

Listen to the (Quantum) Whistling Gyros!

An auditory phenomenon discovered by UC Berkeley physicist Richard Packard could lead to superfluid gyroscopes that operate at a relatively toasty 2 kelvin rather than the near-zero kelvin required by liquid helium-3. Packard's research team forced helium-4, a superfluid, through an array of apertures on the order of 10–3 mm dia. until it reached critical velocity. At that point, a minuscule quantum vortex surged across each aperture, carrying away some of the energy of the flow. As the fluid accelerated and decelerated, it created vibrations that produced a whistling sound with a falling frequency.

(You can [listen to this “quantum whistle” online.](#))

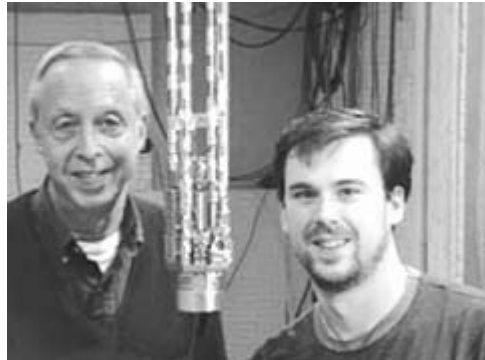
Packard's results indicate that because of random speed fluctuations, a single aperture will not whistle. Rather, all the flows act coherently to produce it.

Superfluid gyros are based on a superfluid-filled vessel with two arrays of apertures. When the vessel rotates, the quantum whistle's volume changes. These deviations can be used to identify extremely small rotational motion, a useful tool on submarines or aircraft in areas where GPS signals are unavailable. The gyros could improve GPS-based navigation as well by adding their data to those collected by the existing telescope array that constantly updates information about the Earth's rotation.

Packard also speculates that the quantum whistle “may also permit scientists to develop very sensitive rotation sensors to measure small surface twisting signals created when an earthquake's vibrations travel through irregularities in the Earth's crust. In fact, we can take this concept even further. If seismologists can measure rotation signals from seismic activity on Mars, they might learn a lot about Martian structure.”

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Professor Packard and grad student Ernie Hoskinson used a cryostat insert for their experiment with helium-4.



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