



ANTHROPOLOGY 447  
*Human Reproductive Ecology*

**Spring Semester 2010**  
*Tuesdays*  
*1:30 to 4:30 PM*  
*University Museum Room 330*

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Office hours: by appointment, please email me.

**Course description:** Human reproductive ecology (HRE) is an emerging subfield within the larger field of evolutionary biology. This subfield considers reproduction as an aspect of human biology that is responsive to the ecological context. The perspective we will take is evolutionary, that is, we will assume that current human reproductive physiology is the product of natural selection. In addition, we will take a biocultural approach: the ecological context will be defined as the product of the interaction between biological and social variables. We will take three contemporary human populations as examples of different ecologies: the Toba of northern Argentina, the Tzutujil Maya of Guatemala, and the population of Northeastern Philadelphia. Some of the questions we will explore include:

- Why is menstruation inhibited in some women (e.g., female athletes and dancers)?
- Can your level of physical activity influence your probability of getting pregnant?
- Can social stress have an impact on female fecundity?
- Which environmental factors affect male fecundity?
- Do all women around the world have the same hormone levels? If there is variation, is that translated into different fertility rates?
- How can we monitor human reproductive status in the laboratory and in the field?

This is a seminar-style graduate and advanced undergraduate course designed to provide an overview of the latest advances in human reproductive ecology and the mechanics of writing a research proposal. We will discuss readings and exchange ideas on the different directions that this relatively new discipline may take. As a way of reviewing the material and train ourselves to present our ideas to a funding agency, we will write individual research proposals.

**Course requirements:**

Grading will rest on the following assignments:

- 1) Readings assignment (15%): For each of the selected readings, you will have to identify the major premise or topic (one or two paragraphs). You will have to turn in this assignment on the week in which the readings are to be discussed.
- 2) Individual class presentations and participation in class discussions (25%): You will have to give a short oral presentation of the material from the readings at least two times during the semester, contribute to the class discussion of the readings, and provide substantial feedback to your peers' proposals.
- 3) Funding agencies assignment (5%): This is a one-page report on your search of possible sources of funding for your proposed research. Due date: **March 23**.
- 4) Take home exam (15%): This will consist of 2 or 3 short essays questions aimed at summarizing the most important points in human reproductive ecology. Due **March 30**.

- 5) Certificate of Human Subject Protection training course (5%) This is web-based training course for the social and behavioral sciences at Penn (see details below) Due date: **April 6**
- 6) Research proposal (35%): This is a mock research proposal in which you propose to study a particular question in human reproductive ecology. You will have to follow the format of the L.S.B. Leakey Foundation research grants application ([www.leakeyfoundation.org](http://www.leakeyfoundation.org)). There will be three partial deadlines for the proposal, which are designed to help you organize your work and produce a better final product. On **March 2nd**, you will have to tell us which topic you selected as well as the reason for choosing that particular topic (10 out of 100 pts). On **April 13**, you must turn in a draft of the research proposal which will be distributed to the rest of the class ahead of time for feedback (40 out of 100 pts). Drafts will be presented by you and reviewed in class (the more complete you turn in your draft, the better the feedback you will get). **May 4, 11 AM is the deadline for turning in the final proposal** (50 out of 100 pts).

Grading will be based on the following cut-offs:

100% = A+,	87.0 – 89.9% = B+	77.0 – 79.9% = C+	67.0 – 69.9% = D+
95.0 – 99.9% = A,	83.0 – 86.9% = B	73.0 – 76.9% = C	63.0 – 66.9% = D
90.0 – 94.9% = A-,	80.0 – 82.9% = B-	70.0 – 72.9% = C-	60.0 – 62.9% = D- >60% = F

### Required readings:

- 1) *Reproductive Ecology and Human Evolution (REHE)* (2001) Edited by Peter T. Ellison, Aldine de Gruyter, New York. (Van Pelt QP251 .R444485 2001)
- 2) *Planning, proposing, and presenting science effectively: a guide for graduate students and researchers in the behavioral sciences and biology (PPP)* (1997) by Jack P. Hailman and Karen B. Strier, Cambridge University press. (Van Pelt QH315 .H25 1997).
- 3) In addition to the chapters from the REHE and the PPP books you will have supplementary readings (7 or 8 per week), which will be posted on BlackBoard.

### Syllabus and schedule

JANUARY 19

#### Introduction to the course – Organizational Meeting

- Ellison, P. T. (2001) Introduction: Ecology, Reproduction, and Human Evolution (REHE)
- Ellison, P. T. (1994). "Advances in Human Reproductive Ecology." *Annual Review of Anthropology* 23: 225-275.
- Vitzthum VJ. (2009) The ecology and evolutionary endocrinology of reproduction in the human female. *Am J Phys Anthropol* 140 Suppl 49:95-136.

JANUARY 26

#### Three ecologies: the Toba, the Tz'utujil Maya, and the NE Philadelphians

- Hinshaw, R., Pyeatt, P. and Habicht, J-P. (1972). Environmental Effects on Child-Spacing and Population Increase in Highland Guatemala. *Current Anthropology*, Vol. 13(2): 216-230
- Early, J. (1970) Demographic Profile of a Maya Community: The Atitecos of Santiago Atitlan. *The Milbank Memorial Fund Quarterly*, Vol. 48, No. 2, Part 1, 167-177.
- Early, J. D. (1970) The Structure and Change of Mortality in a Maya Community. *The Milbank Memorial Fund Quarterly*, Vol. 48, No. 2, Part 1, 179-201.
- Braunstein, J. and Miller, E. (1999). Ethnohistorical Introduction. Peoples of the Gran Chaco. E. Miller. Westport, CT, Bergin & Garvey.
- Mendoza, M. (1999). The Western Toba: Family Life and Subsistence of a Former Hunter-Gatherer Society. Peoples of the Gran Chaco. E. S. Miller. Westport, CT., Bergin & Garvey.
- Valeggia, C. R. and Tola, F. (2003) The Argentine Toba. In: *Encyclopedia of Medical Anthropology*. C. Ember and M. Ember (Eds.), Plenum/Kluwer Press, New York pp. 564-572.

### **Female reproductive biology**

- Shibley-Hyde, J. and Delamater, J.D. (2006) Biology and the Menstrual Cycle, Chapter 6. In: Understanding Human Sexuality, 9<sup>th</sup> Edition, McGraw Hill.
- Ellison, P. (2001) Balancing Act. In: On Fertile Ground: A Natural History of Human Reproduction. Harvard University Press, pp.165-200.
- Lipson, SF (2001) Metabolism, Maturation, and Ovarian Function (REHE).
- Jasienska, G. (2001) Why Energy Expenditure Causes Reproductive Suppression in Women (REHE).

### FEBRUARY 2

### **Female reproductive biology**

- Vitzthum, V.J. (2001) Why Not So Great Is Still Good Enough (REHE)
- Vitzthum, V.J. (2002) Salivary progesterone levels and rate of ovulation are significantly lower in poorer than in better-off urban dwelling Bolivian women. Hum Rep 17 (7); 1906-1913.
- Jasienska, G. & Jasiensky, M. (2008) Interpopulation, interindividual, intercycle, and intracycle natural variation in progesterone levels: A quantitative assessment and implications for population studies. Am J Hum Biol 20:35-42.
- Cole LA, Ladner DG, Byrn FW. 2009. The normal variabilities of the menstrual cycle. Fertil Steril 91(2):522-7.

### **Early Life Effects on Reproduction**

- Chisholm, J.S. & Coall, D. A. (2008) Not by Bread Alone: The Role of Psychosocial Stress in Age at First Reproduction and Health Inequalities. In: Evolutionary Medicine and Health: New Perspectives. W. Trevathan, E.O. Smith & J. J. McKenna, eds. Oxford University Press, New York, 134-148.
- Jasienska G, Ziolkiewicz A, Lipson SF, Thune I, Ellison PT. (2006). High ponderal index at birth predicts high estradiol levels in adult women. Am J Hum Biol 18(1):133-140.
- Núñez de la Mora, A. & Bentley, G. (2008) Early Life Effects on Reproductive Function. In: Evolutionary Medicine and Health: New Perspectives. W. Trevathan, E.O. Smith & J. J. McKenna, eds. Oxford University Press, New York, pp 149-168.

### FEBRUARY 9

### **Male reproductive biology**

- Bribiescas, R. (2001) Reproductive Physiology of the Human Male. (REHE)
- Campbell, BC, Lukas, WD and Campbell, KL (2001) Reproductive Ecology of Male Immune Function and Gonadal Function. (REHE)
- Bribiescas, R. (2006). "On the Evolution, Life History, and Proximate Mechanisms of Human Male Reproductive Senescence." Evolut Anthropol15.
- Vitzthum VJ, Worthman CM, Beall CM, Thornburg J, Vargas E, Villena M, Soria R, Caceres E, Spielvogel H. 2009. Seasonal and circadian variation in salivary testosterone in rural Bolivian men. Am J Hum Biol 21(6):762-8.

### **Comparative Framework**

- Muller, M.N. and Wrangham, R.W. (2001) Reproductive Ecology of Male Hominoids. (REHE)
- Knott, C. (2001) Female Reproductive Ecology of the Apes. (REHE)
- Emery Thompson M, Jones JH, Pusey AE, Brewer-Marsden S, Goodall J, Marsden D, Matsuzawa T, Nishida T, Reynolds V, Sugiyama Y, Wrangham RW. Aging and Fertility Patterns in Wild Chimpanzees Provide Insights into the Evolution of Menopause. Curr Biol 17, 2150:2156.
- Whitten PL, Turner TR. 2009. Endocrine mechanisms of primate life history trade-offs: growth and reproductive maturation in vervet monkeys. Am J Hum Biol 21(6):754-61.

FEBRUARY 16

### **Field and laboratory techniques in HRE**

Valeggia, C.R. (2007) Taking the lab to the field: Minimally invasive techniques for monitoring reproductive hormones in population-scale research. *Pop Dev Rev* 33(3) 525-542.

McDade TW, Williams S, Snodgrass JJ. 2007. What a drop can do: dried blood spots as a minimally invasive method for integrating biomarkers into population-based research. *Demography* 44(4):899-925.

### **Planning research**

PPP Chapter 1. How to Plan Research

FEBRUARY 23

### **Conception, implantation and pregnancy**

Pike, I.L. (2001) The Evolutionary and Ecological Context of Human Pregnancy (REHE).

Dufour, D. L. and M. L. Sauter (2002). "Comparative and evolutionary dimensions of the energetics of human pregnancy and lactation." *Am J Hum Biol* 14(5): 584-602.

Wadhwa, P. D., J. F. Culhane, et al. (2001). "Stress, infection and preterm birth: a biobehavioural perspective." *Paediatr Perinat Epidemiol* 15 Suppl 2: 17-29.

### **Fetal loss**

Baird DD. 2009. The gestational timing of pregnancy loss: adaptive strategy? *Am J Hum Biol* 21(6):725-7.

Holman, D. J. and Wood, J.M. (2001) Pregnancy loss and Fecundability in Women. I (REHE)

Vitzthum et al (2006) A prospective study of early pregnancy loss in humans. *Fert Ster* 86 (2): 373-379.

Nepomnaschy, P. A., K. B. Welch, et al. (2006). Cortisol levels and very early pregnancy loss in humans. *Proc. Natl. Acad. Sci. USA* 103(10): 3938-3942.

MARCH 2 -- **Turn in topic of proposal and rationale for choosing it.**

### **Child survival**

Ball, H. and Panter-Brick, C (2001) Child Survival and the Modulation of Parental Investment: Physiological and Hormonal Considerations (REHE).

Blaffer-Hrdy, S. (2005) On Why It Takes a Village: Cooperative Breeders, Infant Needs, and The Future. In: *Evolutionary Perspectives in Human Development*, pp. 167-188.

Ball, H. & Klingaman, K. (2008) Breastfeeding and Mother-Infant Sleep Proximity: Implication for Infant Care. In: *Evolutionary Medicine and Health: New Perspectives*. W. Trevathan, E.O. Smith & J. J. McKenna, eds. Oxford University Press, New York, pp. 226-241.

### **Fecundability**

Wasser, SK and Place, NJ (2001) Reproductive Filtering and the Social Environment. (REHE)

Nepomnaschy, P. A., K. Welch, et al. (2004). Stress and female reproductive function: A study of daily variations in cortisol, gonadotrophins, and gonadal steroids in a rural Mayan population. *Am J Huma Biol* 16(5): 523-532.

Ellison, P. T., Lipson, S.F., Jasienska, G. and Ellison, P. L. (2007) Moderate anxiety, whether acute or chronic, is not associated with ovarian suppression in healthy, well-nourished, Western women. *Am J Phys Anthropol* 134:513-519.

MARCH 9 SPRING BREAK – NO CLASSES

MARCH 16 **Take home exam sent today by email**

### **Breastfeeding and postpartum fertility**

Holman DJ, Grimes MA, Achterberg JT, Brindle E, O'Connor KA. 2006. Distribution of Postpartum Amenorrhea in Rural Bangladeshi Women. *Am J Phys Anthropol* 129(4):609-619.

- Valeggia, C.R. and Ellison, P.T. (2001) Lactation, Energetics, and Postpartum Fecundity. (REHE)
- Valeggia C, Ellison PT. (2009). Interactions between metabolic and reproductive functions in the resumption of postpartum fecundity. *Am J Hum Biol* 21(4):559-66.
- Tennekoon, K. H., S. Wasalathanthri, et al. (2005). Serum leptin and lactational amenorrhea in well-nourished and undernourished lactating women" *Fertility and Sterility* 83(4): 988-994.

### **Menopause**

- Sievert, L.L. (2001) Aging and Reproductive Senescence. (REHE).
- Sievert, L. L.; Morrison, L; Brown, D. E.; Reza, A.M. (2007) Vasomotor symptoms among Japanese-American and European-American women living in Hilo, Hawaii. *Menopause* 14(2): 261-269.
- Obermeyer, C.M. & Sievert, L.L. (2007) Cross-cultural comparisons: midlife, aging, and menopause. *Menopause* 14(4):663-667.

<b>MARCH 23 Turn in funding agencies assignment</b>
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### **Life-history theory**

- Kaplan, H, Hill, K, Hurtado, AM, and Lancaster, J (2001) The Embodied Capital Theory of Human Evolution. (REHE) Kaplan, H., Hill, K, Hurtado, AM, and Lancaster, J (REHE)
- Marlowe, F (2000) The Patriarch Hypothesis. *Human Nature* 11(1):27-42.
- Hawkes, K.; Blurton Jones, N (2005) Human Age Structures, Paleodemography, and the Grandmother Hypothesis. In E Volland, A Chasiotis, and W Schiefnhovel (eds.) *Grandmotherhood: The Evolutionary Significance of the Second Half of Female Life*, Rutgers University Press, pp. 118-120.

### **Evolutionary ObGyn**

- Sievert, L. L. (2008) Should Women Menstruate? An Evolutionary Perspective on Menstrual Suppressing Oral Contraceptives. In: *Evolutionary Medicine and Health: New Perspectives*. W. Trevathan, E.O. Smith & J. J. McKenna, eds. Oxford University Press, New York, pp. 181-195.
- Doyle, C., Swain Ewald, H.A., and Ewald, P. W. (2008) An Evolutionary Perspective on Premenstrual Syndrome: Implications for Investigating Infectious Causes of Chronic Disease. In: *Evolutionary Medicine and Health: New Perspectives*. W. Trevathan, E.O. Smith & J. J. McKenna, eds. Oxford University Press, New York, ppp. 196-215.
- Robillard, P-Y, Dekker, G, Chaouat, G., Chaline, J. and Hulsey, T. (2008) Possible Role of Eclampsia/Preeclampsia in Evolution of Human Reproduction. In: *Evolutionary Medicine and Health: New Perspectives*. W. Trevathan, E.O. Smith & J. J. McKenna, eds. Oxford University Press, New York, pp. 216-225.

<b>MARCH 30 Take home exam due today</b>
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### **Research Proposal workshop**

PPP Chapter 2. How to Write a Research Proposal

### **Ethical considerations**

Code of Ethics of the American Anthropological Association

Code of Ethics of the American Association of Physical Anthropologists

- Hurtado, A.M. and Salzano, F.M. (2003) Introduction. In: Salzano, F. M. and A. M. Hurtado (Eds). *Lost Paradises and the Ethics of Research and Publication*. NY: Oxford University Press, pp 3 - 26.
- Hill, K. and Hurtado, A.M. (2003) The Ethics of Anthropological Research with Remote Tribal Populations. In: Salzano, F. M. and A. M. Hurtado (Eds). *Lost Paradises and the Ethics of Research and Publication*. NY: Oxford University Press, pp 193 - 210.

APRIL 6 **Human Research Subject Certificate due today**

**Organizational meeting.** Your research proposal draft should be sent to all participants of the class via email.

PPP chapter 4. How to Present Research.

APRIL 13 NO MEETING (AAPA IN NEW MEXICO)

**Email your individual proposal drafts to the class and to me**

APRIL 20

**Discussion of individual proposal drafts**

One person will be the presenter of her/his proposal, the others will be the reviewers. Each of the reviewers must read the proposal IN DETAIL and provide written feedback to the presenter.

APRIL 27

**Discussion of individual proposal drafts**

**Tuesday May 4, 11 AM DEADLINE TO TURN IN FINAL PROPOSAL →  
HARD COPY IN MY MAILBOX, PLEASE.**