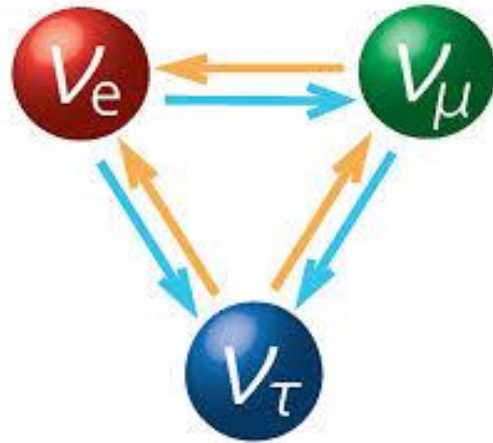


## Can you change a neutrino's flavor?

Neutrinos are the lightest and most abundant particles of matter, and they may help explain some of the biggest mysteries of our universe. Neutrinos come in three types, called flavors associated with three other fundamental particles — the electron, muon and tau leptons. A neutrino can morph from one flavor to another — this is called neutrino oscillation. Physicists at Fermilab study how neutrinos change, or oscillate, from one type to another. This activity compares the neutrino oscillation to a coupled pendulum. When two pendulums are joined with a string, energy transfer happens from one to another and back again, just like neutrinos oscillate from one type to another and back again.



**Materials:** two training tennis balls with strings attached, pool of string.

**Activity:** take 1m string and make 2 knots in the middle 20cm away from each other. Attach both ends of the string to stable objects (such as backs of chairs). Hang both balls 20 cm away from each other on the string as shown in the photo above. Start swinging one ball while the other is still. Let the balls swing and observe the pattern in their behavior—when you swing one ball, the other ball starts swinging while the original ball slows down.

**Questions to ask:** Why does the second ball (which you did not touch) start swinging? What pattern do you see in the balls' amplitudes? How can you explain this pattern?

**Useful links:** [https://ed.fnal.gov/lsc\\_exhibits/list.html](https://ed.fnal.gov/lsc_exhibits/list.html)

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