

FROM THE DEPARTMENT CHAIR



As Black Friday gave way to Giving Tuesday, my inbox transitioned from pleas for consumerism to pleas for altruism. Altruism, or helping others at a cost to oneself, is an interesting phenomenon for the biologist to consider. Parents tend to offspring, and in eusocial insects, younger siblings are cared for by their older siblings. Are these examples of altruism? It turns out that they are not. Rather, they are examples of kin selection. Genetic representation in the next generation is the currency of evolution, and if you help those that share your genes to be successful, you are successful. In what has become known as Hamilton's Rule, in recognition of late evolutionary biologist William Hamilton, the cost and benefit are often weighed by relatedness. To illustrate this rule, in an apocryphal story about the eminent scientist J.B.S. Haldane, he was asked if he would rescue his brother from drowning, if it meant that he himself would perish. Haldane quipped that he would not, but that he would act in such a manner to save two brothers or eight cousins. Siblings share roughly 50% of their genome, and first cousins share roughly 12.5%. Thus, in either scenario, Haldane would have replaced himself genetically 100%. Most of us do not make such explicit calculations, and we must be careful about extrapolating from natural history to human society. If the mood strikes, we can give to a toy drive, our favorite charity, or our *alma mater* without consideration of shared genes. But should you decide to give your sibling a nicer gift than your cousin this holiday season, you can blame it on Hamilton and Haldane. ~ K W Pecor, Chair

DEPT SCHOLARS EARN FOUR GRANTS

We are extremely proud to share that in the past several months, faculty members of the TCNJ Biology Department have been awarded four separate research grants, from the National Science Foundation (NSF) and the National



Institutes of Health (NIH), to consider specific aspects of the organisms pictured here. Receiving awards from the NSF are associate professors **Wendy Clement, PhD**, and **Gary Dickinson, PhD**. NIH grants were awarded to associate professors **Nina Peel, PhD**, and **Jeffery Erickson, PhD**. Kudos to all four!

Such a high funding success rate, and the significant recognition of the research work being done here in the biology department of a relatively small, liberal arts, primarily undergraduate institution are tremendous honors, and admittedly bring many benefits both to the department and the College. But we are especially proud that it recognizes not only our faculty's deep commitment to research, but also to providing such incredibly rich collaborative research opportunities to our students.

The grants themselves fund research representing a vast range of investigation into factors affecting how life develops. From the regulation of cell function at the molecular level, through processes impacting the fetal development of mammalian organs, and the development of the trait of organ fusion within some plants, to the effects of global warming and ocean acidification on the development and activities of invertebrate marine life, these grants will fund work by faculty and students to answer developmental questions, and discover new questions to be answered.

Dr. Nina Peel's research is generally interested in the genetics of cell division, and uses the microscopic roundworm *Caenorhabditis elegans* as the model organism. Her grant award (her second!) from the National Institute of General Medical Sciences will investigate tubulin proteins as the building blocks of microtubules (hollow rod-like structures which contribute to structure, mobility and cell division functions in cells), and the role that glutamylation (a type of modification) (continued pg 2)

NEWS BRIEFS

Another Bio Babe Arrives

Congratulations to Associate Professor

Nina Peel and her spouse on the recent birth of their son Moses, who joins big

sisters Maeve and Zola. We wish the entire family good health, happiness, and as much sleep as possible!



Clams Decrease

Our own Associate Professor **Gary Dickinson** was interviewed for and quoted in a recent article in *Heated*, an online magazine about nutrition, cooking, food politics and social justice, which explored the decreasing sustainability of harvesting clams, due to climate change and increasing coastal development. Dr. Dickinson's lab studies the effects of changes in salinity and other stressors on the growth, development and sustainability of marine invertebrates, and for the article he commented on the dire effects of climate change and development on the clam beds, including those near Charleston, SC.

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Four Grants continued

of tubulin proteins affects and regulates the roles, functions and responses of microtubules, especially during cell division.

Dr. Jeffery Erickson also received NIH funding, specifically from the National Heart Lung and Blood Institute. His research continues to contribute to the fund of knowledge related to Sudden Infant Death Syndrome (SIDS), which is thought to be related to cardiorespiratory impairment. Dr. Erickson's lab focuses on the role of the neurochemical serotonin in the development and maturation of cardiorespiratory control in neonatal mice. The studies supported by his NIH grant will assess the effects of nicotine exposure during prenatal development on postnatal breathing behavior and heart rate in mice that are genetically deficient in brain serotonin.

Funding has also been received to support investigation of more visible aspects of development. **Dr. Wendy Clement** is an evolutionary biologist and plant systematist, and her work seeks to understand plant diversity: how plant groups originated, how they evolved, and how they spread throughout the world. The specific research, funded by a grant from the National Science Foundation (NSF) and shared with collaborators at Yale University and St. John's University, is to investigate a trait in plants known as fusion. The vast diversity of flowering plants is often the result of fusion, in which new structures develop through the fusion of component parts. Uniquely-shaped flowers may be the result of fused petals, or larger fruits may be the result of the fusion of many smaller fruits. Dr. Clement's research group will travel widely to collect samples and study the genetic regulation and evolution of the trait in honeysuckles. Then, in addition to analyzing and presenting the research at various conferences, the research will be shared through botanical images in an art exhibit called "*Plant Communication and the Art of Fusion*," to be displayed at both the TCNJ Art Gallery, and the Arnold Arboretum at Harvard University.

Finally, **Dr. Gary Dickinson** also received a grant from the NSF to study the effects of environmental factors or stressors – such as warming ocean temperatures and increasing ocean acidification – on the growth and development of barnacles. His research involves not only the growth of the animal's exoskeleton (exterior shell or covering) as it is impacted by these stressors, but also the animal's ability to adhere itself to marine surfaces, and the impacts of temperature and acidification on that ability.

Each of these principal investigators on these grants will engage student researchers in the work being done, and in the analysis and presentation of the research, enabling them to significantly contribute to the growth of knowledge in the specific study area.

Congratulations to our four awardees! We look forward to your findings.



Photos from one of several class field trips by members of Dr. Howard Reinert's "Pine Barrens Ecology" class during the Fall semester to explore the unique ecology of this fascinating New Jersey coastal ecosystem.

◀ Sampling • Canoeing the Mullica River ▶



SCHOLARSHIP

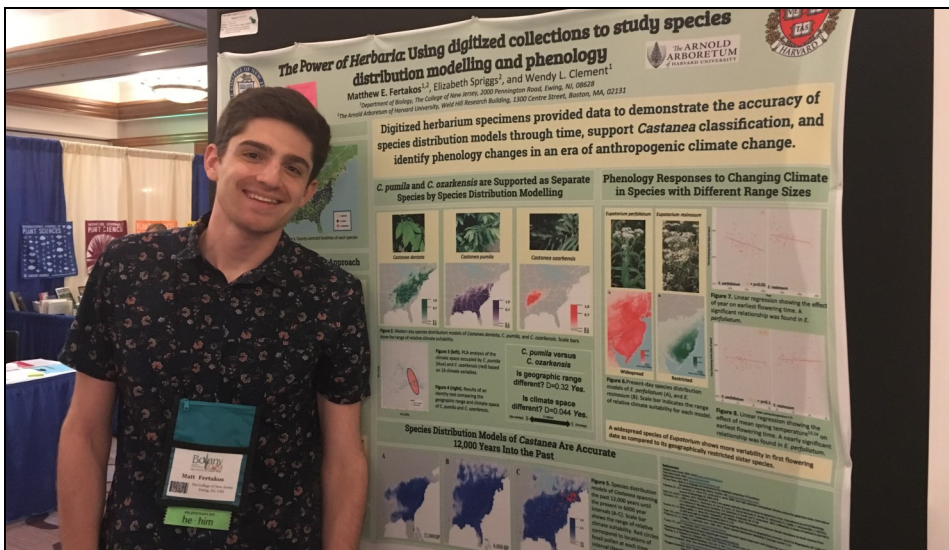
Research Presentations

Dr. Wendy Clement and her students were busy with presentations of their research at various conferences in 2019:

In June, **Dr. Clement** presented a poster on “Citizen Science, Data Science, and Climate Change: an inquiry-module using species distribution modeling to study species variation in the classroom” at the *Evolution 2019 Conference* in Rhode Island.

In July, Clement Lab students **Aaron Lee** and **Matt Fertakos** accompanied Dr. Clement to the *2019 Botany Conference* held in Tucson, Arizona. Aaron presented the lab’s research poster entitled “Exploring the evolutionary history of the CUP-SHAPED COTYLEDON (CUC) gene family in the honeysuckles (*Lonicera*, Caprifoliaceae) and relatives,” while Matt Fertakos presented a poster on “The power of herbaria: Using digitized collections to study species distribution modeling and phenology.”

In September, Clement Lab students **Aaron Lee** and **Labeeqa Khizir** presented research at the *Evolutions in Philadelphia Conference*. Aaron once again presented his poster from the July Botany 2019 Conference, and Labeeqa presented research on “Solving the plastid puzzle: de novo assembly of *Viburnum* using next generation sequencing.”



Matt Fertakos with his poster at the 2019 Botany Conference in Tucson.

Dr. Nina Peel attended the 22nd *International C. elegans Meeting* held in Los Angeles in June, accompanied by two research students, **Jessica Dominguez** and **Bhumi Shah**. The students each presented a poster of their research.

Dr. Janet Morrison attended the annual meeting of the *Ecological Society of America* in July.

Dr. Dennis Shevlin traveled to Minneapolis in August to attend the *Mycological Society of America's 2019 Annual Meeting*, at which he presented research on the “Population Biology of the smut *Sporisorium ellisii* from New Jersey, Pennsylvania, Ohio and North Carolina.”

Dr. Leeann Thornton also traveled in August, to San Jose, CA, to attend and present

research at the *Plant Biology 2019 Conference*. Her poster and discussion described her work on “Characterizing the role of CYP72A enzymes in maize environmental stress responses.”

Recent Publications

Steffel, B. V., Smith, K. E., Dickinson, G. H., Flannery, J. A., Baran, K. A., Rosen, M. N., McClintock, J. B. and Aronson, R. B. (2019). Characterization of the exoskeleton of the Antarctic king crab *Paralomis birsteini*. *Invertebrate Biology*, e12246.

New Faces in the Bio Department



The Fall 2019 semester welcomed two new instructors in the Biology Department. We’re glad to have them among us, offering their scholarship and experience to our students. They are:

TCNJ Visiting Assistant Professor and a Teacher-Scholar Faculty Fellow **Zachary Grochau-Wright** is an evolutionary biologist and astrobiologist, who studies the evolution of multi-cellular life using volvocine green algae as a model system. He is particularly interested in understanding the evolution of genetic and developmental controls during the evolutionary transition from single-celled to multicellular life. Zach earned his undergraduate biology degree from Humboldt State University, and his PhD in Ecology and Evolutionary Biology, with a minor in Astrobiology, from the University of Arizona. Zach is fascinatingly also a circus performer and juggler, and has created a juggling routine that serves as a metaphor for biological evolution. How cool is that?

TCNJ Visiting Assistant Professor **Brian O’Neill** is a neuro-scientist whose research interests focus on the neurotransmitter dopamine. He is a graduate of Stevens Institute of Technology with a degree in chemical biology, and received his PhD in neuroscience from The Ohio State University. He is fervent in his commitment to understanding and teaching the public of the genetics and neurobiology of psychiatric disorders, such as addictions, ADHD, autism, and those involving the neurotransmitter dopamine.



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UPCOMING EVENTS

Tri-Beta Induction Ceremony

Thursday, April 9, 2020, from 7 to 9 pm in the Student Center

Some of our best and brightest biology majors will be inducted into the local chapter of *Beta Beta Beta*, the national biology honor society, at this annual event. The keynote speaker for the 2020 event is Dr. Sidney Strickland, PhD, a neurobiologist at The Rockefeller University, who does research on the function of the brain in Alzheimer's disease. Alumni are particularly invited to join us.

Save the Date: Alumni Weekend

Campus wide, Fri & Sat, Apr 24 - 25

Come join the PRIDE as Lions gather from far and wide! A variety of events and activities will be happening, as well as your chance to catch up and hang out with friends!

Senior Awards Dinner

Friday, May 8, 7 pm, Washington Crossing Inn, Washington Xing, PA

Awards for Excellence in Biology will be presented to a handful of Seniors at this annual banquet.

COMMENCEMENT!

Thursday & Friday, May 21 & 22

Celebrate with family, friends and alumni as members of the Class of 2020 receive their diplomas and set off for fame and fortune. The time and location for the Biology Department Ceremony has not yet been announced, but will certainly be posted on the TCNJ website in the near future. The Main College-Wide Ceremony will be held in Lions Stadium at a time yet to be announced over the course of the two-day event.