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Dr. Lynam's lab team

E&S Research Outreach: Getting Passionate People into Research!

by Elizabeth Amedee, Junior Chemical Engineer; Thomas Holland, Senior Biomedical Engineer; and Julia McCown, Junior Chemical Engineer

To prepare for successful careers in engineering and science, many Louisiana Tech students participate in research. The process of performing research teaches the students patience, perseverance, and teamwork. Often, while the end result of research is shown through presentations and publications, the arduous path to those findings is not discussed. Research prepares students to persevere in their chosen field despite failures they encounter and provides them with experience working in a team. The efforts of an individual rarely result in discoveries; rather, a team's combined knowledge, ideas, and observations provide avenues for innovation. Below, Engineering and Science students Elizabeth Amedee, Julia McCown, and Thomas Holland describe their experiences in research at Louisiana Tech.

Elizabeth Amedee

My name is Elizabeth Amedee, and I like to hammock, box, and cook. After changing my major to chemical engineering

during my sophomore year of college, I wanted to get involved in extracurriculars relating to my new curriculum. My first day as a sophomore, I reached out to upperclassmen in my new major and was guided to join a research group. Following my decision to join Dr. Joan Lynam's Biomass Lab, my college-career path shifted. Working in the Biomass Lab, I received a letter of recommendation and advice from my mentor, Dr. Lynam. My position in the lab aided me in the application process for National Science Foundation Research Experience for Undergraduates (NSF-REU) programs across the country.

In the Biomass Lab, I am researching a new recipe for concrete that utilizes waste products from industry, specifically waste created in paper mills. Additionally, I used guayule, a popular shrub found on the U.S.-Mexico border, to construct rubber latex. Another biomass that I have worked with is a pine tree from the Southeastern U.S. called loblolly. Lignin, an organic polymer found in plant cell walls that increases rigidity, can be extracted from these pine needles and refined to create red dyes, biofuels, and other products. Apart from my research in the Biomass Lab, I participated in an NSF-REU at Louisiana State University (LSU). There, I created nanofilms in the Badische Anilin und Soda Fabrik (BASF) lab. BASF, a German chemical company, remains the world's leading chemical producer worldwide. Specifically, in

LSU's BASF lab, the nanofilms were developed to increase the availability of clean water across the globe.

For students looking to begin research at Louisiana Tech, I recommend starting as soon as possible. This journey begins by reaching out to professors who teach subjects that interest you to see whether they have any openings in their lab and whether they know of openings in other labs. While research teams consist of mostly people in a specific concentration, students of related concentrations can also participate. For example, Damien Luke Gautreaux, my good friend from lab, is an industrial engineering major, but he has gained skills and knowledge by working in the chemical engineering lab that he never would have learned in class.

Research provides many benefits. While lab work may seem tedious or pointless at times, the pursuit of knowledge remains worthwhile. Research can begin with one question and end with twenty new questions. In most cases, a correct approach is found after a lot of incorrect approaches have been explored. Once the proper procedure is optimized, a scientific paper is written and submitted to journals for review and publication. Typically, research papers are written by a group of people, thus encouraging collaboration. Additionally, writing scientific papers improves communication skills. Students can even present their research at conferences in the form of talks and poster presentations to further expand their connections throughout the scientific community.

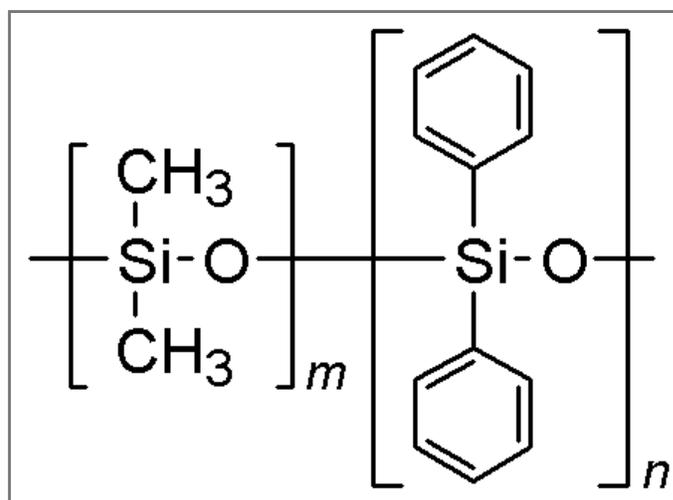
Thomas Holland

Hi, my name is Thomas Holland, like the current actor portraying Spiderman. In my free time, I enjoy woodworking and blacksmithing. As a senior biomedical engineering major, I am involved in multiple organizations on campus, including the Biomedical Engineering Society, Alpha Eta Mu Beta, and Tau Beta Pi. I have also been a member of the Louisiana Tech roller hockey team for the past three years.

Some of my favorite projects have been those in Biomaterials, Calculus II, and Statics I. For three years, I have been working in a lab that focuses on microfluidics devices.

Specifically, my lab manufactures microfluidic devices and performs DNA testing. For my first three years, I worked for Dr. Niel Crews, but this year, I'm working for Dr. Gorgana Nostorova. During my time, I have participated in several projects. My first project involved constructing a microfluidic device that implemented a poly-di-methyl-siloxane (PDMS) and glass bonding technique. This technique is used to mold microfluidic devices. These devices were then used for DNA reverse transcription. Additionally, I worked on a project involving a large volume syringe with a self-contained motor, which served as a pump for microfluidic devices in aerospace research. The biggest project that I worked on implemented a needle required for rapid DNA testing that will soon be used on the International Space Station.

Through my involvement in research, I gained many skills. In class, professors give assignments with a goal and an expected outcome in mind. Typically, students are provided with a general direction and a rubric that determines the student's level of success. In my experience with research projects, I was rarely given an outline or rubric to follow. Sometimes, my principal investigator proposed likely outcomes or potential methods. However, these outcomes and methods were loosely followed since research is new to all of those involved. The end result can be a surprise to both the student and the principal investigator. Research taught me to be independent and resilient. When the proposed procedures failed, I had to be willing to try new methods and sift through scientific journals to find methods that worked in similar situations. Additionally, I was expected to meet deadlines in a professional setting. This results-driven atmosphere created a sense of urgency, and I had to balance other projects and assignments appropriately.

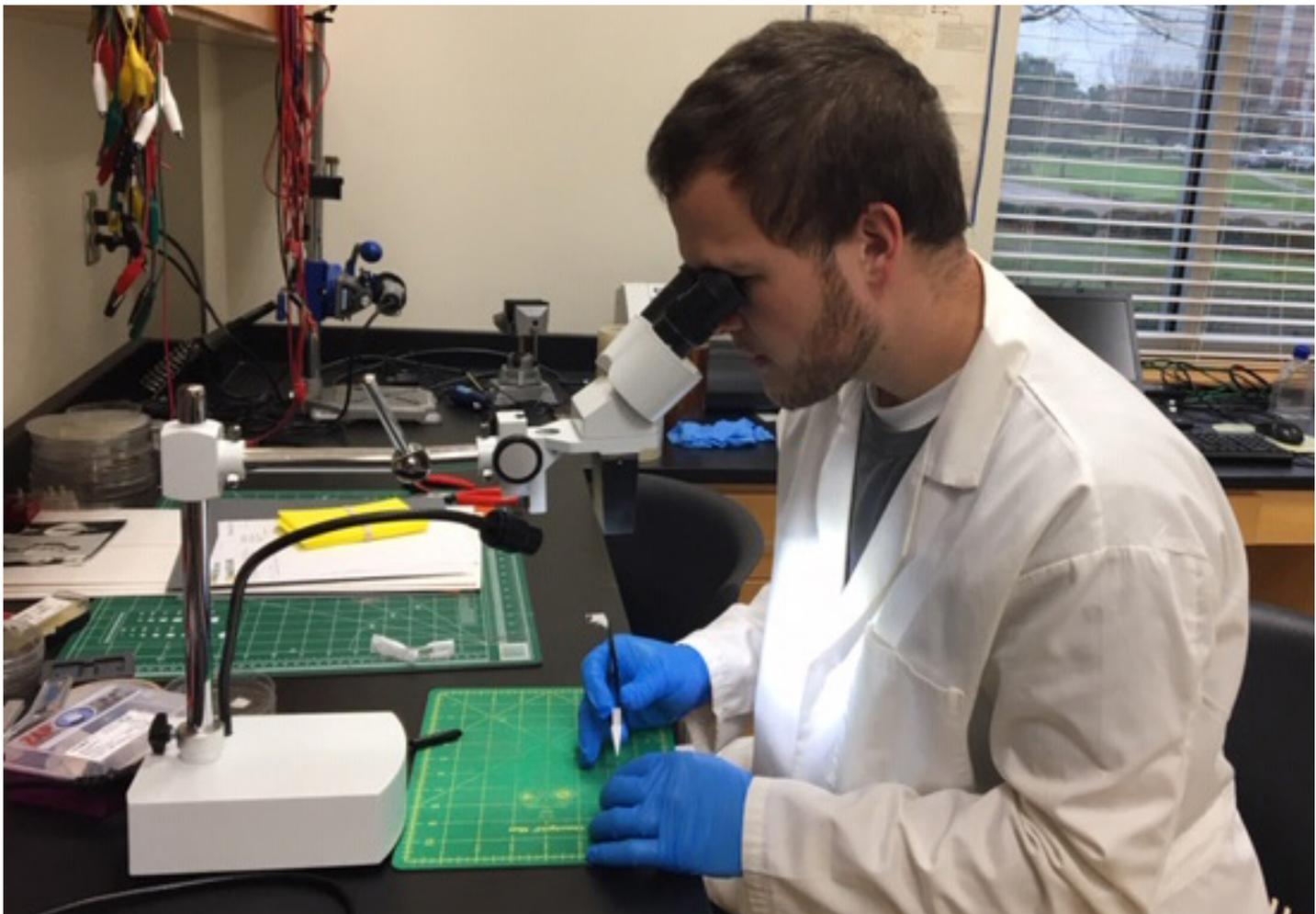


Chemical formula of poly-di-methyl-siloxane (PDMS) which was used for molding microfluidic devices.

Julia McCown

I am Julia McCown, and I am a chemical engineering junior at Louisiana Tech and a member of the American Institute for Chemical Engineers. During the fall quarter of my sophomore year, I took the chemical engineering seminar course, CMEN 301, and learned about all of the lab opportunities available. Dr. Joan Lynam's Biomass Lab piqued my interest, and I scheduled an appointment to meet with her. The Biomass Lab transforms waste byproducts into useful products. For a little over a year, I have participated in Dr. Lynam's research and worked on various projects.

Currently, I am involved with three major projects. The goal of one of these projects is to turn algae into a biofuel using deep eutectic solvents. These ionic solvents are compounds formed by homogeneous mixtures of Brønsted-Lowry or Lewis acids and bases. This mixture has a lower melting point than that of its individual components. For my second project under the LaSpace Undergraduate Research Assistantship grant, I separate synthetic urine into water



Thomas Holland (BS Biomedical Engineering) working in Dr. Nestorova's lab.

and a concentrated urea solution. Since urine contains a large amount of nitrogen, the concentrated urea solution can then be used as a fertilizer. For an Environmental Protection Agency grant, I use hydrothermal carbonization to convert lion manure into a product that can be burned as fuel. Under high pressure and temperatures, hydrothermal carbonization allows organic compounds, like the lion manure, to be made into structured carbons. The formation of brown coal occurs over a span of millions of years, and hydrothermal carbonization essentially emulates this in a few hours. Along with my three projects, I also assist graduate students with their research.

I highly recommend that all students interested in pursuing research join a lab on campus or an REU. Working in a lab provides valuable leadership experience and problem-solving skills. Unlike labs required in the curriculum, research labs do not have set procedures that end in a known result. Not all experiments result in the desired project, but even the failures can result in new findings. Projects in research labs encourage students to become familiar with failure and require passion for that project. Participating in projects gives students a sense of responsibility and the communication skills necessary for group work. If the student decides to

forego a future in research after working in a lab, these skills remain invaluable in all fields.

Research opportunities exist for students in every College of Engineering and Science major at Louisiana Tech. Determine which professor performs research that interests you, and ask about openings in his or her lab. Before joining any research lab, consider your goal and what you want from your education. Being in a research lab takes time, but most professors will work with you to accommodate your academic schedule. Ask as soon as possible, and do yourself a favor: Try Louisiana Tech campus research! You only have four years in college, so make them count.

Sources:

<https://www.nsf.gov> NSF Graduate Research Fellowship Program
[https://www.nsfgrfp.org/Louisiana Tech's Biomass Lab](https://www.nsfgrfp.org/Louisiana%20Tech's%20Biomass%20Lab)
<http://www2.latech.edu/~lynam/lab.html>