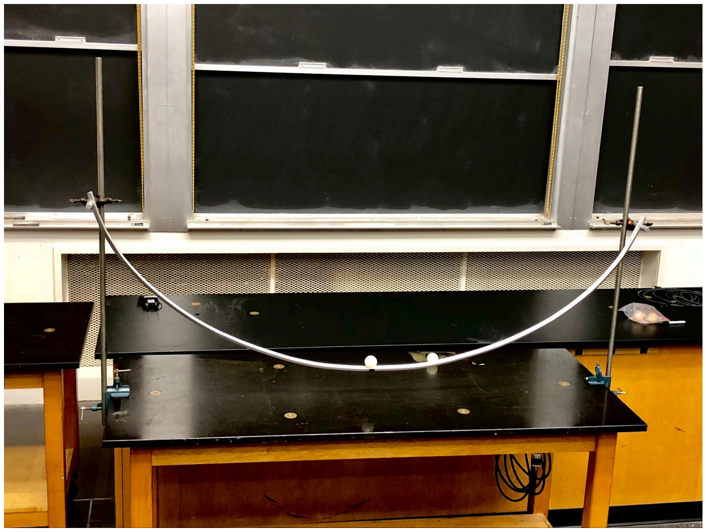

1D15.50/3A10.50 Cycloid Track

1D15.50: To demonstrate the properties of a cycloid track.
3A10.50: To demonstrate the period of oscillation of a ball on a cycloid track does not depend on the height from which the ball was released.

DESCRIPTION Two balls on a cycloid track are released simultaneously. Regardless of the difference in their starting heights, they always meet at the lowest point of the cycloid. Similarly, a ball released from any point along the track will oscillate back and forth with the same period.

LINK TO VIDEO

SUGGESTED TECHNIQUE

1. Begin by releasing the two balls from the same height on opposite sides of the track. Note that both balls meet in the middle.
2. Release the balls again, but this time release one ball from a dramatically different height than the other. Note that both balls still meet in the middle.
3. Remove one of the balls. Position the other ball at any point along the track.
4. Release the ball and time the period of oscillations.
5. Release the ball from a different position on the track and time the period of oscillations. Note that it's the same.

TECHNICAL DETAILS

LOCATION OF APPARATUS

EQUIPMENT	LOCATION
Cycloid Track	Above Blue Shelves Room 066
Balls and Cup	General Use E

LOCATION OF COMMON ACCESSORIES

SETUP INSTRUCTIONS

Setup Time ~20 min

1. Use bench clamps, rods, and right angle clamps to set up the cycloid track on a table (see photo).
2. Provide two balls and a cup to hold the balls so they don't roll away.

ADDITIONAL RESOURCES

REFERENCES

American Journal of Physics reference articles available from demonstration staff.

Kelly Miller, "Using Demonstrations to Teach, Not Just Entertain", TPT, Vol. 51, # 9, Dec. 2013, p. 570.

Thomas B. Greenslade Jr., "Galileo's Paradox", TPT, Vol. 46, # 5, May 2008, p. 294.

Dale T. Hoffman, "A Cycloid Race", TPT, Vol. 29, # 6, Sept. 1991, p. 395.

George M. Hopkins, "Cycloid Curve", Experimental Science, p. 52.

Richard Manliffe Sutton, "M-88, Galileo's Inclined Planes", Demonstration Experiments in Physics, 1938, p. 42.

D. Figueroa, G. Gutierrez, and C. Fehr, "Demonstrating the Brachistochrone and Tautochrone", TPT, Vol. 35, # 8, p. 494 - 498, Nov. 1997.

Dale T. Hoffman, "A Cycloid Race", TPT, Vol. 29, # 6, p. 395, Sept. 1991.

Julius Sumner Miller, "Further to The Brachistochrone", TPT, Vol. 24, # 5, May 1986, p. 262.

- D. Edge, "The Brachistochrone - or, The Longer Way Round May be the Quickest Way Home", TPT, Vol. 23, # 6, Sept. 1985, p. 372 - 373.

Thomas B. Greenslade, Jr., "Time of Descent Apparatus (Photo)", AJP, Vol. 72, # 12, Dec. 2004, p. 1500.

- E. Joens, T. M. Antatnackovic, M. Dehn, "Remarks on the Brachistochrone with Viscous Friction", AJP, Vol. 56, # 8, Aug. 1988, p. 758.

H. A. Yamani and A. A. Mulhem, "A Cylindrical Variation on the Brachistochrone Problem", AJP, Vol. 56, # 5, May 1988, p. 467.

David G. Stork and Ju-xing Yang, "The General Unrestrained Brachistochrone", AJP, Vol. 56, # 1, Jan. 1988, p. 22.

Letters to the Editor, "Problem: "The Unrestrained Tachistos", AJP, Vol. 55, No. 4, April 1987.

Ju-xing Yang, David G. Stork, and David Galloway, "The Rolling Unrestrained Brachistochrone", AJP, Vol. 55, # 9, Sept. 1987, p. 844.

N. Ashby, W. E. Brittin, W. F. Love, W. Wyss, "Brachistochrone With Coulomb Friction", AJP, Vol. 43, # 10, Oct. 1975, p. 902.