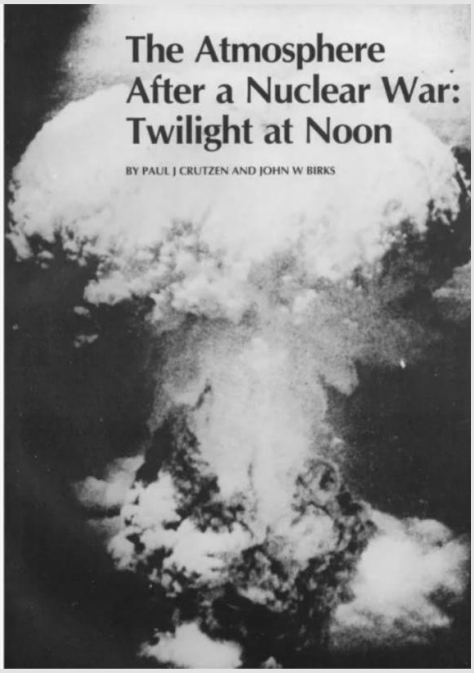
Fall 2022 Newsletter

2B Technologies

2B Buzz

Spotlight

2B Tech Co-Founder John Birks Honored with the 2022 Future of Life Award



We are extremely proud to announce that John Birks, Co-founder of 2B Technologies, has received an award from the Future of Life Institute for his role in discovering and communicating the climatic effects of nuclear war, i.e., "nuclear winter."

John's paper, co-authored with Paul Crutzen and published in 1982 in the journal *Ambio*, was the first to show how widespread fires from the use of nuclear weapons would generate enough smoke to significantly block sunlight for many weeks, triggering worldwide famine through its effects on agriculture. "The Atmosphere After a Nuclear War: Twilight at Noon" was a catalyst for international research on the topic, leading to the popularized term, "nuclear winter."

World leaders in the late 1980s, notably including Ronald Reagan and Mikhail Gorbachev, came to understand that even a limited-scale nuclear war would devastate the entire planet. This work is widely credited for ending the nuclear arms race and many believe that it helped prevent a nuclear war between the Soviet Union and the United States.

Watch the video below about how the science by John and his colleagues quite literally averted disaster and protected humanity.

The Atmosphere After a Nuclear War: Twilight at Noon

The Future of Life Award

Air Pollution News

Wildfire Plumes Are Getting Taller--And Why That Matters

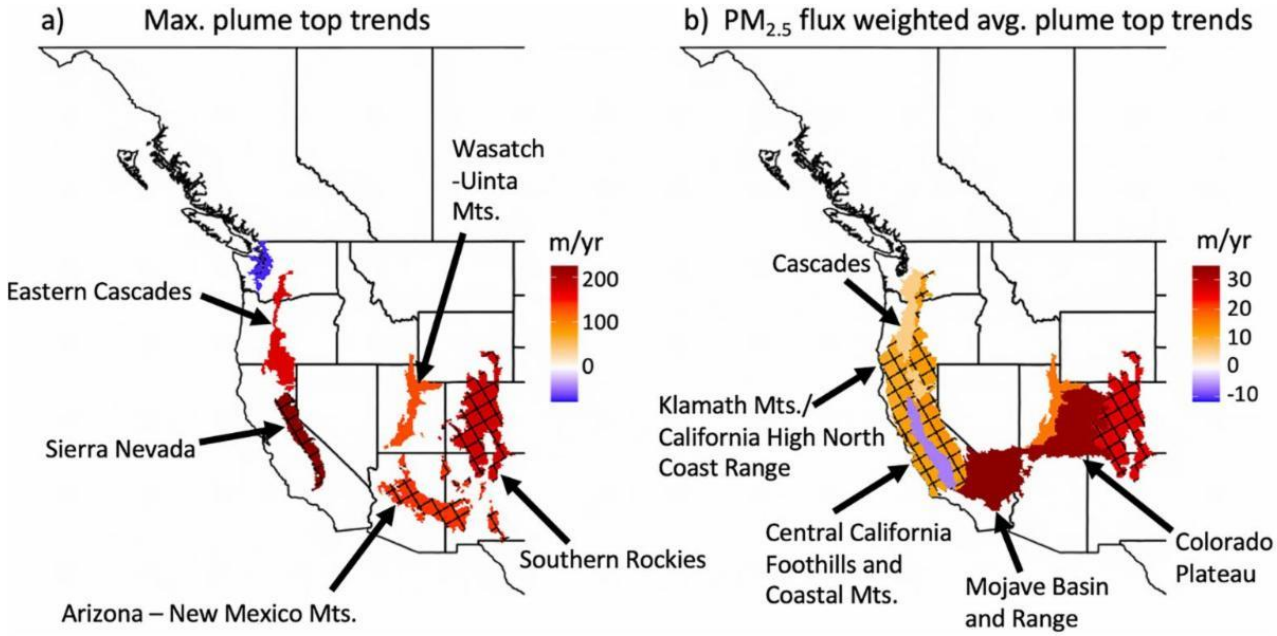
New Findings Have Implications for Air Quality, Climate

Figure credit: University of Utah.

Wildfires are not just occurring more frequently. They're getting more intense...and according to a new study, they're getting *taller*.

That matters because the plumes are like a pipeline for transporting particles to upper layers of the troposphere and even the stratosphere, where they then can spread farther. This means that the effects on air quality become more extensive. For example, Utah is more likely to experience the effects of fires in California. Indeed the effects can become continental in scale. In August 2018, Western Canadian wildfire smoke reached New York City.

In the new study, researchers from the University of Utah focused on the American West and Canada, assembling a database of an astounding number of plumes (~4.6 million) that occurred in August and September over the years 2003-2020. Modeling the plume data, they determined the trends in the maximum height reached by the plumes. The maximum height was increasing in nearly all areas, to the tune of 300 to over 700 feet *per year*. (To put it in perspective: The Eiffel tower is about 1000 feet tall.)



Left: Trends in the maximum heights of the ~4.6 million plumes that occurred from 2003-2020. Right: The trends in the average plume height, weighted by the $PM_{2.5}$ flux of the plume. Figure 1 of Wilmot et al., 2022.

The biggest jumps in max plume height also seemed to occur in the most recent few years, suggesting that the trend may be accelerating. More data are needed to establish this impression statistically.

When fire plumes reach further upward, there are consequences for climate as well as air quality. In the higher layers of the atmosphere, the particles have a longer lifetime and exert direct and indirect radiative effects. And there is the risk of a potential feedback loop in which the lofted particles actually suppress rainfall, which then increases wildfire activity.

The authors note that the trends in wildfires and their plumes are most likely due to climate changes, such as increasing temperatures and decreasing precipitation. Though many nations are taking various actions to address climate change, lead author Taylor Wilmot notes that to some extent, the horse is already out of the barn: "The reality is that some of these [climate change] impacts are already baked in, even if we cut emissions right now. It seems like largely we're along for the ride at the moment."

Wildfire Plumes in the Western US Are Reaching Greater Heights and Injecting More Aerosols Aloft as Wildfire Activity Intensifies, T. Wilmot, D.V. Mallia, A. Gannet Hallar, and J. Lin, *Scientific Reports* (2022), **12**, 12400.

Link to Scientific Reports Paper

Case Study: 2B Tech's Model 106-L Ozone Monitor

Monitoring Ozone in the Remote Forest-- for *Years*!

Using 2B Tech's Monitors Found to be Cost Effective and Sustainable

How does ozone pollution affect forests? And what happens if you put our 2B Tech ozone monitors in the remote forest for FIVE YEARS to find out?

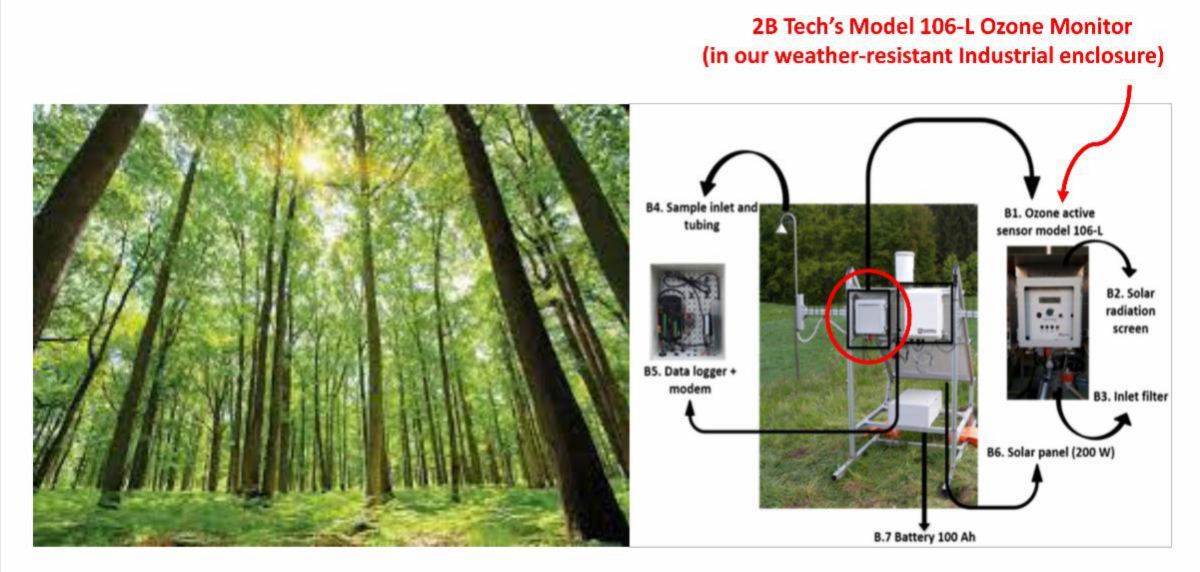


Figure Credit, right panel from Figure 1 of Carrari et al., 2021.

Researchers in Europe did just that, leaving our Model 106-L monitors (in our rugged "Industrial" enclosures) in remote forest areas to run unattended for long stretches of time. The study looked at costs compared to a passive ozone sampling system that was less expensive at startup.

Over the long haul, it was more economical and environmentally sustainable to run the 2B Tech systems, because they required less frequent human interactions and fewer trips to the monitoring sites. In addition, the higher quality of the data from the 2B Tech monitors meant that researchers could use the data in stomatal flux studies of how the ozone affects the trees.

This is a "WIN x 3" for the researchers, the trees, and 2B Tech! Read the open-access study by Carrari et al., linked below!

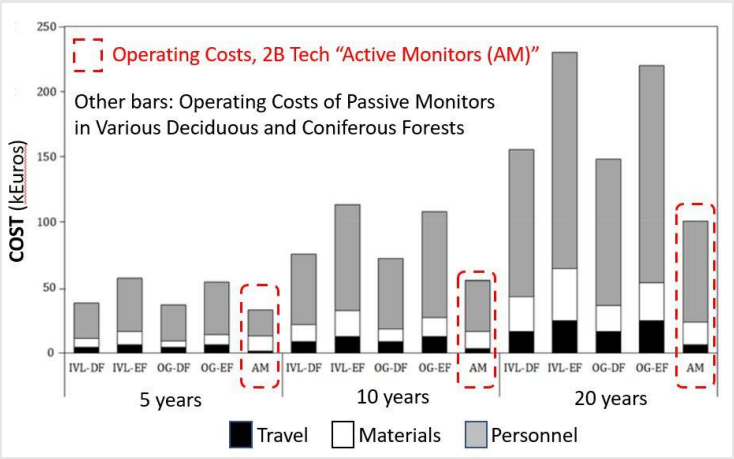


Figure: Modeled monetary costs of passive sensor systems (IVL, OG) versus active monitoring with the 2B Tech Model 106-L, over 3 time horizons of monitoring. Based on the MOTTLES 5-year study in European forests. Figure Credit: Modified from Figure 4 of Carrari et al., 2021.

Economic and Life Cycle Analysis of Passive and Active Monitoring of Ozone for Forest Protection, E. Carrari, A. De Marco, A. Laschi, O. Badea, L. Dalstein-Richier, S. Fares, S. Leca, E. Marchi, P. Sicard, I. Popa, Y. Hoshika, A. Materassi, G. Pallante, D. Pitar, and E. Paoletti, *Environments* (2021), **8** (10), 104.

Link to Environments Paper

The 2B Tech Model 106-L Ozone Monitor

Employee Spotlight

Andrew McCullough: Making Sure Our Instruments Get from Point A to Point B

Meet Our Shipping and Manufacturing Assistant

If you've received a shipment from us in the last few years, Andrew McCullough most likely packed it up for you. An expert in all things related to packing and shipping, Andrew is 2B Tech's ace Shipping and Manufacturing Assistant.

Andrew joined the 2B Tech team in August 2019 (and he's been surrounded by boxes ever since!). Over that time, he's mastered the ins and outs of shipping our ~20 different instruments, each of which has its own time-tested procedures and materials for safe and secure transport. He also helps out in putting together some of the spare parts we send to customers, and making various assemblies that go into our instruments.

In the shipping world, timing is crucial and things can get challenging when there are large shipments to far-off places. Andrew handles it with calm confidence. He's learned some tricks along the way to make his work more efficient. And as he notes, "I'm handy with a tape gun!"

Andrew is a true Colorado native who now lives near Denver. In his spare time, you'll find him with friends going to concerts, movies, and comedy shows, or playing video games. He also recently completed a course in video production and enjoys honing his newfound skills in that area. Aside from that: If Andrew's friends need any help with packing for a move or gift-wrapping, Andrew is *the man*!
