

DIVERSITY OF BIOLOGICAL SEX CHARACTERISTICS (BIOL 4873/5873), FALL 2026

Instructor: Dr. Ari Berkowitz
Richards Hall 111
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Class: Tu Th 1:30-2:45 PM, Richards Hall 304
Office Hrs: Tu Th 9:30-11:30 AM, W 2-3 PM, or by appt.

Required readings: Available on Canvas (canvas.ou.edu)

COURSE OBJECTIVES

After completing this course, you should be able to:

- 1) Explain the advantages and disadvantages of sexual reproduction and how it likely evolved.
- 2) Describe the diversity of non-human animal genetic, hormonal, anatomical, physiological, and behavioral sex characteristics.
- 3) Explain how vertebrate sex determination, differentiation, and development typically occur.
- 4) Describe the diversity of human anatomical and physiological sex characteristics and explain the likely causes of such diversity.
- 5) Discuss, using biological evidence accurately, under what circumstances you think human genital surgeries should occur and how you think athletes with atypical sex characteristics should be allowed to compete.

GRADING

<u>Course component</u>	<u>Contribution to grade</u>
Papers [3-5 pages each; 4873: 3 papers (topics 1-3); 5873: 4 papers (incl. 2 topic-3 options)]...	60%
Oral questioning (as a follow-up to each paper).....	20%
Pop quizzes.....	10%
Class participation.....	10%

Pop quizzes will include material from required readings assigned for that day or before. There will be no make-up quizzes.

Grading Errors: If you believe there was an error in a quiz or a mistake in paper grading, you must give the instructor a *written* description of the apparent mistake and your reasoning within one week of receiving the grade. (You can use email.) The instructor will decide on the complaint and inform the student *at a later time*.

IMPORTANT DATES

Due dates for paper 1: 1st draft-September 29; final version-October 13
Due dates for paper 2: 1st draft-October 22; final version-November 5
No class (Thanksgiving): November 26
Due dates for paper(s) 3-4 final version: December 14

NOTES

- 1) **Attendance and class participation are expected.** Some important announcements may also occur during class. Please contact the instructor promptly if you need to miss class for medical reasons.
- 2) **Readings:** All readings will be available on Canvas (canvas.ou.edu) as pdf files and/or links to internet sites. Students are expected to access and read all the readings labeled “required.” Readings labeled “optional” are completely optional.
- 3) **Discussions:** This course will emphasize class discussions. **Please be civil and respectful of each other at all times.** Disagreements are acceptable and even encouraged, as they will help us gain a deeper understanding of the issues, but we must disagree without being disagreeable. Please don’t make assumptions about your fellow students or expect anyone to volunteer anything personal. Create space for everyone to have an opportunity to share. If you don’t often share, think about challenging yourself to contribute more than you typically would. If you frequently share, consider pausing a bit longer to see if others would like to speak up in that gap.

The University of Oklahoma fosters an inclusive culture of respect and civility, belonging, and access, which are essential to our collective pursuit of excellence and our determination to change lives. The unique talents, perspectives, and experiences of our community enrich the learning, and working environment at OU, inspiring us to harness our innovation, creativity, and collaboration for the advancement of people everywhere.

Unauthorized audio/video recording is strictly prohibited in this course and its associated online spaces. This policy protects all participants and respects intellectual property and FERPA rights. Violations and any refusals to comply may result in disciplinary action through the Office of Student Conduct and/or removal from the classroom with an unexcused absence. Should you require recording accommodations, please register with the ADRC and obtain specific permission. Any recordings authorized by the accommodation process will be made by the instructor and provided through an encrypted online process. These restrictions are designed to protect intellectual property rights and privacy concerns. Failure to adhere to these policies will result in a referral to the Office of Student Conduct for policy violation.
- 4) **Email:** Some communications may be via e-mail. You are expected to access your OU e-mail account (or set e-mail forwarding appropriately) and check for course-related messages **daily**.
- 5) **Plagiarism:** Regulations and responsibilities stated in the *Student Code* and *Faculty Handbook* will be followed in the event of academic dishonesty. (See <http://integrity.ou.edu/>.) **Papers must be written entirely by the student alone; plagiarism will not be tolerated. Student papers should not copy phrases from publications, should not quote authors, and should not make any use of generative artificial intelligence software. Student papers will be submitted electronically to Turnitin.com to check for plagiarism.**
- 6) **Incomplete:** If a grade of W or I is requested, University policy will be followed.
- 7) **Reasonable accommodation policy:** The University of Oklahoma (OU) is committed to the goal of achieving equal educational opportunity and full educational participation for students with disabilities. If you have already established reasonable accommodations with the Accessibility and Disability Resource Center (ADRC), please [submit your semester accommodation request through the ADRC](#) as soon as possible and contact me privately, so that

we have adequate time to arrange your approved academic accommodations. If you have not yet established services through ADRC, but have a documented disability and require accommodations, please complete [ADRC's pre-registration form](#) to begin the registration process. ADRC facilitates the interactive process that establishes reasonable accommodations for students at OU. For more information on ADRC registration procedures, please review their [Register with the ADRC](#) web page. You may also contact them at (405)325-3852 or adrc@ou.edu, or visit www.ou.edu/adrc for more information. Note: disabilities may include, but are not limited to, mental health, chronic health, physical, vision, hearing, learning and attention disabilities, and pregnancy-related. ADRC can also support students experiencing temporary medical conditions.

- 8) **Adjustments for Pregnancy/Childbirth Related Issues:** Should you need modifications or adjustments to your course requirements because of documented pregnancy-related or childbirth-related issues, please contact the Accessibility and Disability Resource Center at 405/325-3852 and/or the Institutional Equity Office at 405/325-3546 as soon as possible. Also, see the Institutional Equity Office [FAQ on Pregnant and Parenting Students' Rights](#) for answers to commonly asked questions.
- 9) **Religious observances:** It is the policy of the University to excuse the absences of students that result from religious observances and to reschedule examinations and additional required classwork that may fall on religious holidays, without penalty. [\[See Faculty Handbook 3.15.2\]](#)
- 10) **Title IX Resources and Reporting Requirement:** The University of Oklahoma faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX. There are resources available to those impacted, including: speaking with someone confidentially about your options, medical attention, counseling, reporting, academic support, and safety plans. If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone confidentially, please contact [OU Advocates](#) (available 24/7 at 405-615-0013) or [University Counseling Center](#) (M-F 8 a.m. to 5 p.m. at 405-325-2911). Because the University of Oklahoma is committed to the safety of you and other students, and because of our Title IX obligations, I, as well as other faculty, Graduate Assistants, and Teaching Assistants, are mandatory reporters. This means that we are obligated to report gender-based violence that has been disclosed to us to the Institutional Equity Office. This includes disclosures that occur in: class discussion, writing assignments, discussion boards, emails and during Student/Office Hours. You may also choose to report directly to the Institutional Equity Office. After a report is filed, the Title IX Coordinator will reach out to provide resources, support, and information and the reported information will remain private. For more information regarding the University's Title IX Grievance procedures, reporting, or support measures, please visit [Institutional Equity Office](#) at 405-325-3546.
- 11) **Mental health support services:** Support is available for any student experiencing mental health issues that are impacting their academic success. Students can either be seen at the University Counseling Center (UCC) located on the second floor of Goddard Health Center or receive 24/7/365 crisis support from a licensed mental health provider through [TELUS Health](#). To schedule an appointment or receive more information about mental health resources at OU please call the UCC at 405-325-2911 or visit [University Counseling Center](#). The UCC is located at 620 Elm Ave., Room 201, Norman, OK 73019.

12) **Final exam preparation period:** Pre-finals week will be defined as the seven calendar days before the first day of finals. Faculty may cover new course material throughout this week. For specific provisions of the policy please refer to OU's [Final Exam Preparation Period policy](#).

13) **Emergency protocol:** During an emergency, there are official university [procedures](#) that will maximize your safety.

Severe Weather: If you receive an OU Alert to seek refuge or hear a tornado siren that signals severe weather.

1. Look for severe weather refuge location maps located inside most OU buildings near the entrances.
2. Seek refuge inside a building. Do not leave one building to seek shelter in another building that you deem safer. If outside, get into the nearest building.
3. Go to the building's severe weather refuge location. If you do not know where that is, go to the lowest level possible and seek refuge in an innermost room. Avoid outside doors and windows.
4. Get in, Get Down, Cover Up.
5. Wait for official notice to resume normal activities.

Additional [Weather Safety Information](#) is available through the Department of Campus Safety.

14) **Active Threat Guidance:** The University of Oklahoma embraces a Run, Hide, Fight strategy for active threats on campus. This strategy is well known, widely accepted, and proven to save lives. To receive emergency campus alerts, be sure to update your contact information and preferences in the account settings section at one.ou.edu.

RUN: Running away from the threat is usually the best option. If it is safe to run, run as far away from the threat as possible. Call 911 when you are in a safe location and let them know from which OU campus you're calling from and location of active threat.

HIDE: If running is not practical, the next best option is to hide. Lock and barricade all doors; turn off all lights; turn down your phone's volume; search for improvised weapons; hide behind solid objects and walls; and hide yourself completely and stay quiet. Remain in place until law enforcement arrives. Be patient and remain hidden.

FIGHT: If you are unable to run or hide, the last best option is to fight. Have one or more improvised weapons with you and be prepared to attack. Attack them when they are least expecting it and hit them where it hurts most: the face (specifically eyes, nose, and ears), the throat, the diaphragm (solar plexus), and the groin.

Please save OUPD's contact information in your phone.

NORMAN campus: *For non-emergencies call (405) 325-1717. For emergencies call (405) 325-1911 or dial 911.*

15) **Fire Alarm/General Emergency:** If you receive an OU Alert that there is danger inside or near the building, or the fire alarm inside the building activates:

1. *LEAVE* the building. Do not use the elevators.
2. *KNOW* at least two building exits
3. *ASSIST* those that may need help
4. *PROCEED* to the emergency assembly area
5. *ONCE safely outside, NOTIFY first responders of anyone that may still be inside building due to mobility issues.*
6. *WAIT* for official notice before attempting to re-enter the building.

[OU Fire Safety on Campus](#)

STUDENT PAPER TOPICS

Paper 1: What are the advantages and disadvantages of sexual reproduction between a female and a male, as compared to the alternatives?

Paper 2: What kinds of variations of sex-related genes, hormones, anatomy, physiology, and behavior occur among non-human animals and what are their likely causes and advantages?

Paper 3 (& 4) **options:**

(Whichever topic you choose, your paper should include all the most relevant biological evidence from the required readings and our class discussions.)

What are the biological causes of diverse human sexual anatomy, physiology, and behavior?

How do brains differ in relation to sex, sexual orientation, and/or gender identity?

Under what circumstances should there be surgery to alter human sexual anatomy and why?

How should intersex, transgender, and nonbinary athletes be allowed to compete, and why?

Note: For the first two papers, a draft paper must be uploaded to Canvas by the draft paper due date. The draft paper will not be graded, but if it is not submitted on time, there will be a grade deduction of 1/3 grade per day late on the student's final paper grade.

TIPS FOR READING ORIGINAL RESEARCH ARTICLES

When you read, focus on the Introduction, Summary or Abstract, and Discussion or Conclusions (probably read in that order). Try not to get hung up on methodological details or unfamiliar vocabulary, but if you need to know a term to follow the reading, look it up in a dictionary or Google it. As you read, ask yourself the following questions: What did the author(s) basically do in the key experiment(s)? Why did they choose to do this particular experiment(s)? What was the major finding(s) of this experiment(s)? How did the authors interpret this finding(s)? Do you think this interpretation of the finding(s) is reasonable? Try to identify the key 1-3 data figures in the article and evaluate whether they really support the authors' conclusions.

WEEK	TOPIC	REQUIRED READINGS	OPTIONAL READINGS
Week 1: 8/25	Overview	Swift 2024	Dimijian 2005 ; Roughgarden 2011 ; Roughgarden 2023 ; McLaughlin et al. 2023
Weeks 1-2: 8/27, 9/1, 9/3	<u>Evolution of Sex</u> Advantages and disadvantages of sexual reproduction	Stearns & Hoekstra 2005 Ch. 8; Hurst 2016 ; Roughgarden 2009 Chs. 1-2; Crow 1994	Openstax Biology 11.1 ; Stearns & Hoekstra 2005 pp. 70-75; Maynard Smith, 1988; Tobler & Schlupp 2008
Weeks 3-4: 9/8, 9/10, 9/15	> 2 sexes; parthenogenesis	Gaines 2022; Simon et al. 2002; Neaves & Baumann 2011; Booth et al. 2023	Yadav et al. 2023; Whitfield 2004; Spolsky et al. 1992; Kearney et al. 2022; Ricemeyer et al. 2026; Fahy 2021; Smith & Shuker 2025
Weeks 4-5: 9/17, 9/22	Sexual selection	Stearns & Hoekstra 2005 pp. 236-273; Roughgarden 2007	Winteritz & Abbate 2015; Ah-King 2022
Weeks 5-6: 9/24, 9/29	<u>Diversity of Non-human Animal Sex Characteristics</u> Vertebrate sex determination, differentiation, and development	Capel 2017; Berkowitz Human Physiology lectures (3)	Uhlenhaut et al. 2009; Matson et al. 2011; Okashita et al. 2025; Terao et al. 2022; Wang et al. 2022; Laycock & Meeran 2013; Silverthorn 2016; Brennan 2022; Tamisiea 2023
Weeks 6-7: 10/1, 10/6	Hermaphrodites + intersex animals	Roughgarden 2009 Chs. 3-4; Scharer & Ramm 2016; Levy et al. 2020; Hall et al. 2025	Cormier 2021 ; Graham & Rhodes 2025; Portmann 2024; Brennan 2026
Weeks 7-8: 10/8, 10/13, 10/15	Diverse sex anatomy, physiol., & behavior; >2 animal genders	Simon 2013 ; Jimenez et al. 2023; Roughgarden 2009 Ch. 6 + pp. 136-153; Kustra & Alonzo 2025; Maney 2025	Glickman et al. 2005; Falk et al. 2021; Zimmer 2026; Berger 1985; Diaz et al. 2021; Gomez et al. 2023; vom Saal et al. 1999; Schreffer 2022
Week 9: 10/20, 10/22	<u>Brains: Differences Due to Sex, Sexual Orientation, and/or Gender Identity?</u> Non-human animal brains	Phoenix et al. 1959; Agate et al. 2003; McCarthy 2020	Kundakovic 2025
Week 10: 10/27, 10/29	Human brains	Hines 2020; Joel et al. 2020; Eliot 2021	Jordan-Young 2012; Joel et al. 2015; Joel 2022 ; DeCasien et al. 2022; Eliot 2024; Jacobs 2024
Week 11: 11/3, 11/5	Gay & transgender people's brains	LeVay 2017 Ch. 3+; Roselli 2017	LeVay 1991; Balthazart 2020; Zhou et al. 1995; Garcia-Falgueras and Swaab 2008; Schillace 2022; Rastogi et al. 2022; Bakker 2024
Weeks 12-13: 11/10, 11/12, 11/17	<u>Sex-atypical People – Surgeries and Athletics</u> Intersex people	Fausto-Sterling 2000 Ch. 3, pp. 45-54; Ainsworth 2015; Quinn 2018, 2015 ; BBC News 2015	Quinn 2016 ; Montañez 2017 ; InQueery 2018 ; ABC Science 2023 ; NPR 2023 ; Sandberg & Gardner 2022; Reyes et al. 2023; Ruderman & Zayhowski 2024 ; Imperato-McGinley et al. 1974; Springer et al. 2016
Weeks 13-14: 11/19, 11/24, 12/1	Genital surgeries	Fausto-Sterling 2000 Ch. 3, pp. 54-77; Kiira Tricia ; Dreger 2017 ; Gaffney 2025; OK SB 613 & 904	Ferrera & Casper 2018; AL SB184; EO 1-20-25 ; EO 1-28-25 ; Rosenthal 2023 ; Wirmer et al. 2024; Carpenter et al. 2024; Barbee et al. 2024 ; Lee et al. 2024; Dai et al. 2024; Risen 2024; Ghorayshi et al. 2025; Mar et al. 2025
Weeks 15-16: 12/3, 12/8, 12/10	Athletic competitions	Padawer 2016; Martínez-Patiño 2005; Surprenant 2021 ; French 2023; IOC 2026; Schneid 2026; de la Cretaz 2021	Fenichel et al. 2013; Jennings & Braun 2024; EO 2-5-25 ; Joyner et al. 2025; IOC 2021; Siczekowska et al. 2026; State laws

Note: This schedule is tentative and may be changed by the instructor as needed.