**PCB4023 Molecular & Cell Biology Course Paper**

**Instructor: Prof. S. Williams**

**A Nobel Endeavor: Review of scientific discovery and innovation in cell & molecular biology**

**Preface**

Over the past 30 years significant strides have been made that vastly expanded our knowledge and understanding of biological phenomena. Some of these scientific breakthroughs have received great accolades in recognition of their importance and impact. For this paper you will write a review of a selected Nobel prize-winning research that led to a major discovery of an important biological process/principle or scientific innovation related to topics covered by this course.

**You must choose ONE scientific discovery from the list provided and your review must include the following components:**

* Introduction. A description of the scientific discovery and the scientist(s) who conducted the research.
  + The institutions and relevant period of time where/when the work was done.
  + Citation(s) of the original publication(s) of the research.
  + Description of the current knowledge at that time. What was known? What was unknown? Were there any other competing theories or alternative points of view?
* Experimental Methodology. A description of ONE of the experimental methods used by the investigator(s). Describe the results and conclusions of the experiment.
* Illustration. Include a diagram illustrating the mechanism/process/principle identified. The illustration must be properly cited from its original source.
* Impact. Describe the significance of the investigators’ findings and its impact on our knowledge of molecular biology. Cite at least one example of research that was based on the original discovery.
* Your review should be 3 – 4 pages in length (min: 3, max: 4) typed, normal-spaced 12-pt font. A **bibliography** in APA format is REQUIRED and is not included in your page count. Do not add cover pages, photos or charts to your review. This is an assessment of your original writing so please review the College’s policies on academic dishonesty and plagiarism at <http://www.mdc.edu/policy/student_rights_and_responsibilities.pdf>.
* The grading parameters are as follows:

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| --- | --- |
| **Paper Component** | **Points Awarded** |
| Introduction | 15 |
| Experimental Methodology | 10 |
| Impact | 10 |
| Illustration | 5 |
| Bibliography | 5 |
| Presentation (spelling, grammar, creativity) | 5 |
| **Total** | **50** |

**An “A” Paper/Essay:** A paper that is exceptional. It is interesting or unusual and demonstrates sophistication of thought. The main points are clear, complex, well developed, and well supported. The structure of the paper follows a clear logical organization, and all sources are critically examined. The sources are current, relevant, of high quality, and well-integrated in the paper. The paper is free of grammatical and spelling errors.

**A “B” Paper/Essay:** A paper that is solid and fulfills the assignment. It has a clear logic but minor lapses in development. It touches on the complexity of the argument and shows careful reading of the sources. The structure follows a logical progression of ideas, but not all evidence is clearly related to the main ideas. It may contain a few grammatical problems, but not enough to make reading difficult.

**A “C” Paper/Essay:** A paper that is adequate but less effective in responding to the assignment. It presents the central idea in general terms and demonstrates basic comprehension of the sources. It is difficult to find a logical structure to the argument, and the paper often relies on generalizations or unrelated examples. Sentences may be awkward or confusing enough to make reading difficult.

**A “D” Paper/Essay:** A paper that does not respond to the assignment. The argument may be too vague or there is little complexity to the ideas. The organizations can be difficult to follow, and the paper offers insufficient evidence from the literature. No integration of the literature reviewed is evident.

**An “F” Paper/Essay:** A paper that does not respond to the assignment, has no central argument, and uses no sources. There is little apparent organization. There is no supporting evidence, or it is irrelevant.

* **Doing your research.** This paper requires a survey/search of scientific literature. Databases such as Google Scholar and NCBI PubMed are highly recommended for locating scientific papers and reviews relevant to your selected topic. The MDC library online databases are also an excellent resource for research. To access the MDC databases, you will need to go to the library webpage (accessible from college website) and log in using your student ID number and the last 4 digits of your student ID as the password.

**DEADLINE & SUBMISSION:**

**PAPER IS DUE ON**

* **April 7th, 2020**
* **LATE SUBMISSIONS WILL NOT BE ACCEPTED!**

**2 COPIES ARE TO BE SUBMITTED**

* **A paper copy submitted to the instructor**
* **An electronic version uploaded to a designated Turnitin Folder on Blackboard**
* **Turnitin matching report must NOT exceed 20%. Papers exceeding 20% will not be accepted.**

*OPTIONAL: Students may submit an early draft for review by the professor. The “draft” must be a COMPLETE paper and must be submitted as a MS Word Document (.doc/.docx) attachment via Blackboard email no later than* ***March 19th, 2020.***

**LIST OF NOBEL-AWARDED RESEARCH/DISCOVERIES (Choose ONE for your review)**

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| [**The Nobel Prize in Physiology or Medicine 2018**](https://www.nobelprize.org/prizes/medicine/2018/summary/)  [**James P. Allison**](https://www.nobelprize.org/prizes/medicine/2018/allison/facts/) **and** [**Tasuku Honjo**](https://www.nobelprize.org/prizes/medicine/2018/honjo/facts/)  **"for their discovery of cancer therapy by inhibition of negative immune regulation."** |
| [**The Nobel Prize in Physiology or Medicine 2016**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2016/)  [**Yoshinori Ohsumi**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2016/ohsumi-facts.html)  **"for his discoveries of mechanisms for autophagy".** |
| [**The Nobel Prize in Chemistry 2015**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2015/)  [**Tomas Lindahl**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2015/lindahl-facts.html)**,** [**Paul Modrich**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2015/modrich-facts.html) **and** [**Aziz Sancar**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2015/sancar-facts.html)  **"for mechanistic studies of DNA repair"** |
| [**The Nobel Prize in Physiology or Medicine 2013**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2013/)  [**James E. Rothman**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2013/rothman-facts.html)**,** [**Randy W. Schekman**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2013/schekman-facts.html)and[**Thomas C. Südhof**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2013/sudhof-facts.html)  **"for their discoveries of machinery regulating vesicle traffic, a major transport system in our cells"** |
| [**The Nobel Prize in Physiology or Medicine 2012**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2012/)  [**Sir John B. Gurdon**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2012/gurdon-facts.html)and[**Shinya Yamanaka**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2012/yamanaka-facts.html)  **"for the discovery that mature cells can be reprogrammed to become pluripotent"** |
| [**The Nobel Prize in Chemistry 2012**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2012/)  [**Robert J. Lefkowitz**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2012/lefkowitz-facts.html) **and** [**Brian K. Kobilka**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2012/kobilka-facts.html)  **"for studies of G-protein-coupled receptors"** |
| [**The Nobel Prize in Physiology or Medicine 2009**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2009/)  [**Elizabeth H. Blackburn**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2009/blackburn-facts.html)**,** [**Carol W. Greider**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2009/greider-facts.html)and[**Jack W. Szostak**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2009/szostak-facts.html)  **"for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase"** |
| [**The Nobel Prize in Chemistry 2009**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2009/)  [**Venkatraman Ramakrishnan**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2009/ramakrishnan-facts.html)**,** [**Thomas A. Steitz**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2009/steitz-facts.html) **and** [**Ada E. Yonath**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2009/yonath-facts.html)  **"for studies of the structure and function of the ribosome"** |
| [**The Nobel Prize in Chemistry 2008**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2008/)  [**Osamu Shimomura**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2008/shimomura-facts.html)**,** [**Martin Chalfie**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2008/chalfie-facts.html) **and** [**Roger Y. Tsien**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2008/tsien-facts.html)  **"for the discovery and development of the green fluorescent protein, GFP"** |
| [**The Nobel Prize in Physiology or Medicine 2007**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2007/)  [**Mario R. Capecchi**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2007/capecchi-facts.html)**,** [**Sir Martin J. Evans**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2007/evans-facts.html) **and** [**Oliver Smithies**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2007/smithies-facts.html)  **"for their discoveries of principles for introducing specific gene modifications in mice by the use of embryonic stem cells"** |
| [**The Nobel Prize in Chemistry 2006**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2006/)  [**Roger D. Kornberg**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2006/kornberg-facts.html)  **"for his studies of the molecular basis of eukaryotic transcription"** |
| [**The Nobel Prize in Physiology or Medicine 2006**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2006/)  [**Andrew Z. Fire**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2006/fire-facts.html) **and** [**Craig C. Mello**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2006/mello-facts.html)  **"for their discovery of RNA interference - gene silencing by double-stranded RNA"** |
| [**The Nobel Prize in Chemistry 2004**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2004/)  [**Aaron Ciechanover**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2004/ciechanover-facts.html)**,** [**Avram Hershko**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2004/hershko-facts.html) **and** [**Irwin Rose**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2004/rose-facts.html)  **"for the discovery of ubiquitin-mediated protein degradation"** |
| [**The Nobel Prize in Physiology or Medicine 2002**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2002/)  [**Sydney Brenner**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2002/brenner-facts.html)**,** [**H. Robert Horvitz**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2002/horvitz-facts.html) **and** [**John E. Sulston**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2002/sulston-facts.html)  **"for their discoveries concerning genetic regulation of organ development and programmed cell death'"** |
| [**The Nobel Prize in Physiology or Medicine 2001**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2001/)  [**Leland H. Hartwell**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2001/hartwell-facts.html)**,** [**Tim Hunt**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2001/hunt-facts.html) **and** [**Sir Paul M. Nurse**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/2001/nurse-facts.html)  **"for their discoveries of key regulators of the cell cycle"** |
| [**The Nobel Prize in Physiology or Medicine 1999**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1999/)  [**Günter Blobel**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1999/blobel-facts.html)  **"for the discovery that proteins have intrinsic signals that govern their transport and localization in the cell"** |
| [**The Nobel Prize in Physiology or Medicine 1997**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1997/)  [**Stanley B. Prusiner**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1997/prusiner-facts.html)  **"for his discovery of Prions - a new biological principle of infection"** |
| [**The Nobel Prize in Physiology or Medicine 1995**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1995/)  [**Edward B. Lewis**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1995/lewis-facts.html)**,** [**Christiane Nüsslein-Volhard**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1995/nusslein-volhard-facts.html) **and** [**Eric F. Wieschaus**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1995/wieschaus-facts.html)  **"for their discoveries concerning the genetic control of early embryonic development"** |
| [**The Nobel Prize in Physiology or Medicine 1994**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1994/)  [**Alfred G. Gilman**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1994/gilman-facts.html) **and** [**Martin Rodbell**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1994/rodbell-facts.html)  **"for their discovery of G-proteins and the role of these proteins in signal transduction in cells"** |
| [**The Nobel Prize in Physiology or Medicine 1992**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1992/)  [**Edmond H. Fischer**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1992/fischer-facts.html) **and** [**Edwin G. Krebs**](http://www.nobelprize.org/nobel_prizes/medicine/laureates/1992/krebs-facts.html)  **"for their discoveries concerning reversible protein phosphorylation as a biological regulatory mechanism"** |
| [**The Nobel Prize in Chemistry 1989**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1989/)  [**Sidney Altman**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1989/altman-facts.html) **and** [**Thomas R. Cech**](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1989/cech-facts.html)  **"for their discovery of catalytic properties of RNA"** |