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SCIENCE NEWS

SCIENCE NEWS LETTER ®

THE WEEKLY SUMMARY OF CURRENT SCIENCE

Red Maple Budding

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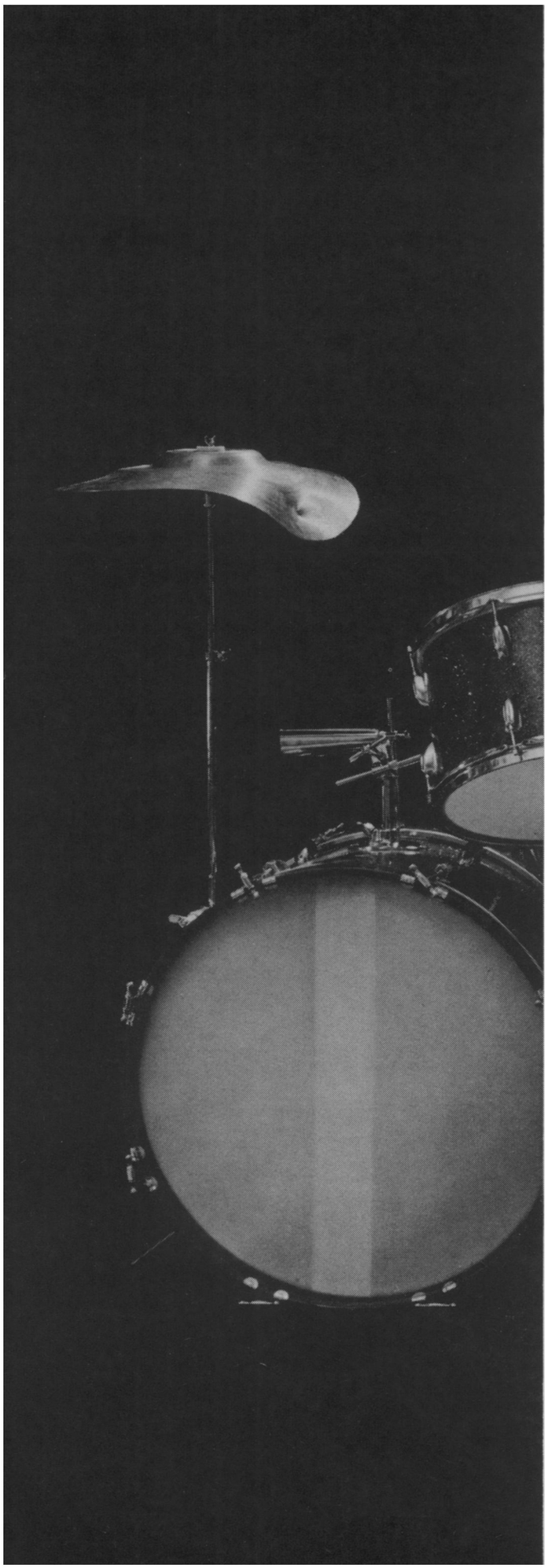

One of a series briefly describing GM's research in depth

Lead cymbals and hysteresis loops

Lead isn't exactly the cymbal maker's dream material. But then, not everyone wants a material that resonates, peals, or hums.

Lead isn't the engineer's dream material, either. It lacks strength and weighs too much.

A curious phenomenon being explored by GM Research physicists could give engineers what they've never had before: a material with the noise damping qualities of lead and the physical strength of steel. The phenomenon, called magnetomechanical damping, originates with the tendency of magnetic domains to line up when a ferromagnetic material is stretched or squeezed.

What happens, apparently, is that vibrations shuffle domain boundaries and cause a cyclic variation in the magnetization of the material; the material is cycled through a small magnetic hysteresis loop, and part of the vibrational energy is converted into heat.

What excites us now is our finding that some iron-silicon alloys with usable tensile strengths (e.g., 70,000 psi) can give very high damping. This damping occurs at strain values associated with audible vibrations, and it's relatively independent of frequency.

But we need to learn much more before we can tailor alloys for specific applications; for instance, how do magnetic domain walls interact with static and dynamic strain? What are the detailed effects of crystallographic orientation and of specific impurities?

Still, the spirit of science thrives on unanswered questions.

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