

INSTRUCTOR: LARS TOMANEK, PH.D.

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Office hours<sup>1</sup>: Tu 12-1, W 11-12:30, F 11-12

Text:

- Peter W. Hochachka and George N. Somero (2002): **Biochemical Adaptation – Mechanism and Process in Physiological Evolution**, Oxford University Press, Oxford, ISBN: 0-19-511703-4).
- *Recommended (if deficiencies exist)*: Richard W. Hill, Gordon A. Wyse and Margret Anderson (2004): **Animal Physiology**, Sinauer Associates, Inc, Sunderland, MA, ISBN: 0-87893-315-8.
- *Recommended (if deficiencies exist)*: Pat Willmer, Graham Stone and Ian Johnston (2005): **Environmental Physiology of Animals**. Blackwell Publishing, Malden, MA, ISBN: 1-4051-0724-3.
- *Recommended (if deficiencies exist)*: David Randall, Warren Burggren and Kathleen French (2002): **Eckert Animal Physiology – Mechanisms and Adaptations**, Freeman, New York, ISBN: 0-7167-3863-5.

Learning Objectives: At the end of this course you should have an understanding of the following:

- How organisms regulate their water and ion balance in response to a changing environment.
- How diverse organismal groups deal with temperature stress on several levels of biological organization.
- How animals maintain metabolic scope in response to anaerobic conditions during exercise and diving in marine mammals.
- How animals sense their environment, process the information and respond to it.
- Know the hormones and their action in the context of development and stress.

Description:

Integrative Systems Physiology deals with three fundamental aspects of physiological processes: the cellular basis of physiological processes, the integration of these processes on an organismal level and the dependence of these processes on the evolutionary history and the ecology of an organism.

Class Meetings:

Laboratory: M 12:10 – 3:00      53-313  
 Lectures: Tu/Th 3:10 – 4:30 PM      22-219

Assignment calendar<sup>2</sup>:

January 18	Last day to withdraw <sup>3</sup>	
February 05/12	Paper presentation	100
February 15	Mid-term <sup>5</sup>	200
February 26	Research proposal (first draft)	100
March 05/12	Research proposal (second draft)	100
March 05/12	Proposal defense	100
March 18	Research proposal (final version)	50
	Laboratory reports	100
March 23	Final exam <sup>5</sup>	200
	<u>Unannounced lecture summaries<sup>7</sup> (2)</u>	<u>50</u>
	TOTAL	1000 points

Grade computation<sup>6</sup>

900 – 1000	A	“Borderline cases” will be subjected to “+/- grading”
800 – 899	B	(i.e., 900-909 = A-; 890-899 = B+;
700 – 799	C	800-809 = B-; 790-799 = C+; etc.)
600 – 699	D	

Lecture and Laboratory Schedule:

<b>Date</b>	<b>Topic<sup>4</sup></b>	<b>Reading will be assigned</b>
Mon Jan 08	<i>Lab#1: Introduction</i>	
Tues Jan 09	Water and solutes: patterns and mechanisms	
Thur Jan 11	Water balance and ion regulation: osmoregulation and excretion	1
Mon Jan 15	<b>ML King Birthday - Holiday</b>	
Tues Jan 16	The mammalian osmoregulatory system and adaptations in desert animals	
Thur Jan 18	Temperature: introduction and protein adaptations	2
Mon Jan 22	<i>Field trip :Morro Bay and Montana de Oro State Park</i>	
Tues Jan 23	Temperature: cont. protein adaptations	
Thur Jan 25	Temperature: heat-shock proteins and biogeographic distribution patterns	3
Mon Jan 29	<i>Lab#3: Metabolism in response to ion and temperature stress</i>	
Tues Jan 30	<i>Guest lecture: Stress physiology of plants</i>	
Thur Feb 01	Temperature: membrane adaptations, mitochondria and respiration	4
Mon Feb 05	<b><i>Paper presentation (15 min + 5 min discussion)</i></b>	
Tues Feb 06	Adaptations to cold and freezing: metabolic responses	
Thur Feb 08	Metabolism: aerobic and anaerobic metabolism	5
Mon Feb 12	<b><i>Paper presentation (15 min + 5 min discussion)</i></b>	
Tues Feb 13	Metabolism: regulation and scaling with body size	
Thur Feb 15	MID-TERM <sup>5</sup>	6
Mon Feb 19	<i>Lab#6: Metabolism and protein activity (kinetics and thermal stability)</i>	
Tues Feb 20	Oxygen availability in tissues and transport: regulatory mechanisms	
Thur Feb 22	Diving in mammals	7
Mon Feb 26	<i>Lab#7: Protein separation techniques:2D gel electrophoresis and western analysis</i>	
Tues Feb 27	Overview of the nervous system and neurons	
Thur Mar 01	Synapses, plasticity and learning	8
Mon Mar 05	<b><i>Lab#8: Proposal presentation I</i></b>	
Tues Mar 06	Sensory physiology, animal navigation and migration	
Thur Mar 08	Neural integration and higher neural processes	9

Mon Mar 12	<b><i>Lab#9: Proposal presentation II</i></b>	
Tues Mar 13	The vertebrate stress response: hormones and chemical control systems	
Thur Mar 15	Systems biology	10
Fri Mar 23	FINAL EXAM <sup>5</sup> (4:10 – 7:00 PM)	

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