

## An open letter to Stetson University physics majors:

June, 2021

What a pleasure to be asked to share some thoughts with fellow Stetson physics students, past, present and future! If it weren't for the small physics department, and highly engaged faculty I wouldn't even BE a physicist. I am in physics today because Dr. Pan Papacosta noted my curiosity in this area while I was taking a general education physics course and asked me to consider physics as a potential major. There began my career in physics and engineering and now food science.



*Carla Ramsdell, PE  
Practitioner in Residence,  
Appalachian State University*

And what a ride my career has been! In a nutshell -

- I started with my BS in **physics** at **Stetson**, a solid foundation that has allowed for a host of other opportunities.
- From there, I earned my MS in **mechanical engineering** at **The University of Florida** where my thesis was focused on thermodynamics applied to a biomedical engineering project, reducing endotracheal tube fires during carbon dioxide laser surgery.
  - During my graduate degree, I did an internship at **Martin Marietta** Aerospace for two summers, helping with the design of aerodynamic defense equipment.
- I was then employed by **Siemens / Westinghouse** as a thermodynamic design and test engineer for 12 years in Orlando, FL, working on gas and steam turbines for power generation.
- Our family then moved to Boone, NC where my husband, Jeff took a position as a faculty member at Appalachian State University. I took a **short break** from physics and engineering as I spent time at home with my three children in their early years.
- I then worked part time for a small HVAC engineering design firm, **Building Performance Engineering** in Boone, NC for 5 years in Boone, NC, performing thermodynamic design work on high-efficiency buildings.
- Finally, I started teaching in the **physics and astronomy department at Appalachian State University** in Boone, NC in 2008. I teach predominantly general education courses and enjoy bringing the wonder of physics to both future scientists and non-scientists.

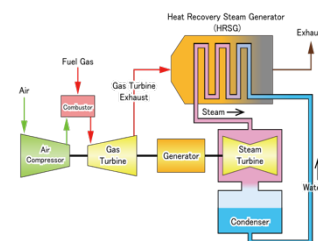
As is apparent, my physics degree opened and continues to open many incredibly diverse career opportunities. What's important to note is that as physicists we learn, above all else, to be **problem solvers**. While the science knowledge is critical, the training in logical sequence solutions that a physics education provides trains our thought process to handle challenges methodically to achieve desirable outcomes.

I am currently a food physicist, studying the energy of our food system and its impact on the earth's energy balance and so I frequently view life through the lens of food. As such, rather than the typical linear progression of my education and career, I'd like to use this open letter to correlate my professional journey to the stages of .... well .... baking a delicious, loaf of sourdough bread. The stages of this process, like the stages of my career include mixing, kneading, rising, baking, cooling, sharing and enjoying! Not seeing the connection? Let's dive into the recipe:

## Step 1: Mix ingredients

*For our bread recipe, first mix flour, yeast (sourdough starter), salt and water.* My early college years were a bit of a jumble. I had a difficult time deciding on a major, perhaps because so many areas were of interest to me. I believe the mix of disciplines I gained from my short stints in nursing, elementary education and accounting in my undergraduate degree helped to widen my perspective. Additionally, after my BS in physics from Stetson, I received an MS in mechanical engineering at The University of Florida. This mix of the pure science of my BS with the applied science focus of engineering in my MS proved to be a great combination, as are the combination of these simple ingredients in our dough loaf. I would encourage students to seek out courses that aren't typically paired with physics to gain important trans-disciplinary perspectives that can enhance your core focus.

Once in the workforce, I would encourage you to continue to seek out trans disciplinary mixing, reaching out to colleagues related to your work but addressing it from a different viewpoint. This mixing of perspectives extends beyond your immediate workplace and group of colleagues. Becoming actively involved in professional and community organizations that have overlap with your work is also critical, both for your professional and personal development and these organization's purpose. I currently serve as the vice chair of the board of directors of Blue Ridge Women in Agriculture. This is not a place that you may naturally expect to find a physicist / mechanical engineer, however, I have gained critical perspective to augment my work while helping this local foodway non-profit organization. I have grown and I am hopeful that my unique voice has also advanced the work of this organization as well.



*Most of my engineering career was spent designing combined cycle power plants*  
Photo: Wikimedia commons

## Step 2: Knead -

*Once the ingredients are loosely combined in our loaf of bread, it is important to knead them. This physical force actually helps to interlock two proteins, glutenin and gliadin, together to form long molecular chains which will trap escaping gas and develop an ideal texture.* My educational and early career years were very much a period of kneading and mental and social development. I learned quickly the power of collaboration - that only when we work together as a team can we expect amazing results. Individual work, like an individual ingredient, typically falls flat. The continual give and take and "ah-ha" moments that come through developing long-standing collaborators makes work more enjoyable and more meaningful.



*Stetson's Society of Physics Students, 1988*

I would strongly encourage you to take time to make these cross-connections during your educational years and beyond. These friendships will elevate your work and the work of your collaborators in ways neither of you could have seen. While they sometime seem less "efficient", the long-term benefit far outweighs the slower pace of genuine collaboration. I still have very fond memories of hanging out in the basement of Sage Hall working through homework problems with my fellow physics students during my time at Stetson. This laid the critical groundwork of collaboration that I still embrace today in the workplace.

### Step 3 - Rise

*Now, we let our dough just sit in a warm environment to increase in size, developing amazing flavor thanks to the fermentation of the yeast. It is in this stage that the benefits of the past mixing of ingredients and cross linking become apparent. Particularly important in this stage is the contribution of the sourdough starter. The portion of our original ingredients that come from the past to grow with the newer ingredients to accomplish these amazing flavors.* We must seek knowledge from the past in order to inform our scientific endeavors of the future. This comes both by listening to those who have worked in our focus area for their long careers and also learning from discoveries and mistakes of those from the past. As with our bread, we can rise to something greater than the sum of our original ingredients thanks to the time spent learning from and leaning on others.

Rest is also critical and often under-prioritized in many professional environments. I have had several times in my career when I under-prioritized the importance of REST, crumbling instead to the pressure of the deadline. I now notice that those periods of my career were the least joyful and lacking in clarity that leads to real invention and creative ideas. The constant go-go pressure is effective for short bursts to reach deadlines or prepare for critical meetings, but equally important is time to rest and rejuvenate. I can't tell you how many solutions to my work problems have come when I slow down and conscientiously carve out time to rest and leave work behind for a bit. Vacation days are a critical part of your future benefit package - don't ever let a day escape unused! When rested, you will be more beneficial to your employer.



*Jeff and I and our three children at home in the Appalachian Mountains*

### Step 4 - Bake -

*Finally, after a long and successful fermentation, our bread is ready for the oven. Place it in a hot oven (400F) for 30 minutes. Here it will be tested by fire. If we followed the recipe correctly, the heat of the oven will excite the yeast to release one last burst of gas. Also, if the gluten development was sufficient the phase-change of the liquid water in our dough to steam in the oven will give the bread one final burst of height or oven-spring, resulting in the perfect sourdough texture. This final rise will only occur if the crust remains moist and pliable, capable of growing to accommodate the expanding dough.* In the same way, our career pathways are frequently put to the test. These tests come in the form of economic downturns, outside competition or unexpected experimental results. Sometimes, thanks to hard work and collaboration, the outcomes of these tests are amazing and result in new knowledge or product for the greater good. Other times, however, the hard work appears to have resulted in deflated idea or product.

Note that there isn't a single bread baker who hasn't experienced a flopped loaf of bread. Mistakes and setbacks are part of the learning experience and while disappointing, typically make you and your work stronger and more resilient. Stick with it - start again. Mix the ingredients differently, find new collaborators, step away for a bit, head "back to the drawing board." These setbacks often emerge as the turning point that brings you and your work to an amazing new place.



*Solar Cooking Demonstration at  
Appalachian State University, 2020*

While disappointing setbacks are part of a typical career, I hope you will also have projects that are more successful than you originally expected or hoped (like particularly delicious loaves of bread). Enjoy these successes and be sure to celebrate these victories with all the people who made this success possible. These are peak moments of your career and should be fully appreciated as they make the before-mentioned setbacks easier to manage.

Lastly, I have found that it is important to remain pliable and adaptable. Just as a crust that is too rigid early in the baking process will often result in a dense loaf of bread since it will not allow for the expansion of the crumb, our fixed viewpoints will stifle other's creativity. Challenge yourself to remain open to other's ideas and adaptable to their viewpoints, sometimes allowing them to shape the future direction of a project in ways you could not have envisioned yourself. Again, this collaboration is critical to real progress.

### **Step 5 - Let cool**

*Once the internal temperature of our loaf has reached 200F, remove from the oven and allow to rest. This stage will set the crust and the interior crumb. It appears there is nothing happening of significance in this stage, but it is a critical part of the recipe. While tempting, cutting into the loaf too early will result in less ideal texture.* The cooling stages of my career have come in many forms. The obvious "cool downs" are necessary when I am frustrated with a colleague or feel that I or a friend have been unfairly treated. I have learned that the peak of my frustration is NOT the time to fire off an email or storm into someone's office. When you feel you or a co-worker have been wronged or not treated fairly, speak up - this is critical for ensuring equity in the work place. But do so when your emotions have cooled down and you can present your story in a productive way to lead to real change.

I have also experienced frustration with the progress of a project I am passionate about that is not progressing as quickly as I hoped. My type A personality tends to think the best solution is to turn up the heat and work harder, but often the better choice is to cool down and re-evaluate why the pace is struggling. This pause to re-focus often helps me to recognize a new direction or breakthrough that clears the way for a better path forward.

### **Step 6 - Share & Enjoy**

*Once the loaf has cooled to room temperature, slice, and enjoy! I would strongly encourage you share this delicious loaf with people around you and spread the goodness to others.* As a faculty member, I have the pleasure of sharing my ideas and experiences with many students through the years. The gift of teaching is that I have, without a doubt, learned as much from my students sharing their ideas and perspectives as they have learned from me!

My final encouragement to you, our future scientists is to SHARE your knowledge with others openly. This sharing comes in the form of scientific collaboration and communication with other scientists so that we can each learn from each other's work and move the overall knowledge into



new and exciting places. But, this sharing also (and of equal importance) comes in the form of communication to the non-scientific community.

One of my passions is to improve the overall literacy about global climate change so that we as a human population can combine our collective passions to alter the course of our current lifestyles in ways that will benefit future generations, not compromise their futures. I feel that we have this capability, but only when everyone is on board. The fact that people still use the words “believe in” associated with climate change indicate that we, as scientists haven’t shared our knowledge with the general public in these areas in ways that everyone can understand. This is about understanding science, not choosing to believe or not believe. I encourage you to prioritize sharing your work with the non-scientific community as much as with your science colleagues to improve the overall literacy in this and other critical areas.



*Presenting Food Physics as part of a climate change solution at PhysCon, 2019*

I wish you all the best of luck and enjoyment during your years at Stetson and beyond. Keep in touch with your fellow physics classmates and maybe even share a loaf of bread with them from time to time!!

Warm Regards,

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PS If you want to follow a more comprehensive recipe for sourdough bread, [try this one](#).

*Nothing like a delicious loaf of sourdough bread!  
(Except, maybe, a Stetson physics degree ☺)*