

# The Neuroscience of Fear

## Syllabus Summer 2012

### Introduction

Humans share similar brain structures, controlling the fear response, with mammals, birds and reptiles. These structures are evolutionally preserved because fear helps protect us from danger, injury and death. Now, we live removed from the dangerous elements of nature, but our primal fear instincts remain. Do emotions have a function in our consciousness today or are they merely intrusions from another time?

We will examine the evolutionary aspects of the fear response, how it ties into decision-making and our everyday lives. We will examine this issue from a multidisciplinary perspective, synthesizing recent work from the fields of biology, psychology, neuroscience and philosophy. Labs will include gross anatomy lab, sensory lab and tour of the department of Neurology.

### 3 credits/1 Unit

**Instructor:** Ana Y. Estevez, Ph.D., St. Lawrence University; and James C. Leiter, M.D., Dartmouth University. Guest Lectures: John Michael, PhD, GNOSIS Research Center. Troels Kjaer, MD, Head of Neurology, Copenhagen Hospital.

**Prerequisites:** 1 year of college level biology or psychology

**Text:** *The Emotional Brain: The Mysterious Underpinnings of Emotional Life* by Joseph E. LeDoux, various primary literature

### Objectives:

Upon completion of the course students will be able to:

- Explain the function of the brain, from nuclei to neurons, especially the fear circuit
- Explain the psychological and physiological effects of fear
- Describe the concepts of the consciousness/unconsciousness and attention
- Discuss the concepts and basis of perceptions and emotions
- Analyze how fear is a component of several mental disorders

### Topics covered:

- Organization of the brain and peripheral nervous system : 5/24
- Cellular elements involved in brain function: neurons and their connections and signals: 5/24
- Study of emotions from a historical perspective: 5/25
- Nuclei and pathways: 5/25
- Conditioned fear responses and the development of 'learned triggers' and contextual cues: 5/26
- Fear conditioning and the study of emotions: 5/26
- Perception of fear (historical overview of philosophical positions, the concept of representation): 5/29
- The auditory circuit, the amygdala and the fear conditioning paradigm: 5/29; **QUIZ**
- Behavioral and physiological aspects of fear: 5/30
- Cellular basis of memory: 5/31

- Concepts of sensory memory, short-term memory, working memory, long-term memory: 5/31;  
**QUIZ**
- Guest Lecture GNOSIS Research Institute. : 6/1-6/2 John Michael
- Lab Copenhagen Hospital 6/1 1pm
- The effects of autonomic nervous system and stress hormones on emotional memory: 6/5
- Attention and Consciousness (psychological and philosophical perspectives): 6/6
- Conscious and Subconscious, processing of emotions, decision making.: 6/7; **QUIZ**
- Theories of Emotion (the role of emotions in reasoning, self-understanding, moral judgments): 6/8
- Pathological Conditions: Panic, phobia, stress disorders: 6/9
- Student Presentations: 6/12
- **FINAL**