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Belt-snap and towel-snap shock waves GARY SETTLES, MICHAEL HARGATHER, MICHAEL LAWSON, RORY BIGGER, Penn State — Traditional simple means of generating shock waves are examined by high-speed imaging. A leather belt is folded upon itself at mid-length and the ends are grasped firmly in each hand. When pushed together a loop forms, and when quickly pulled apart the loop closes rapidly, producing a sharp "crack" similar to the cracking of a whip (Shock Waves 8(1), 1998). The towel-snap mimics whip cracking by causing the towel end to rotate supersonically. We investigated these phenomena using a high-speed digital camera (10k and 30k frames/sec, 4 microsec exposure) and a sensitive schlieren optical system of 1m aperture. Results show that compression of the air between the two rapidly-approaching leather belt bands first causes a spherical shock wave to form near one hand. The compression then runs along the belt length toward the other hand at supersonic speed, producing an oblique shock wave that is responsible for the audible crack. In the towel-snap, shock waves are visible from tip motion in open air as well as from the compression due to snapping the towel against a surface. There are no known useful applications of these simple phenomena, but they do address how weak shock waves can be generated by muscle power alone. Several other related examples are also mentioned.

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