These are hallmarks of an environment not only focused on excellence and discovery, but also on developing a true understanding of the self and one’s calling. They are the hallmarks that differentiate the University of Dayton Department of Biology from so many others, as Dr. Jayne Robinson, department chair points out.

“Helping students determine what they want to do with the rest of their life is rewarding and exciting,” says Robinson. “We want our students to stretch their imaginations by providing them with opportunities and guidance to discover their vocation, their calling.”

University of Dayton’s Theta Kappa chapter of Beta Beta Beta has continued its growth as a national biology honor society, expanding its membership and its community service projects.

Since the fall of 2010, membership has tripled according to junior pre-medicine major Amy Whitaker, who is the incoming president of Beta Beta Beta. “When I joined there were roughly 30 full members and now we have a total membership of 121 including 56 new members just inducted on December 1,” she said.

This rapid growth of membership over the last two years has provided the organization with several opportunities to expand their service on campus and in the surrounding Dayton area. All members are required to participate in one long-term service project and two other short-term service events.

The group participates in three long-term service projects working with children in the Dayton area. At Holy Angels Elementary School, the Beta Beta Beta members assist students weekly with homework and preparation for science projects. Beta Beta Beta members also tutor at DECA (Dayton Early College Academy), and volunteer at Adventure Central, an after-school program for inner city youth, by tutoring and joining in outdoor activities with the children.

“The expansion of our organization has lead to more opportunities...
**Circle of discovery** continued from page 1

According to Dr. Robinson, the department’s focus on vocation is not based merely in encouraging students to dream about their futures. Instead, it’s about an undergraduate program designed to be truly life-changing, a program that’s built from the following components.

**The Developmental Model**

The Biology Department follows a developmental model for students that is both serial and parallel. The serial development occurs through a continuum of courses in which biology and environmental biology majors increase their knowledge and skills. This continuum emphasizes career development as a key objective.

In their first semester, students participate in ASI 150 – the introduction to the university experience - where students explore what it means to be a biology major and how that translates into a variety of careers. Students begin developing a resume, career goals and a plan for how to meet those goals. In the later courses, BIO 299, the sophomore seminar, and BIO 420, the capstone seminar, majors continue to hone their resumes, career goals and plan. They also learn to read and evaluate scientific literature and give an oral presentation about a biological topic that interests them, thereby developing the professional skills to be a successful biologist.

The developmental model is also parallel because students experience career development through many avenues simultaneously: coursework, advising, seminars, undergraduate research, internships, service, and student organizations. As the students progress through the coursework and experiential opportunities, their scientific knowledge and skills grow, and they discover which areas excite them. “It’s the entirety of experiences both inside and outside the classroom that helps to develop the whole individual,” explains Robinson, “so by the time our students earn their degrees, they possess professional resumes, oral presentation skills, content knowledge, hands-on experience, and the analytical and computer skills valued by employers, graduate schools and professional schools.”

**Biology as the Foundation**

According to the Census Bureau’s 2010 American Community Survey, 7% of the top 1% of earners majored in biology, leading all other majors. CareerCast’s best job rankings listed biologist as the 4th best job in 2010 and the 7th best job in 2011.

“I think it’s important for students to realize biology is a solid foundation for a huge number of vocations,” says biology professor Dr. Albert Burky. “Training for biology includes math, physics and chemistry applied to a biological perspective. This training provides graduates with integrative, quantitative and qualitative skills that prepare them well for almost anything they might want to do now or in the future.”

Kaitlin Moredlock (’08), who graduated from University of Notre Dame School of Law in 2011 and is currently an associate attorney at Cozen O’Connor in Philadelphia, PA, is one of the many examples of UD graduates who’ve applied their biology training to achieve success in another field.

“My research in the biology department required that I think about a number of possible outcomes and test my hypotheses in a systematic way,” Moredlock said. “This approach has worked well in my experiences in criminal law and litigation.”

**Opportunities for Discovery**

“You never know when you’ll wander into something new that will completely capture you!” says Dr. Robinson of the many ways that UD students can explore their career and vocational opportunities. Students are guided by faculty advisors toward engagements that enrich their core academic experience. These include undergraduate research, internships, service, and student organizations such as **AEA** and **AEΔ** (learn more about **AEA** and undergraduate research on pages 1 and 2) The research experience is invaluable and frequently recognized as the single most impactful educational experience for our students.

“While working in Dr. Robinson’s and Dr. Rowe’s research labs completing my undergraduate thesis, I learned much about what it means to be a scientist,” said Brittany Demmitt (’11) now a graduate student at University of Colorado. “I learned the importance of collaboration, persistence, and creativity within the scientific field. Ultimately it was this research experience that led me to pursue my doctorate in molecular biology.”

The Biology Department provides many other opportunities for discovery and enrichment to undergraduates including: mentoring from faculty, graduate students and post-doctoral fellows; a “Careers in Biology” seminar series hosted by professionals from diverse fields of biology; and weekly scientific seminars on biomedical and ecological topics which are led by researchers from across the country.

“Our students are exposed to different types of professional presentations and interactions. These help them develop the people skills that are important to their success,” says Dr. Burky.

**Advising: Mentoring the Individual**

“It goes beyond basic assistance with choosing classes. Advising is really about developing a personal relationship over time,” says Dr. Burky, explaining one aspect of the biology department advising program that is unique and serves UD students so well.

Among the features that make the program distinctive is that all advising is done by full-time, tenure-track faculty members who teach and conduct research, rather than by professional advisors whose sole focus is advising students. Senior faculty members mentor junior faculty, providing them initial training in advising standards and ongoing assistance with the myriad of advising issues for students.

“We work hard to match each student with an advisor in the same general area,” said Dr. Robinson. “A student who wants to pursue a medical degree will be matched with a biomedical advisor, and a student interested in habitat restoration will work with a faculty advisor in the environmental/ecology area.”

The topics of personal relationships and being matched to the right advisor resonate with graduates.

“During my time at UD, I really enjoyed the fact that I could develop great relationships with my professors,” says Kelly Wedell (’08), who now works as an Environment Protection Specialist with the EPA in Washington D.C. As a UD undergraduate, Wedell worked as a teaching assistant for biology professor Dr. Carl Friese, whom she described as a phenomenal mentor. She attributes her current career path to his encouragement and influence. “He only wanted the best for me, and made sure I put myself in the right position to obtain just that,” she said.

“The development of the whole individual is so important,” says Dr. Burky, “because you never quite know where your interest might be captured and how it might lead you down another little twist in the road to something that is ultimately rewarding in a way you had never imagined. We try our very best to help with that development, that discovery.”

http://biology.udayton.edu
for us to volunteer in the community,” said Ashley Berding, a junior medicinal chemistry major who is the vice president of Tri-Beta.

“While this expansion is great, we have so many people volunteering that I actually have to tell people they can’t do the tasks they want. I am busy looking for more opportunities that we can all be involved in,” Berding said.

The short term volunteer events they are involved in on campus include: Dance Marathon, Spike for Charity, Patterson Homestead cleanup, and fundraising by selling jerseys in the spring. Each of these projects helps get their name out on campus.

“We have often been viewed as a resume-booster type of organization and we want to get away from that stigma,” said Berding. “In addition to scholarship, we want to be known as a fun organization that cares about doing service for the community that we are part of.”

“I am very proud of our Tri-Beta chapter,” said academic adviser Dr. Carl Friese. “Not only are we one of the best service organizations on campus, but those efforts are built on top of outstanding scholarship and research efforts. Because of this and more, our chapter is achieving national recognition.”

The organization has not only made strides locally, but also nationally. In March of 2013 UD’s Tri-Beta organization will host the Regional Convention for the Midwest. This will take place on March 23, 2013 and will include students from 42 colleges from Michigan, Ohio, Indiana, and Kentucky and Illinois.

“We have worked hard to prepare for this, and Drs. Benbow and Friese have been influential in the preparation,” said Whitaker. “This will be a one day event to showcase biological research. We can also utilize this to allow fellow UD students to see what research is being done on campus by their classmates and by students from other colleges across the region.”

The day will include poster presentations and podium talks from students and a keynote speaker highlighting biological research and undergraduate participation in research. Many of the details are still being planned at the moment but the excitement is palpable when the students speak about it.

“I have loved the organization since I joined my freshmen year and as a junior I am proud to be planning the regional convention,” said Whitaker. “We have made positive strides and are currently revising our constitution to accommodate the increased membership of our organization. Our goals are to increase scholarship, research and service to the community.”

Casey Hanley shares love of science with students

Casey Hanley has always been passionate about the environment and biology. Since a young age science and nature have appealed to him.

“I have always been attracted to ecology, the environment, and the outdoors. Even as a kid I enjoyed playing in the creeks and being outside”, said Hanley. “When I came to UD I was a communications major but I switched to biology because I felt like I was missing something.”

Hanley completed his B.S. in environmental biology in 2004 and then continued his studies with UD biology professor Dr. Albert Burky, focusing on aquatic entomology and earning his M.S. in 2008.

While pursuing his degrees, Hanley enjoyed several opportunities with other students and with faculty to learn, conduct research, and teach in the field. Traveling to Georgia, Florida, and Costa Rica, both as a student and teaching assistant, he was able to work in an area that he cares deeply about, nature and the environment.

Hanley’s experiences as a graduate teaching assistant and his love for biology led him to the position of Biology Laboratory Coordinator at UD, where he now shares his enthusiasm for UD and science with others. As the Biology Laboratory Coordinator, Hanley manages the administration of five laboratory courses, two for science majors and three for non-science majors.

“Casey ensures that all the lab sections run smoothly for us by leading weekly lab teaching meetings, supervising the students...continued on page 4
Three students represent UD at βββ National Convention

The National Convention for Beta Beta Beta (βββ), a national biological honor society, was held in San Juan, Puerto Rico from May 10th-16th, 2012 with numerous countries and universities represented, including the University of Dayton. Three UD students: Andrew Steffensmeier, Taylor Piatkowski and Emily Sandmann attended the national convention thanks to funding from Tri-βeta.

Andrew Steffensmeier, a junior pre-medicine major was chosen by the βββ national board to present a poster about his research on Alzheimer’s using the fruit fly as a model.

“I have been working on this since my freshmen year and every summer since,” said Steffensmeier. “I use a model organism, Drosophila melanogaster, to study the effects of Alzheimer’s in the eye of fruit flies then conduct drug screens with new types of medicine to counteract the effects. My goals are to combat or prevent the degrading of the eye, and I have had positive effects with some drugs. Eventually we will move to larger specimens after we have conducted enough successful treatment using the drugs.”

Steffensmeier carried out his research in the lab of his mentor, biology professor Dr. Amit Singh. He was able to attend the convention because of a national grant he received through βββ that helped to fund his research and travel costs.

“I was encouraged by Dr. Carl Friese, [UD βββ faculty advisor] to apply for the grant. He thought it would be a great opportunity to showcase the research I have been working on,” said Steffensmeier. “Beta and the University of Dayton Honors Program have assisted me greatly by funding my research.”

Taylor Piatkowski represented UD at the convention in her role as president of Tri-beta, voting on key issues and meeting with other representatives to plan UD’s upcoming regional βββ convention.

Chemistry major Emily Sandmann (’12) whose work was funded by the Department of Chemistry, presented her research poster evaluating the adsorption kinetics of denatonium benzoate to 2:1 layered aluminosilicate minerals.

All three students received funding to support their travel to the national Tri-Beta convention from UD’s local Tri-Beta chapter.

“It illustrates just how far our local βββ chapter has come that we could afford to send three people to Puerto Rico,” said Friese.

The convention highlighted undergraduate student research but also focused on the local issues Puerto Rico has been facing.

“One of the first presentations was about how overpopulation has led to issues of preserving the rain forests,” he said. “The rapid increase in population has created overcrowding and a decrease in the natural resources available.”

“I learned much from my time in Puerto Rico, I will take what I learned there with me in my future,” said Steffensmeier. “The most important thing I learned was that even though we are not from the same backgrounds, science connects all cultures”.

Taylor Piatkowski, Andrew Steffensmeier and Emily Sandmann in San Juan, Puerto Rico

Casey Hanley continued from page 3

who prepare the materials for the labs, writing lab manuals and continuously improving the laboratory curriculum,” said Dr. Jayne Robinson, biology department chair. “He makes the tough task of overseeing 30 lab sections and approximately 15 teaching assistants and laboratory instructors each term look easy.”

Hanley especially enjoys the time he spends with students in the classroom.

“Teaching the labs gives me a chance to see the students make connections between the lectures and labs. Working with both majors and non-majors provides me with varying levels of knowledge of biology and allows me to teach a broad range of skills,” he said.

In addition to managing the labs, Hanley also teaches College Teaching Seminar, a course that equips graduate students with the skills to be effective teaching assistants.

“This is a course that I feel is very important,” said Hanley. “I want the undergraduate students to get a high quality education and the best way to ensure that is to properly prepare the teaching assistants for what they might experience in a classroom.”

As laboratory coordinator, Hanley also continues to foster his love for the outdoors and shares this excitement with others. This past summer he participated in Dr. Kelly Williams’ Marine Biology course in Hawaii, where Hanley helped teach students about the ecology of the islands.

Having experienced life at UD as a student and now as a staff member, Hanley sees the uniqueness that is offered here. The community aspect is what drew him here and has continued to inspire him in the classroom and in the field.
A generation of regeneration research pays off!

The past year has been especially rewarding for biology professor Dr. Panagiotis Tsonis, who was selected to present highlights of his research in September at UD’s 3rd annual Spotlight on Technology, Arts, Research and Scholarship, or STARS 2012. During the STARS event, Tsonis was also recognized as the recipient of the 2012 George Nolan Researcher of the Year by the UD Chapter of Sigma Xi, the Scientific Research Society.

Dr. Tsonis’ presentation, “Tissue Regeneration: Past, Present and Future,” focused on his ongoing work in lens and limb regeneration in newts and highlighted a recent discovery that the newt’s ability to regenerate the lens is not affected by either age or repeated injuries. The study, published in the international journal Nature Communications, reports that the newt’s regenerative capacity, at least in the lens, appears to be virtually limitless. This game-changing knowledge resulted from over 17 years of painstaking work conducted in collaboration with his doctoral advisor and mentor in Japan, Professor Goro Eguchi.

The commitment and tenacity required to continue such an experiment for nearly two decades is a testament to the enduring relationship between these two world class scientists who have contributed so much to our knowledge of regeneration and molecular biology. With a career in regenerative biology spanning three decades, Tsonis attributes his success to the passion and persistence inspired by Dr. Eguchi. During his career, Tsonis has been supported by nearly $7 million in research funding from the National Eye Institute, the Arthritis Foundation and others. He has authored over 160 peer-reviewed publications, several book chapters, and two textbooks.

When asked how regeneration research will impact the biomedical field, Dr. Tsonis identifies two challenges: One is to understand why regenerating is advantageous to a newt and not to a primate. The second challenge is to use this knowledge to find cures for replacing damaged tissues.

Sciences partner to develop new curriculum pilot for non-science majors

A new way of thinking has the science departments at UD collaborating to create a novel curriculum for non-science major students, which will be piloted over the next two years.

The innovative program, the Global Citizens Science Sequence (GCSS), is designed to enable students to understand and thoughtfully process the scientific aspects of their lives and the problems that will face them as citizens of an increasingly complex and interconnected world.

The GCSS is based on the principles of the new Common Academic Program (CAP) that will replace the current general education model for all UD students. CAP emphasizes integration and crossing boundaries between the different disciplines. As students progress through the three course GCSS, they will be able to demonstrate four learning outcomes: 1. An integrated foundation of scientific knowledge, 2. Discovery skills including analytical and problem-solving skills, 3. An understanding of scientific inquiry, and, ultimately 4. Scientific citizenship, an ability to express how science relates to their own lives and issues facing society.

The first course in the sequence, FINS I (Foundations of Integrated Natural Sciences): The Dynamic Universe, introduces students to the foundation sciences of physics and chemistry. Building on these principles, students will continue to FINS II: Evolution and Environment where they will apply the “systems sciences” of biology and geology to understand the complex and ever-changing environment of Earth and life in the context of human societal concerns.

Finally, for the third course in the sequence, students can choose from a diverse set of capstone courses that will be designed to help students explore the scientific dimensions of problems of broad societal significance, for example, global climate change.

In addition to improving the integration between the sciences, the GCSS will also improve the integration between lectures and labs as all students in a lecture section will be enrolled in corresponding lab sections concurrently. By doing this, it provides the students with immediate, interactive, hands-on learning experiences that allow them to see how science affects their daily life.

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Faculty and staff highlights

• Dr. Eric Benbow (principal investigator) along with Dr. John Wallace (Millersville University), Jennifer Pechal (postdoctoral fellow, UD), and Jennifer Lang (graduate student, UD) received a grant from the American Academy of Forensic Sciences to evaluate the use of bacterial community assessment on decomposing carcasses for making estimates of how long a body has been submerged. The data will have immediate application in forensic science and crime scene investigation protocols. Benbow also received funding from the City of Dayton, Department of Water, Division of Environmental Management to continue the partnership with the City of Dayton for developing a storm water monitoring program that meets Ohio EPA requirements.

• Dr. Mark Nielsen was awarded funding from US Air Force Research Laboratories for a graduate research assistant.

• Drs. John Rowe and Mark Nielsen, and collaborators’ article, “Differential toxicity of silver and titanium dioxidenanoparticles on Drosophila melanogaster development, reproductive effort and viability,” in the journal *Chemosphere* was selected by Science Direct as one of the "Top 25 Environmental Publications of 2011." Rowe also received a grant from US Air Force Research Labs/Oak Ridge Institute for Science and Education for a post-doctoral associate.

• Dr. Amit Singh was invited guest editor for the special issue of the journal *Developmental Dynamics: Drosophila as a Model for Understanding Development and Disease*. Drs. Amit Singh and Madhuri Kango-Singh’s contributed image for this special issue was also selected for the American Association of Anatomists 125th Anniversary brochure.

• Dr. Tom Williams was awarded an NSF grant to understand the development and evolution of a fruit fly pigmentation trait. The research will elucidate how genome DNA sequence evolves to encode information that connects the activities of diverse genes into a functional network that makes a phenotype. and evolution of regulatory network controlling sexually dimorphic fruit fly development.

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Thank you for your gifts!

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