Patrick Caton story, Part Two

(As published in The Oak Ridger's Historically Speaking column the week of May 25, 2020)

Benita Albert brings us part two of her story on Patrick Caton. Can you imagine the experience of getting to sit in on one of her former students as he teaches an engineering class? You have to know she was extremely proud to be asked. Let's join her!

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On a beautiful, early fall morning of 2019, my husband, daughter, and I crossed the stately campus of the United States Naval Academy to meet Dr. Patrick Caton, Professor of Mechanical Engineering and a 1993 ORHS alumnus. He had invited me, his former ORHS Calculus teacher, and my family to sit in on his class on "Energy Analysis for Transportation Systems."

This invitation was especially meaningful for my Navy veteran husband, Mark, who was thrilled to attend a Naval Academy classroom and to meet bright, young midshipmen (also known as 'firsties' for their senior class status). My daughter, Allison (ORHS 2000 grad), works in environmental science in the Annapolis area, and she was delighted to share in this unique experience.

Patrick met us on the steps of the USNA Chapel, the historic focal point of the campus, and he walked with us to the north campus and Rickover Hall where his class was soon to convene. As we entered the Hall we passed a bust of Hyman Rickover and an impressive, large scale model of the U.S.S. Constitution. Midshipmen filled the hallways, an orderly wave of young people/future military leaders moving from one class to the next.

Settling into the back row of class, we were soon to witness the arrival of seventeen students and to receive a worksheet of skeleton notes for the day's lesson. Five learning objectives, listed at the top of the page, set the goals for discussion followed by lecture notes and key questions. Broadly, those questions covered: 1. What fuels are used for mobile power? 2. What are prime movers for transportation? 3. To what extent can transportation be improved? 4. How could fuel economy be maximized? and 5. What effect does electrification of the transportation sector have on energy security and environmental security?

The class was fast-paced, interactive, supplemented by graphics and data displays, insistent on previously learned facts and formulas, and engaging. 'Dr. Caton,' as his 'firsties' addressed him, was enthusiastic and in full command of the topic but also solicitous of their input and questions.

I feverishly took notes on a topic entirely new to me, and I delighted in the chance to observe the vibrant learning atmosphere. I smiled to see daughter Allison also filling in her skeleton note answers while husband Mark could not resist joining the student chorus of answer responses. We all came away wanting to learn more about our one-hour immersion in energy analysis.

I was awestruck by so much of what I learned, but in particular by the comments on the energy efficiencies of most gasoline powered automobiles. That efficiency remains in the 20% range, meaning as Dr. Caton simply put it, "When we pump ten gallons of gas, we only use approximately two gallons to move us down the road —it's as if we are pouring eight gallons on the ground. The efficiency can increase for diesel engines and could even approach 50% for giant diesels with mammoth pistons, but obviously, their weight would be an issue."

The class hour seemed to fly by, and though it made me want to car shop given this new knowledge, I came away realizing this is so much more complicated than a single perfect choice for personal transportation or for the larger world of mobile transport.

Zooming out from this one-class snapshot, the enveloping course, titled "Energy Analysis, Policy, and Security," is the brainchild of Patrick Caton working with several of his colleagues in different disciplines. It is an interdisciplinary course enlisting input and instruction from the Economics, Mechanical Engineering, Oceanography, and Political Science Departments.

A portion of the course overview, as printed on the USNA course website, follows:

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"The primary objectives…are to develop leaders who understand and support the energy mission of the United States…and to foster geopolitical awareness of the relationship between energy and national security. …Overarching themes include: 1. The basics of energy science; 2. Energy scarcity and national security; 3. Energy as a strategic factor in military operations; 4. The economics of energy development and usage; 5. Current and developing energy technologies; 6. Energy agreements and policy process; and 7. The environmental impact of energy."

Also, from the course description: "The second part of the course applies these major themes to the fossil fuel, nuclear power, and renewable energy sectors. Underlying all these topics and subtopics is the question: How do energy innovation, policy, technology, and economics affect the ability of the U.S. military to successfully and efficiently succeed in its various missions?"

After class, my daughter Allison asked Patrick if he had been an ORHS Combined Studies student (Note that in part one of his story, Patrick cites Combined Studies as an ORHS favorite memory). Allison commented that his energy course design reminded her of the interdisciplinary thinking modeled by Combined Studies. Patrick's enthusiasm for his work and his extended academic and avocational choices evoke an incessant curiosity and a passion for new challenges and adventures.

I asked him to describe other interesting USNA projects he has led. His response follows:
"I came to USNA in 2005 just out of graduate school. Initially, I was active in diesel fuel research, focused on alternative biologically-based and synthetic diesel fuels. I'm now working on testing new kinds of polymers as ingredients in Navy rocket fuels. That's my main area of research, and the area that I'm paid to do.

"On the side, I'm active with lots of student projects in many diverse areas. I've done some research in the area of waste-to-energy. Several years ago, we took waste food from the main food service here at USNA and figured out a way to turn it into pellets that we then burned. We found that we could recover useful energy by burning the waste food directly.

"We've also tried to examine bio-digestion as a way to recover energy from food waste, which is a well-known process, but not widely implemented on commercial food services. One interesting student project in this area was a challenge for students to modify a diesel-powered vehicle to operate directly from the fryer grease in the food service's large fryers.

"Their 'final exam' was to drive their vehicle to the food service location, fill up an extra fuel tank with whatever the fryer grease was that day, and then drive off around a course powered solely by the grease. Currently, I have two student projects ongoing: one to reduce the drag on the Hydra 70 rocket system and the other to figure out the best way to power medical equipment in the backcountry, away from any developed power source.

Why should Patrick be interested in backcountry medical equipment? Outside of his USNA pursuits, he is a volunteer firefighter/EMT and a wilderness EMT. Patrick and his two teenage sons are leaders in a church-related 'Battalion Group' which he describes as "Christ-centered leadership" that focuses on activities in the outdoors/wilderness as a backdrop. His family also includes a sixth-grade daughter and a wife who serves as the college counselor in the private school their children attend.

Patrick began garnering USNA teaching awards as early as his second year on campus, and as of this printing, he has received at least five awards both from engineering and school-wide recognitions. I asked what he loved about teaching.

He answered, "I view teaching as a leadership challenge: How can I get a group of (for me) twenty-year-old students to do things that they otherwise don't want to do? Like, listen to me, do their homework well, etc. I like that challenge. I also just love to explain things, and I like to think about how best to explain something. Besides that, the teaching profession is very nice! It ebbs and flows—there are really busy moments, but then there are natural breaks (Thanksgiving, Christmas, spring break, the summer) which reduce the stress and make it always changing. It's never the same for too long before your schedule and your students change."

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Finally, I posed the following: "You were raised by scientific parents in a 'science town.' Most American students do not have such a heritage to influence their academic interests…What innovations would you suggest to engage student interest in science?"

An abbreviated portion of his answer follows:
"I don't have a great answer. I honestly think it's hard to replace what happens at home, in the family, and in the community by a school initiative. …If I could give one answer to the question of student engagement and interest, I suppose it would be 'enthusiasm and confidence.'

"I've always valued teachers who were enthusiastic about what they were doing—they always tended to inspire. Enthusiastic, inspired teachers – in any discipline – breed confidence in their students that 'they can figure it out.' I think inspiring confidence can be one of the most important things schools do.

"Otherwise, I can always just learn math, or science, or history by reading a book on my own; there are great online courses I can take; I can certainly read literature at home by the fire. But few people will. What's the point of getting together in a classroom and putting one person upfront besides just accountability and grade assignment?
"In Oak Ridge, you were constantly reminded of the heroic history of people doing science to win a war. Maybe the best thing schools can do, on a smaller level, is to inspire a similar kind of enthusiasm to engender confidence in students…no matter the subject or focus."

I was so honored to observe the power of scientific applications, the art of multi-variable problem solving, and the discussion of policy issues intertwined in Patrick's instruction. My heart was full as I listened in on his class, enjoyed the lively conversations between students and their professor, and reflected on that eager and disciplined former Calculus student of mine---now a "master teacher."

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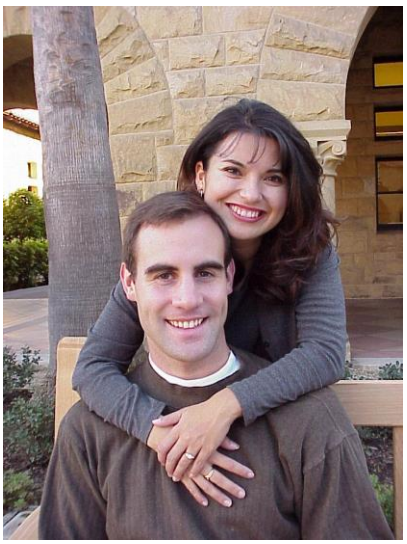
Don't you see the pride Benita has coming through? Can you imagine the joy she has to see a former student not only enter the education field, but excel in such a marvelous way and then to be invited to sit in on a class where he is the teacher? Benita is rightly overjoyed and must have been most gratified to see Patrick in his element of advanced engineering education. Payback for her must have been sweet indeed.



Patrick's engagement picture with his wife, Sunny

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Patrick and his two sons, Luke and Dakota, taken at the Wind River Range, WY, on top of the continental divide

Patrick, Luke and daughter, Avery, surfing at Pismo Beach, CA

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Patrick's family in Yosemite National Park