

Cosmic Mapmaker	12
Maglev Trains, History and Future	14
Cryogenic Propellant Depots	22

COLD FACTOR FACTOR

Spitzer's Revolutionary Technology and Impact on Future Telescopes | 8

NONPROFIT ORG US POSTAGE PAID MARCELINE, MO PERMIT NO. 13

Volume 38 Number 3 2022



The Next Generation in Cryogenics and Superconductivity

This feature introduces outstanding young professionals (under 40 years of age) who are doing interesting things in cryogenics and superconductivity and who show promise of making a difference in their fields. Debuted in the Summer 2006 issue, the feature has presented many young persons whom we are proud to see have indeed lived up to that promise.



Eric O'Connell, 31

My educational and professional background: I earned my BS in Mechanical Engineering in 2012

from the University of Massachusetts Dartmouth.

How I got into cryogenics: My introduction to cryogenics was somewhat of a coincidence. For my senior capstone project in college, my team and I designed a high temperature, magnetic thermal annealing oven used for processing silicon wafers for semiconductors. This experience with high vacuum environments and heat transfer led me to Vacuum Barrier Corporation. During a facility tour, I was exposed to the everyday uses of cryogenics in the food and beverage industry - from utilizing the expansion of liquid nitrogen when vaporized to pressurize water bottles, to purging food containers, and to increased shelf life. My interest was sparked. I joined the Vacuum Barrier engineering team in 2012, just a few weeks after graduation.

My mentor(s) and my experience with them: Jack Ross, vice president of engineering, and Erik Showers, product development manager, have both been excellent mentors over my almost ten years at Vacuum Barrier Corporation. With over 50 years of cryogenic experience, they have been great professional resources every step of the way. **My current company/position:** I am a mechanical engineer at Vacuum Barrier Corporation.

Awards/honors I received: I placed first in my Senior Capstone Project.

Some of my contributions to the cryogenic field: At Vacuum Barrier Corporation, we strive to provide the highest quality products and constantly aim to improve our liquid nitrogen transfer and injection equipment. Recently, I led the effort to design and implement a high pressure cryogenic static seal on our main line cryogenic piping connections. The cryogenic seal significantly decreases the heat loss at these connections and improves the efficiency of the entire piping system.

What are the most important developments in cryogenics? The COVID-19 pandemic has proved that liquid nitrogen can benefit various industry sectors more than ever. Cryogenic preservation using low pressure liquid nitrogen is vital to preserving many medical materials including vaccines, blood and biological tissues.

What advances do you hope to see in the future? Everyone has experienced how vulnerable supply chains are, currently and over the past few years. Inerting fresh food and drink packages extends the product shelf life significantly, allowing products to survive transit through today's delayed supply chains. Expanding liquid nitrogen applications throughout the food and beverage, biotech and pharmaceutical industries benefits end customers greatly.

Where can readers find out more about your projects? www.vacuumbarrier. com



Ronit Patil, 27 My educational

and professional background: I have a master's degree in Mechanical Engineering from Drexel University in

Philadelphia and a Bachelor of Engineering in Mechanical Engineering from the University of Mumbai.

How I got into cryogenics: I got into cryogenics when we decided to enhance our offering to customers. Our company, Penflex, works with compressed gases and cryogenic liquids, like liquid helium, and has strict leak testing and cleanliness requirements. We wanted to provide a comprehensive report of testing and cleaning that had been carried out on the hoses our customers were purchasing, so we brought these processes in-house. While there certainly were design requirements that I had adhered to in building hoses for cryogenic applications previously, I would consider the time spent researching, testing and learning about leak testing and cleanliness standards for cryogenic service to be when I truly entered the field.

My current company/position: I am a sales engineer at Penflex Corporation in Gilbertsville, Pa. I look after our customers in the Northeast, many of whom are involved in the cryogenics space.

My mentor(s) and my experience with them: I would say that someone who shares my attention to detail, and perhaps even exceeds me in his desire for exactitude, is Dave Gregor, Penflex's Level II non-destructive examiner. Dave is also our certified welding instructor and examiner and has great experience in teaching people new processes and committing those processes to paper. He was my guide for developing the specifications that would govern the use of the helium mass spectrometer we purchased, as well as those which would ensure we meet our customers' cleanliness requirements. Penflex now has an in-house standard for hoses that have a requirement of helium mass spectrometry testing. I'm happy to report that these documents have been useful in training newcomers and ensuring consistency across our cryogenic products.

Some of my contributions to the cryogenic field: I think bringing cryogenic leak testing and cleaning in-house is a contribution to the cryogenic field. In doing so, we have added another informed supplier to the list of those offering these important services. For instance, some of our cryogenic hoses are used to move liquid helium through MRI machines, and contaminants in the hoses could impact the level of superconductivity needed for the machines to run properly. Bringing things into a tighter focus, I think the investment in our mass spectrometer and learning more about preparing hoses for cryogenic service is a value-add for our customers. We can now, with more confidence than ever before, provide an accurate representation of what has been done.

What are the most important developments in cryogenics? Power generation is a key market for Penflex, so I'm quite familiar with it. I think the way cryogenic technologies have helped to diversify usable energy sources is significant. Just think of LNG's trajectory over the last century. Not only did cryogenics enable the development of large-scale liquefaction processes, but it also fueled advances in storage and transfer that allowed for its commercialization. The "cleanest burning" fossil fuel is now a mainstay in supplying electricity needs around the world.

The kinds of products I work on support this supply chain. Our hoses and expansion joints are made using the 300 series austenitic steels or other high-nickel alloys, often termed "cryogenic steels" because, by design, they will not become brittle and crack at low temperatures. Most other materials will. Liquified natural gas is just one example of how cryogenics has helped this industry evolve. Liquid air could soon become the newest renewable energy to make headlines, and the list goes on. Our job as a supplier to businesses pushing the field of cryogenics forward is to keep current on developments and recognize how advancements in metallurgy, welding and testing could deliver a better product. At times, customers come to us

39

with prototyping requests, and I always enjoy those kinds of opportunities.

What advances do you hope to see in the future? The field of quantum computing is fascinating, and I think, while it may still be a few years out, we'll be seeing some major developments in this arena before too long. I'd love to see whether there's an overlap between such cuttingedge technology and the work we do. Perhaps the refrigeration systems needed to support the computers' operation are an opportunity—something to keep an eye on!

Where can readers find out more about your projects? Penflex Cryogenic Transfer Hoses (with videos featuring Dave Gregor and myself): www.penflex.com/cryogenichose-and-braid-solutions-liquid-transfer, Penflex (General Resources): www.penflex. com, and LinkedIn: www.linkedin.com/ company/7237893 do



cryogenicsociety.org