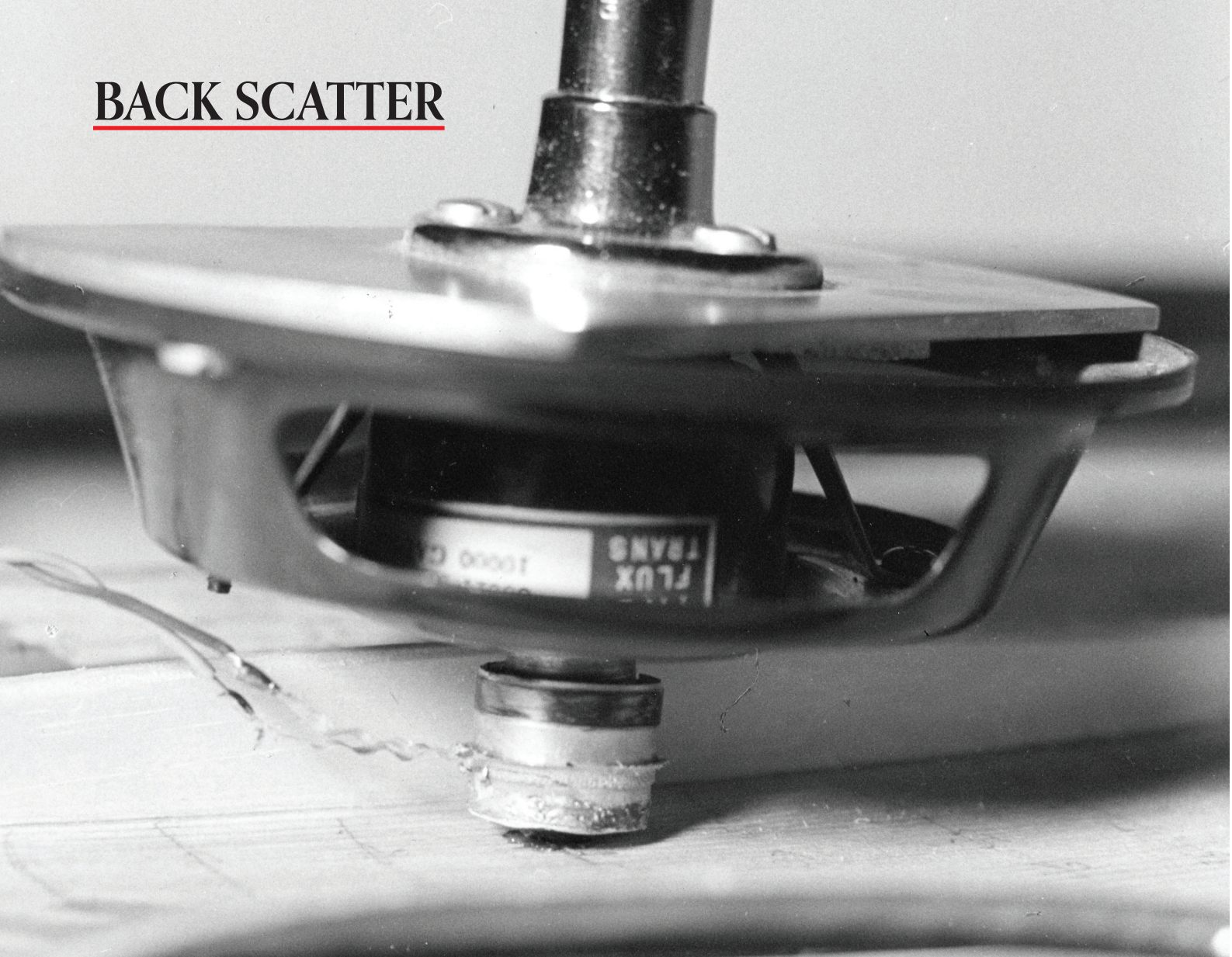

Measuring violin resonances

Carleen Maley Hutchins, a mid-20th-century science teacher and luthier, sought to quantify the historically qualitative craft of violin making. This photo shows a moving-coil electromagnetic transducer applied to the wooden plate of a violin. The transducer allowed Hutchins to measure the vibrating plate's resonant frequencies. She determined that the best-sounding violins, including the ones played by famous violinists, have top and bottom body plates characterized by resonances that are within a whole tone of either of the instrument's two middle strings—on a traditional violin, the A string is tuned to 440 Hz and the D string to 294 Hz.

When building a stringed instrument, a luthier can change the resonances of the instrument's top or bottom plate by shaving wood from its underside. When two plates are paired to create the body of the instrument, their resonances either complement each other to create a rich, full tone or work against each other to deaden the tone. Rather than pairing plates by ear through trial and error, Hutchins measured and tuned the target resonances of each plate. She applied her deep understanding of the instrument to develop the violin octet (see the article by Hutchins, PHYSICS TODAY, February 1967, page 23). The family of violins—from the largest, a contrabass, to the smallest, a treble violin—spans the tonal range of the piano, and the instruments have acoustical properties different from the viola, cello, and bass. (Courtesy of the AIP Emilio Segrè Visual Archives, PHYSICS TODAY Collection.) —EMW

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