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MAKING OF THE NAVAL ARCHITECTS

THE MICHIGAN STORY AND REFLECTION OF THE COLLEGE JOURNEY OF A NAVAL ARCHITECT

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Written by BRENDAN FALKOWSKI



(Main): Scale model testing of a low-profile vessel at the Aaron Friedman Marine Hydrodynamics Laboratory at University of Michigan. Photo: Michigan Engineering;
(Bottom left): The Aaron Friedman Marine Hydrodynamics Laboratory is housed in the basement of West Hall at University of Michigan. Photo: Brendan Falkowski

I always knew I wanted to do something with boats when I grew up. I basically lived on the water, growing up sailing on Lake Michigan in the summertime. The Great Lakes and the ships that plied them weren't just things that I lived near, they were part of me. It was only natural that I would go on to pursue a degree in naval architecture once I got to college. University of Michigan is one of only nine schools in the United States offering degrees in Naval Architecture & Marine Engineering, three of them being service academies. Michigan consistently ranks among the top programs both nationally and globally. When deciding where to go to school, University of Michigan offered more opportunities for music, extracurriculars, and more while being reasonably close to home. It was a clear choice for me.

Nestled behind a patch of trees on Draper Drive in Ann Arbor, MI, lies the University of Michigan's Naval Architecture & Marine Engineering (NA&ME) department. Most who attend the University of Michigan do not even know it exists. One of the first programs of its kind, the NA&ME department can trace its roots

all the way back to 1879. The Department's strong heritage and legacy is evident through the facilities, curriculum, and alumni.

Congress authorized the U.S. Navy to assign officers to engineering colleges across the country to teach courses in "steam engineering and iron shipbuilding" as far back as 1879. Mortimer E. Cooley, a mechanical engineering graduate of the United States Naval Academy, Class of 1878, was detailed to Michigan to serve as the first Professor of Steam Engineering and Iron Shipbuilding. Cooley was one of only four professors of engineering at the University, which only had 69 students enrolled in engineering at the time.

Cooley later helped to secure appropriations from the University Board of Regents to establish an official curriculum and Department of Naval Architecture & Marine Engineering in 1900. He was also responsible for hiring the first Professor, Herbert C. Sadler from University of Glasgow, for the newly-established program. Cooley and Sadler were also instrumental for the construction of West Engineering – now known simply as West Hall – in 1904, which housed engineering classrooms in addition to the model basin. Cooley became the founding Dean of the College of Engineering when it was created in 1915, with Sadler serving as Dean later in his career. The Quarterdeck Honorary Society was founded at this time as well. Courses in Aeronautics were offered beginning in 1914 and a complete degree in 1916. Aeronautics later became its own department in 1930, now known as the Aerospace Engineering department.

The Department aided significantly in training naval architects and marine engineers for service in World War II to serve in roles of research, design, and field work for the war effort. Research facilities and activities expanded greatly throughout the 1950s, and the department awarded its first Doctor of Philosophy (Ph.D.) degree in 1960. The U.S. Coast Guard established an officer educational program with the NA&ME department in 1959 for master's degrees, a program that continues to send 'Coasties' to Ann Arbor today.





(Main): Scale model testing in the model basin at the Aaron Friedman Marine Hydrodynamics Laboratory. Photo: Michigan Engineering; (Bottom left): M. Mack Earle, photo as a student at University of Michigan, with a clipping of his student identification card. Photo courtesy of the Earle family



The NA&ME department is one-of-a-kind among the engineering departments at University of Michigan in that it has facilities on both North and Central Campuses. The Aaron Friedman Marine Hydrodynamics Laboratory (MHL) is found in the basement of West Hall on Central Campus, leftover from the College of Engineering’s days on Central. There lies the original 1904 model basin along with other world-class facilities for additional testing and research. The model basin is used to tow scale models of ship designs to measure and scale up to full-scale resistance and powering requirements. Original plans from the 1960s called for the construction of a new classroom building and model basin on North Campus, though these plans never materialized. The department moved classroom and office facilities to North Campus in 1977, in a renovated and enlarged building leftover from an old nuclear laboratory. While classes today largely remain on North Campus, students in the NA&ME department will conduct lab experiments in the MHL on Central for several classes, and have 24/7 access to computer labs in both facilities.

The MHL was the first NA&ME facility I ever stepped foot in. As I was preparing my college applications, legendary NA&ME undergraduate advisor, Warren Noone, offered the opportunity for me to see the MHL during my campus tour. This tour, led by another student in the department, showed me that this program was one like no other.

In addition to its storied history, the NA&ME department boasts several notable alumni on both the Great Lakes and

around the world. NA&ME alumni have gone on to do big things and serve in prestigious positions such as shipyard presidents to Chief Naval Architect of the US Navy and more. One such alumni is M. Mack Earle, a 1936 graduate of the NA&ME program. Earle went on to become the Chief Naval Architect of Maryland Drydock in Baltimore and eventually led his own consulting firm. He was the mastermind behind the conversion of surplus WWII cargo ships to Lakers, including the *Joseph H. Thompson*, *McKee Sons*, *Tom M. Girdler*, *Thomas F. Patton*, and *Charles M. White*. He is also responsible for designing methods to “jumboize” T2 tankers and pioneered a harbor oil skimmer design, the first of its kind. Like my own experience, M. Mack Earle grew up around the ships, drawing inspiration from his childhood to forge his career path designing the steel behemoths that plied the waterways. Earle was raised on Neebish Island and would return during the summers with his family throughout his life, bringing them along on adventures of watching the boats go by on the St. Marys River. He was defined by his aptitude for naval architecture, and for his





(Main): In addition to classes students have been afforded opportunities for field experiences as well. Here students are pictured at HII Ingalls Shipbuilding in Pascagoula, MS, during a spring break shipyard trip. Photo: HII Ingalls Shipbuilding; (Bottom left): NA&ME Class of 2026 in Fluid Dynamics (ME 320) class together, August 2024. Photo: Brendan Falkowski

passion for the ships. I have had the privilege of meeting his wonderful son and daughter-in-law who still spend summers in the very same cabin he grew up in, watching the ships go by. Joseph P. Fischer is another alumnus who made a major impact on the Great Lakes, with a hand in the design of many ships constructed by Bay Shipbuilding during the 1970s. He later went on to lead the naval architecture firm Bay Engineering Inc. from the 1990s to 2019, when it was taken over by present-day owner Travis Martin. Other notable alumni include Kari Wilkinson, who currently serves as President of Newport News Shipbuilding, as well as Scott Ferguson and Bruce Nelson, two highly-revered naval architects in high-performance sailing yacht design.

Graduates typically go on to pursue careers in the commercial maritime industry, Navy, or research fields, though are not limited to any one of these. Post-graduation opportunities are endless, but the journey to graduation is often one of the most memorable parts. It is here that students learn the fundamental engineering principals necessary for their work and meet classmates who they will turn into lifelong colleagues. So, what does the experience of a NA&ME student at Michigan look like? Let's take a look.

Students at University of Michigan's College of Engineering (CoE) all start their college careers in one pool, all defined by the "undeclared major" status. While they begin their prerequisite studies in chemistry, physics, and mathematics, they are introduced to the 17 different undergraduate engineering major options offered at the University. And after their first semester, they are able to declare their major that they wish to pursue. Oftentimes students don't know what they want to major in and will wait to declare. I declared my major as soon as I was able to at the end of first semester.

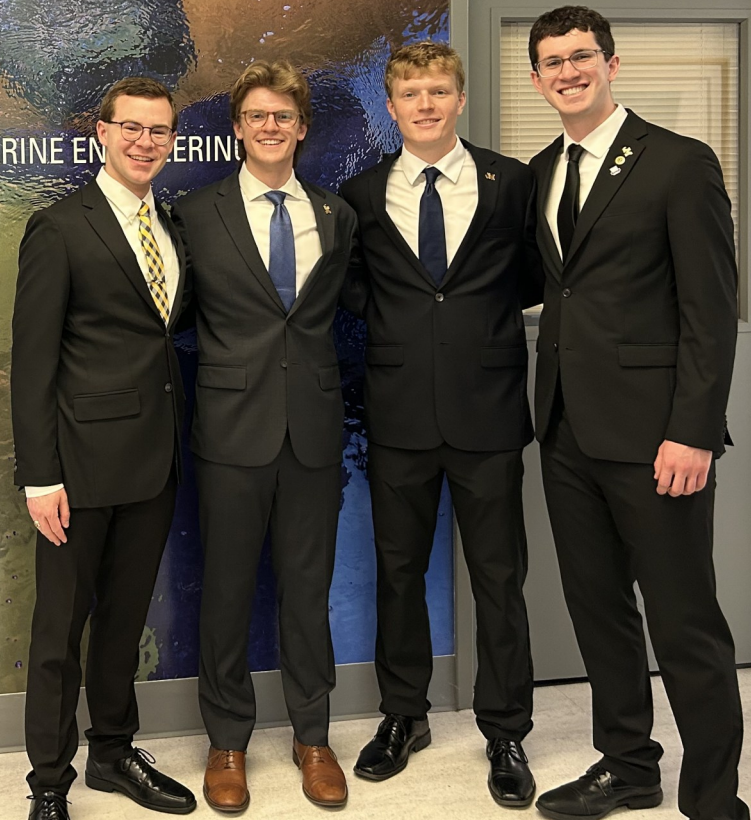
In their first year, most engineering students will not have any major-specific classes. Instead, they will be focused on the general fundamentals of engineering, being chemistry, physics, mathematics, and a selection of humanities courses. Students at University of Michigan CoE are required to take a set number of credits in humanities and other courses categorized as "Intellectual Breadth", to expand their horizons beyond engineering principles.

Sophomore year means students begin taking their first courses in the NA&ME department, beginning with NAVARCH 270 – the introductory NA&ME course. Students learn the basics of building boats and the core elements of what it means to be a naval architect. This was easily one of my favorite classes of college so far, this is where the immersion into the world of naval architecture begins, learning the first principles, and you really





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(Main): The author's NA 475 team—Team BEAM—after Advisory Board presentations. Photo: Carli Hansen; (Bottom right): Rendering of the Team BEAM Next-Generation Logistics Ship concept. Rendering: Michael Otenbaker

begin to form the first bonds with your classmates. Fall semester also includes thermodynamics and physics of electricity and magnetism. In the winter, students learn about statistics, statics and mechanics of materials, and dynamics of moving bodies. These courses establish the more advanced foundations for courses in junior and senior year.

The most challenging semesters of the NA&ME program are during junior year, with courses that cover high-level concepts and foundations, paving the way for design courses during second semester junior and senior year. Fall semester of junior year typically consists of introductory fluid dynamics, marine dynamics and vibrations, and marine electricity, energy, and power systems. Each of these classes leads into a more in-depth version during winter semester, with hydrodynamics, marine structures, and marine engineering design, where students design a ship's power and propulsion plant, topped with a course focused on working in teams. While challenging, it was during these semesters that I really was able to notice how much I had grown along my journey at Michigan so far, from handling new levels of stress to more complex challenges in the classroom.

Students wrap all the things they have learned over the previous three years into their final classes during senior year. Students begin the fall with a laboratory class in the hydrodynamics facility on Central Campus, technical electives of their choice, all while also learning how to design their first comprehensive ship in NAVARCH 470 – combining everything they have learned into an individual container ship design project. Second semester brings an advanced structures course, a final technical elective, and the final gauntlet of an undergraduate engineering degree: the Capstone project. Students work in teams of 4-5 students to design a ship over the course of the semester. The type of ship is up to the students; the main requirement is that it is something that pushes them to

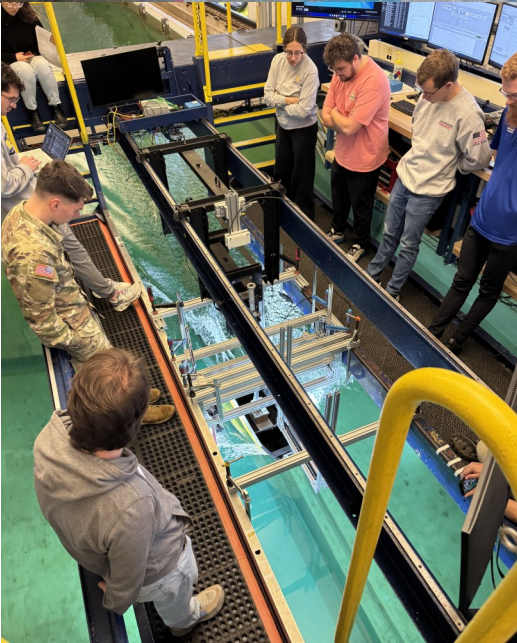
challenge themselves. Prior to graduation, students present their design projects to the NA&ME Advisory Board – a group of industry professionals that guide large-scale department decisions and strategy. Students also have the opportunity to enter their design into competitions within the department and through the Society of Naval Architects and Marine Engineers.

My 475 team – also known as Team BEAM – designed a concept for the US Navy's Next-Generation Logistics Ship. The design focused on a small oiler and munitions supply vessel that could operate stealthily and defend itself in contested waters. All the while, it would keep US Navy surface combatants with full fuel tanks and stocked galleys, and offer a new method to reload vertical launch system missile launchers while in combat theater. We learned so much over the course of the project, it was very rewarding to step into something I wasn't as familiar with and dive in.

School and life in college wasn't always easy though. Classes were challenging, and sometimes weren't offered every



(Main): Painting the rock on Washtenaw and Hill Streets is a tradition University of Michigan students and organizations. Here NA&ME department students are shown painting the rock in the Fall of 2024. Photo: Michigan Engineering; (Bottom left): NA&ME students observe tests in the MHL model basin during one of their laboratory classes. Photo: Anika Lorant.



semester if you needed to retake a class or wanted to get ahead in your studies. Extra care had to be taken to make sure you passed all of your classes and stayed on track. Balancing school, hobbies, activities, and personal items was difficult. The challenges were not always pleasant, but you don't grow when things are nice and easy.

In addition to the Bachelor's Degree in Naval Architecture & Marine Engineering, Michigan offers Master's and Doctorate levels of study. Master's degrees can be completed in a myriad of ways, oftentimes one of either the traditional two-year master's studies or through the subsequent undergraduate-graduate study (SUGS) program, which takes only one additional year following graduation from the undergraduate program.

In 2025, the NA&ME department's Building Resources in Innovation, Design, and Graduate Education Initiative – better known as BRIDGE – took on its first cohort of students for the newly-added 2-year Masters of Engineering degree offered

through NA&ME and the College of Engineering. This program aims to develop the next generation of naval engineers, and offers students fully-funded tuition by the U.S. Navy and industry sponsors, research experience, practicum projects, and the opportunity to take a wide range of classes at the University to fulfill the degree requirements. The BRIDGE program allows students an intimate learning environment with an alliance of specific professors mentoring their own specialty disciplines.

Many professors in the department conduct research sponsored of a wide range of organizations. Students have the opportunity to work as part of the research teams during their time of study at the University of Michigan, whether in an undergraduate or graduate role. Research work gives students the unique experience of working in a laboratory environment and insight into the world of academic research.

Even with all of the business of school work and studies, students in the NA&ME department still find time for tailgating for football games, project teams, club sports, and extracurricular activities. Many are involved with student organizations across campus. NA&ME students participate in several of the College of Engineering student project teams, designing and building complex machines for competition with students from other schools. These include the Electric Boat Project Team, Concrete Canoe Project Team, UM Autonomy (Surface), Robosub (Undersea), Human-Powered Submarine, and the Wolverine Offshore Wind. Other students participate in athletics organizations on campus, such as the Men's and Women's Rowing Teams, Club Sailing, Club Gymnastics, and the Michigan Marching Band. I performed as a member of the Michigan Marching Band during all four years of school. The Marching Band taught me a ton about putting in hard work to attain my

(Main): Students partake in marine-related activities outside the classroom as well. Here students Elliott Sirianni, Evan Sirianni, Brendan Falkowski, and Luke Fenchak go sailing together. Photo: Deann Falkowski;
(Bottom right): NA&ME students at the SNAME Great Lakes-Great Rivers section meeting, Fall 2024.



goals and the importance of dedication and perseverance. Outside of academics and extracurriculars, my classmates and I spent a lot of time doing activities outside the classroom together, such as sporting events and sharing meals.

The class size in the NA&ME department is quite small; in fact, it is one of the smallest units in the entire CoE. My graduating class size is 20 people, while the previous class was 16. Upcoming classes are starting to get a much bigger, well into the low to middle 30s. With these small class sizes, students in the NA&ME program are able to get an uncommon experience at a university as big as Michigan – a close-knit group of classmates who all know each other, and one-on-one time with professors who actually remember your name and know you personally. The faculty to student ratio in the department is very small, making it easy for students to build relationships with their professors and be able to have access to more resources.

Over the last two years alone the NA&ME department has grown, and is continuing to grow fast. The department reached over 100 total undergraduate students in 2025 for the first time in many years. With the incoming BRIDGE cohort, the NA&ME facilities are at capacity, and in great need of investment for improvement and expansion. Due to University policy, the majority of funding for capital improvement and new building projects for departments like NA&ME comes from private and corporate donors. To continue to provide quality graduates in the quantities that they are needed, industry must step up to support this invaluable resource and program for developing the next generation of engineers and designing the ships of tomorrow.

Students are afforded many great networking and professional development opportunities through The Honorary Quarterdeck Society, the University of Michigan student section of the international professional organization Society of Naval



Architects and Marine Engineers (SNAME). Quarterdeck hosts companies in the industry to present to students about the work they do and interface with the student body, while interviewing students for internships and entry-level positions. Students are also able to take the opportunity to attend regional SNAME meetings as well as the annual SNAME Maritime Convention in the fall. It may appear evident early on, and for some it will come later on, but the importance of building relationships with others in the industry is undeniable, and Quarterdeck and SNAME provide an amazing pipeline to begin making those connections.

These connections can help land internships and even jobs later on down the road. The Quarterdeck Society has an excellent network of companies who come in annually to present about

Internships are a major part of the NA&ME experience. (Main): The author is shown on a ship visit to the DOROTHY ANN / PATHFINDER during his internship at Interlake Maritime Services, 2024. Photo: Rick Hanning; (Bottom left): The author in front of the tug BRADSHAW McKEE while in drydock during his internship at Port City Marine Services, 2023. Photo: Andrew MacDonald; (Bottom right): The author with the BADGER in drydock during his internship with Bay Engineering, 2025. Photo: Jason Thornton



their work and interview students for internships and those graduating for full-time jobs. Internships are a critical part of building the experience necessary to learn and apply the skills learned in the classroom. I was lucky enough to have internships in the Great Lakes maritime industry all three summers during my time as an undergraduate student.

Following my freshman year, I interned at Port City Marine Services, a local Great Lakes tug



and barge operator with deep historical ties to other areas of the shipping and commodity business. There I was able to engage with the real-world industry with time in the shipyard and onboard the vessels. My office time was spent learning about fuel and propulsion systems for the future as the company looked for the path forward for the future of its fleet.

After sophomore year, I spent the summer working at Interlake Maritime Services in Cleveland, OH. I was able to spend a lot of time with boots on the ground, or should I say deck, and learn the ropes of keeping a large fleet of ships active and operational, offering assistance for any challenges that came up during the season in addition to ongoing longer-term projects.

Last summer I interned at Bay Engineering in Sturgeon Bay, WI. I spent the summer performing structural calculations, working on drawings, and learning the truly technical components of the job in both fleet support and new vessel design. I was afforded the opportunity to continue working part-time throughout the school year, and accepted an offer



to return as a full-time employee after graduation.

I learned so much – if not more than when I was in the classroom – during my internships, with hands-on and office time that gave me a real-world perspective to the materials we covered in class. On top of that, I was able to grow as an individual in addition to my professional growth. Living in new places away from home and Ann Arbor provided additional opportunities to grow and explore what was around me, and learn to spend time outside my comfort zone.

A NA&ME degree is a key that can open a door to many different career paths, ranging from work in design, fleet management, research, renewable energy, policy, law, and even business. NA&ME Senior, and my very good friend, Evan Sirianni puts it best; “The NA&ME department at Michigan provides the young, aspiring engineer with more opportunities and connections than they can fathom. I find myself struggling to say ‘no’ to the world-class opportunities that come my way. The graduates of this department are truly change makers, going on to lead marine sectors and beyond as CEOs, presidents, and chief engineers. Look no further for the degree whose value far surpasses its investment cost.”

(Main): West Hall archway at University of Michigan's Central Campus in Ann Arbor, MI, home of the Aaron Friedman Marine Hydrodynamics Laboratory. Photo: Brendan Falkowski; (Inset right): The author performing as part of the Michigan Marching Band during his time at Michigan. Photo: UMich Band Photography; (Bottom right): The author as a boy at the Soo Locks, seeing the big ships he will one day design and work with. Photo: Adam & Deann Falkowski



To all the kids out there who love boats, are interested in STEM, or already know they want to be a naval architect, I encourage you to go after those dreams, and explore the opportunities a NA&ME degree could provide you. If it's your time to apply for colleges, send in that application. If you're a few years down the road, work hard, study, and go after it. Even without a direct interest in maritime, if you or someone you know is looking for a career faced with unique challenges, a degree in NA&ME will give you the key you need to open the door to a rewarding career in one of the most globally-connected, technically-challenging, and in-demand fields in existence right now. There's no time like now to take on a career in the maritime industry. Go and chart your course.

Special thanks to my family, friends, and mentors who supported me along my journey through the NA&ME department at Michigan, without you it would not have been possible to write this story. □





Scott Bjorklund Photo

BRENDAN FALKOWSKI is a Naval Architect/ Marine Engineer student at University of Michigan who shares his passion for the Great Lakes shipping industry through his newsletter, work, and photography. He hails from Bath, MI. He is an avid musician and is a member of the Michigan Marching Band. Brendan is also a competitive sailor, and is an assistant coach and photographer for the Bath High School Sailing Team. He enjoys sailing, photography, chasing boats, and spending time with his friends and family.

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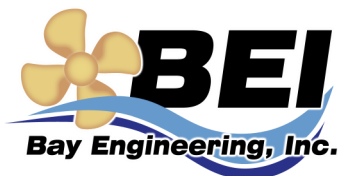
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Cover: Brendan Falkowski stands before the West Hall archway at University of Michigan's Central Campus in Ann Arbor, MI, home of the Aaron Friedman Marine Hydrodynamics Laboratory. Photo: Brendan Falkowski

