Funding by the NSF Graduate Teaching Fellows Program in K-12 Education (GK-12) DGE 0538555

UD GK-12 Website Development

Jeff Spraggins: www.udel.edu/GK-12


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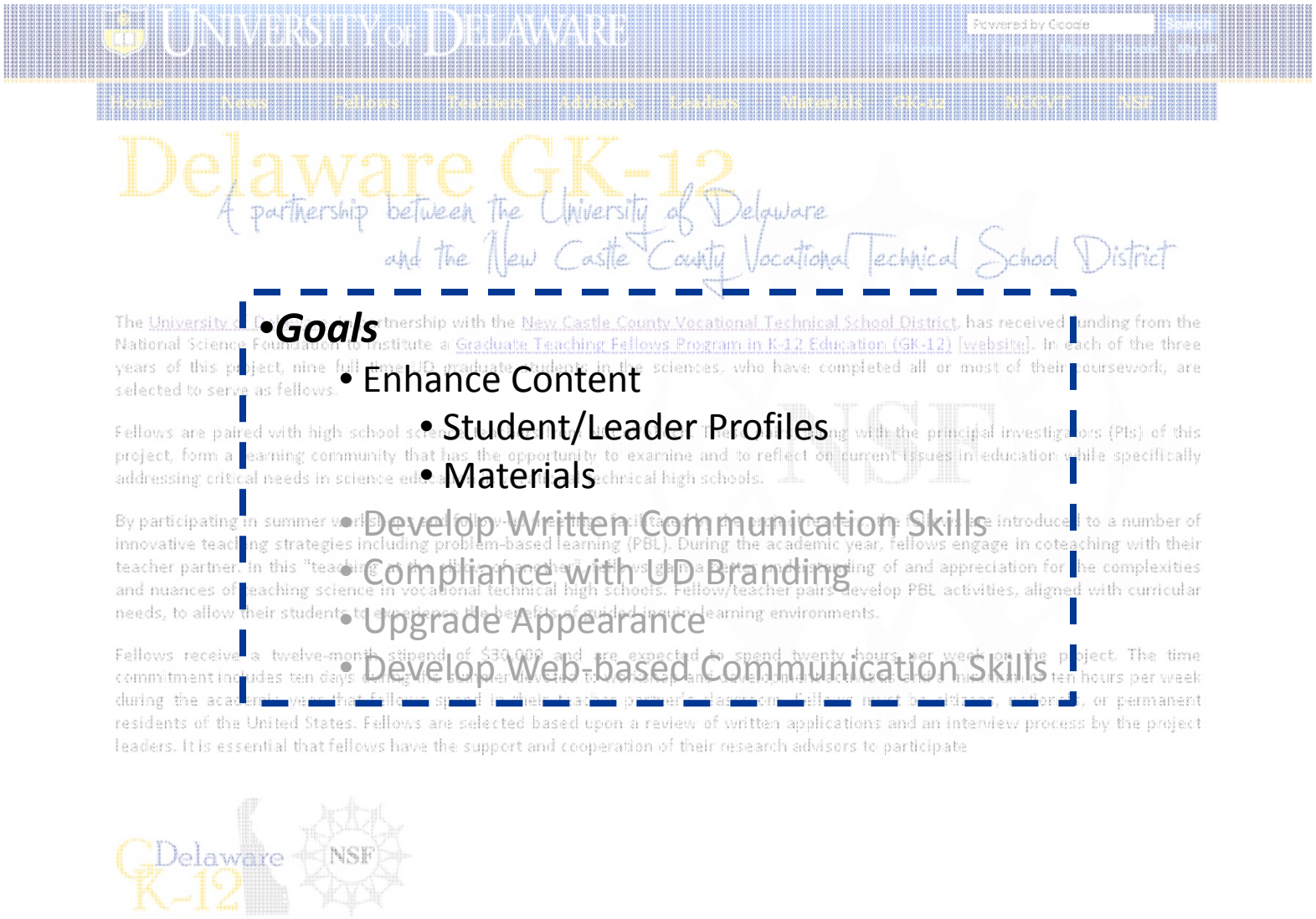
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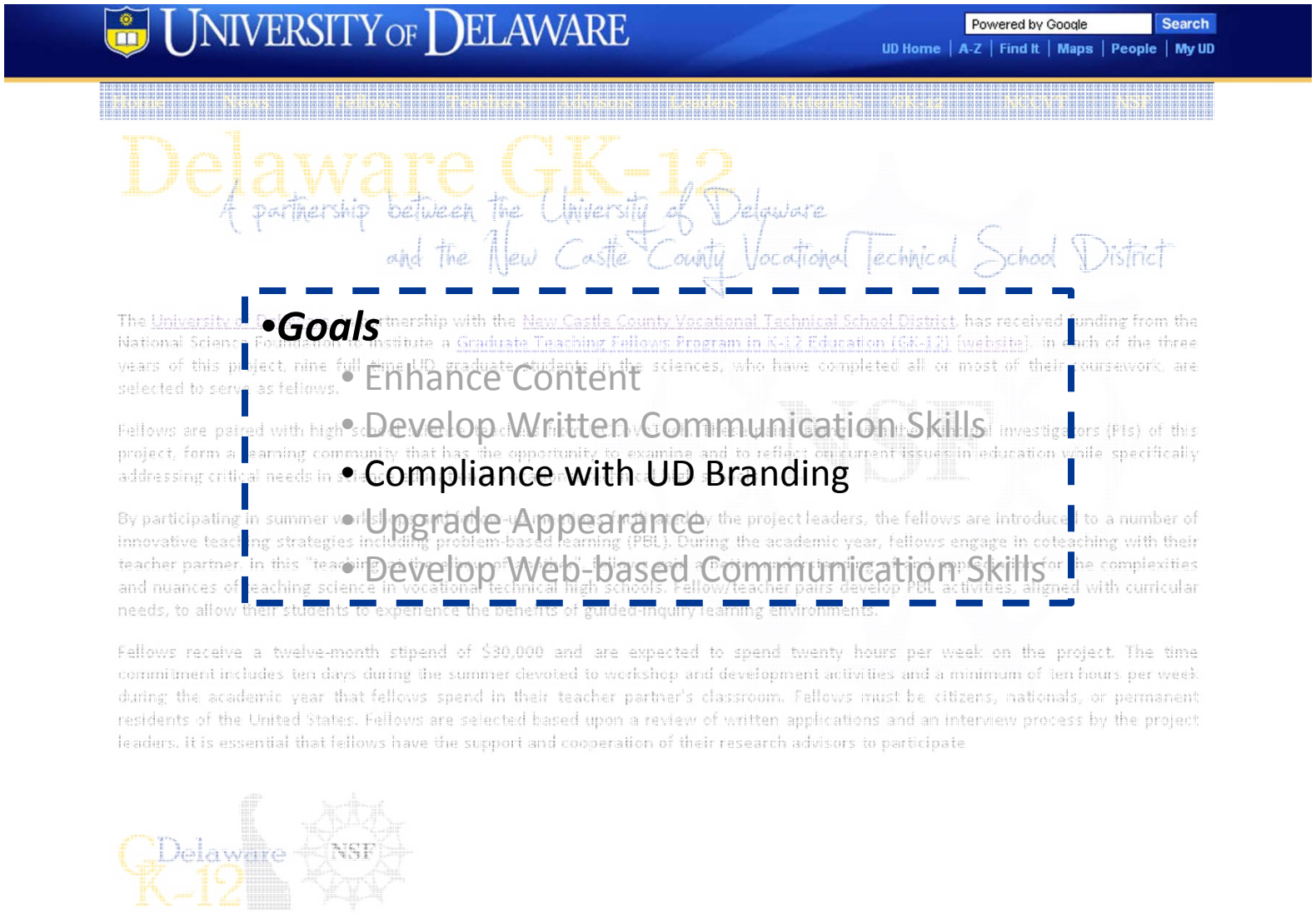
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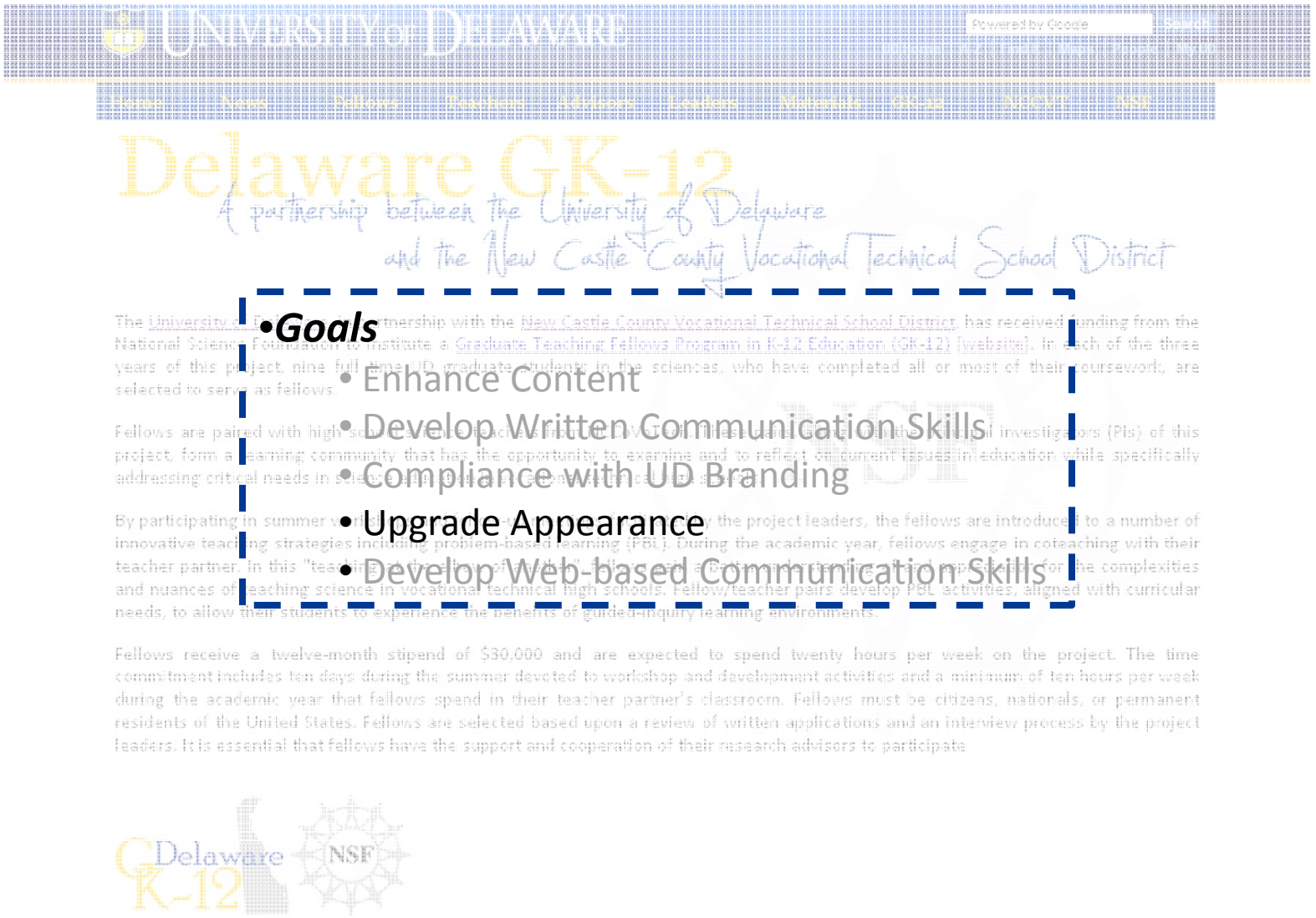
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Fellows Teachers Advisors Leaders Press/Media

2008 Press Coverage:

University of Delaware:
6/11/2008, UDaily: "Symposium highlights NSF GK-12 UD fellows' work" (article pdf, photos: 1, 2)

2007 Press Coverage:

University of Delaware:
5/24/2007, UDaily: "NSF GK-12 conference showcases UD fellows' work" (article pdf, photos: 1, 2, 3)
2/20/2007, UDaily: "NSF-funded program boosts teachers' skills" (article pdf, photo)

NSF, March 2007: Delaware GK-12 receives honorable mention for Media Award (photo)

2006 Press Coverage:

4/24/2006 Press Event at Howard High School of Technology:
PowerPoint presentation (3.9 Mb) [Updated Oct 2006 to include all 2006 Teachers and Fellows]

University of Delaware:
4/25/2006, UDaily: "UD, NCC vo-tech district announce NSF project" (article pdf, cover pdf, photo)
8/17/2006, UDaily: "NSF workshops target science education, teaching methods" (article pdf, photo)

The News Journal/delawareonline.com:
4/24/2006 print "School to offer science for real world" (article pdf)
4/24/2006 p.m. newscast (local copy) [play 0:51 to 1:38]

WDEL 1150AM News Talk Radio:
4/24/2006 newscast (local copy)

Conference Presentations:

October 2006, Annual Meeting of Geological Society of America, Philadelphia
poster "Delaware GK-12: Improvement of Science Education in Vocational Technical High Schools through Collaborative Learning and Co-Teaching" (abstract, poster)

March 2007, Seventh Annual NSF GK-12 Project Meeting, Washington, DC
poster "Delaware GK-12: Improvement of Science Education in Vocational Technical High Schools through Collaborative Learning and Co-Teaching" (abstract, poster jpg, poster pdf [71Mb!])

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[in the News...]

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Delaware GK-12

A partnership between the University of Delaware and the New Castle County Vocational Technical School District

The University of Delaware, in partnership with the New Castle County Vocational Technical School District, has received funding from the National Science Foundation to institute a Graduate Teaching Fellows Program in K-12 Education (GK-12) [website]. In each of the three years of this project, nine full time UD graduate students in the sciences, who have completed all or most of their coursework, are selected to serve as fellows.

Fellows are paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

By participating in summer workshops and follow-up meetings facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of $30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate

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- 2007 Fellows
- 2008 Fellows
  - Adam Aguiar
  - Christy Beal
  - Mary Boggs
  - Dana Boltuch
  - Kristy Longsdorf
  - Patricia Jones
  - Jeffrey Spraggins
  - Joshua Wickman
- Application

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[2008-2009 Graduate Teaching Fellows]

[Home] [Fellows] [2008 Fellows] [2007 Fellows] [2006 Fellows] [UD Graduate Fellowship Application]

[Adam Aguilar]
Biological Sciences
aaguilar@udel.edu
5-min Presentations
Research: PPT, PDF
Teaching: PPT, PDF

[Christy Beall]
Entomology and Wildlife Ecology
niobe@udel.edu
5-min Presentations
Research: PPT, PDF
Teaching: PPT, PDF

[Mary Boggs]
Biological Sciences
mboggs@udel.edu
5-min Presentations
Research: PPT, PDF
Teaching: PPT, PDF

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Delaware GK-12

[Profile: Adam Aguiar]

[Home] [Fellows] [2008 Fellows] [Adam Aguiar]

Myself and My Research: I am 25 years old and from a little town on the coast of central New Jersey. Being a graduate student at the University of Delaware is a privilege in that I can visit my parents and three younger brothers at my leisure. Here at UD I'm currently pursuing my PhD in molecular biology where my area of study focuses on the implications of a specific protein in prostate cancer (PCa) progression. Techniques like cell culturing, invasion-, migration-, and growth-assays allow me to investigate the functions of this protein on a variety of PCa cell model systems. My hopes are that the research I complete here contributes and eventually leads to improved treatment strategies and diagnostic measures for people suffering from PCa. The passion I have for research and teaching that led me to pursue this track mold my future aspirations as well. I plan to use the skills I acquire here in obtaining a post doctoral degree. Ultimately, my goal is to find a position as a full professor at a small university, and possibly aiding in additional cancer research.

In The Classroom: At Saint George's Vocational High School I work with Mr. Mike Kittel in teaching sophomore biology. Here I implement methods and equipment from the laboratory at UD in exposing the students to how science is currently undertaken in today's field. Also, bringing my knowledge base on cancer and cell biologies surely adds to lesson impact and classroom discussion for many topics. Relating such material to practical, real-life, applications is a consistent goal of mine. From this experience my love for teaching has grown even further, and I have gotten as much from the students as they've received from the classroom.

Developed Class Material

Research: PPT, PDF Teaching: PPT, PDF

Lectures (PPT): *coming soon*

Lectures (PDF): *coming soon*

Additional Information

Contact: aaguiar@udel.edu

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Lectures (PPT): *coming soon*
Lectures (PDF): *coming soon*

Additional Information
Contact: aaguiar@udel.edu

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Delaware GK-12

[Profile: Christy Beal]

[Home] [Fellows] [2008 Fellows] [Christy Beal]

Research: The purpose of my PhD project is to determine if birds prefer to forage for insects on native tree species as opposed to non-native trees. Several previous studies have focused on the fact that insect biomass is higher on native plants than on alien plants. Most birds, even those that eat seeds as adults, feed their young caterpillars. Caterpillars provide a high energy food source in a convenient carrying package that can be easily feed to baby birds. If native vegetation, and its associated insects, attracts a greater number of birds, much of the general public could be encouraged to actively participate in creating a suburban environment that is usable by a large variety of insect and bird species, as well as appealing to humans. The average homeowner does not want to encourage insects to live on their plants. However, encouraging backyard birds is a billion dollar business. According to a survey conducted by the U.S. Fish and Wildlife Service on Fishing, Hunting and Wildlife Recreation over 52 million Americans consider themselves, at least to some degree, to be bird watchers. I have been comparing bird foraging frequency and caterpillar biomass on native and non-native landscape trees in suburban and park areas in Southern New Jersey and Eastern Pennsylvania. Data collection began in the Spring of 2007. At each site bird counts are conducted by both myself and volunteers on ten different species of commonly planted landscape trees. Simultaneously, caterpillar biomass for each tree is determined by collecting frass (caterpillar droppings). Frass is weighed and the individual pellets counted for each 24-hour period during bird counts.

In the classroom: Since I started my graduate [illegible] semester TAing or teaching introductory courses for Entomology. The GK-12 program offered me a fantastic opportunity to adapt my teaching to high school students, and to learn how to work with an age group that I had no previous experience with.

Working with Lisa Currie has been a blast. Ninth grade integrated science provides the students with a general overview of physics, chemistry and Earth science. In addition, Lisa has facilitated the addition of a little entomology and soil science into the regular curriculum.

Developed Class Material
Research: PPT, PDF Teaching: PPT, PDF

Lectures (PPT): *coming soon*
Lectures (PDF): *coming soon*

Additional Information
Contact: niebs@udel.edu
Center for Managed Ecosystems

This year, we tied soils and insects into conservation of matter and cycles in the hope of linking classroom labs to the world that the kids live in every day. I am a firm believer that science needs a bit of a WOW! factor to keep kids interested, but it also needs to be linked to everyday life to be truly comprehended. Pet cockroaches and sorting through dirt for worms and insect are a memorable link to real science in the classroom. Additionally, the students worked on a two week renewable energy project that related their everyday choices to global issues.

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Delaware GK-12

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Research: PPT, PDF Teaching: PPT, PDF

Lectures (PPT): *coming soon*
Lectures (PDF): *coming soon*

Additional Information
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Delaware GK-12

[Profile: Mary Boggs]

[Home] [Fellows] [2008 Fellows] [Mary Boggs]

Research: My research focuses on understanding the mechanism of pain sensation in bone. How pain is transmitted when disease or injury occurs in bone, especially in patients with cancer that has metastasized to bone, is not well understood and thus the pain is not well treated. A better understanding of this mechanism will aid in targeting therapeutics to better treat patients with pain induced by bone cancer.

I hypothesize that the mechanism of pain sensation is through cell-to-cell communication between the most abundant cell type of bone cell and sensory neurons that innervate bone. In order to study this communication, I prepare surfaces that are patterned with two types of extracellular matrix proteins using a technique called micro-contact printing. This allows me to culture both cell types together to better study their interactions.

Further studies focus on manipulating bone cells on the patterned surfaces and monitoring for changes in intracellular calcium and membrane potential in the neuron, which would be indicative of direct activation of the neuron through bone cell activity. An understanding of this would be useful for development of better therapeutics to treat cancer induced bone pain.

In the classroom: Teaching science to students has been a vital part of my upbringing as a scientist. I began working with students when I was in college, particularly with undergraduates in biology, chemistry and organic chemistry. With this experience, I have learned that in order to really understand the sciences, one must appreciate it and understand it by being able to relate to it. I believe that if you are able to relate science to what you do in your everyday life, it drives you to appreciate, and desire to learn it.

Developed Class Material
Research 2007: PPT, PDF Teaching 2007: PPT, PDF
Research 2008: PPT, PDF Teaching 2008: PPT, PDF

Lectures (PPT): *coming soon*
Lectures (PDF): *coming soon*

Additional Information
Contact: mboggs@udel.edu

Working with Phyllis Meyer last year, we developed a project on having students understand the cell cycle by relating it to what happens when the cycle loses regulation, mainly, cancer. Giving this model to the students provided them with an initiative to understand and learn the material. This year, my work with Mike Kittel has focused primarily on understanding how enzymes work in the body, and why people with enzyme deficiencies require supplements. One example of this was using a lab focused on Beano® and lactase to discuss what the enzymes do, having the students collect data in a system where the enzyme was either present or not, and then discussing how it is useful in the body. Aside from this, I am also working with Florence Malinowski in development of the Biotechnology Career area at St. George's. My work there focuses on helping students with the essential techniques and understanding that they need for working in the biology lab setting.

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Lectures (PPT): *coming soon*
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Delaware GK-12

[Profile: Dana Boltuch]

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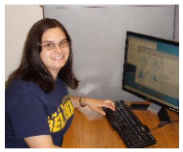

Research: My research is doing gamma-ray astronomy with the VERITAS collaboration. VERITAS (the Very Energetic Radiation Imaging Telescope Array System) is an Imaging Atmospheric Cherenkov Telescope (IACT) located in southern Arizona. Gamma-rays, like all light, travel through space in a straight line. Some of the gamma-ray photons produced by an object in space will intersect Earth, allowing us to "see" the object they came from in gamma-ray light. Although gamma rays themselves cannot penetrate Earth's atmosphere, when a gamma ray hits the upper atmosphere, it decays into a shower of particles and visible photons that travel along the same path as the incoming gamma ray.

This visible light is what IACTs see, allowing us to observe gamma ray sources from the ground. Gamma rays are the most energetic form of radiation in the universe, far more energetic than visible light. Because they are so energetic, they can only be produced in extreme environments that are impossible to recreate on Earth. Gamma rays are seen from the far reaches of the universe in things like quasars and gamma-ray bursts, but they can also be produced by sources within the Milky Way. Some examples of galactic gamma ray sources are black holes, supernovae, and pulsars. These galactic sources of gamma rays are the focus of my work with the VERITAS collaboration.

In the classroom: I have long had an interest in education and teaching. As an undergraduate, I did research in Physics education and helped to develop a curriculum for a portable planetarium to teach high school students about radio astronomy. Now, as a graduate student, I have had further experiences in the classroom through my participation in the GK-12 program. During the 2008-2009 school year, I have worked with teacher Jessica Jackson, as well as teacher Timothy Brewer and fellow graduate student Joshua Wickman, to develop curricular materials to teach 11th grade Integrated Science students about multiwavelength astronomy and energy. We have also investigated the effectiveness of alternative testing methods at revealing student understanding with students in an inclusion special education model.

Developed Class Material
Research: PPT, PDF Teaching: PPT, PDF

Lectures (PPT): *coming soon*
Lectures (PDF): *coming soon*

Additional Information
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[Home] [Fellows] [2008 Fellows] [Adam Aguiar]
Myself and My Research: I am 25 years old and from a l
Jersey. Being a graduate student at the University of Delau
parents and three younger brothers at my leisure. Here a
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prostate cancer (PCa) progression. Techniques like cell
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systems. My hopes are that the research I complete her
improved treatment strategies and diagnostic measures
passion I have for research and teaching that led me
aspirations as well. I plan to use the skills I acquire her
Ultimately, my goal is to find a position as a full profess
aiding in additional cancer research.
In The Classroom: At Saint George's Vocational
High School I work with Mr. Mike Kittel in
teaching sophomore biology. Here I implement
methods and equipment from the laboratory at
UD in exposing the students to how science is
currently undertaken in today's field. Also,
bringing my knowledge base on cancer and cell
biologies surely adds to lesson impact and
classroom discussion for many topics.
Relating such material to practical, real-life,
applications is a consistent goal of mine.
From this experience my love for teaching has
grown even further, and I have gotten as much from the students as they've received from the cl
Developed Class Material
Research: PPT, PDF
Teaching: PPT, I
Lectures (PPT): coming soon
Lectures (PDF): coming soon
Additional Information
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change
direct activation of the neuron through bone cell activity. An understanding of this would be useful for
development of better therapeutics to treat cancer induced bone pain.
In the classroom: Teaching science to
students has been a vital part of my
upbringing as a scientist. I began working
with students when I was in college,
particularly with undergraduates in biology,
chemistry and organic chemistry. With this
experience, I have learned that in order to
really understand the sciences, one must
appreciate it and understand it by being able
to relate to it. I believe that if you are able to
relate science to what you do in your
everyday life, it drives you to appreciate, and
desire to learn it.
Developed Class Material
Research 2007: PPT, PDF
Research 2008: PPT, PDF
Teaching 2007: PPT, PDF
Teaching 2008: PPT, PDF
Lectures (PPT): coming soon
Lectures (PDF): coming soon
Additional Information
Contact: mboggs@udel.edu
Working with Phyllis Meyer last year, we developed a project on having students understand the cell cycle by relating it to what
happens when the cycle loses regulation, mainly, cancer. Giving this model to the students provided them with an initiative to
understand and learn the material. This year, my work with Mike Kittel has focused primarily on understanding how enzymes
work in the body, and why people with enzyme deficiencies require supplements. One example of this was using a lab focused on
Beano® and lactase to discuss what the enzymes do, having the students collect data in a system where the enzyme was either
present or not, and then discussing how it is useful in the body. Aside from this, I am also working with Florence Malinowski in
development of the Biotechnology Career area at St. George's. My work there focuses on helping students with the essential
techniques and understanding that they need for working in the biology lab setting.
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Delaware GK-12
Profile: Kristy Longsdorf
[Home] [Fellows] [2007 Fellows] [2008 Fellows] [Kristy Longsdorf]
Research: My research is part of a collaboration between the Beebe (analytical chemistry) and Fox
(organic chemistry) research groups at the University of Delaware. We are exploring the
development of a novel method for attaching biological molecules, like proteins, on unnatural
surfaces, such as glass and silicon. While many methods exist for attaching biomolecules, these
methods do not directly control how the molecule is oriented relative to the surface. This can
affect the biomolecule's function and interaction with other molecules if it is facing the wrong
direction. My goal is to use an organic molecule as a tether to link biomolecules to the surface so
that after they are attached to a surface they are facing the "right" way and can still do their job.
This chemistry has many applications ranging from lab-on-a-chip research to biomedical
industries.
As a surface scientist, the chemical changes made to the glass or silicon surfaces are monitored through surface-sensitive
techniques, such as X-ray photoelectron spectroscopy (XPS) and time-of-flight secondary ion mass spectrometry (TOF-SIMS). XPS
is useful for determining chemical state information that tells whether the carbon on the sample is from a carbon-carbon,
carbon-oxygen or carbon-hydrogen bond. TOF-SIMS provides chemical composition information from masses of chemical
fragments. Similar to putting pieces of a jigsaw puzzle together, we use the different mass fragments to see if they fit together to
make the compounds we put on the surface.
In the classroom: The GK-12 program has
provided a unique insight to teaching at the
high school level that I would have otherwise
never known. As a returning GK-12 fellow, I
have had the opportunity to work with both
Krista Webb and Terence Blanch within the
NCCVT School District. For the 2007-08 school
year at Delcastle High School, Krista and I
worked with 9th grade students in Physical
Science and 11th grade students in
Integrated Science. As a special education
teacher, Krista was interested in creating
more hands-on experiences for the various
types of learners in her classroom. In the second semester we developed several activities to engage students for the astronomy
portion of the Integrated Science course.
Developed Class Material
Research 2008: PPT, PDF
Research 2007: PPT, PDF
Teaching 2008: PPT, PDF
Teaching 2007: PPT, PDF
Lectures (PPT): coming soon
Lectures (PDF): coming soon
Additional Information
Contact: kristy@udel.edu
Currently, at St. Georges High School Terence Blanch and I have 9th graders for Physical Science. Our goal this semester is to use
the technology of digital media to enhance student performance and understanding of scientific inquiry and experimentation. In
lectures we currently use digital video camera to display demonstrations on the projector screens for easier viewing. Digital
cameras are also used to capture images during a lab experiment for later reference and class discussion. We plan to have
students experiment with video lab reports giving them a chance to verbally explain their experiment and results versus the
conventional written form.
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Delaware GK-12
Profile: Christy Beal
[Home] [Fellows] [2008 Fellows] [Christy Beal]
Research: The purpose of my PhD project is to determine if birds prefer to forage for insects on
native tree species as opposed to non-native trees. Several previous studies have focused on
the fact that insect biomass is higher on native plants than on alien plants. Most birds, even
those that eat seeds as adults, feed their young caterpillars. Caterpillars provide a high energy
food source in a convenient carrying package that can be easily fed to baby birds. If native
vegetation, and its associated insects, attracts a greater number of birds, much of the general
public could be encouraged to actively participate in creating a suburban environment that is
usable by a large variety of insect and bird species, as well as appealing to humans. The
average homeowner does not want to encourage insects to live on their plants. However,
encouraging backyard birds is a billion dollar business. According to a survey conducted by the
U.S. Fish and Wildlife Service on Fishing, Hunting and Wildlife Recreation over 52 million
Americans consider themselves, at least to some degree, to be bird watchers. I have been
comparing bird foraging frequency and caterpillar biomass on native and non-native landscape trees in suburban and park areas
in Southern New Jersey and Eastern Pennsylvania. Data collection began in the Spring of 2007. At each site bird counts are
conducted by both myself and volunteers on ten different species of commonly planted landscape trees. Simultaneously,
caterpillar biomass for each tree is determined by collecting frass (caterpillar droppings). Frass is weighed and the individual
pellets counted for each 24-hour period during bird counts.
In the classroom: Since I started my graduate
semester TAing or teaching introductory
courses for Entomology. The GK-12 program
offered me a fantastic opportunity to adapt
my teaching to high school students, and to
Developed Class Material
Research: PPT, PDF
Teaching: PPT, PDF
Lectures (PPT): coming soon
Lectures (PDF): coming soon
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News Fellows Teachers Advisors Leaders Materials GK-12 NCCVT NSF
elaware GK-12
Profile: Dana Boltuch
[Fellows] [2008 Fellows] [Dana Boltuch]
Research: My research is doing gamma-ray astronomy with the VERITAS collaboration.
VERITAS (the Very Energetic Radiation Imaging Telescope Array System) is an Imaging
Atmospheric Cherenkov Telescope (IACT) located in southern Arizona. Gamma-rays, like all
light, travel through space in a straight line. Some of the gamma-ray photons produced by
an object in space will intersect Earth, allowing us to "see" the object they came from in
gamma-ray light. Although gamma rays themselves cannot penetrate Earth's atmosphere,
when a gamma ray hits the upper atmosphere, it decays into a shower of particles and
visible photons that travel along the same path as the incoming gamma ray.
This visible light is what IACTs see, allowing us to observe gamma ray sources from the
ground. Gamma rays are the most energetic form of radiation in the universe, far more
energetic than visible light. Because they are so energetic, they can only be produced in
ne environments that are impossible to recreate on Earth. Gamma rays are seen from the far reaches of the universe in
like quasars and gamma-ray bursts, but they can also be produced by sources within the Milky Way. Some examples of
tic gamma ray sources are black holes, supernovae, and pulsars. These galactic sources of gamma rays are the focus of my
with the VERITAS collaboration.
classroom: I have long had an interest in
education and teaching. As an
undergraduate, I did research in Physics
education and helped to develop a
curriculum for a portable planetarium to
teach high school students about radio
astronomy. Now, as a graduate student, I
have had further experiences in the
classroom through my participation in the
GK-12 program. During the 2008-2009 school
year, I have worked with teacher Jessica
Jackson, as well as teacher Timothy Brewer
and fellow graduate student Joshua Wickman, to develop curricular materials to teach 11th grade Integrated Science students
about multiwavelength astronomy and energy. We have also investigated the effectiveness of alternative testing methods at
revealing student understanding with students in an inclusion special education model.
Developed Class Material
Research: PPT, PDF
Teaching: PPT, PDF
Lectures (PPT): coming soon
Lectures (PDF): coming soon
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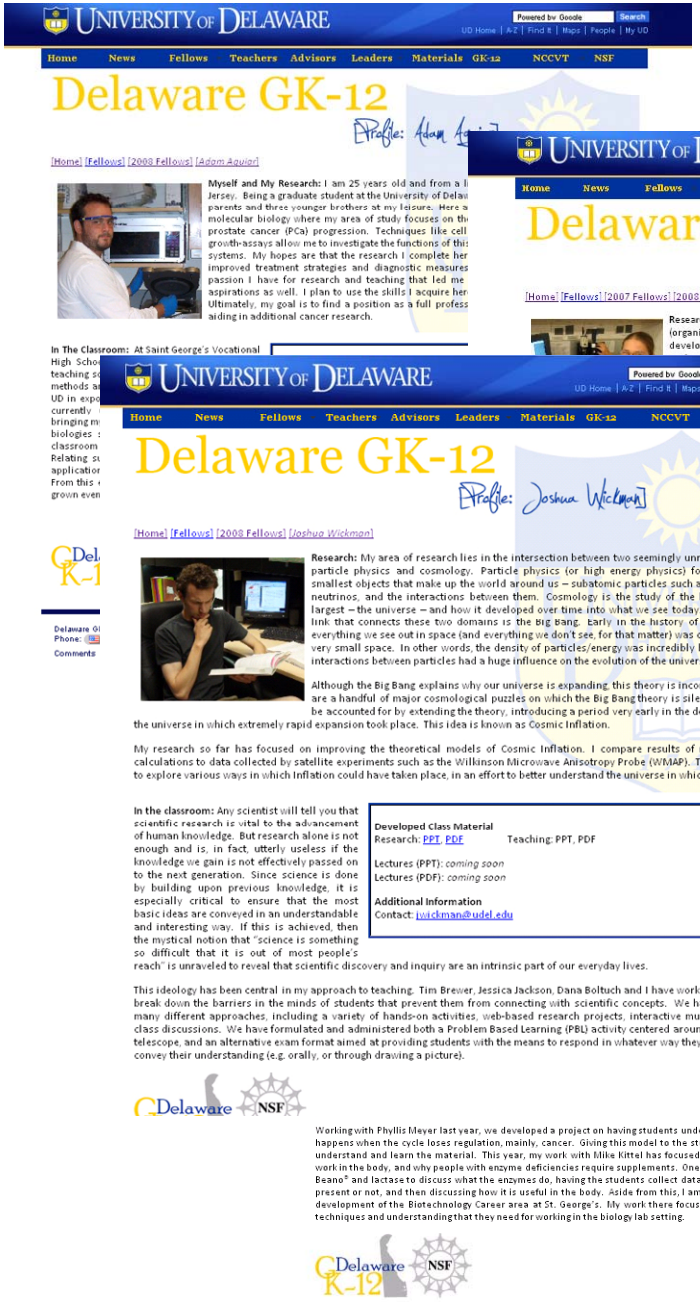
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Delaware GK-12
Profile: Adam Aguiar
[Home] [Fellows] [2008 Fellows] [Adam Aguiar]
Myself and My Research: I am 25 years old and from a l
Jersey. Being a graduate student at the University of Delau
parents and three younger brothers at my leisure. Here a
molecular biology where my area of study focuses on th
prostate cancer (PCa) progression. Techniques like cell
growth-assays allow me to investigate the functions of thi
systems. My hopes are that the research I complete her
improved treatment strategies and diagnostic measures
passion I have for research and teaching that led me
aspirations as well. I plan to use the skills I acquire her
Ultimately, my goal is to find a position as a full profess
aiding in additional cancer research.
In The Classroom: At Saint George's Vocational
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Delaware GK-12
Profile: Kristy Longsdorf
[Home] [Fellows] [2007 Fellows] [2008 Fellows] [Kristy Longsdorf]
Research: My research is part of a collaboration between
(organic chemistry) research groups at the Universit
development of a novel method for attaching biologica
d silicon. While many method
ontrol how the molecule is o
unction and interaction with
an organic molecule as a tet
d to a surface they are facing
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al Information
kristy@udel.edu
r we developed several activit
have 9th graders for Physical
rmance and understanding of
y demonstrations on the proj
experiment for later reference
a chance to verbally explain
ms would be useful for
Delaware GK-12
Profile: Joshua Wickman
[Home] [Fellows] [2008 Fellows] [Joshua Wickman]
Research: My area of research lies in the intersection between two seemingly unrelated topics, particle physics and cosmology. Particle physics (or high energy physics) focuses on the smallest objects that make up the world around us – subatomic particles such as quarks and neutrinos, and the interactions between them. Cosmology is the study of the largest of the largest – the universe – and how it developed over time into what we see today. The missing link that connects these two domains is the Big Bang. Early in the history of the universe, everything we see out in space (and everything we don't see, for that matter) was contained in a very small space. In other words, the density of particles/energy was incredibly high, meaning interactions between particles had a huge influence on the evolution of the universe.
Although the Big Bang explains why our universe is expanding, this theory is incomplete. There are a handful of major cosmological puzzles on which the Big Bang theory is silent. These can be accounted for by extending the theory, introducing a period very early in the development of the universe in which extremely rapid expansion took place. This idea is known as Cosmic Inflation.
My research so far has focused on improving the theoretical models of Cosmic Inflation. I compare results of mathematical calculations to data collected by satellite experiments such as the Wilkinson Microwave Anisotropy Probe (WMAP). This allows us to explore various ways in which Inflation could have taken place, in an effort to better understand the universe in which we live.
In the classroom: Any scientist will tell you that scientific research is vital to the advancement of human knowledge. But research alone is not enough and is, in fact, utterly useless if the knowledge we gain is not effectively passed on to the next generation. Since science is done by building upon previous knowledge, it is especially critical to ensure that the most basic ideas are conveyed in an understandable and interesting way. If this is achieved, then the mystical notion that "science is something so difficult that it is out of most people's reach" is unraveled to reveal that scientific discovery and inquiry are an intrinsic part of our everyday lives.
Developed Class Material
Research: PPT, PDF Teaching: PPT, PDF
Lectures (PPT): coming soon
Lectures (PDF): coming soon
Additional Information
Contact: jwickman@udel.edu
This ideology has been central in my approach to teaching. Tim Brewer, Jessica Jackson, Dana Boltuch and I have worked together to break down the barriers in the minds of students that prevent them from connecting with scientific concepts. We have employed many different approaches, including a variety of hands-on activities, web-based research projects, interactive multimedia, and class discussions. We have formulated and administered both a Problem Based Learning (PBL) activity centered around designing a telescope, and an alternative exam format aimed at providing students with the means to respond in whatever way they feel will best convey their understanding (e.g. orally, or through drawing a picture).
Delaware NSF
Working with Phyllis Meyer last year, we developed a project on having students understand the cell cycle by relating it to what happens when the cycle loses regulation, mainly, cancer. Giving this model to the students provided them with an initiative to understand and learn the material. This year, my work with Mike Kittel has focused primarily on understanding how enzymes work in the body, and why people with enzyme deficiencies require supplements. One example of this was using a lab focused on Beano® and lactase to discuss what the enzymes do, having the students collect data in a system where the enzyme was either present or not, and then discussing how it is useful in the body. Aside from this, I am also working with Florence Malinowski in development of the Biotechnology Career area at St. George's. My work there focuses on helping students with the essential techniques and understanding that they need for working in the biology lab setting.
Delaware GK-12
Profile: Christy Beal
[Home] [Fellows] [2008 Fellows] [Christy Beal]
Research: The purpose of my PhD project is to determine if birds prefer to forage for insects on native tree species as opposed to non-native trees. Several previous studies have focused on the fact that insect biomass is higher on native plants than on alien plants. Most birds, even those that eat seeds as adults, feed their young caterpillars. Caterpillars provide a high energy food source in a convenient carrying package that can be easily fed to baby birds. If native vegetation, and its associated insects, attracts a greater number of birds, much of the general public could be encouraged to actively participate in creating a suburban environment that is usable by a large variety of insect and bird species, as well as appealing to humans. The average homeowner does not want to encourage insects to live on their plants. However,
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hes of the universe in
ay. Some examples of
ys are the focus of my
ated Science students
ve testing methods at
Delaware GK-12
Profile: Patricia Jones
[Home] [Fellows] [2008 Fellows] [Patricia Jones]
Research: The extracellular matrix (ECM) is the major component of bone tissue and consists of proteins such as type I collagen and vitronectin. The adhesion of osteoblasts—the bone forming cells—to the extracellular bone matrix has been shown to be important to processes such as proliferation, differentiation, mineralization, and mechanotransduction. Consequently, my research concerns the signaling pathways that are activated in the osteoblast due to attachment to these matrix components. Previous research indicates that osteoblasts and osteoblast precursors respond to different ECM proteins in a unique manner. We believe that exposing osteoblast precursors to the appropriate ECM can drive these cells to increase their proliferative capacity. To that end, we are working on designing a three-dimensional scaffold that will maximize proliferative and anabolic responses of osteoblasts to the ECM.
In an aging population, the need for these kinds of artificial scaffolds to facilitate healing of osteoporotic and non-union fractures is great. Current therapies have many disadvantages including the risk of disease or death to the patient, as well as rejection of the implanted material. Understanding how osteoblasts respond to their extracellular environment and determining the conditions necessary for the proliferation of osteoblastic precursors in a three-dimensional scaffold will facilitate the development of novel and effective materials that will enhance bone formation and maintenance in vivo.
In the classroom: In the GK-12 program, I have been working with Florence Malinowski in the Biotechnology vocational classroom at St. Georges. This year, we have worked to introduce a number of standard laboratory techniques to the students, while also providing them with a basic working knowledge of the chemical and biological principles needed to succeed in the biotechnology field. Throughout the year, I have helped to design laboratory activities and lessons, as well as set up a tissue culture facility in the classroom. Some activities we have done in the lab this year include solution preparation, extraction of plant DNA, chromatography, transformation of E. coli, and plant tissue culture. Despite the great deal of behind the scenes work I have done in the classroom, I have most enjoyed my time spent working with the students in both the laboratory and classroom setting. Although I hope to have enhanced their experience in the classroom, the students have helped me to gain new perspectives on my own research through their insightful questions and thoughts. My participation in the GK-12 program has truly been an invaluable experience that has improved my teaching skills and has given me an appreciation of the importance of linking science education with scientific research.
Developed Class Material
Research: PPT, PDF Teaching: PPT, PDF
Lectures (PPT): coming soon
Lectures (PDF): coming soon
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Profile: Kristy Longsdorf
Profile: Christy Beal
Profile: Joshua Wickman
Profile: Jeffrey M. Spraggins
Profile: Patricia Jones
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Delaware GK-12

Profile: Jeffrey M. Spraggins

[Home] [Fellows] [2008 Fellows] [2007 Fellows] [Jeffrey Spraggins]

Research: My research focuses on the use of FT-ICR mass spectrometry for the analysis of environmentally significant samples. A Fourier Transform Ion Cyclotron Resonance Mass Spectrometer (FT-ICR Mass Spec) is an instrument that measures the masses of individual molecules that have been electrically charged to form ions. Although measuring the mass of something is not all that impressive, the ability of this instrument to measure individual ions with extreme accuracy and resolution merits such an intimidating name. In addition, the design of the instrument allows for it to be used as a gas phase beaker where reactions can be observed between ions and molecules in real time.

One example of how we use this powerful technique is our study of the environmentally important reactions between metal clusters and hydrogen sulfide. By monitoring these reactions within the mass spectrometer we have been able to understand more completely the reaction pathways and rates of reaction for cadmium clusters. Currently we are working on systems with iron and zinc metals. Reactions between metal clusters and hydrogen sulfide are important for understanding both the chemistry taking place near hydrothermal vents (geysers on our ocean floors) and the fate of metal pollutants in our natural waterways.

In the classroom: Although I enjoy research, teaching is my true passion. I have a couple fundamental beliefs that drive my teaching philosophy. I believe that (1) any student, if motivated, can learn (and enjoy) science and (2) there should be no separation between what is taught in the classroom and the research that we, as scientists, focus so much of our time and effort working on.

Working with Terry Blanch (St. Georges

Developed Class Material

Research: PPT, PDF Teaching: PPT, PDF

Lectures (PPT): [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11]

Lectures (PDF): [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11]

Hydrothermal Vent Activity 1: Underwater Volcanoes

Hydrothermal Vent Activity 2: Discovery of a New Ecosystem

Hydrothermal Vent Activity 3: Discovery of a New Ecosystem 2

Presentations


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A partnership betw ersity of Delaware
and the New Castle County Vocational Technical School District
The University of Delaware, in partnership with the New Castle County Vocational Technical School District, has received funding from the National Science Foundation to institute a Graduate Teaching Fellows Program in K-12 Education (GK-12) [website]. In each of the three years of this project, nine full time UD graduate students in the sciences, who have completed all or most of their coursework, are selected to serve as fellows.
Fellows are paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.
NSF
By participating in summer workshops and follow-up meetings facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.
Fellows receive a twelve-month stipend of $30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate
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[2008-2009 Teachers]

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Amy Quillen
Science Specialist
NCC Vo-Tech School District

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Jamie Holder Physics & Astronomy jholder@physics.udel.edu Dana Boltuch
Randy Duncan Biological Sciences RLDUNCAN@udel.edu Patricia Jones
Doug Tallamy Entomology & Wildlife Ecology DTALLAMY@udel.edu Christy Beal
Tom Beebe Chemistry & Biochemistry BEEBE@udel.edu Mary Boggs
Kristy Longsdorf
Doug Ridge Chemistry & Biochemistry DOUGR@udel.edu Jeffrey Spraggins


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George Watson
Kathryn Scantlebury
Deborah Allen
Richard Donham
John Madsen
Amy Quillen
Jane Butler Kahle
Delaware GK-
A partnership between the University
and the New Castle
nal Technical School District
The University of Delaware, in partnership with the New Castle Coun
cal School District, has received funding from the National Science Foundation to institute a Graduate Teaching Fellow
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Delaware GK-12

[Delaware GK-12 Project Leaders]

[Home] [Leaders]

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Profile: George H. Watson

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George H. Watson holds a Ph.D. in Physics and is the Unidel Professor of Physics at the University of Delaware; he is currently the Deputy Dean of the College of Arts and Sciences at UD. He serves as the principal investigator of the National Science Foundation GK-12 Project "Improvement of Science Education in Vocational Technical High Schools through Collaborative Learning and Coteaching".

George is director and founding member of the Institute for Transforming Undergraduate Education, created by UD to promote reform of undergraduate education through faculty development and course design. He has been a member of several organizing committees for international problem-based learning conferences, including PBL2002, hosted by the University of Delaware, PBL2006, PBL2008, and PBL2010. He has been supported by a NSF DUE grant for development of PBL curricula for introductory physics and be ALO/USAID funding for a project on science education reform in Peru through PBL.

George's physics research has been in experimental condensed matter physics and laser spectroscopy, funded by NSF in the areas of optically-disordered random media, photon localization, and photonic band structure measurements, particularly in colloidal crystals.

See George Watson's Home Page for more information.
Contact: ghw@udel.edu

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- 2008 Fellows
- 2007 Fellows
- 2006 Fellows

Delaware GK-12

A partnership between the University of Delaware and the New Castle County Vocational Technical School District

The University of Delaware, in partnership with the New Castle County Vocational Technical School District, has received funding from the National Science Foundation to institute a Graduate Teaching Fellows Program in K-12 Education (GK-12) [website]. In each of the three years of this project, nine full time UD graduate students in the sciences, who have completed all or most of their coursework, are selected to serve as fellows.

Fellows are paired with high school science teachers from NCCoVoTech. These pairs, along with the principal investigators (PIs) of this project, form a learning community that has the opportunity to examine and to reflect on current issues in education while specifically addressing critical needs in science education in vocational technical high schools.

By participating in summer workshops and follow-up meetings facilitated by the project leaders, the fellows are introduced to a number of innovative teaching strategies including problem-based learning (PBL). During the academic year, fellows engage in coteaching with their teacher partner. In this "teaching at the elbow of another", fellows gain a better understanding of and appreciation for the complexities and nuances of teaching science in vocational technical high schools. Fellow/teacher pairs develop PBL activities, aligned with curricular needs, to allow their students to experience the benefits of guided-inquiry learning environments.

Fellows receive a twelve-month stipend of $30,000 and are expected to spend twenty hours per week on the project. The time commitment includes ten days during the summer devoted to workshop and development activities and a minimum of ten hours per week during the academic year that fellows spend in their teacher partner's classroom. Fellows must be citizens, nationals, or permanent residents of the United States. Fellows are selected based upon a review of written applications and an interview process by the project leaders. It is essential that fellows have the support and cooperation of their research advisors to participate

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Delaware GK-12

[Developed Materials: 2007-2008 GK-12 Fellows]

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Teacher Pair: Brian Heeney

Subject: Biological Sciences

Developed Materials

Research Presentation: PPT, PDF

Teaching Presentation: PPT, PDF

Activities

Mutation and Cancer

Mutation and Cancer Presentation: PPT, PDF

Baceria-Tobacco Mutaiton Lab: DOC, PDF

Baceria-UV Mutaiton Lab: DOC, PDF

Lorenzo's Oil

Lorenzo's Oil Presentation: PPT, PDF

Lorenzo's Oil Guiding Questions: PPT, PDF

Paperclip/Fatty Acid Modeling Activity: DOC, PDF

Natural Selection at Work

Bacterial Resistance Presentation: PPT, PDF

Serratia Ampicillin Resistance Lab: DOC, PDF

TB Simulation Activity: DOC, PDF

Owl Pellet for Integrated Sciences

Owl Pellet Presentation: PPT, PDF

Barn Owl Worksheet: DOC, PDF

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The Big Picture

- New GK-12 Website
  - Enhanced Web-presence for UD GK-12
  - Educational Resource
  - Written Communication Skills
  - Web-based Communication Skills