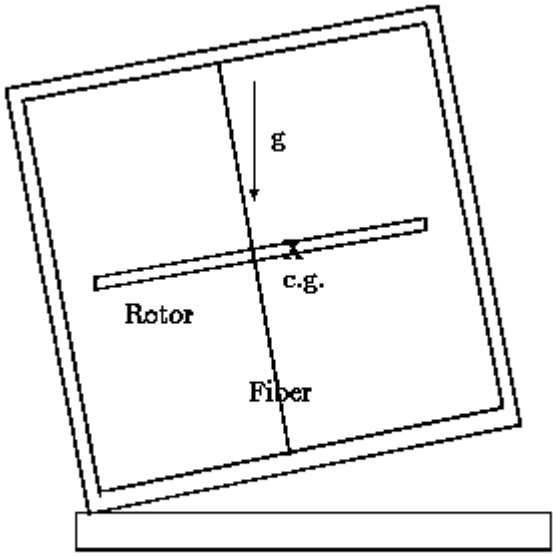
NOVEL TILTMETER

(Prototype brought to workshop)

Randall D. Peters
Mercer University

Figure 1. Photograph of the tilt-sensitive torsion pendulum, showing electronics support.

The instrument is tilt-sensitive because the 'fiber' is tied to both top and bottom of the case, as illustrated in Fig. 2.



Tilt sensitive torsion pendulum

Figure 2. A small offset of the center of gravity from the axis of rotation reduces the sensitivity to accelerations.

Tilt (secondary) at right angles to the primary tilt shown in Fig. 2 results in rotation with a large mechanical amplification.

The instrument uses a fully differential capacitive array to measure rotor position, as illustrated in Fig. 3.

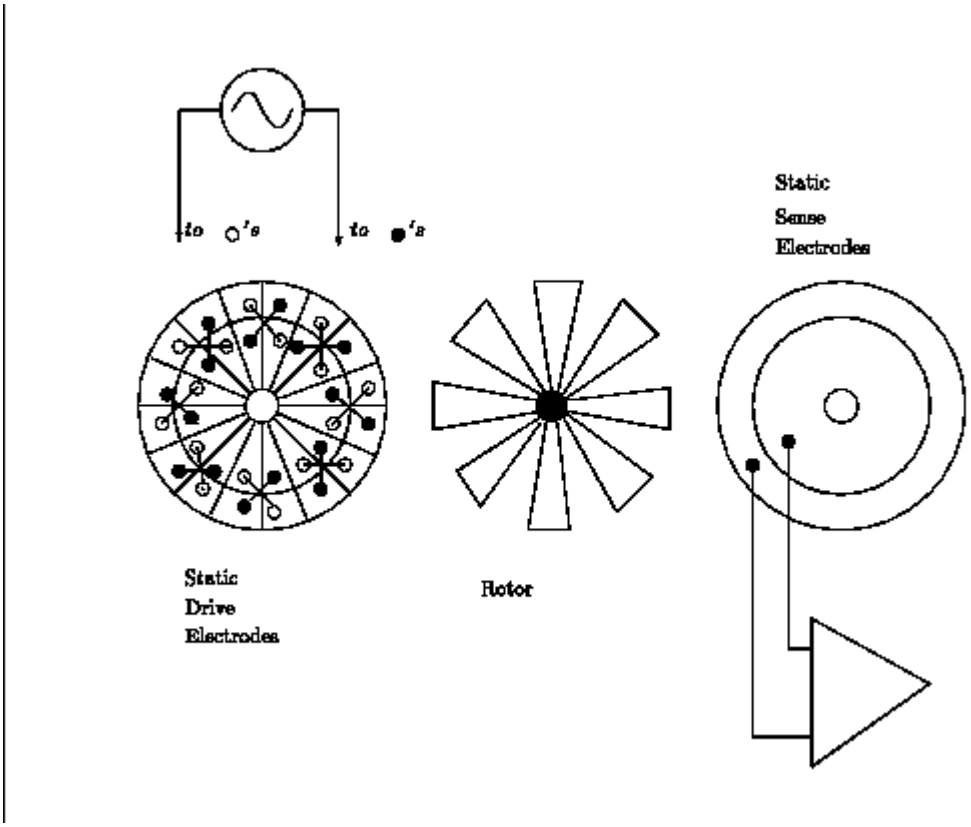


Figure 3. Detector sensitivity is increased by connecting eight units in parallel to form an angle array.

The instrument responds to direction change of the earth's field, as illustrated in the example of Fig. 4.

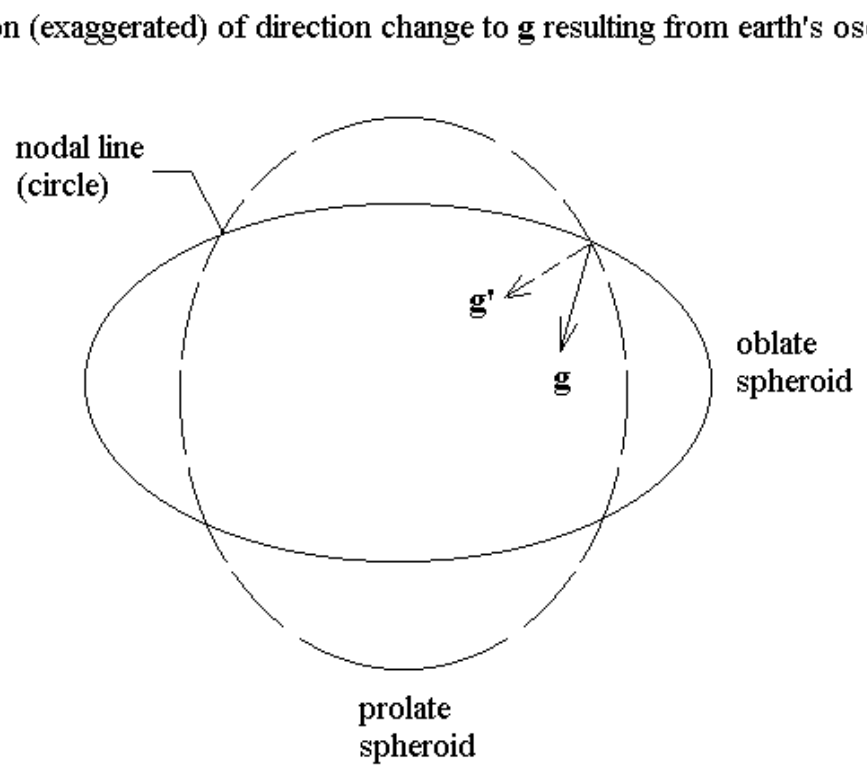


Figure 4. The change in the direction of **g** is more important than its magnitude change, as the earth oscillates in its lowest eigenmode with a period of 54 min.

If the tiltmeter is located at a point on a nodal line, then it responds to the shape change of the earth (like a super-sensitive plumb-bob, moving from the direction of g to that of g').

This tiltmeter has advantages over conventional seismic instruments for measuring earth 'hum' in the sub 1 mHz range.