# Intellectual Origins of Modern Biology

# BIOL 4023

**Instructor:** Dr. Don Stewart (*He/Him/His*)

**Office:** Bio Building 434
**Office hours:** ~2:00-4:00 Tuesday or by appointment

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**Lecture:** M/W/F, HSH 141, 8:30 AM - 9:20 PM

| Evaluation | Percentage | Dates |
|---|---|---|
| Assignments | 15% | TBD |
| Mid-Term Test | 15% | Wed., 9 Oct. 2024 |
| Group presentation | 20% | TBD (Near end of term) |
| Term Paper | 20% | TBD (Near end of term) |
| Participation | 5% | |
| Final Exam | 25% | TBD |

## Part 1: Course Information

### Course Description

A brief survey of major developments in biological thought. The philosophical basis of modern biology will be examined with emphasis on the development of the scientific method. The development of evolutionary thinking and the other major concepts in biology will be traced. May not be used by arts students as a science credit.
Prerequisite(s): 12h in BIOL above the 1000-level, each completed with a minimum grade of C-.

### Course Materials & Requirements

**Textbook**: There is no formal textbook for his course. Instead, several required readings have been collected from various sources. These will be available as links or as PDF files on ACORN. In addition, later in the term you will read and review a biography or autobiography of a significant figure in the history of biology. Many biographies and autobiographies are available through the Vaughan Library. Because you do not have to purchase a text for the course, you might consider buying a personal copy of the book that you will be

reviewing. If ordering your own copy, do so as early as possible. A list of biographies will be available by mid-September.

**Course Structure**

This course will consist of lectures, occasional group discussions and group presentations at the end of term.

**Student Learning Outcomes**

Intellectual Origins is meant to reinforce your appreciation for several core concepts in science and biology. We will examine major issues related to the historical and philosophical development of science generally but with a particular focus on the growth of biological thought. Where and when did "scientific thinking" originate? How does scientific thinking differ from other attempts at explaining the world? As "scientific thinking" progressed throughout the millennia, how did biology fare? How does biology differ from other the scientific disciplines such as physics and chemistry? What were some of the key conceptual advances or paradigm shifts in the development of biological thought and who was responsible for these advances?

Given that "Nothing in biology makes sense except in the light of evolution" (Theodosius Dobzhansky, Russian geneticist and evolutionary biologist), we will spend a fair bit of time examining the origins of this important concept. How did scientists explain the natural world prior to the works of Charles Darwin and Alfred Russell Wallace? How did they explain diversity? How did they define species? How did they account for the particular distributions of plants and animals around the planet? How did they explain how it is that organisms are so well adapted to their environments? How did ideas from other realms of society impact these scientific ideas?

As we investigate these questions, we will compare and contrast the way that people have approached these issues throughout the ages and discuss how modern biologists have settled into their current approach to understanding nature. In my lectures on the history of biology, my focus will be on the contributions of primarily male biologists to our discipline as this has been the focus of most of the historical literature in biology and science generally. However, there is considerable material available on the contributions of female scientists (and scientists from other historically marginalized groups) to biology in the 20$^{th}$ and 21$^{st}$ centuries and their significant contributions will be explored in group presentations and individual essays.

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**How to Meet the Learning Outcome**

To succeed in this course, you should come to lecture, read the material posted on ACORN, participate in discussions and be actively engaged in preparing for your group presentation.

## Part 2: Topic Outline/Schedule

Topics to be covered:

Cornerstones of Modern Biological Thought
Memes and scientific thinking
The "Unnatural" Nature of Science
Ancient Greece and the Roots of Scientific Thinking
Aristotle and Plato
Galen and Hippocrates
The Dark Ages, The golden Age of Islam, and Scholasticism
The Renaissance and the Scientific Revolution
Dealing with Biodiversity – An Historical Perspective
The Emergence of Taxonomy – e.g., Cesalpino, Linnaeus
Pre-Evolutionary thinkers in France and England - Geoffroy, Buffon, Cuvier and others

Development of the concept of evolution by natural selection - Darwin and Wallace
Group Presentations

The instructor reserves the right to amend the above course plan with reasonable notice, and in consultation with the class. The exact topics covered may vary depending upon how quickly we cover the material.

## Part 3: Assessment and Grading

General: You will be assessed on several assignments, one midterm exam, a final exam (combination of short answer and essays), participation and a group presentation.

Group Presentations: During November and December there will be group presentations on a variety of important developments in the history of biological thought.

Individual Essays: Each student will be responsible for reading a biography or an autobiography of an important biological figure. I will post a list of biographies in September. The focus of these essays will be to place the work of the individual scientist into the broader context of the development of biological thought. What approach did (do) they use in their research? What has been more significant about their work, the discovery of new facts or key conceptual advances? Can you identify any particular personal or societal factors that may have impacted the way they approach(ed) science?

*To reduce competition for library resources, and to spread your work out throughout the term, half of the class will hand in their individual essays in mid-November and the other half in late November or early December. The schedule will be determined in relation to the timing of your group presentation. *Specific presentation dates and essay due dates will be posted in late October or early November.*

## Part 4: Course Policies

None

## Part 5: University Policies

University policies are available in the Acadia University Academic Calendar or through the Registrar's website: https://registrar.acadiau.ca/welcometotheregistrarsoffice.html

**Equity, Diversity and Inclusion**

Acadia University is committed to becoming a culturally safe and anti-oppressive community. This can only be achieved where there are simultaneous efforts to eliminate all forms of discrimination and harassment from our campus community, including the elimination of all discrimination, harassment and violence based on one's identity, including but not limited to, gender, race, class, ethnicity, sexual orientation, disability, gender identity, gender expression, and Indigeneity. The policy against harassment and discrimination, and resources for students who believe they may have experienced, or witnessed, discrimination or harassment, are available here: https://www2.acadiau.ca/student-life/equity-judicial/equity.html

**Last Drop Day**

Last day to drop a course and receive a "W". Please check the Acadia University calendar dates, which are available here: https://registrar.acadiau.ca/AcademicCalendars.html

**Inform Your Instructor of Accommodations**

Acadia University is dedicated to improving access to campus life for all students with disabilities. While we attempt to ensure that all courses are accessible, we recognize that there are barriers that need to be

addressed on an individual basis. Students who require accommodations to complete coursework or otherwise fully participate in class should contact Accessible Learning Services directly as soon as possible. https://www2.acadiau.ca/student-life/accessiblelearning.html

**The Use of Animals in Teaching and Research**

The use of animals in teaching and research at Acadia University is done in accordance with guidelines on the care and use of animals published by the Canadian Council on Animal Care (CCAC). For more information on the CCAC, please visit their website at http://www.ccac.ca

**Commitment to Integrity**

It is standard practice in Biology to check exams and assignments for cheating and plagiarism. Cheating in the class and/or lab, including plagiarism, will not be tolerated. Please read the appropriate sections of the current Acadia University Academic Calendar: https://registrar.acadiau.ca/AcademicCalendars.html

Information on copy-write and course content from Acadia University is available through the Vaughan Memorial Library: http://libguides.acadiau.ca/c.php?g=433650&p=5027078

The spoken and written course content (including the syllabus, handouts, lectures, presentations, labs, assignments, quizzes, tests, and exams) are the intellectual property of the instructor and may only be copied for personal use. Sharing these materials or uploading them where they may be accessed by others is a violation of copyright. If you wish to make audio, video, or photographic recordings in class, you must first obtain the consent of the instructor and of any other persons (e.g., guest speakers, other students) who may be captured in such recordings. In the case of personal use by students with disabilities, the instructor's consent shall not be unreasonably withheld.

## Part 6: Program Learning Outcomes

| **Foundations of knowledge** | | **Course specific examples** | **Proficiency**<br>1-Introduction<br>2-Reinforcement<br>3-Proficient |
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| Scientific method, inquiry and hypothesis testing | Find, understand and apply information from the literature; understand how to use the scientific method to examine problems from different perspectives | Explore the roots of scientific thinking from the ancient Greeks through the Scientific Revolution to the modern day. | 3 |
| Historical concepts and contributions by important figures | Explain foundational concepts in biology, Two-eyed Seeing, and ethical implications of scientific discoveries | Explore how scientific ideas have developed over the past 2+ millennia | 3 |
| Biodiversity and ecology | Understand the genetic, taxonomic and ecosystem levels of biodiversity; focus on SW Nova including the Acadian Forest and Bay of Fundy ecosystems | Explore the development of formal ideas in taxonomy and how they were influenced by historical figures and then by Darwin's idea of descent with modification. | 3 |
| Genetics and evolution | Understand the chemical basis of heredity, genetics and genomics; integrate concepts across disciplines to understand evolution | The development of key concepts in evolution will form a large portion of this class. | 3 |
| Human and environmental health | Understand form and function in health and disease within a One Health framework, integrating human and environmental health | Some student presentations will deal with historical perspectives on disease | 2 |
| **Lab and field skills** | | | |
| Experimental design | Gain experience in applying the scientific method | n/a | n/a |
| Safety | Work safely and productively in lab and field settings | n/a | n/a |

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|---|---|---|---|
| Lab skills | Gain experience with basic and advanced lab techniques and understand their application in research, health science and industry | n/a | n/a |
| Field skills | Gain experience in basic and advanced field skills and understand their application in ecology, conservation biology and environmental change | n/a | n/a |
| Data acquisition, analysis and interpretations | Collect data, present results both qualitatively and quantitatively, and interpret outcomes in light of the literature | n/a | n/a |
| Statistical analysis | Use R and or other programs to analyze biological data | n/a | n/a |
| **Professional skills** | | | |
| Ethical practices | Demonstrate ethical conduct, apply principles of academic integrity and understand the principles of EDI in science | Discuss examples of historical bias in science | 2 |
| Collaboration and group work | Work effectively in groups within and across disciplines | Prepare a group presentation on an influential development in biology in the last 150 years | 2 |
| Critical thinking | Analyze and evaluate information to make science-based decisions | A key objective of the course is to emphasize the centrality of making evidence-based decisions in science, but also to apply this type of thinking to everyday life | 2 |
| Computer proficiency | Use common and discipline- specific software | n/a | n/a |
| Scientific communication | Communicate science effectively to both scientific and general audiences | Incorporate and discuss class concepts as part of a group presentation to the class | 2 |