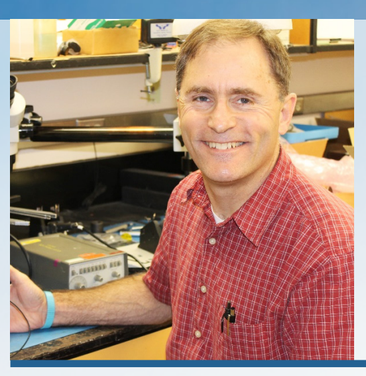
The Statewide Committee for Research honors Alaska's

# Northern Innovators



## Jeff Rothman

*Northern Innovators Hall of Fame Member*

Every once in a while, someone looks at a product and thinks, “I can make that better.”

Most of those people turn to the next distraction. The leap does not happen. But Jeff Rothman persisted.

He improved a sensor that, when deployed in an Alaska forest, can detect a nuclear explosion on the far side of the planet or a volcanic eruption in an Aleutian storm. His patented infrasound sensor is smaller, more accurate and uses less power than its predecessor. While other sensors are the size of a blender, his is a hockey puck.

Rothman is the inventive supervisor of the Electronics Shop at the Geophysical Institute at the University of Alaska Fairbanks. There, in the basement of the eight-story Elvey Building, he engineers solutions for researchers who launch rockets into the aurora, those who study glaciers and flyers of unmanned aerial vehicles.

The university and Rothman were awarded a patent for his tiny infrasound monitor in April 2016. They are now sold by Chaparral Physics, part of the Geophysical Institute. The Institute purchased the assets of the New Mexico company in 2004.

Institute researchers have long used arrays of infrasound microphones on campus to detect signals from near and far.

Infrasound waves have a frequency below 20 Hertz, which is about the lowest frequency we can detect (though migrating songbirds can perhaps use it for direction finding). Infrasound waves are big, slow and long-lasting, and come from nuclear explosions, winds over distant mountains, volcanoes, the roar of the ocean and even the aurora. UAF’s Buck Wilson once detected a nuclear bomb detonated in China. The wave from the blast took more than six hours to get to Fairbanks. The signal registered again 37 hours later as the wave completed another lap around Earth.

Infrasound arrays are set up around the world as part of the Comprehensive Nuclear Test Ban Treaty. World leaders who signed the treaty agreed to ban the testing of nuclear bombs in the atmosphere. One of the centers for monitoring technology is in Fairbanks.

Rothman designed an ultralow noise amplifier that allows an inexpensive semiconductor pressure sensor to perform as well as an expensive large diaphragm microphone. He fit it into a circular package less than two inches tall and weighing seven ounces. That sensor and supporting equipment fits in a small backpack. Both are easy to for scientists and others to deploy.

An expanding market for the sensors comes from those studying volcanoes. Volcanoes emit infrasound signals during every eruption. These signals tell volcanologists how much ash has been released into the atmosphere and how much danger it presents to airline traffic. Infrasound has been a valuable tool at volcanoes such as Cleveland, where weather is often stormy and there is no close seismic network.

Along with his work improving the products of Chaparral Physics, Rothman developed a small, re-useable sounding rocket that could save researchers thousands in allowing them to test payloads without mounting a full campaign. The 10-foot carbon-fiber rocket is an alternative to a ride on a full-scale rocket that can cost $1 million. Scientists and students could use Rothman’s rocket for $10,000.

Rothman is a flight instructor and an unmanned aerial vehicle operator. He also designed an electric field probe for atmospheric scientists, tested and helped develop ejectable payloads for NASA sounding rockets, supervised the operation of a Department of Energy particle accelerator and redesigned a prototype human kidney perfusion apparatus.