

# PROTOCHIPS CONNECTIONS

## IT'S ALL ABOUT CONNECTIONS

### Portland Bound



**Mike Coy | Senior Director,  
Global Applications  
Marketing**

I attended my first M&M in 1993 in Cincinnati, OH. At the time, I was a grad student finishing up my degree and had become totally fascinated by the capabilities of electron microscopes and the new worlds they revealed. I was looking for a job in the electron microscopy field and was incredibly excited to attend the conference and see what opportunities were out there.

It's now 29 years later, and I am possibly even more excited to attend M&M 2022 than I was for the show in 1993. For the first time since 2019, microscopists and scientists from all over the world will gather in person to share their research and results, presenting new technology and techniques to push the horizons of EM even further. I can't wait to see what's presented.

At Protochips, we are incredibly excited to show you our contributions to the advancements in the field. By pairing our machine vision AXON™ Platform to our market leading in-situ Holders, we have created a new level of solutions that will enhance productivity and enable new discovery. Adding our new AXON Dose™ module, you will now be able to quantify, visualize and report electron dose in ways that weren't possible previously.

I'm really looking forward to seeing all the friends and colleagues I've made in almost 30 years of attending M&M. Please stop by our booth and see what we've been up to!



**David Nackashi, PhD |  
CEO, Co-founder**

Two months ago in May, I was fortunate enough to attend and give a short presentation on behalf of Protochips at the 2022 PICO conference at Kasteel Vaalsbroek. It was a fantastic scientific program and chance to see old friends for the first time in almost 3 years. In addition, several trends were apparent throughout the program. One was the speed of adoption of pixelated STEM detectors and how much great scientific work is coming from these techniques. Our community has a significant data volume challenge ahead, but the potential is amazing and in time new data handling techniques will certainly be developed.

Another was how careful each talk was to report dose rate and total accumulated dose information for the TEM data they collected. One point was very clear: we don't have a standard way to calibrate or report dose information that can easily be shared and reproduced, especially when using different detectors or TEMs. Since Protochips first introduced Poseidon, our liquid TEM solution, we've consistently received feedback on the importance of this capability. Of course, this need extends well beyond liquid TEM.

After years of development, Protochips just released our AXON Dose module which includes a dose calibration holder (based on a Faraday cup) and our revolutionary AXON software for visualizing and sharing dose. Our CTO and my cofounder, John Damiano, authored an article in this month's [Microscopy Today](#) explaining our approach and why capabilities including drift correction

are so important to accurately measuring dose. The most exciting part of this, however, is the inclusion of accurate dose information into the metadata of every image and sharing this data on our freely available AXON Studio™ platform. In one experiment, we've actually shown beam damage to a specific zeolite sample can be correlated to a total accumulated dose level and the results reproduced between two very different TEMs from different labs across the world!

For those of you coming to M&M this year in Portland, please come by our booth and see real dose datasets for yourself in a variety of applications including the zeolite experiment I described above. We look forward to seeing many of you for the first time in 3 years and we hope you have an educational and enjoyable conference!

## DISTRIBUTOR SPOTLIGHT



EDEN Instruments has been our distributor in France since 2014 and is a company fully oriented around in-situ TEM and SEM experimentation. Led by Stéphane Aguy, EDEN is an outstanding resource supporting Protochips customers and products and has built an install base of more than 30 holders in France.

Additionally, EDEN uses a strong technical base to support workshops and classes in France like the AXON Workshop just held at the University of Diderot hosting many prominent TEM users in Paris.

EDEN Instruments also represents other complementary products like EBIC and low dose cameras that fit well with the Protochips product lines.

EDEN can be reached at

E-mail: [stephane.aguy@eden-instruments.com](mailto:stephane.aguy@eden-instruments.com)

Website : [www.eden-instruments.com](http://www.eden-instruments.com)



The EDEN Team is composed of:

Stéphane Aguy, *CEO*

Marc Lalande, *Technical Director*

Alexandru Delamoreanu, *Sales Engineer*

Nadège Roumane, *Sales Assistant*



# AXON



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FREE WALLPAPER**



## OUR CUSTOMERS

| Dr. Deborah Kelly

*“We are thrilled to work with the Protochips team as we strive to establish the ‘Real-time Revolution’ in atomic imaging”*

## EMPLOYEE SPOTLIGHT



**Dylan Wood**

Americas Regional Sales Manager  
Location: San Francisco, CA

*“Grateful to be a part of Protochips as I get excited to build a better future through clean energy, advanced medical treatments, sustainable materials, and better data.”*

I joined Protochips April 2021 and am loving this team! My home is San Francisco, California, and I love hiking among the Redwoods and hearing the Golden Gate Bridge sing in the wind.

Grateful to be a part of Protochips as I get excited to build a better future through clean energy, advanced medical treatments, sustainable materials, and better data.

I am managing the Americas Sales Team across the United States, Canada, and Latin America and am responsible for the direct support of TEM laboratories in the Western US.

I studied physics and music at Vanderbilt University. Physics to ask the big questions about our existence, music to explore the joy of being human. My research was inspired by astronomy and enabled by electron microscopy. Amazing

how the large- and small-scale universe are so similar! My music degree is in singing opera and playing violin.

Many of you know me from my 9 years at Oxford Instruments, Nanoanalysis where I was an Engineer and an Applications Scientist, specializing in EDS, EBSD, and WDS for TEM, FIB, and SEM. It was fun learning Spanish and Portuguese to teach EM from Canada to Brazil. I then spent a year as a Sales Manager at Vision Research before Joe told me about AXON and I immediately joined the Protochips team.

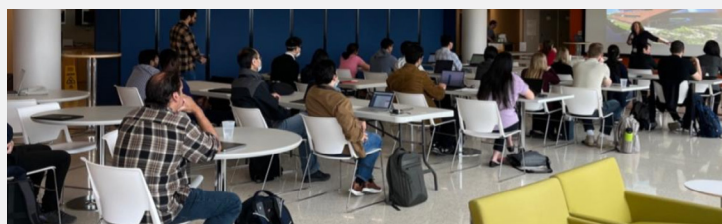
Music is still an important tune in my life as I sing the standards and play violin to stay grounded. After work I love biking and hiking in the California sun. You can contact me any time to talk TEM, physics, cosmology, AI, music, or just for fun! [dylan.wood@protochips.com](mailto:dylan.wood@protochips.com) and [linkedin.com/in/wooddylan/](https://www.linkedin.com/in/wooddylan/)

## PSU WORKSHOP RECAP

To mark the creation of the Protochips In Situ Machine Vision Platform (PRISM) initiative at Pennsylvania State University, Protochips and the Center for Structural Oncology at Penn State hosted a joint workshop on May 24-25, 2022. The PRISM initiative was developed to elevate existing in-situ TEM technologies in the Materials Characterization Laboratory (MCL) by incorporating Protochips' machine vision workflows and data integration systems. The program featured invited talks from Haimei Zheng (Lawrence Berkeley National Lab), Wenpei Gao (North Carolina State University), and Liza DiCecco (McMaster University) that highlighted a broad range of in-situ TEM applications.

Attendees were able to participate in live demonstrations of the Protochips Poseidon Select and Atmosphere 210 systems and see firsthand how the machine vision software, AXON, can streamline the process of collecting and analyzing TEM data.

Dr. Deb Kelly, the director of the PSU Center for Structural Oncology, whose mission is to improve the vision of the nanoworld while battling emerging threats to human health, gave a live demonstration of liquid-EM imaging of SARS-



*Dr. Jennifer Gray, TEM Staff Scientist at PSU, welcomes attendees during the workshop.*

CoV-2 using a novel, low-cost method of preparing liquid cell “sandwiches” using a silicon nitride (SiN) MEMS grid clipped to a conventional continuous carbon grid. This simplified liquid cell enables a static liquid environment to be imaged in a conventional single tilt or cryo-TEM holder.

You can read more about this method and advances in liquid-EM techniques for biological applications in the Kelly Lab's recently published Microscopy & Microanalysis Paper: “Automated Tools to Advance High-Resolution Imaging in Liquid”

Protochips and PSU look forward to collaborating on more workshops and tutorials in the future with the aim to advance the field of in-situ microscopy for both materials and life science applications.





# PRODUCT SPOTLIGHT

Jennifer McConnell | Product Manager

## Generating Vapor at Room Temperature for Gas-Solid Interaction Studies

Most catalysts and protective coatings are utilized in humid environments within the real world, and the humidity plays a large role in the durability of these materials over time. When using gas-phase in situ TEM to study the aging of these materials, the ideal situation would be to create the most realistic experimental environment so you can observe what happens in the real world, and this includes adding humidity.

Creating humidity within an in situ TEM system requires one important capability in order to do this in a reproducible and quantitative manner: *there needs to be a means to prevent condensation within the gas lines.*

Two major issues are caused by condensation:

- The humidity percentage set for the environment is no longer accurate as vapor has condensed out of the gas phase
- Contamination of future experiments due to the difficulty of removing liquid water from gas lines

### What causes condensation in the gas lines?

Most commonly, it is caused by the vapor experiencing a decrease in temperature large enough to cause it to condense. Typically, vapors are created by heating a liquid up to its boiling point and introducing the vapor to a carrier gas, like when using a bubbler. However, once the vapor leaves the initial creation point, it experiences a temperature drop back down to room temperature, which will cause some of it to condense back into the liquid phase.

### How can condensation be prevented?

Keep the temperature constant through the entire gas flow path.

The Protochips Atmosphere system is unique in this instance, using Volumetric Blending to create vapors at room temperature by manipulating pressure instead of temperature. Looking at a liquid's phase diagram chart, at low pressures liquids, will vaporize at room temperature, allowing them to travel through the entire gas flow path at the same temperature as where it was created without experiencing a drastic temperature drop.

### Can the Atmosphere system only vaporize water?

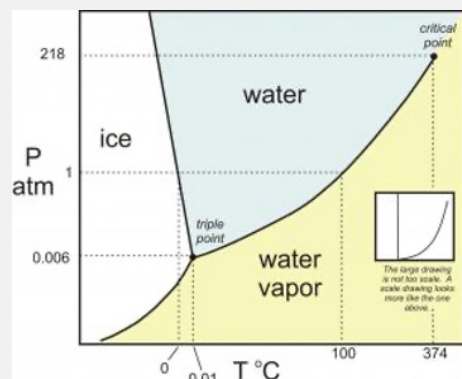
The Protochips Atmosphere system is not limited to only vaporizing water! Since the Volumetric Blending technique does not require calibration to specific gases, you are free to vaporize any liquid that is compatible with the materials of the system. This includes methanol, ethanol, propane, benzene, etc. that can be used as reactants as part of different experiments, providing a wide range of flexibility for your project and others in your lab.

Want to learn more about our machine vision-based Atmosphere system? Download our brochure here:

[DOWNLOAD](#)



Protochips Atmosphere in situ TEM Gas Cell System



Phase diagram of water  
[https://serc.carleton.edu/research\\_education/equilibrium/phaserule.html](https://serc.carleton.edu/research_education/equilibrium/phaserule.html)

# HIGHLIGHTED PUBLICATION

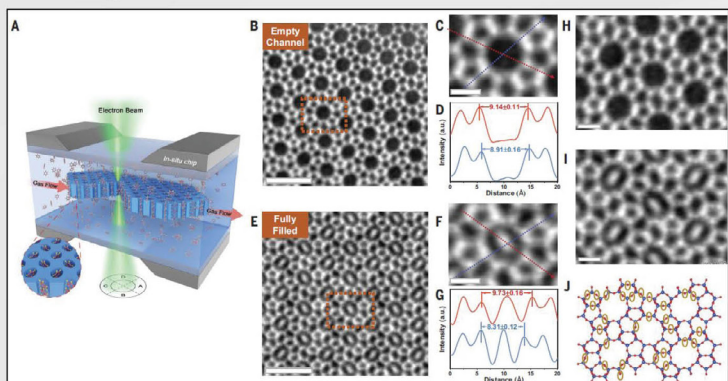
## ATMOSPHERE

Publication featured in Science



### In Situ Imaging of the Sorption-Induced Subcell Topological Flexibility of a Rigid Zeolite Framework

Hao Xiong, Zhiqiang Liu, Xiao Chen, Huiqiu Wang, Weizhong Qian, Chenxi Zhang, Anmin Zheng and Fei Wei



# CONGRATULATIONS!

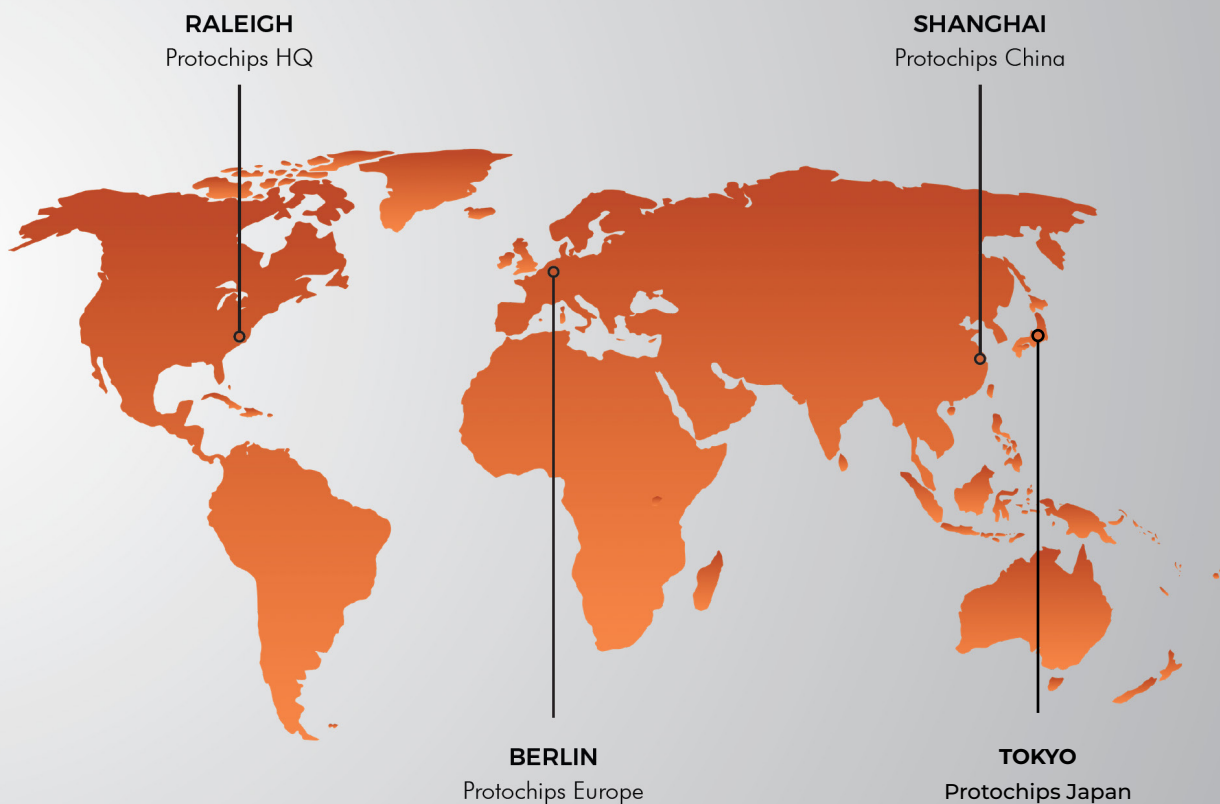


Liza-Anastasia DiCecco;  
McMaster University

Congratulations to Liza-Anastasia DiCecco! Liza, a third year student at McMaster University in the Grandfield group, selected as the North American winner of the inaugural Nano Letters Seed Grant Award for her work studying the mineralization of hydroxyapatite using liquid-EM to better understand the interaction between bone and medical titanium implants. Liza has worked extensively with Protochips' Poseidon Select system both at McMaster and during her time as a visiting scholar in Dr. Deborah Kelly's lab at Pennsylvania State University. We are excited to have such a talented young researcher utilizing our in-situ products and look forward to seeing the next step in her research!

"Through using liquid in-situ electron microscopy techniques, I'm exploring nanoscale dynamic biomineralization events at biomimetic conditions. This is impacting our understanding of biomineralization processes and providing us new tools to answer big questions, key for instance to the study of implant osseointegration and for exploring treatment pathways for hard tissue diseases like osteoporosis."

# WHERE ARE WE?



## EVENTS

### **Microscopy & Microanalysis 2022**

July 31-Aug 4, 2022  
*Portland, OR*

### **Gordon Research Conference**

October 9-14, 2022  
*Ventura, OR*

### **JASIS 2022**

September 7-9, 2022  
*Japan*

### **The 4th East-Asia Microscopy Conference**

December 1-4, 2022  
*Taipei*