

# **Neuro-SMART (Neurosciences Student Mentoring and Research Training) Program**

**Course Name:** Research Orientation Module in Comparative Neuroanatomy

**Course Number:** Bio 922 Field Studies (DMACC), SC1531 Biology Workplace Exp S1 (High School); SC1532 Biology Workplace Exp S2 (High School);

**Course times and location:** Spring Term A- Days 8am- 9am, Des Moines University, Room 204 Ryan Hall

## **Instructor Information:**

### **Instructors in charge:**

Dr. Muhammad Spocter (DMU), Mrs. Brenda Foncesca (Kemin), Ms. Kacia Cain (DMPS), Dr. James Sacco (Drake).

### **Instructor contact details:**

#### **Dr. Spocter**

**Office:** Room 152 Ryan Hall, Department of Anatomy, Des Moines University

**Office Phone:** 515-271-1577

**Email:** Muhammad.Spocter@dmu.edu

**Office hours** Tuesday 10:30-11:30; Thursday 11:30-12:30; and by appointment

**Lab Manager:** Kathleen Bitterman (kathleen.bitterman@dmu.edu)

**Research Assistant:** MSA student (Paul Couchmann)

## **Course Purpose and Goals:**

This is an introductory course designed to familiarize students with comparative neuroanatomy and some of the research methods employed in mapping the human brain.

As a natural science course, it is designed to expose students to the scientific method and allow them to explore using basic observational skills and relevant theoretical knowledge, the underlying neuroanatomy controlling behavior in mammalian species. Students will have the opportunity to study science outside of the traditional classroom setting and to apply this knowledge by collaborating on a research project pertaining to mammalian brain evolution.

Because this course assumes no prior knowledge of neuroscience, the first few class meetings will focus on fundamentals of neuroanatomy and neurophysiology. With this background we will survey functional systems in the brain, highlighting phylogenetic

variation in projection pathways, neocortical diversification, and evidence of brain evolution from fossil endocasts. Through this series of practical sessions, short lectures and seminars we hope to provide you with the suitable tools and exposure to neuroscience methods that will empower you to continue your inquiry beyond the classroom. Many of the skills you'll be exposed to during this research orientation are not exclusive to neuroscience and thus can be transposed to future careers in other disciplines requiring quantitative and critical thinking.

We will build our understanding progressively by working toward a series of **goals**. By the end of the course, you should be able to think like a natural scientist to:

- 1) *Use your observational skills and basic quantitative procedures to contrast and compare features in the cerebro cortex of different mammalian species;*
- 2) *Identify basic mammalian neuroanatomy and its functional correlates;*
- 3) *Have a basic understanding of evolutionary theory as it pertains to the study of comparative neuroanatomy;*
- 4) *Articulate the results of relevant scientific literature and the significance of any data collected during the research rotation;*
- 5) *Evaluate the limitations in the data collected, how well or poorly this fits with existing models and the pitfalls and strengths of each of these models.*

### **Class Prerequisites:**

This course is open to all high school students meeting the requirements set out through our existing collaboration with the Des Moines Public School System (Contact: Ms. Kacia Cain).

Prerequisites include:

- ✓ Successful completion of college Anatomy and Physiology or college Biotechnology at Central Campus, and
- ✓ Concurrent enrollment in the second course, either college Anatomy and Physiology or college Biotechnology at Central Campus.

In order to help you understand the concepts and the methods used in contemporary scientific inquiry, we will be making use of basic statistical procedures and image analysis methods to show you how these work and how to adequately quantify and describe certain neuroanatomical features. There is absolutely no need to fret about this, as we are here to guide you through this learning process and to give you that proverbial head start and early exposure to methods that you are likely to encounter again at a later stage.

**Note:** Given the limitations of working in a laboratory environment, the student numbers for this class are capped at 20 students per orientation cycle. All inquiries about student enrollment should be made through Ms. Kacia Cain.

## **Course Materials:**

**Schedule:** A detailed schedule of seminar times, lectures and practical sessions is listed at the end of this syllabus.

**Reading Assignments:** In order to provide you with a more complete understanding of evolutionary neuroanatomy, reading assignments have been selected for this course and will be provided to you in either electronic or paper format.

As there is hardly enough time to cover all of the interesting aspects of evolutionary neuroanatomy, I urge you to do any extra reading if you come across a topic of interest and relevant to neuroanatomy. Our team will be happy to recommend additional reading material on any course-related topic you wish to pursue and help you design a research project in a related area of interest.

## **Class website:**

The class website is ([The Evolving Brain Laboratory](#))

We will use it to post --

- announcements,
- photos and videos,
- readings,
- information about the week's activities in the lab.

## **Grading Policy:**

**Your grade will be composed of the following -**

### **Attendance and Participation**

To satisfy the class requirement of this course and to promote participation in the laboratory activities, half the total class grade will be based on an evaluation of your class attendance and participation in the laboratory. You are thus urged to attend the lecture series and to interact in group discussions in laboratory so as to ensure that you get the maximum worth from your learning experience. Please see the attached rubric for details of the assessment criteria.

As a component of your participation and learning experience, you will be asked to keep a research orientation portfolio. **Please bring a spiral bound notebook or composition notebook to class for this purpose.** This portfolio should consist of a weekly log of the research activities undertaken in the lab and the key issues learned during the orientation, lecture or discussion series. To sufficiently complete this task, each student is expected to spend a few minutes after each class reflecting on the orientation experience.

## Project Assignments

The second half of your grade will be based on an evaluation of your literature review and team research projects. Complete project details and assessment criteria will be provided at the outset of each assignment.

## Syllabus

Class Hours: 8:00am-9:00am (MTTF), 8:00am-8:50am (W)

Location: Ryan Hall, Department of Anatomy, Des Moines University

Abbreviations: **O**=Orientation; **Lab**= Laboratory Exercise; **R**=Reading Assignment;  
**D**= Discussion; **Lec**= Lecture

DATE	Title	Location	Activities
1/16/2018 Tue.	Brief welcome and Introduction; <b>Lec</b> : Gross Brain, Blood Supply & Cranial Nerves:	Ryan Hall 181	<b>Lec Assigned R1</b>
1/18/2018 Thur.	<b>Lab</b> : Gross Brain Dissection: surface anatomy- lobes and gyral and sulcal landmarks	Ryan Hall 120	Lab
1/23/2018 Tue.	<b>Lab</b> : Gross Brain Dissection: surface anatomy- lobes and gyral and sulcal landmarks	Ryan Hall 120	Lab
1/25/2018 Thur.	<b>Lab</b> : Gross Brain Dissection: Blood supply and the circle of Willis	Ryan Hall 120	Lab
1/29/2018 Mon.	<b>Lab</b> : Gross Brain Dissection: Blood supply and the circle of Willis	Ryan Hall 120	Lab
1/31/2018 Wed.	<b>Lab</b> : Gross Brain Dissection: Cranial nerves:, Names, locations and modalities	Ryan Hall 120	Lab
2/02/2018 Fri.	<b>Lab</b> : Gross Brain Dissection: Cranial nerves:, Names, locations and modalities	Ryan Hall 120	Lab
2/06/2018 Tue.	<b>D</b> : Discuss Reading Assignment 1: Philosophy of Science discussion: <i>What is Science? (Chapter 2)</i>	Ryan Hall 181	<b>Discuss R1; Assigned R2</b>
2/08/2018 Thur.	<b>Lec</b> : Brain Stem, meninges, ventricles and CSF Dissection	Ryan Hall 120	<b>Lec</b>
2/12/2018 Mon.	<b>Lab</b> : Brain Stem, meninges, ventricles and CSF Dissection (Kemin Team Visit)	Ryan Hall 120	<b>Lab</b>
2/14/2018 Wed.	<b>Lec</b> : Cerebral cortex lecture	Ryan Hall 181	<b>Lec</b>
2/16/2018 Fri.	<b>D</b> : Discuss Reading Assignment 2: <i>Evolving Brains (Allman) Chapter 7, pp. 159-192</i>	Ryan Hall 181	<b>Discuss R2; Assigned R3</b>
2/21/2018 Wed.	<b>Lab</b> : Cerebral cortex	Ryan Hall 120	<b>Lab</b>
2/23/2018 Fri.	<b>Lab</b> : Cerebral cortex	Ryan Hall 120	<b>Lab</b>

2/28/2018 Wed.	Working with online image databases, Allen brain Atlas, Brain Museum.org and Brainmaps.org	Ryan Hall 181	Lab
3/2/2018 Fri.	<b>D:</b> Discuss Reading Assignment 3: <i>Evolving Brains (Allman) Chapter 7, pp. 192 - 208</i>	Ryan Hall 181/Commons	Assigned R4 Lab
3/06/2018 Tue.	<b>Lec:</b> Brain Evolution lecture	Ryan Hall 181	Lec
3/08/2018 Thur.	<b>Lab: Group 1-</b> Brain Size and morphology in the Fossil Record,  <b>Lab: Group 2-</b> Relative brain size, allometric scaling, and regression analysis, cladistics exercise	Ryan Hall 204 & Ryan 181	Lab
<b>SPRING BREAK</b>			
3/20/2018 Tue.	<b>Lab: Group 1-</b> Brain Size and morphology in the Fossil Record  <b>Lab: Group 2-</b> Relative brain size, allometric scaling, and regression analysis, cladistics exercise	Ryan Hall 204 & Ryan 181	Lab
3/22/2018 Thur.	<b>Lec:</b> Imaging software and 3D tools in neuroscience	Ryan Hall 204	Lec
3/26/2018 Mon.	<b>Lab:</b> Image analysis and 3D reconstruction software: ImageJ, ITKsnap	Ryan 181	Lab
3/28/2018 Wed.	<b>Lec:</b> Bioinformatics and its application to the brain (Dr. James Sacco)	Ryan Hall 181	Lab
4/02/2018 Mon.	<b>Lab:</b> Bioinformatics lab exercises – Dr. James Sacco	Ryan Hall 181	Lab
4/05/2018 Thur.	<b>D:</b> Discuss Reading Assignment 4: <i>Neuropil distribution in the cerebral cortex differs between humans and chimpanzees</i>	Commons	Discuss R4
4/09/2018 Mon.	<b>Lab:</b> Working with PUBMED and article searches	Ryan Hall 181	Lec/Lab
4/11/2018 Wed.	<b>Seminar:</b> Toolkit introduction and Project examples (Dr. Spocter)	Ryan Hall 181	Lec/Lab
4/13/2018 Fri.	<b>Research Project: Literature review &amp; project outline</b>	Ryan Hall 281	Project
4/17/2018 Tue.	<b>Research Project: Literature review &amp; project outline</b>	Ryan Hall 181	Project

<b>4/19/2018 Thur.</b>	<b>Research Project: Literature review &amp; project outline</b>	Ryan Hall 181	<b>Project</b>
<b>4/23/2018 Mon.</b>	<b>Research Project: Literature review &amp; project outline</b>	Ryan Hall 181	<b>Project</b>
<b>4/25/2018 Wed.</b>	<b>Research Project: Literature review &amp; project outline</b>	Ryan Hall 181	<b>Project</b>
<b>4/27/2018 Fri.</b>	<b>Research Project: Literature review &amp; project outline</b>	Ryan Hall 281	<b>Project</b>
<b>5/01/2018 Tue.</b>	<b>Seminar sample:</b> The homologues of human language areas in chimpanzees (MA Spocter)	Ryan Hall 181	<b>Presentation</b>
<b>5/03/2018 Thur.</b>	<b>Research Project Presentations</b> Presentations – 3 groups (15 minutes each + 5 minutes for questions) 3	Ryan Hall 181	<b>Project</b>
<b>5/07/2018 Mon.</b>	<b>Research Project Presentations</b> Presentations – 3 groups (15 minutes each + 5 minutes for questions)	Ryan Hall 181	<b>Project</b>
<b>5/09/2018 Fri.</b>	<b>D: Preparing an Academic Portfolio (MA.Spocter)</b>	Ryan Hall 181	<b>Discussion</b>
<b>5/15/2018 Tue.</b>	<b>Preparing an Academic Portfolio- Student exercise</b>	Ryan Hall 181	<b>Lab</b>
<b>5/17/2018 Thur.</b>	<b>Preparing an Academic Portfolio- Student exercise</b>	Ryan Hall 181	<b>Lab</b>
<b>5/21/2018 Mon.</b>	<b>What is your Online presence and how can I use social media to promote 'my academic brand'</b>	Ryan Hall 181	<b>Lab/Lec/Com</b>
<b>5/23/2018 Fri.</b>	Student Surveys and exit interviews/ Video Testimonials	Ryan Hall 181	<b>Lab/Lec/Com</b>
<b>5/30/2018 Wed.</b>	Lab breakfast and group picture	Ryan 181 & Commons	<b>5/31/2017 Wed.</b>