Recent Examples of Student-Led Independent Study, Research, and Presentations
Abbot Independent Scholars Program (AISP)

The AISP provides selected seniors (and the occasional younger student) who have exhausted the course offerings in their desired area(s) of study an opportunity to work independently with a faculty mentor for course credit. The number of credits assigned to a student's independent project depends on the nature and scope of the planned work. Each project is graded on the standard 0–6 scale by the supervising faculty mentor. Seniors who successfully complete a term of independent work may apply to be Abbot Scholars in the spring term. As an Abbot Scholar, the student will pursue an independent project (typically a continuation or expansion of work done previously), prepare some form of public exhibition based on his or her work, and, together with his or her mentor, participate in a colloquium involving all Abbot Scholars and their mentors.

Winter Term 2010-2011

**Student: Michael**
Physics - Conduct a series of small projects in astronomy, including the recording of sunspots over an extended period of time, plotting the light curve of an asteroid, and using the observatory’s SBIG STL 1301-E CCD camera.

**Student: Ben**
Chemistry – Study the synthesis of organic materials and the reaction mechanisms behind the synthesis, including nucleophilic substitution, reactions involving enolates, cycloaddition reactions, and actions involving aromatic heterocycles.

**Student: Jesse**
Art - To achieve a better understanding of art history through greater exposure to the methodology of art historians, including the works of one of art’s most prolific practitioners, Gian Lorenzo Bernini.

**Student: Connor**

**Student: Kerry**
English - Translate into English (pentameter, blank verse) select myths from Ovid’s Metamorphoses, while investigating the myths’ history, artistic renderings, and origins.

**Student: Michael**
Art - Create small-scale special effects in film, focusing primarily on Adobe After Effects, and briefly exploring the power of Autodesk Maya and/or 3D Studio Max.

**Student: Georgia**
History - Examining the U.S. government’s portrayal of nuclear weaponry, the atomic/hydrogen bomb in popular culture, and the ensuing social ramifications affecting family life in the 1950s.

**Student: Kevin**
Art - Exploring different forms of photography, including portrait, studio, panoramic, high-speed, time lapse, high dynamic range, and macro, while documenting the typical life and events of students at Phillips Academy.

**Student: Patrick**
Art - Scripting and creating a fictional movie, and collaborating with students in the 309 and 409 courses to help them develop, shoot, and edit their own work.
Student: **Justin, Scotty, and Ric**  
Math/Computer Science – The learning of Object Oriented Programming languages by familiarization with the programming language Objective C (the language of iPhone/iPod touch application development).

Student: **Tim and Randy**  
Math/Computer Science – Study of the Ruby computer programming language with the goal of producing a user-friendly, database-centric website.

Student: **Shane, Peter, Matt, Connor, Ben, and Jackie**  
Biology - Using a variety of teaching tools – including anatomy DVDs and models, radiographs, and assorted medical graphics – to learn a working vocabulary of the language of medicine, focusing on anatomy, physiology, pathology, laboratory medicine, radiology, and pharmacology.

Student: **Ric, Asa, Kelvin, Juliette, and Ram**  
Chemistry - The study of frontier molecular orbital theory and its applications in organic chemistry, particularly the role molecular orbitals play in ionic, thermal pericyclic, radical, and photochemical reactions.

Student: **Mia and Stassja**  
English - Building a portfolio that includes essays, poetry, short fiction, literary criticism, autobiography, and letters.

Student: **Mia and Sascha**  
Religion & Philosophy – The investigation of four foundational questions: What is religion (an introduction to the discipline as a whole)? What does it provide for the individual (examining the psychological components of religion)? What does it offer modern society (its place in an ever-more technologically enabled and globalized world)? And what is the future of faith (in what direction does religion seem to be heading, in terms of the level of dedication, popularity, functionality, etc)?

Student: **Kate and Sosha**  
Art - To better understand the human figure, increase observational skills, and improve the ability to render these forms in figure drawing.

Student: **Lucy**  
English - Reading and analyzing representative poems of Sylvia Plath in the context of gender criticism in order to elucidate the theme of mothering.

Student: **Mike**  
English - Independent screenplay project.

Student: **Eugene**  
History – A study of the evolution of communism, culminating in a research paper focused on Soviet mediation in China and its influence on the creation of the Chinese communist party and Mao’s rise to power.

Student: **Emelyn**  
Psychology - Exploring attitudes toward eating disorders and how they adversely affect the treatment of eating disorder patients.

Student: **Jennifer**  
Biology – Examining the neurological basis for gaining and retaining memories of and about music.

Student: **Phil**  
Music - A research paper, musical analysis, and three compositions, along with significant outside reading and film viewing to strengthen theoretical, practical, and working knowledge of musical composition for film.
Student: Eric
History - An examination of genocide in the 20th century through the work of those who spoke out against it, including Samantha Power.

Student: Jenn
English - The completion of a short novel that centers on youth, rejuvenation, and new horizons.

Student: Charlie
Theater/Dance - Writing, editing, rehearsing, recording, and performing original poetry.

--- Winter Term 2009-2010 ---

Student: Zahra
Arabic - Through the reading of three novels and analysis of relevant films, tracing the concept of the prostitute in the pages of Arab literature and the eyes of the culture itself.

Student: Rainer
History - Abolitionism in black and white.

Student: Scotty
History/Spanish - Gain a greater understanding of Guatemalan politics and culture in the last half of the 20th century, including subjugation and oppression of the indigenous people, the shift away from plantation systems to an open market, the New Left currently rising in the political sphere, U.S. foreign policy, and civil war.

Student: Ann
Music - A study of Appalachian Folk music and the history behind three songs performed for the PA community.

Student: Anita
History - Research the ratification of the Constitution, including the debates over ratification in Massachusetts, New York, and Virginia.
"Doing science," the first goal of Andover’s science program, is the mechanism by which many students learn best. It is this principle that guides the Molecular Biology Research Program. Beginning with instruction on model systems and techniques widely used in professional laboratories, students enrolled in biology 600 embark on independent research projects of their own choosing. In past years, students have examined a wide range of topics, from the roles that specific genes play in the proliferation and migration of brain cancer cells; to the genetic controls promoting successful regeneration of motor neurons in nematodes; to novel gene targeting strategies for the production of “humanized” proteins in bacteria. The laboratory space provides students with a wealth of resources, including a mammalian tissue culture area and a multitude of molecular biology reagents and equipment. Projects culminate in a written scientific paper and a presentation before the Phillips Academy community. Dr. Christine Marshall-Walker, instructor in biology, runs the molecular biology lab.

**Molecular Biology Research Laboratory**

**Student Researcher: Zahra**

Cell migration plays a key role in brain cancer invasion, an early step in metastasis, and proteins that regulate migration are often unregulated in tumor cells. The poliovirus receptor CD155 has recently been shown to affect migration levels of select malignant glioma strains, fueling the exploration of treating brain cancer with oncolytic virus recombinants. In the beginning phase of experimentation, we analyzed the migratory behavior of control C6 gliomas through two rounds of transfilter assays. In order to explore the function of CD155 in glioma migration, we then conducted two over-expression experiments with the use of a full-length cDNA expression vector and compared the resulting migration rates to control data. We found that an average of 304.25 control cells cross our transfilters after 5.5 hours, and an average of 354.5 cells transfected with the PVR expression vector. Our results reflected a 16.5% increase in cell migration due to an increased presence of the protein CD155. To confirm that CD155 was expressed in the rat C6s, we subsequently conducted two Western Blots: one comparing control C6s and transfected C6s, and the other running control C6s next to a human U87 glioma control cell line. The blots establish that CD155 is indeed present in both of these human and rat strains of glioma, and that our over-expression was successful.

**Student Researcher: Luke**

We have developed a rapid modular chromosomal integration system, whereby any gene on the chromosome of Escherichia coli can be removed and replaced by another gene of interest (GOI). By expressing genes on the chromosome of E. coli, many of the potential limitations of plasmid-based gene expression, such as a varying number of plasmid copies and relative instability, can be avoided. Previous chromosomal integration methods rely on either gene replacement, in which a native gene is swapped for a GOI; or on precise insertion of gene cargo into the chromosome. Gene replacement methods are preferable to pure insertion strategies, because replacements allow for the deletion of unwanted genes in addition to the integration of novel genes. Virtually all gene replacement methods, however, are limited by either efficiency, or by their ability to allow the integration site to be chosen, to eliminate vector and marker DNA, or to screen for successful integrants. Some of the pure insertion strategies, on the other hand, have been able to avoid such problems. We have combined the functional abilities of chromosomal gene replacement with the efficiency and streamlined approach of pure insertion strategies for a more simple and efficient method for the chromosomal replacement of genes. Because our system circumvents the limitations imposed by previous methods, it should have many applications in the biotechnology industry, as well as in the field of genetics, for stable, single-copy gene expression.

**Student Researcher: Jack**

We sought to determine the role UNC-129 plays in regulating dorsoventral guidance of DD Gabaergic motor axons in C. elegans through RNAi-mediated knockdowns. Located within the dorsal nerve cord (DNC) of C. elegans, UNC-129 is oppositely graded from the UNC-6/Netrin pathway, a pathway of highly conserved guidance cues that repel commissural axons from the ventral nerve cord in C. elegans. UNC-129 facilitates long-range UNC-6-mediated chemorepulsion by regulating UNC-40 dependent and UNC-5 independent netrin receptors on commissural growth cones. We first knocked down UNC-129 in mutant UNC-70 and wild-type C. elegans through RNAi by feeding. By observing DD motor neurons marked by green fluorescent protein, we then quantified the number of incomplete DD commissures that failed to reach the DNC. We found that knocking down RNAi in the brittle axons of UNC-70 C. elegans increased the percentage of incomplete commissures, consistent with UNC-129’s role in facilitating long-range guidance. Our results suggest that UNC-129 may regulate guidance in the regeneration of broken axonal commissures, but confirmation will require further research.
Research in the Gelb Observatory

Gelb’s roof-level dome rotates 360 degrees and is outfitted with a DFM 16-inch Schmidt-Cassegrain reflector telescope. Computer control of both the dome and telescope allows remote astronomical viewing and data analysis for students and faculty alike who are conducting research or simply enjoying an evening of observing and learning. Physics instructor Caroline Odden oversees the observatory. Mrs. Odden was recently chosen to participate in a research project with NASA astronomers in an attempt to characterize approximately 300 objects in a particular region of the sky. Odden and her team will present their findings at the semiannual meeting of the American Astronomical Society (AAS) in January 2013.

Student Researchers: Teddy and Michael (winter 2011)
The primary goal of this project was to determine the rotation rate of a main belt asteroid. After familiarizing themselves with the school’s 16” telescope and SBIG STL 1301-E CCD camera, the students took a series of pictures of a main-belt asteroid. By taking frequent pictures over the course of several hours, the students were able to detect slight variations in the brightness of the asteroid. Using Maxim DL, the students quantified these variations in the form of a light curve. In addition to their asteroid study, the students used the camera to image several familiar deep sky objects and used the school’s solar telescope (during the day) to observe the sun and track the migration of sunspots.
The CAMD Scholars Program was created during the spring of 2007 by the Office of Community and Multicultural Development (CAMD) as an opportunity for selected Phillips Academy students to pursue independent summer research projects related to diversity and multiculturalism. Students work closely with a faculty advisor as well as the program coordinator during spring term to focus and shape projects that will be developed and completed during the summer. CAMD Scholars write a significant research paper in the summer and make a presentation to the PA community during the subsequent school year.

### 2011-2012 CAMD Scholars

**Student: Gabriele**  
Social Networking: Friend or Foe to the Queer Community?

**Student: Miranda**  
From Black Panthers to Broadway: Evolution of the Black Thespian

**Student: Apsara**  
The Impact of Archaeological Tourism on Indigenous Communities

**Student: Seyoung**  
Third Culture Kids: Global Nomads in Search of a Home

**Student: Vidush**  
Female Prostitution in Thailand Among Youths

### 2010-2011 CAMD Scholars

**Student: Aazim**  
The Rise of Militant Islam in the Afghanistan/Pakistani Region

**Student: Hector**  
The School Bus: Vehicle of Boston’s Desegregation Legacy

**Student: Matthew**  
Atheism in America: An Analysis of Nonbelievers

**Student: Jennifer**  
A+ Because I’m Asian: An Examination of the Model Minority Myth

### 2009-2010 CAMD Scholars

**Student: Mandisa**  
A Glimpse of South Africa: Through the Eyes of Its Youth

**Student: Alessandra**  
Dreams: Lost in Translation? The Impact of Immigration on Childhood Aspirations

**Student: Lily**  
The Changing Face of Judaism: A Search for Jewish Identity in North America

**Student: Bijan**  
The Stigma of Class

**Student: Jae-Hyuk**  
Asian Americans in US Politics
Brace Center for Gender Studies
Student Fellow Presentation Series

Each spring, returning Phillips Academy students are invited to submit proposals for fellowships to support independent summer research projects in gender studies, including multiracial and multicultural dimensions. The Student Fellows Series is presented in the fall and provides an opportunity for the fellows to share their research findings in a public forum.

2010-2011

Student Fellow: Seyoung
Seek My Face, Hear My Voice: Foreign Domestic Workers in Hong Kong

Student Fellow: Kerry
No More Shame, No More Blame: Women and Aids in South Africa

Student Fellow: Yerin
South Korean Working Mothers: Entangled in a Web of Confucian and Modern Values

Student Fellow: Midori
More Than Just a Women’s Issue: The Prevalence of Rape Myth Acceptance in Society and its Implications for Adolescents

Student Fellow: Diego
The Struggles and Achievements of Ecuadorian Women in the Workplace

2009-2010

Student Fellow: Taylor
Queersighted: Portrayals of Gays and Lesbians in the Mass Media

Student Fellow: Mari
Hired for Life: Translating the Historic Problems of the Modern Japanese Company Man

Student Fellow: Ellen
Stand By Your Man: Media Reaction and Public Perception of Cases of Adultery in High Profile Politicians

Student Fellow: Juliet
Chinatown’s Working Women: The Forging of a New Social Identity

Student Fellow: Meredith
Muslim Women in Politics: Paradox or Reality?