

Woody's World

A Q&A with the inventor of a pirate-scaring noisemaker, a helicopter for every garage, and a way to hack gravity itself.

INTERVIEW BY WILLIAM LIDWELL
PHOTOGRAPHY BY JENNY PFEIFFER

Woody Norris is standing 50 feet away from me, pointing a menacing-looking sci-fi contraption at my head. We're in the back lot of his American Technology Corporation in San Diego, Calif. Woody's device is called the LRAD (for Long Range Acoustic Device). It looks something like a big spotlight, the main difference being that it projects sound instead of light. Woody yells to me, "We are going to start with some music. This is really cool!"





Now hear this: Elwood "Woody" Norris' Long Range Acoustic Device was developed for the U.S. military to send a painful blast of noise at small boat crews attempting to get near U.S. vessels.



He fiddles with the controls and I hear classical music as clear as if I were next to the speaker. I smile and nod back. Woody grabs a microphone and speaks through the LRAD, "Now I'll play some pre-recorded commands being used by our troops in Iraq." I can hear him clearly. I begin to hear a series of commands like "Halt" and "Put your arms over your head" quickly followed by their Arabic equivalents. Again, I nod. Then I see Woody and his prototyping guru, Jeff Belka, chatting back and forth, nodding, and smiling. They are up to something. Woody looks my direction and all I see is a big set of teeth slowly revealed by a widening smile.

He turns a control on the LRAD and a 150db siren screams out of the device — my hands instinctively shoot up to cover my ears. The siren is so loud I can't think or do anything. I am paralyzed. The siren lasts for only a couple of seconds before Woody turns it down. I start to put my hands down and he cranks it. My hands shoot back up and I stand there at his mercy. We do this dance a few times until Woody is convinced that I get it. The LRAD is cool technology. It has all manner of communication, crowd control, and acoustic weapon potential. Before I can clear my head and convert my thoughts to words, Woody starts to reach for the LRAD again. "It is cool! It is cool!" I shout. He gives me an approving look and motions me in. "Yeah, cool," he says. "Now we can continue."

A recent winner of the Lemelson-MIT Award for Invention and holder of more than 40 patents, Woody Norris is the classic American success story. Born of modest means and largely self-educated, Woody is the founder of a number of companies based on his inventions, ranging from personal flying aircraft to a variety of revolutionary acoustic technologies. As inventors go, he is a rare breed that enjoys selling as much as inventing — an unusual blend of P.T. Barnum and Thomas Edison.

Woody's workshop is within eyeshot of his huge and opulent home on an adjacent hilltop. As we go inside, my eyes are immediately drawn to the notes and diagrams on his whiteboard. Intriguing terms like "plasma antenna" and "optical cobweb" fill the board. On the workbench,

I spot some very strange-looking speakers, a gas chromatograph, and circuit boards that he appears to be reverse engineering. Seeing this array of gadgetry leads to my first question ...

When did you discover that you wanted to be an inventor?

My whole life I have been dragged along by circumstance. I became an inventor by accident. Around 1960, I was reading a magazine that had an article about a new kind of electric shaver that ionized off your whiskers — it had drawings and everything. The article intrigued me. The further I read, the more incredulous I became, and sure enough, at the end it said, "April fool." Here is the part that changed the rest of my life. To the side of the article, there was a small box, outlined in black and titled, "Editor's Note: Submissions Wanted." It was a contest announcement inviting readers to write next year's article. The winner would receive \$250. I was only making about \$400 a month at the time, so that was a lot of money to me. I dropped what I was doing, dreamed up a new invention, and wrote the article.

My invention idea was a record player tone arm that made a straight line across the record instead of pivoting at an arc. Since that is how they cut records, it seemed reasonable to me that a straight-line playback arm would be superior. I was literally in the process of licking the envelope to submit my article when I stopped myself. I decided that I should call some hi-fi stores pretending that this was the real deal and see if they would believe it — the thought being that if it could fool them, then it could definitely fool the readers of the magazine. So I called up every retailer in the Seattle area and not only did they believe it, they were excited about it. At that point, I decided I better build the thing instead of submitting the article. And that set me on the path to inventing things.

Of your many inventions, I am most intrigued by the HyperSonic Sound technology. How does it work?



HyperSonic Sound is my landmark invention. It allows you to project sound like a very focused beam of light. With a normal speaker, sound propagates outward as waves in the air. If I point a normal speaker away from you, you still can hear the sound. With a HyperSonic Sound speaker, if I point the speaker away from you, you won't hear anything. How does it work? Ultrasonic frequencies are very directional because their wavelengths are so short — the higher the frequency, the more like a beam they become. So I figured out a way to increase the frequency of standard audio content to ultrasonic levels. If you do this in a particular way, the ultrasonic signal demodulates in the air and turns into audible sound. So instead of emitting audible sound from a single source like a speaker, the sound is actually made in the air at an infinite number of points along this ultrasonic column. It's like having a billion little speakers lined up and pointing in the same direction. It is very cool — like magic.

Can you describe your process of invention?

I largely invent by analogy. I find things that are successful in one environment and then think about parallels in other environments where people have not yet discovered or exploited the concept. For example, I came up with the idea for HyperSonic Sound by analogy. I was watching television one day and I noticed that the logo on the TV had three colors: red, green, and blue. These are the colors that are squirting onto the screen from the back of the picture tube from which millions of colors are created. By mixing just a few colors, you can get millions of colors. I thought to myself that this was pretty cool. And then I thought about electronic circuits, where there are components called mixers that allow you to mix a couple of frequencies together to get new ones. So it occurred to me that if you can mix energy optically and electronically, why couldn't you mix sound energy in a similar way? Then I started thinking about the possibility of mixing sound that is inaudible to people — in this case, ultrasonic sound — in a way that would result in audible frequencies. And that is where the HyperSonic Sound idea came from. I solved the artificial hip problem in a similar way.

The artificial hip problem?

When someone gets an artificial hip, it can fall out of socket quite easily. It takes many months of conscious effort for patients to learn how to do things in a way that prevents the artificial hip from disengaging. When one disengages, it is very painful and costs thousands of dollars to reset. Anyway, I was approached by a group of doctors who wanted a way to detect when an artificial hip started to separate and then set off an alarm. In this way, people could stop what they were doing and tense up their muscles to prevent the hip from disengaging. Additionally, they didn't want any active electronics or power sources to be inside the body.

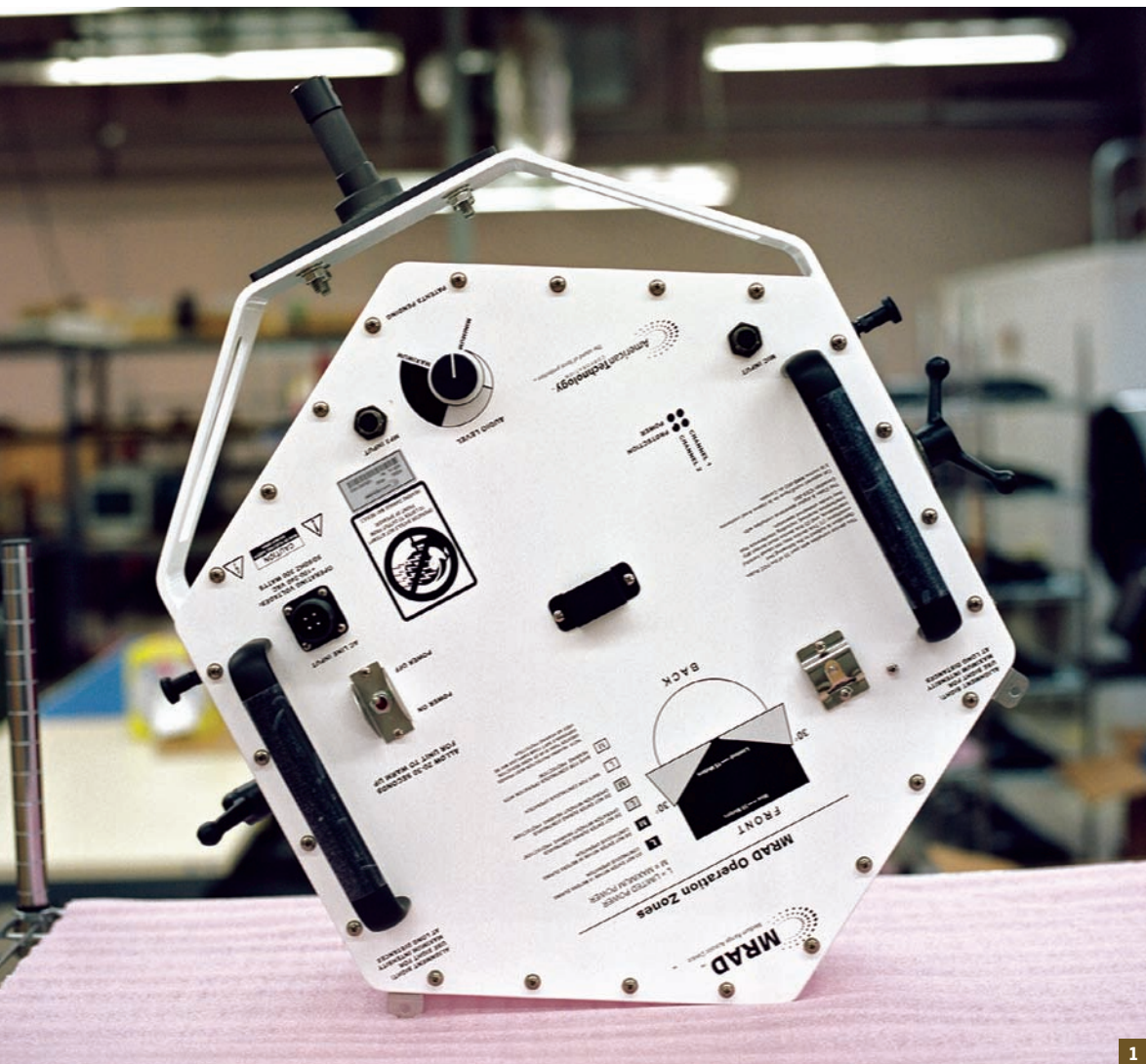
Now, around the time they contacted me, I had been playing around with a guitar. I noticed that when one string was tuned to the same note as another string, plucking one vibrated them both. This is sympathetic vibration. So I started thinking about the string I plucked as a radio transmitter sending out a signal and the receiver as the other string that is tuned to the same frequency. The second string did not start vibrating for free — it takes energy to get it to move. It then occurred to me that I could make a transmitter that sends a signal into the body, and if there was a thing inside the body that was tuned to the same frequency, then we could use the change in frequency as a trigger. So I embedded a resonant circuit — which is simply a coil of wire — in the artificial hip that was tuned to the same frequency as an externally worn transmitter. If the hip started separating, the

1. American Technology, Norris' company, donated several MRAD "sonic lasers" for Hurricane Katrina crowd control and rescue operations.

2. A component of an artificial hip alarm, which warns patients that their implant is about to dislocate.

3. A HyperSonic Sound speaker.





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