

BLAIR

BULLETIN



BOGLE SCIENCE CENTER POWERS DYNAMIC CURRICULUM


P. 04

TABLE FEET: LEADING & SERVING THE BLAIR FAMILY, ONE DINNER AT A TIME

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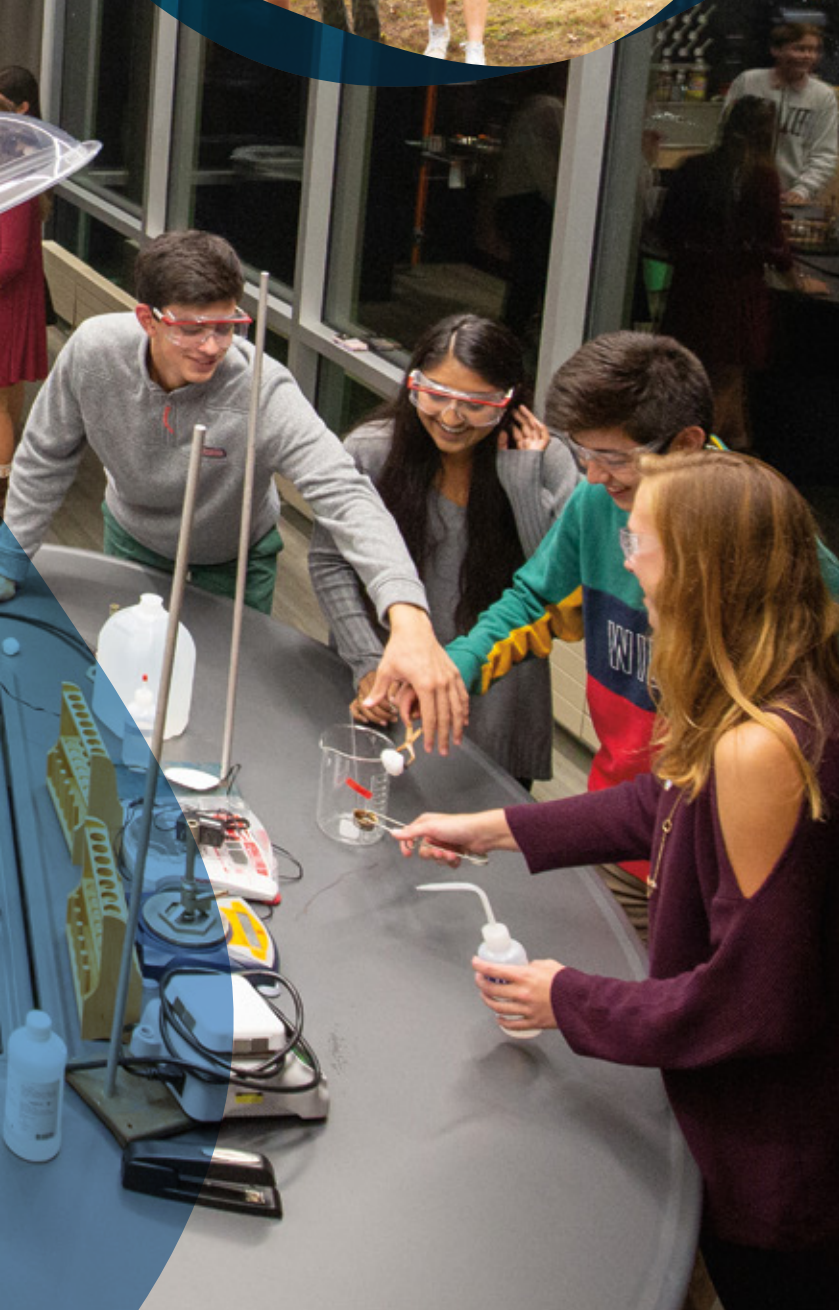
BLAIR'S TWO LONGEST-SERVING TEACHERS TO RETIRE

P. 26

The image shows a large, modern science laboratory. In the foreground, several students are gathered around a lab bench, focused on their work. One student is using a pipette, while others observe. The lab benches are equipped with various pieces of equipment, including robotic arms with clear safety shields, sinks, and storage cabinets. The room is well-lit with recessed ceiling lights, and the overall atmosphere is one of active learning and scientific inquiry. The text is overlaid on a semi-transparent teal circular shape.

THE BOGLE SCIENCE CENTER:

*A Powerful Platform
for the 21st-Century
Study of Science*



WHEN

the doors of the expanded and renovated Bogle Science Center

opened in September, Blair students and teachers entered a state-of-the-art academic facility, optimally designed for the 21st-century study of laboratory sciences. New classroom/labs (CLABS), fully refurbished laboratories and classrooms, upgraded technology, top-of-the-line furnishings and equipment, and a host of well-thought-out details awaited—and, with the start of classes, it all came to life.

Having invested considerable time over the past few years preparing for the science center's new capabilities, Blair's science teachers were ready from day one to infuse mini-labs, demonstrations, collaborative work and hands-on experiences into their classes. "Our curriculum has become more dynamic, and teachers are finding new ways to use these amazing spaces every day," said department chair Kelly Hadden, who cited students' ability to perform experiments on their own benchtops equipped with "elephant-trunk" exhaust hoods—instead of gathering to watch a teacher do the reaction—as just one of the ways that they are getting involved in the process.

"It's all geared toward engaging students in the science behind the theories they are learning in the classroom."

Here, we welcome you inside the Bogle Science Center as we explore six intriguing electives that are among the 18 science courses offered at Blair this year. With more lab-based electives on the horizon, we hope this gives you a taste of what it is like to study science at Blair today.

—**Suzy Logan '99** & Joanne Miceli



EXPERIMENTS UNDERWAY IN INTEGRATED SCIENCE RESEARCH



The Bogle Science Center’s integrated science research laboratory has been a busy place this year as eight juniors implemented research projects of their own design. The inquisitive and highly motivated students make up Blair’s

first integrated science research (ISR) class, and under Mrs. Hadden’s guidance, they are attempting to answer research questions sparked by their interests and replete with real-world implications.

BUILDING UP TO EXPERIMENTS

It took nearly a year for ISR students to reach the point of actually beginning their experiments, but they have learned that “it takes time to do science right,” according to Mrs. Hadden. The journey began last spring in “Foundations of ISR,” a semester-long elective that introduced students to the world of scientific research, connected them to scientific literature, and gave them the opportunity to investigate a topic or question of their own choosing. Having developed and successfully presented

their research proposals—on everything from using MAP gels to create an enhanced-healing cast for animals to working with non-Newtonian fluids to optimize protection in Kevlar-type vests—class members dove into their projects last summer by contacting scientists working in their areas of interest.

“Students identified potential ‘mentors’ through journal articles and other primary resources,” Mrs. Hadden explained. “They compiled questions, and, together, we conducted conference calls with professionals all over the world. Students have received a remarkable amount of information, as scientists shared research



“Working in the Bogle Science Center has been great because there is so much new equipment available to us. The ISR lab provides a space that is separate from other science labs, allowing us to be greatly immersed in our work.”

—ISR student **Daniel Dai '21**

experience, specific guidance on methods and data that kids never would have gleaned from reading the literature alone.”

Daniel Dai '21, whose project addresses the primary peanut proteins responsible for the legume’s allergenicity—an experiment inspired by his brothers’ allergies—

contacted several possible mentors in hope of understanding how proteins function and how enzymes and reducing agents interact with them. His conversation with University



of California-Merced biochemistry professor Dr. Henry Foreman helped him choose an efficient reducing agent for his experiment, while his call with Michigan State University professor Dr. Sarah Comstock gave him insight into how to best formulate his project and procedure.

Mrs. Hadden is grateful for professional scientists' receptiveness and willingness to help ISR students and pleased that the calls have demonstrated how supportive the scientific community can be. "Students are learning that real-world science should be a collaborative effort, and that's what we're emulating in ISR," she said.

GETTING DOWN TO BUSINESS

The novice researchers gained even more real-world experience when they delved into the business side of science during the first part of the fall semester. As they compiled supply lists, researched instrumentation and priced out equipment for their very different projects, they realized that in order for the class to stay within budget, they would have to think creatively. With further research, they determined that they could share or rent equipment, visit off-campus facilities to access specific technology, or take different approaches that utilize in-house equipment and still perform valid experiments.

When supplies began arriving on campus, the benefits of working in the Bogle Science Center's brand-new ISR lab hit home. Students each have their own storage space

and a dedicated lab bench. And, having been designed for maximum flexibility, the lab can accommodate biological experiments, engineering projects and everything in between, all at the same time.

"The ISR lab was designed for exactly the work we're doing here, and it's exciting for students to grapple with their experiments, troubleshoot and get their hands dirty," Mrs. Hadden said. "There's plenty of space in the lab—it's as if each student owns a piece of the building."

DOING ACTUAL SCIENCE

ISR is unlike most Blair courses in that there are no textbooks, written tests or traditional graded assignments. Instead, throughout the year, students are required to provide various deliverables, including completed calls with professional scientists, a materials list and data sets. For their first signature assessment, they turned in project updates and next steps, and in the weeks before Thanksgiving, winter and spring breaks, they worked on plans to keep their experiments going during the extended time away from campus, especially if they involve living cells or organisms.

Daniel aimed to create a few SDS PAGE gels last fall to prepare for practice electrophoresis. "The purified proteins I am using in my experiment are relatively expensive, so Mrs. Hadden and I ordered less-expensive proteins that I can use to test my procedure and make revisions,"



he explained. As he got deeper into his experiment, he especially enjoyed the freedom ISR has afforded him to research a topic that is important to him. "I am so grateful to the Blair science department for this wonderful opportunity, and I can't wait to see how my experiment turns out!"

Meanwhile, **Lucy Clayton '21**, who is studying the effect of different dyes on the efficiency of a solar cell made out of concrete, created the semiconductor or the photoanode as the first step of her project last fall. "I made little concrete disks that have a certain blending of material in the mixture to enhance the conductivity of the concrete," she said. "These are the bases of my project, and I added the other parts of the solar cell around the concrete."



"The atmosphere of the renovated Bogle Science Center is invigorating, and its aesthetic matches the core qualities of science. The building is open and flows nicely, like the different fields of science. Its newness blends seamlessly into the old red brick, which matches the idea that science takes old ideas and turns them into innovations. I am really excited to work in the ISR lab this year and see what new ideas we can come up with in the new space."

—ISR student **Lucy Clayton '21**

For Lucy, the best part of ISR is the fact that she is applying the ideas she has learned in class to challenging, real-life lab work. "ISR isn't just reading from a textbook and doing a prearranged lab with known results," she said. "We are doing actual science, and the

likelihood that our experiments will not be successful is extremely high. It makes science seem more real and concrete."

Mrs. Hadden has continued to support her ISR students as the year has progressed, guiding them to sources of information, helping them communicate effectively and asking questions they might not have considered. "It has been great to see all the growth that has happened as students have experienced the realities of science and gotten results in the lab,"

she said. "It's an honor for me to work with students who share a passion for science—I love teaching this class."

ASTRONOMY: UNDERSTANDING THE COSMOS



Did you ever stop to contemplate how Earth became a planet? Or how a cosmic event that occurred eons ago impacts what is happening in the present day? These are just some of the questions 14 juniors and seniors are considering this year in astronomy, an elective that gives students an understanding of the cosmos beyond that of a standard earth science or physics course.

"My number one goal is to give students a sense of perspective about the universe," said science teacher Michael Ryerson, who developed the course eight years ago and has since expanded it from a half-year to a full-year elective. "The scale of time and space we are talking about is almost more than we can comprehend, but I want students to realize that in a science that is, literally and figuratively, so far away, we can use the same tools that we use in other sciences to understand natural phenomena. The universe is knowable."

The course begins with an overview of topics like gravity, light and waves, particle physics and the work of early astronomers. Then, students look to the skies to study the moon, our solar system, the Milky Way galaxy and beyond. Along the way, they learn about everything from planets, the life cycle of stars and rocketry to black holes, the Big Bang theory and relativity, the latter being topics that students have been most excited to investigate over the years.

In the Bogle Science Center, astronomy now has a dedicated classroom, allowing Mr. Ryerson to permanently display a variety of diagrams and charts and house the School's large telescope where students can access it every class period. The classroom's capacity for total darkness makes for especially realistic simulations of



"Taking this class in the new Bogle Science Center helps us to learn more productively because it provides the materials and spaces that challenge us to not just learn the what, but also the how and why. I've realized how small we actually are compared to enormous solar systems and universes, and how much goes unnoticed on the daily."
—astronomy student **Chloe Rayer '20**

moon phases, the sun's ability to illuminate the solar system as a single point of light and other concepts that are harder to visualize when light is coming from all directions.

"Taking this class in the new Bogle Science Center helps us to learn more productively because it provides the materials and spaces that challenge us to not just learn the what, but also the how and why," observed **Chloe Rayer '20**,

who is taking astronomy to feed her interest in the sky, the solar system and the Earth. "I've realized how small we actually are compared to the enormous solar systems and universes, and how much goes unnoticed on the daily."

Observation of the skies is key to the study of astronomy, and students head to Blair's athletic fields for monthly nighttime telescopic viewing. In the spring, they take to the same

fields to launch rockets they have built from kits and, for their final signature assessment, launch rockets they have designed and built from scratch.

Reflecting on the importance of studying astronomy, Mr. Ryerson noted that when students tackle any area of science, they begin to develop a scientist's mindset and vital skills such as critical thinking and data assessment. "Beyond that, astronomy gives students an appreciation of the forces that shaped planet Earth," he said. "It spurs them to really think about something most people take for granted."





STUDENTS DIVE INTO OCEAN ECOSYSTEMS IN MARINE SCIENCE



Despite Blair Academy's landlocked location, juniors and seniors have the opportunity to explore the depths of the ocean from the Bogle Science Center when they enroll in marine science, a yearlong elective that fosters awareness of society's connection to the sea. Science teacher Rod Gerdsen developed the course in 2005 in response to student interest, and it has been a popular offering in Blair's science curriculum ever since.

The lecture-based course meets in Cowan Auditorium, a space that Mr. Gerdsen says is "brighter and more comfortable" thanks to the Bogle Science Center's renovation. Topics covered include water chemistry, ocean geology, and the biology of ecosystems and the living organisms that populate them.

Readings, discussion and research projects are all part of the class.

In recent years, Mr. Gerdsen has incorporated a virtual-reality ocean dive into the marine science curriculum as well. Utilizing VIVE technology, students don virtual-reality goggles and the STEAM platform places them 80 feet underwater with fish swimming around them.

There, they explore deep-sea hydrothermal vents occupied by giant tubeworms, eyeless shrimp and 800-degree acidic water.

Outside of the lecture hall (for real), marine science students have a number of hands-on opportunities to learn about marine life. On dissection days, the class heads to one of

the Bogle Science Center's spacious biology labs, where there is plenty of room to spread out and lots of natural light to examine spiny dogfish, sea stars and hagfish. A few years ago, Mr. Gerdsen gave his



"Between lectures in Cowan Auditorium and lab days in the newly renovated biology labs, marine science is a great way to prepare for college classes. My favorite thing about the course definitely is dissecting the animals we're learning about."

—marine science student **Robert Rucki '20**



students an up-close look at a larger-than-usual specimen when he dissected a blue shark—that demonstration took place on the plaza in front of the building to accommodate both the size of the shark and the crowd that gathered to observe.

Trips to beachfront locales bring classroom concepts and discussions to life for marine science students, too.

The annual winter long weekend sojourn in the Cayman Islands gave hundreds of students over the past 14 years the opportunity to swim with stingrays and work with green sea turtles. Closer to home, trips to aquariums and the Jersey Shore afford students a closer look at exotic and not-so-exotic marine life.

Mr. Gerdson is proud that a couple of marine science alumni have gone on to fascinating careers in the field, but his main goal in

teaching the class is to help students appreciate the world’s oceans—which, he notes, cover nearly three-quarters of the Earth—and their impact on human society.

“Roughly 70 percent of the planet’s oxygen is produced by algae and phytoplankton, so the ocean’s survival is key to our survival,” he said. “In addition, a wealth of information and

natural resources that have the potential to make our lives better are waiting to be discovered, and I want my students to be aware of this no matter where life takes them.”

And, when life takes them to the shore on family vacations, Mr. Gerdson’s students often send him photos of what they find on the beach.

“They are proud to let me know that no one in their family could identify that shark egg sac that washed ashore—but they could!”



“I grew up hearing about how much fun marine science is from my dad and former students, and I am excited to finally take the class in the newly renovated Bogle Science Center. It’s not only one of my favorite classes at Blair, but I also love my dad’s teaching style, and I’m very grateful to have him my senior year.”

—marine science student Kate Gerdson ’20

ENVIRONMENTAL SCIENCE EXPLORES FOOD, ENERGY & WATER



The study of environmental science has long been a Blair tradition: Generations of Bucs fondly remember former science teacher Rob “Merf” Merrifield’s passion for the subject as he brought them out of the classroom to landfills and local farms to see firsthand humans’ impact on the planet. The fact that the hands-on and inquiry-based elective has evolved in recent years to include more off-campus excursions and some “unconventional” aspects of environmental science has made it popular among Blair juniors and seniors as they learn about food, energy and water.

For the last two years, science teacher

Caroline Chamberlain

has delved into these topics, underscoring how they are “vitally important to human existence, yet require the use of diminishing natural resources.” A typical class will involve Ms. Chamberlain briefly introducing a subject through a lab activity or a video and then asking students to analyze it by generating data, conducting experiments or, in one case of a “water taste test,” assessing the difference between tap and bottled water.

Ms. Chamberlain and her 14 students agree that some of the course’s most interesting units have incorporated forensic concepts that make their studies more engaging and applicable to real-world problems. For example, they have used the integrated science research lab to test genetically modified organisms in food to better understand modern

agriculture’s effects on what humans eat and to study blood spatter and fingerprint analysis as they relate such work to extinction events. Climate change has also been a critical topic of discussion as the class reads studies and articles about Earth’s changing temperature and its potentially devastating impact on all species.

“My favorite part of Ms. Chamberlain’s class is that we explore unconventional aspects of environmental science, and we directly interact with nature and the environment during labs,” said **Chloe Park ’20**. “There are endless fascinating things to discover about the Earth if you take a moment to look around.”

The fact that the Bogle Science Center has

thousands of additional square feet and new technology has also been a sky’s-the-limit game-changer for the class, which recorded podcasts as part of its fall semester signature assessment.

Ms. Chamberlain, who also teaches biology and biology honors, marvels at the fact

that her other classes can be set up in a lab to do complex experiments such as gene testing without impacting the hands-on work environmental science students are doing. “There is so much open space for the kids to study whatever interests them, and our glass-walled classrooms and labs encourage people walking by to engage,” she said. “Our upgraded facility has the technology and budget to support high school students in doing graduate-level work.”

Ms. Chamberlain has also been pleased to see her environmental science students learn how to approach

problems more scientifically, quantify data and “understand the why behind the how.” “In this day and age, you simply can’t accept what’s said at face value,” she said. “Being able to look at something, ask yourself if it is a fact and then assess all of the available information to make your own determination is a critical skill, especially for this generation that could change the impact humans have on the environment.”



“The best part of the new Bogle Science Center is the new technology and equipment in the labs. The updated facilities allow students to conduct labs not possible in the past, paving the way to many interesting experiments.”

—environmental science student **Chloe Park ’20**





AP PSYCHOLOGY DELVES INTO THE HUMAN BRAIN & BEHAVIOR



With 45 seniors enrolled this year alone, Blair's most popular science elective is Advanced Placement (AP) psychology, taught for the last three years by science teacher Shelly Mantegna. Although the class follows the AP curriculum

with the goal of every student taking the AP exam in May, Mrs. Mantegna tries to infuse every class meeting with creative ways to deliver material that introduces students to the systematic and scientific study of human beings' mental processes and behavior.

Given that understanding psychology requires a certain degree of self-reflection and human connection, it is not surprising that a typical class starts with a "bell ringer" question on the board, followed by five minutes of journaling, and then a "turn-and-talk" with classmates about interesting or challenging aspects of

recent coursework and assignments. Because the material lends itself to active learning, Mrs. Mantegna lectures very rarely, instead asking students to participate in surveys, demonstrations and activities that illustrate the points she wants to make during that class block.

"For example, this fall, when we were learning about the power of memory reconstruction, we played a variation on the

game of 'telephone,' and everyone saw firsthand how garbled a message could become and how, as humans, we tend to fill in the blanks because our brains have a natural desire to fill in missing information in order to make things flow nicely," said Mrs. Mantegna. Her classes have also taken

part in demonstrations that highlight why eyewitness testimony can be faulty because people's memories and understanding of the world can be incorrectly shaped by the stories their brains create.



"It has been so interesting to learn about perception and how often we twist what is right in front of us into something easier for us to comprehend. Having my mom as a teacher has been so much fun; it is amazing to see her in her element, doing what she loves. I feel lucky to be part of that."

—AP psychology student Lula Mantegna '20



With the AP test on the horizon at the end of the school year, students have been hard at work studying facts, principles and phenomena associated with each of psychology's subfields, as well as the ethics and methods psychologists use in their science and practice. Specific topics covered to date include brain biology, cognition, research methods and statistics, states of consciousness, learning, sensation and perception, and developmental psychology.

Understanding deeper reasons behind the many things people do every day has been **Thomas Santiago '20's** favorite part of the class. "AP psychology is a class where you want to do the homework and learn more about your brain because of how interesting it is," he said. "There is a deeper psychological reason to almost everything that you do."

Equally impressed about how applicable AP psych is to her life, **Camille Williams '20** calls taking the course

in the new Bogle Science Center "inspiring." In particular, she loves that the building's open aesthetic allows many opportunities to display AP psychology students' work and that its cutting-edge resources are front and center in the "really cool" videos and slideshows of Blair students doing experiments displayed on the lobby's video wall.



"Bogle Science Center's desks and tables lend themselves much more to conversing with your teachers and classmates. With furniture that can be configured and reconfigured individually or in groups, I can more comfortably engage with the material on a more personal level."

—AP psychology student **Elizabeth Montfort '20**

As Mrs. Mantegna and her science department colleagues settle into the Bogle Science Center's state-of-the-art spaces and look to the academic years ahead, she hopes to introduce the physical study of brain samples and lab dissection into her classes. "Everyone should want to know more about how their brain works," Mrs. Mantegna concluded.

"The brain is the most complex part in the human body, changing with each new experience; it is no wonder why our students so enjoy this class."

ANALYTICAL CHEMISTRY: MASTERING THE SCIENTIFIC PROCESS



Almost 40 years after he earned his PhD in physical chemistry from the Massachusetts Institute of Technology, Dr. Michael "Doc" Sayers is one of Blair's most experienced science teachers and extremely familiar with every step of the

scientific process: asking the right questions, determining if and how they can be answered, creating and executing experiments, gathering data, writing a formal laboratory report and preparing a scientific poster to share with colleagues interested in your findings.

In analytical chemistry, Doc is sharing his expertise in all of these steps as he teaches sophomores, juniors and seniors about the practical applications of wet chemistry and complex instrumentation. The class is in the lab more often than not, with Doc framing specific projects and

then guiding students in assessments that underscore the importance of general problem-solving techniques, how to separate what you are studying into discrete and "studyable" things, and practicing classic analytical chemistry skills such as separating mixtures, isolating chemical compounds, and analyzing the quantity of those compounds.

"I work with students to help them master the art of solving problems," said Doc, who noted that some of the course's more popular projects include extracting caffeine in drinks, determining specific amounts of known agents in certain kinds of food and analyzing the metals comprising the U.S. coinage system. "I introduce a topic, explain why it is of interest to us, why we care, give some background information, and then we talk about how we'll apply our ideas before we go back to the lab to do some design work collectively."

After a couple of days in the lab, students reconvene in the classroom and talk about their results, ultimately writing up lab reports to ensure they understand the need for comprehensiveness and a certain style of writing. "The question we are really

answering is 'how do I walk into something I know nothing about and become knowledgeable?'" Doc continued. The year concludes with an independent project where students pursue an analytical question of their choosing, write a formal lab report and create a scientific poster to communicate their findings.

Thanks to the Bogle Science Center's enhanced spaces and equipment, analytical chemistry students are able to conduct experiments that would not have been possible previously. For example, **Peyton Barksdale '20** loved the process of

figuring out how big a mole of gas is by using a single replacement reaction to generate hydrogen gas—something that would be dangerous without Bogle's new "elephant-trunk" system of ventilation. Having a fume hood at individual lab workstations means analytical

chemistry students can do a wide range of experiments that would be too dangerous to conduct in the open and too crowded with a single hood. The fact that the new building also boasts a chemical preparation area overseen by lab technician Robert Crowther, PhD, is an added bonus.

In addition to benefiting from Bogle's roomy CLABS that allow them to leave experiments out for an extended time frame, students can conduct experiments that require an absence of light in Bogle's new dedicated astronomy classroom. In the coming year, Doc hopes the expanded space will allow him and his colleagues to find a permanent home for Blair's liquid chromatograph, a large research-grade machine used for separating very complicated mixtures, which would open up a world of possibilities to Blair science students.



"The best and most helpful thing I learned in analytical chemistry is how to plan and conduct a detailed and methodical lab that continues over the span of a few days. The Bogle Science Center gives us the space to do that."
—analytical chemistry student **Ryan Gomez '20**



THE BOGLE SCIENCE CENTER BY THE NUMBERS



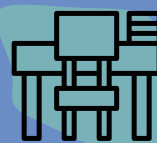
6

Wireless optical spectrometers



19

Elephant-trunk hoods



8

Renovated classrooms

2

D7 conferencing platforms

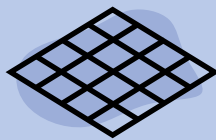
24

Physics smart carts



375

Science students who go through the BSC every day



8,000+

Square footage of Bogle addition



3

Bluetooth microscope cameras

12' x 6.5'

Dimensions of atrium's video wall



18

Science courses offered at Blair

6

CLABS

1

Science department office



36

Microscopes