COURSE OUTLINE

Anthropology 4422G – 9122B

Activity and Energetics in the Past

Winter 2020

This course is cross-listed with graduate and undergraduate students.

Lectures: Thursdays 12:30-3:30 pm
Classroom: SSC-3315

Instructor: Dr. Jay Stock
Office: SSC-3316
Office hours: Please refer to the course site in OWL.
Email: jay.stock@uwo.ca

Credit value: 0.5 credit

Course Description: This course explores the interaction between habitual activity and energetics throughout human evolution, prehistory, and the recent past. Particular focus will be placed on the energetic biology of species, and how it has changed throughout human evolution in relation to habitual activity and changing resources use.

Prerequisites: Registration in fourth year in Anthropology and permission of the instructor. Anthropology 2226A/B and 3336F/G are recommended. Students should have maintained an average of 80% in their third year.

Antirequisites: None.

Course Syllabus:

Energy is a measure of the capacity to do work. Habitual activity and energy use are fundamental characteristics of the biology of any species. Both are extremely dynamic and variable throughout human evolution and prehistory in relation to environmental variation, cognitive evolution, and functional morphology. This course will explore the processes by which energy is captured from the environment and the ways that our changing relationship with energy have shaped the evolution of human behaviour and biology. We will consider the relationship between energy and activity in the palaeobiology of fossil species, between

populations in prehistory, and investigate the ways which our energetic ecology influences human health today. A range of topics will be considered in relation to our understanding of energetics and activity, including diet and foraging behaviour, growth and body size, locomotion, reproduction, immune function, and changing patterns of labour in the past. Throughout the course we will consider the interactions between four inter-related factors: energy, activity, cultural change and human biology.

Course Structure:

Class time will be divided between lectures, group discussions and student presentations. A full course schedule including a week-by-week breakdown of topics and assigned readings will be available on the course's OWL site before the first day of class. Students will be expected to read and be prepared to discuss the assigned reading.

Learning Outcomes:

On successful completion of this course, students will be able to:

1. Explain the fundamentals of energy procurement, metabolism and expenditure in human biology

2. Describe how energy is utilized throughout the lifespan, and how life history variation relates to adaptability

3. Distinguish the unique characteristics of human activity and energetics relative to other species, and identify what is known about the evolution of human energetics

4. Evaluate the role of energetic and behavioural factors in human dispersals and the colonizing of new environments.

5. Critically evaluate the role of dietary transitions in the energetic and behavioural ecology of our species.

6. Understand the relationships between sexual dimorphism, reproductive and energetic ecology and their impact on activity in the past

7. Evaluate the roles of activity and energetic ecology in recent epidemiological transitions and their impact on contemporary health.

8. Generate an effective proposal for new research to answer a novel research question of current relevance to the field.

Course Materials:

There is no single textbook available to sufficiently cover material relevant to this course, but a recent interest in activity and energetics within the field of biological anthropology has led to a range of research and review papers on the topic that will form the reading in this course. Relevant journal articles and book chapters will be made available under the Course Readings tab of the OWL course website. New developments within the field and articles chosen by students will be made available via the OWL site as the course progresses.

Evaluation:

Students will be expected to attend all classes, and to critically engage with the reading and in class discussions. Evaluation will consist of three components, as outlined below.

1. Class Participation (worth 15% of final mark in total, 10% for questions/comments, 5% for summary of research paper). All students are expected to participate in class discussion. Beginning the 2nd week of class all students are required to bring one comprehensive question or comment they've developed for each assigned chapter or article that highlights their critical thinking and stimulates discussion and debate. These may be typed or hand-written and must be handed in at the beginning of class. These will be worth 10% of the course mark. In addition, students will research one additional research paper for each tutorial session that are related to the weekly theme and their own research topic. They will submit a concise summary (200 words maximum) of the work with their question or comment and discuss the research in the class.

2. Fossil species summary and interpretation (15% of final mark).

During weeks four through six, each student will be required to select one fossil hominin species and prepare and submit a 20-minute Powerpoint presentation summarizing what we know and might reasonably infer about the habitual behavior and diet and energetic ecology of that species on the basis of the archaeological record. Emphasis should be placed on the differentiation of sources of evidence, and what remains unknown/untested. The presentations should draw on the theoretical perspectives explored in the early weeks of the course but will involve independent research on hominin palaeobiology.

3. Research Paper (40% of final mark, Due MARCH 15th by 11:59pm). Research topics should provide critical review and creative perspective on current research relating to a population, time period or region of interest to the student, addressing what is known, or could reasonably be inferred about the relationship between energy use and activity in that population. Undergraduate essays should not exceed 3000-3500 words (approximately 12-14 pages, double spaced), graduate student essays should not exceed 4500 words (18 pages), not including the title page, abstract, references cited, figures, tables, figure/table captions, and/or appendices, and topics must be approved by the course instructor. Each essay should include an abstract of no more than 250 words.

The essay will be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

4. Research Grant Proposal (30% of final mark, submitted during exam week). Every student will be responsible for developing a hypothetical research project, presenting it to the class, and submitting a written proposal. Writing a research proposal is an essential skill in academic research and involves a number of transferable skills. A research proposal must identify a research question, determine what data must be collected in order to answer the question, select or develop an appropriate research methodology, and identify an appropriate study area or research context to test hypotheses. The study of energetics and activity in the past is an emerging field, and many relevant and unanswered research questions will arise in the discussions that we will have in this course. Students will pick a question that interests them from the material discussed in the course and will develop a hypothetical research project designed to answer that research question. The model for the proposal will be a mock grant proposal to the Leakey Foundation, one of the primary sources of research funding in Palaeoanthropology. Once you have selected a topic and had it approved by the course instructor, you will write and receive feedback on a 200-word point form summary that includes a research question and a statement of context and importance of the research question. This will be developed into a 1000-word proposal to be presented to the class in the second half of the term. The proposal will include a:

a) Concise statement of your research objectives or the specific questions to be answered.

b) Description of the importance of the research project to your specific field and to the study of human origins. What is the relationship of your research to the mission of The Leakey Foundation (to increase scientific knowledge, education, and public understanding of human origins, evolution, behavior and survival)?

c) Brief history of attempts to answer the same or related questions by other researchers.

d) Detailed explanation of the information needed to answer the research question(s) and your methods (how you plan to gather this information).

e) Summary of any broader implications and your future goals relevant to proposed research.

Each student be required to present their research proposal to the class (March 26th), providing a 10-minute oral summary with 10 minutes for discussion. Other students are expected to critically engage with the proposal and provide constructive feedback. Students will then have the opportunity to revise their proposals in light of the discussion and submit a final version for evaluation, which will worth 25% of the final mark in the course.

Late Assignments: Extensions on assignments will only be given in the case of major medical or personal emergencies as first approved by the academic counselling office. Without an approved extension each day past due (including weekends) will result in the deduction of 5% off the grade for that assignment. Assignments more than five days late will not be accepted and the student will receive a grade of zero for that assignment.

Statement on Seeking Special Accommodations:

Please see your academic counsellor immediately if you will be seeking accommodations based on medical or compassionate grounds. No accommodations will be granted retroactively more than 10 days after an assignment's due date.

Statement on Plagiarism:

Students must write their assignments in their own words. Whenever students take an idea from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing. It is also a

scholastic offence to submit the same work for credit in more than one course. Plagiarism is a major scholastic offence.

Institutional Statements and Policies

All students should familiarize themselves with Western's current academic policies regarding accessibility, plagiarism and scholastic offences, and medical accommodation. *These policies are outlined with links to the full policies on the Anthropology website.*

		THEME	READING	Student work
1	JAN 9	Introduction Structure, aims and course planning	Lohle (1990) Schwartz (2008)	Choose period/place/context for research, proposal
2	Jan 16	Diet - Energy Intake	Cheetham (2010) Leonard (2006) Snodgrass (2012) Smil (2017)	Q's Diet – Paper summary discussion
3	Jan 23	Activity – Energy Expenditure	Macintosh et al. (2017) Malina (2008) Ruff (2019) Thurber et al (2019)	Q's Activity – Paper Summary
4	Jan 30	Life History Theory – Allocation of Energy	Kaplan et al. (2000) Muehlenbein & Flynn (2011) Wells (2016)	Q's Population Size, Demography Paper Summary
5	Feb 6	FOSSIL SPECIES PRESENTATION		
6	Feb 13	Growth	Bogin et al. (2007) Lewis (2006) Kuzawa and Bragg (2012) Pomeroy et al. (2012)	Q's Growth – Paper Summary
7	FEB 20 Reading Week			
8	FEB 27	Storage, Reproduction	Bentley (1996) Bocquet-Appel (2011) Dunsworth et al. (2012) Ellison, P.T. (2008)	Q's Reproduction – Paper Summary
9	March 5	Defence, Immunity, Maintenance	Goodman & Martin (2002) Segerstrom (2007) Shattuck & Muehlenbein (2015) Urlacher et al. (2019)	Q's Immunity – Paper Summary

		THEME	READING	Student work
10	March 12	PRESENTATIONS		ESSAY DUE 15th
11	March 19	Integrative approaches to Activity and Energy in the Past	Migliano et al. (2007) Wells & Stock (2020)	General discussion – Research GAPS Designing research
12	March 26	GRANT WRITING Workshop	Grant Writing Tips Wenner Gren Guidelines	Grant Proposals - 200 word summaries due
13	April 2nd	GRANT Proposal presentations.		
14	EXAM WEEK			GRANT PROPOSAL DUE

READINGS, 2020-01-02 – Subject to change throughout course

Week 1 - Introduction

Loehle, C. (1990) A Guide to Increased Creativity in Research: Inspiration or Perspiration? BioScience, Vol. 40, No. 2, pp. 123-129

Schwartz, M.A. (2008) The importance of stupidity in scientific research. Journal of Cell Science 121, 1771

Week 2 - Diet - Energy Intake

Cheetham, N.W.H. (2010) Chapter 1 - The Flow of Energy in Living Systems. In: Introducing Biological Energetics. Oxford University Press. pp. 3-10.

Leonard (2006) Energetic Models of Human Nutritional Evolution. In: Unger, P. ed. Evolution of the Human Diet. Oxford University Press. pp. 344-359.

Smil, V. (2017) Chapter 2 - Energy in Prehistory. In: Energy and Civilization: A History. MIT Press. pp. 21-35.

Snodgrass (2012) Human Energetics. In: Stinson, S., Bogin, B., and O'Rourke, D. Eds. Human Biology: An Evolutionary and Biocultural Perspective. John Wiley & Sons, Hoboken. pp. 325-384.

Week 3 - Activity – Energy Expenditure

Macintosh, A. A., Pinhasi, R., & Stock, J. T. (2017). Prehistoric women's manual labor exceeded that of athletes through the first 5500 years of farming in Central Europe. *Science Advances*, *3*(11), eaao3893.

Malina, R. M., & Little, B. B. (2008). Physical activity: The present in the context of the past. *American Journal of Human Biology*, *20*(4), 373–391. https://doi.org/10.1002/ajhb.20772

Ruff, C. B. (2019). Biomechanical Analyses of Archaeological Human Skeletons. In A. Grauer & A. Katzenberg (Eds.), *Biological Anthropology of the Human Skeleton* (pp. 183–206). https://doi.org/10.1002/9780470245842.ch6

Thurber, C., Dugas, L. R., Ocobock, C., Carlson, B., Speakman, J. R., & Pontzer, H. (2019). Extreme events reveal an alimentary limit on sustained maximal human energy expenditure. *Science Advances*, *5*(6). https://doi.org/10.1126/sciadv.aaw0341

Week 4 - Life History Theory – Allocation of Energy

Hill, K., & Kaplan, H. (1999). Life history traits in humans: Theory and empirical studies. Annual Review Of Anthropology, 28(1), 397.

Muehlenbein, M.P., Flynn, M.V. (2011) Patterns and processes of human life history evolution. In: Flatt, T., & Heyland, A. (Eds.). Mechanisms of Life History Evolution: The Genetics and Physiology of Life History Traits and Trade-Offs. Oxford, GB: OUP Oxford.

Wells, J. C. K. (2016). Chapter 7 – Life History Theory. In: The metabolic ghetto: An evolutionary perspective on nutrition, power relations and chronic disease. Cambridge University Press. pp. 129-148.

Week 5 – No Readings

Week 6 - Growth

Bogin, B., Silva, M. I. V., & Rios, L. (2007). Life history trade-offs in human growth: Adaptation or pathology? *American Journal of Human Biology*, *19*(5), 631–642.

Kuzawa, C. W., & Bragg, J. M. (2012). Plasticity in Human Life History Strategy: Implications for Contemporary Human Variation and the Evolution of Genus Homo. *Current Anthropology*, *53*.

Lewis, M. E. (2006). Chapter 4 – Growth and Development. In: *The Bioarchaeology of Children*. Cambridge University Press. pp. 60-80. https://doi.org/10.1017/cbo9780511542473

Pomeroy, E., Stock, J. T., Stanojevic, S., Miranda, J. J., Cole, T. J., & Wells, J. C. K. (2012). Trade-offs in relative limb length among Peruvian children: extending the thrifty phenotype hypothesis to limb proportions. *PLoS One*, *7*(12), e51795.

Week 7 – Reading Week

Week 8 - Storage, Reproduction

Bentley, G. R. (1996). Did Prehistoric Women Bear "Man the Hunter"? Reconstructing Fertility from the Archaeological Record. In R. Wright (Ed.), *Gender and Archaeology* (pp. 23–51).

Bocquet-Appel, J. P. (2011). When the world's population took off: The springboard of the neolithic demographic transition. *Science*, Vol. 333, pp. 560–561.

Dunsworth, H. M., Warrener, A. G., Deacon, T., Ellison, P. T., & Pontzer, H. (2012). Metabolic hypothesis for human altriciality. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(38), 15212–15216.

Ellison, P.T. (2008) Energetics, reproductive ecology, and human evolution. PaleoAnthropology 2008:172-200.

Week 9 - Defence, Immunity, Maintenance

Goodman, A. H., & Martin, D. L. (2002). Reconstructing Health Profiles from Skeletal Remains. In R. H. Steckel & J. C. Rose (Eds.), The Backbone of History Health and Nutrition in the Western Hemisphere (pp. 11-60.).

Segerstrom, S. C. (2007). Stress, energy, and immunity: An ecological view. *Current Directions in Psychological Science*, *16*(6), 326–330.

Shattuck, E. C., & Muehlenbein, M. P. (2015). Human sickness behavior: Ultimate and proximate explanations. *American Journal of Physical Anthropology*, *157*(1), 1–18.

Urlacher, S. S., Josh Snodgrass, J., Dugas, L. R., Sugiyama, L. S., Liebert, M. A., Joyce, C. J., & Pontzer, H. (2019). Constraint and trade-offs regulate energy expenditure during childhood. *Science Advances*, *5*(12).

Week 10 – No readings

Week 11 - Integrative approaches to Activity and Energy in the Past

Migliano, A. B., Vinicius, L., & Lahr, M. M. (2007). Life history trade-offs explain the evolution of human pygmies. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(51), 20216–20219.

Wells, J.C.K., Stock, J.T. (2020) Life history transitions at the origins of agriculture: a model for understanding how niche construction impacts human growth, demography and health. Frontiers in Endocrinology.

Week 12 – Grant Writing

Grant Writing – Tips for Graduate Students – Chronicle for Higher Education

Wenner-Gren Foundation – General Evaluation Criteria

Others TBA