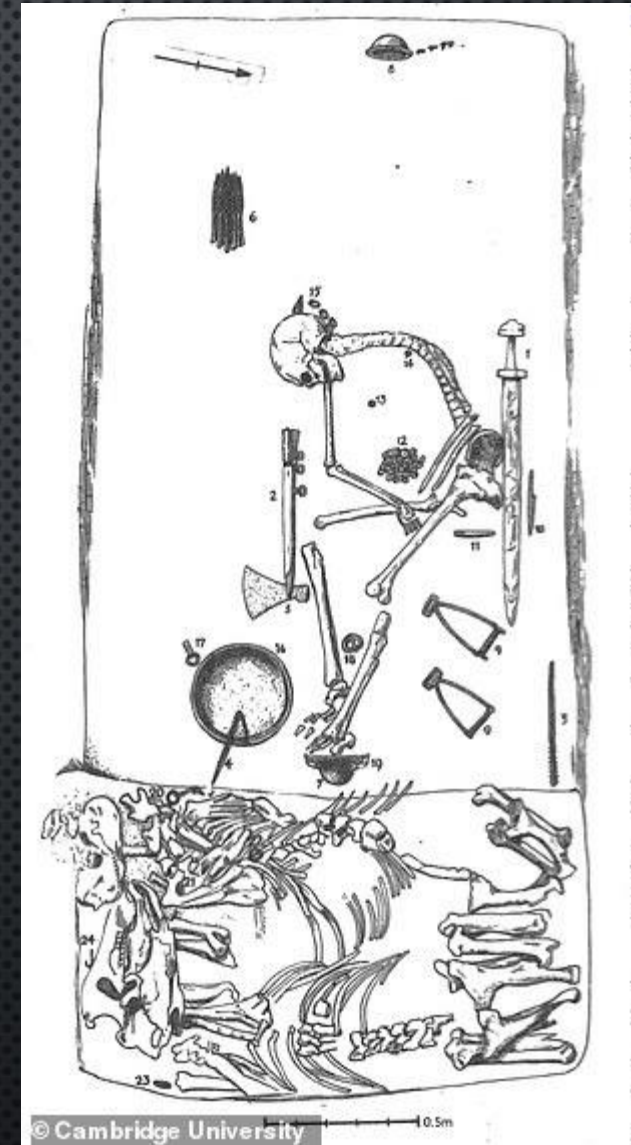
but over the past few years, the use of new methods → in a string of skeletons having their presumed sex overturned!!

The challenges to our views on sex, gender, & love in ancient societies have stirred controversy.

WIDER
DEBATE

VIKING WARRIOR IN BIRKA, SWEDEN

HISTORICAL ASSUMPTION: THE GRAVE CONTAINED NUMEROUS WEAPONS
HAD LONG BEEN ASSUMED TO BELONG TO A MAN SINCE THE LATE 19TH
CENTURY



WIDER
DEBATE

VIKING WARRIOR IN BIRKA, SWEDEN

THE DEBATE WAS INITIATED BY A 2017 PAPER

CONFIRMATION THROUGH DNA TESTING: IT IS A FEMALE!



© Cambridge University

CHALLENGING CONVENTIONAL IDEAS

- THE DISCOVERY OF A POTENTIAL FEMALE VIKING WARRIOR CHALLENGED EXISTING PERCEPTIONS ABOUT THE ROLES OF MEN AND WOMEN IN VIKING SOCIETY.
- **CONVENTIONAL GENDER NORMS:** TRADITIONALLY, WEAPONS LIKE SWORDS WERE ASSOCIATED WITH MEN, WHILE JEWELRY WAS CONSIDERED FEMININE. THIS CREATED A CONFLICT IN INTERPRETING THE FINDINGS.
- **RE-EVALUATION OF WARRIOR STATUS:** SOME ARGUED THAT IF THE SKELETON WAS INDEED A WOMAN, IT WOULD REQUIRE A RE-EVALUATION OF THE CONCEPT OF A FEMALE WARRIOR, WHICH CONTRADICTED TRADITIONAL BELIEFS.

INCONSISTENCY IN INTERPRETATION



why the warrior status was accepted when the skeleton was presumed to be a man, but challenged when it turned out to be a woman??



“I THINK SHE COULD HAVE BEEN A WARRIOR”

- **BUT** UNDERLINES THAT 90% OF GRAVES WITH WEAPONS CONTAIN BIOLOGICALLY MALE INDIVIDUALS
- WEAPONRY IN WOMEN’S GRAVES IS ALSO NO GUARANTEE THAT THEY WERE WARRIORS
- AN AXE COULD BE USED FOR MANY THINGS, INCLUDING VARIOUS NORSE MAGIC RITUALS OFTEN ASSOCIATED WITH WOMEN

“There was space in the mental universe of the Vikings for women warriors,[but] I don’t think it was the norm.”



CHANGING....



A facial reconstruction of a Viking woman buried with weapons at Nordre Kjølén, Solør, Norway. Photograph: National Geographic

MOST AGREE THAT OLD IDEAS ABOUT “MALE” AND “FEMALE” GRAVE GOODS PRODUCE INTERPRETATIONS THAT ARE AT BEST CONVENTIONAL AND AT WORST BIASED.

FROM 2009 TO 2019 THE STORY CHANGED

- LOVERS OF MODENA, ITALY
- A CEMETERY, DATING BACK 1,500 YEARS
- 11 GRAVES ALL SINGLE EXCEPT FOR
- TOMB 16 WITH TWO SKELETONS HOLDING HANDS
- PROTEINS IN TOOTH ENAMEL (SEX ESTIMATION)

THE LOVERS WERE BOTH MALE

BECAME POTENTIAL EVIDENCE OF A FIFTH-CENTURY SAME-SEX RELATIONSHIP



Photograph: University Of Bologna Handout/EPA

Next
question

WHICH LONG-STANDING ANALYSIS WILL BE NEXT TO FALL?

WHAT ABOUT TESTING OTHER
“LOVERS” BURIED ACROSS ITALY?

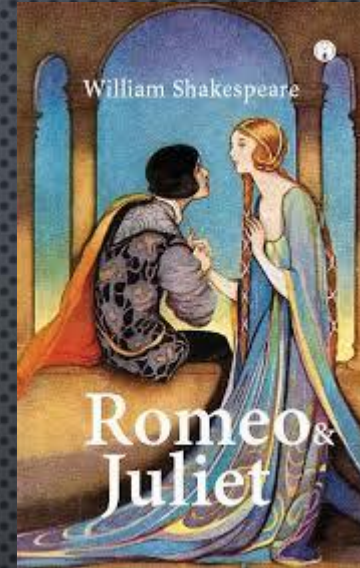
THE LOVERS OF VALDARO AT THE
NATIONAL ARCHAEOLOGICAL
MUSEUM OF MANTUA

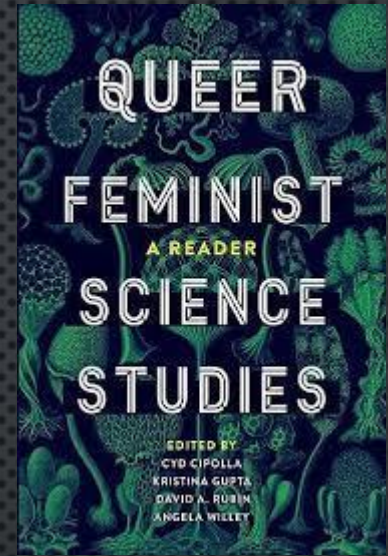
THE 6,000-YEAR-OLD COUPLE BURIED
NOSE TO NOSE AND WITH THEIR ARMS
PRESSED BETWEEN THEIR CHESTS



ALWAYS QUESTIONING

TEENAGERS/**ADOLESCENTS** WHEN THEY DIED, ONE POSSIBLY AS YOUNG AS 16, SO THE OSTEOLOGICAL EXAMINATION THAT DECLARED THEM “FEMALE” AND “PROBABLY MALE” COULD USE SOME MODERN BACK-UP – AND IT’S ON ITS WAY





- LIMITED ANSWERS: WHO LOVED WHOM IS ONE OF THOSE THINGS, AS IS PEOPLE'S SENSE OF IDENTITY
- WE CAN ONLY TRY, AS BEST WE CAN, TO RECONSTRUCT THE LIVES OF PAST PEOPLE BASED ON THE AVAILABLE DATA
- IT IS A MATTER OF RESPECT FOR THE PEOPLE OF THE PAST

"EVERY GRAVE TELLS A DIFFERENT STORY," "BECAUSE THEY WERE ALL REAL HUMANS. THEY HAD THEIR OWN UNIQUE LIVES"

MORE “SEX REVEALS” IN THE FUTURE



1. HOMINIDS

- CHALLENGES WITH POORLY PRESERVED SKELETONS
- LIMITED SKELETAL EVIDENCE: MIGHT ONLY HAVE TWO INDIVIDUALS, MAKING IT HARD TO DETERMINE THE RANGE OF SEXUAL DIMORPHISM.

Lucy or Brucey? It Can Be Tricky to Tell the Sex of Fossil Ancestors

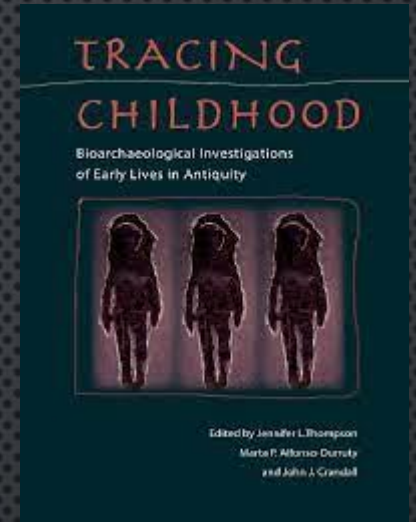
Was Lucy a she? After comparing the famous human ancestor's skeleton with other specimens, some researchers say it can be hard to tell.



MORE “SEX REVEALS” IN THE FUTURE

2. CHILDREN

- CHALLENGES WITH POORLY PRESERVED SKELETONS
- ABSENCE OF SEXUAL DIMORPHISM
- HIGH GENDER STUDIES (GRAVE GOODS)



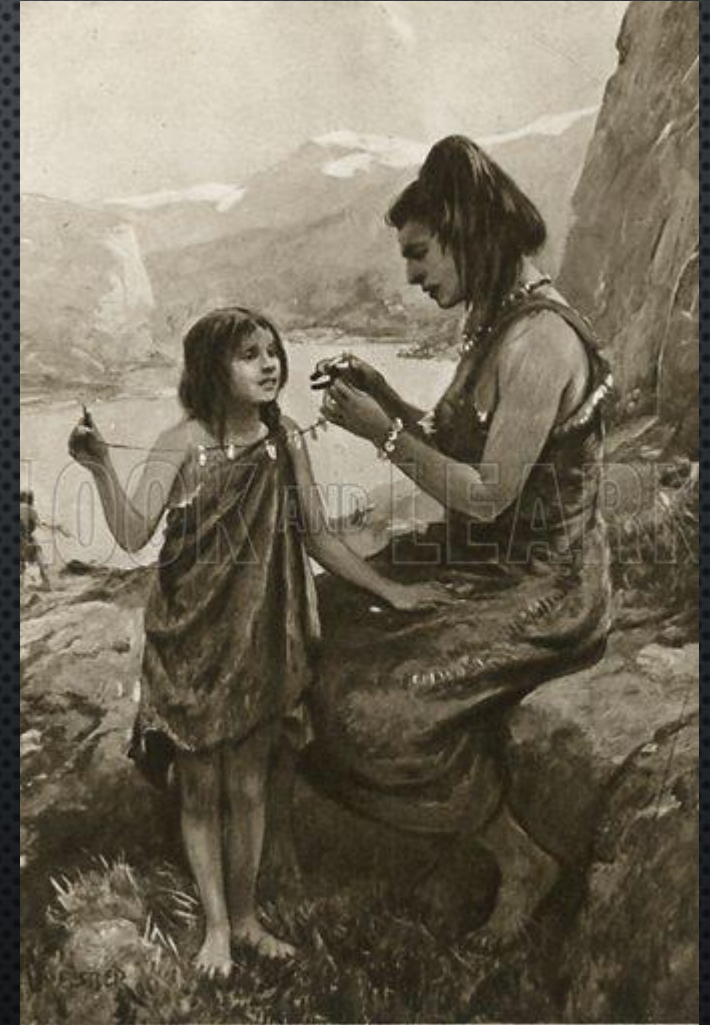
GENDER-SPECIFIC VALUATION



- THE SEX OF A 10,000-YEAR-OLD INFANT GIRL WAS ESTABLISHED BY ANALYZING HER TOOTH ENAMEL
- FOUND IN A GRAVE CONTAINED A WEALTH OF ARTIFACTS, SHELL BEADS & STONE PENDANTS
- PRESENCE OF VALUABLE ITEMS → BABIES [GIRLS HIGHLY VALUED DURING THE MESOLITHIC AGE]
- CHALLENGING PREVIOUS ASSUMPTIONS ABOUT GENDER ROLES AND VALUES

IV. MOTHERHOOD

- WHAT WAS MOTHERHOOD LIKE DURING PAST AGES?
- WHO IS THE MOTHER?
- ANY SKELETAL MANIFESTATIONS FOR PREGNANCY OR GIVING BIRTH?



NAIA "THE MOTHER OF THE AMERICAS"

- WELL-PRESERVED ANCIENT SKELETON OF AN ADOLESCENT GIRL
- FOUND IN A SUBMERGED CAVE IN MEXICO
- SHEDS LIGHT ON THE EARLY PEOPLING OF THE AMERICAS
- PROVIDES VALUABLE INSIGHTS INTO PREHISTORIC POPULATIONS



The skull of 'Naia', a young girl whose bones were found in a cave on Mexico's Yucatán Peninsula. Credit: Paul Nicklen/NGC

[Endocr Connect.](#) 2020 Jun; 9(6): R143–R157.

PMCID: PMC

Published online 2020 May 12. doi: [10.1530/EC-20-0055](https://doi.org/10.1530/EC-20-0055)

PMID: 3

Pregnancy and lactation, a challenge for the skeleton

[E M Winter](#),¹ [A Ireland](#),² [N C Butterfield](#),³ [M Haffner-Luntzer](#),⁴ [M-N Horcajada](#),⁵ [A G Veldhuis-Vlug](#),^{1,6} [L Oei](#),^{7,8}
[G Colaianni](#),⁹ and [N Bonnet](#)⁵

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[Review](#) > [J Forensic Sci.](#) 2012 Jul;57(4):866-72. doi: [10.1111/j.1556-4029.2012.02102.x](https://doi.org/10.1111/j.1556-4029.2012.02102.x).

Epub 2012 Feb 28.

Skeletal indicators of pregnancy and parturition: a historical review

[Douglas H Ubelaker](#)¹, [Jade S De La Paz](#)

Affiliations + expand

PMID: 22372612 DOI: [10.1111/j.1556-4029.2012.02102.x](https://doi.org/10.1111/j.1556-4029.2012.02102.x)

HUMAN NEWBORN BABIES ARE ACTUALLY BIG

At birth:

Gorillas babies are 2.7 % as big as their mothers



chimps babies are 3.3 % as big as their mothers



humans babies are 6.1 % as big as their mothers



TO ACCOMMODATE LARGER BABIES

A WOMAN'S PELVIS HAD TO

1. WIDEN
2. DEEPEN.
3. THE BIRTH CANAL ALSO CHANGED SHAPE.



PARTURITION SCARS



**AMERICAN JOURNAL OF
BIOLOGICAL ANTHROPOLOGY**

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The association of parturition scars and pelvic shape: A geometric morphometric study

Lukas Waltenberger , Doris Pany-Kucera, Katharina Rebay-Salisbury, Philipp Mitteroecker

First published: 09 December 2020 | <https://doi.org/10.1002/ajpa.24196> | Citations: 5



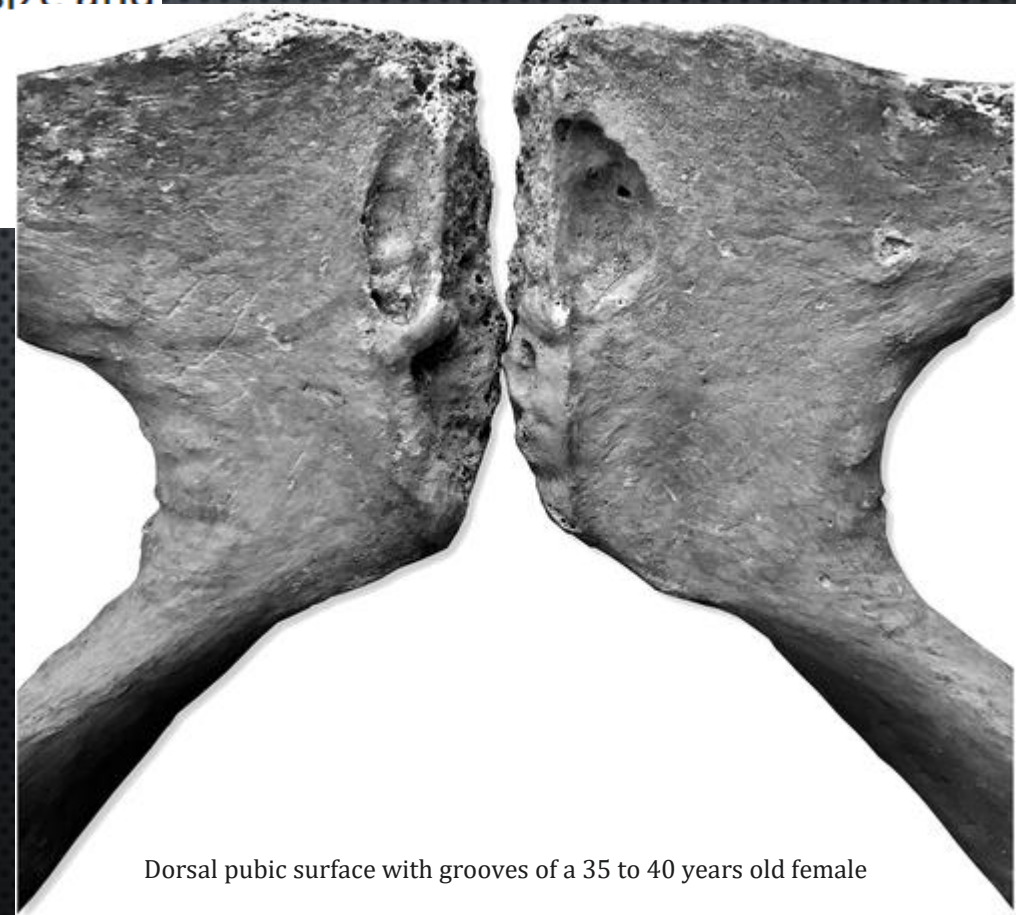
THE ABILITY TO IDENTIFY WHETHER A FEMALE HAS BEEN PREGNANT OR HAS GIVEN BIRTH

1. DORSAL PUBIC PITTING
2. PREAURICULAR GROOVE

Metric and morphological analysis of pelvic scars in a historical sample from Lithuania: Associations with sex, age, body size and pelvic dimensions

Elisa-Maria Praxmarer, Janina Tutkuvienė, Sylvia Kirchengast 

First published: 22 May 2020 | <https://doi.org/10.1002/oa.2887> | Citations: 2



Dorsal pubic surface with grooves of a 35 to 40 years old female

METHODOLOGICAL VARIATION & HISTORICAL PERSPECTIVE



- OVER A CENTURY OF SCIENTIFIC LITERATURE HAS EXAMINED SKELETAL EVIDENCE RELATED TO PREGNANCY, CHILDBIRTH & CHILDCARE
- DESPITE EXTENSIVE RESEARCH, STILL VARIATION IN THE METHODS USED AND INTERPRETATIONS MADE IN THIS FIELD
- UNDERSTANDING THE HISTORICAL DEVELOPMENT OF THEORIES AND RESEARCH HELPS THE FORENSIC SCIENCE COMMUNITY

SKELETAL ALTERATIONS NOT EXCLUSIVE



- SPECIFIC SKELETAL CHANGES ARE NOT EXCLUSIVELY LINKED TO OBSTETRICAL EVENTS; OTHER FACTORS CAN PRODUCE SIMILAR ALTERATIONS
- SKELETAL CHANGES ASSOCIATED WITH CHILDBIRTH ARE NOT ONLY FOUND IN PAROUS WOMEN; THEY CAN ALSO BE PRESENT IN NULLIPAROUS WOMEN AND MEN
- NEED FOR ONGOING RESEARCH INTO SKELETAL ALTERATIONS TO DETERMINE PARITY STATUS IN HUMAN SKELETAL REMAINS

V. FATHERHOOD



V. FATHERHOOD

- HOW ANCIENT IS FATHER CARE OF HUMAN INFANTS AND YOUNG CHILDREN?
- WHY DID IT EMERGE?
- IS IT POSSIBLE THAT FATHER CARE AROSE AMONG THE ANCESTORS OF MODERN HUMANS AND BECAME ESSENTIAL FOR SURVIVAL?
- OR IS IT A RECENT, THOUGH VARIABLE, DEVELOPMENT?
- IS FATHER CARE AN EVOLVED TRAIT OF HOMO SAPIENS OR IS IT A LEARNED CULTURAL BEHAVIOR TRANSMITTED ACROSS GENERATIONS IN SOME SOCIETIES BUT NOT OTHERS?



Fathers and Their Children in the First Three Years of Life

An Anthropological Perspective

Frank L'Engle Williams



FINAL
THOUGHTS &
DEBATES

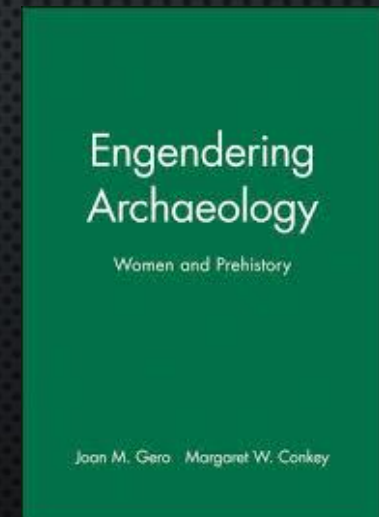
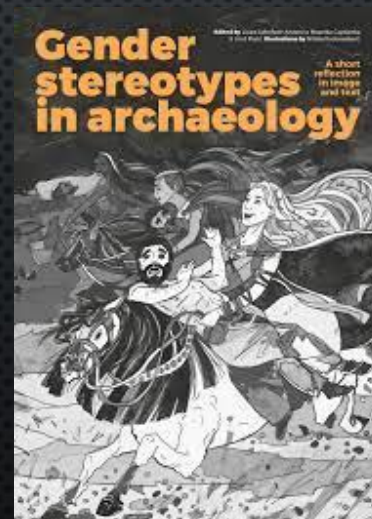
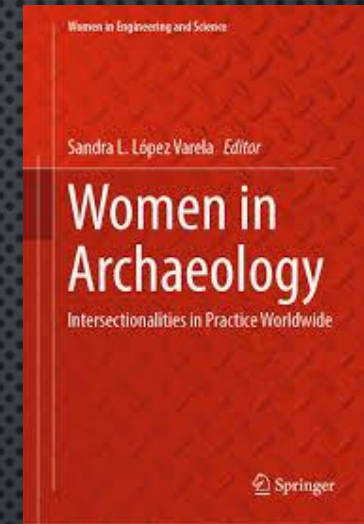
THE GENDER STEREOTYPES

- WERE MEN THE ONLY HUNTERS AND PRODUCERS OF TOOLS, ART AND INNOVATION IN PREHISTORY?
- WERE WOMEN THE ONLY GATHERERS, HOME-BOUND BREEDERS AND CAREGIVERS?
- ARE ALL PREHISTORIC FEMALE DEPICTIONS MOTHER GODDESSES?
- DO WOMEN AND MEN HAVE EQUAL CAREER CHANCES IN ARCHAEOLOGY?



LONGSTANDING BATTLE AGAINST GENDER STEREOTYPES

- GENDER AND FEMINIST ANTHROPOLOGISTS HAVE BEEN ACTIVELY COMBATING GENDER STEREOTYPES THROUGH VARIOUS MEANS, INCLUDING ACADEMIC WORK, MUSEUM EXHIBITIONS, AND PUBLIC WRITING.



PERSISTENCE OF STEREOTYPES

- DESPITE THE EFFORTS, STEREOTYPES CONTINUE TO EXIST AND THRIVE IN BOTH ACADEMIC AND NON-ACADEMIC SETTINGS PARTICULARLY IN PLACES WHERE GENDER ARCHAEOLOGY IS UNDERREPRESENTED.



