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FINDINGS

All Together Now: Synchrony Explains Swaying

What do pedestrians, some species of fireflies and pendulum clocks have in common? Given half a chance, they act in unison, exhibiting what scientists call synchrony. And that is what lay behind the unexpected swaying of the Millennium Bridge in London five years ago, according to a new study.

This sleek \$32 million footbridge, which stretches 1,050 feet over the Thames, opened June 10, 2000, to great fanfare. But as thousands of people streamed across, it began to wobble side to side, inducing queasiness and fears that it might fall. Engineers saw that as the wobbling began, pedestrians adjusted their gait to the wobbling motion. As more people walked in lock step, the woblier the bridge became.

Steven H. Strogatz of Cornell and his colleagues borrowed mathematics describing the synchrony of fireflies and

pendulums and applied them to the dynamics of the bridge. The calculations, reported in the journal *Nature*, show why the north section of the bridge remained steady with 150 people on it but began swaying when the number exceeded 160.

Christian Huygens, a 17th-century Dutch physicist, first observed synchrony in two pendulum clocks that hung close to each other. Even when he set the pendulums in motion so they were not swinging in unison, they resynchronized within half an hour.

Fireflies along rivers in Malaysia and Thailand also synchronize, thousands flashing on and off at once.

As for the Millennium Bridge, after two years, an extra \$9 million and the addition of large shock absorbers, it no longer wobbles. (It was never in danger of falling.)

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