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Chaos Experiment

EX-9907

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Key Concepts:

- Nonlinear Oscillator
- Chaotic Motion
- Phase Space
- Poincare Plot

The chaotic behavior of a driven nonlinear pendulum is explored by graphing its motion in phase space and by making a Poincare plot. These plots are compared to the motion of the pendulum when it is not chaotic.

The oscillator consists of an aluminum disk connected to 2 springs. A point mass on the edge of the aluminum disk makes the oscillator nonlinear. The frequency of the sinusoidal driver can be varied to investigate the progression from predictable motion to chaotic motion. Magnetic damping can be adjusted to change the character of the chaotic motion. The angular position and velocity of the disk are recorded as a function of time using a Rotary Motion Sensor. A real-time phase plot is made by graphing the angular velocity versus the displacement angle of the oscillation.

The Poincare plot is also graphed in real-time, superimposed on the phase plot. This is

achieved by recording the point on the phase plot once every cycle of the driver arm as the driver arm blocks a photogate.

PASCO Advantage:
DataStudio can graph the motion in phase space and superimpose the Poincare plot in real-time, showing students how the motion in phase space relates to actual motion of the oscillator.

Experiment Includes:

- Large Rod Base (ME-8735)
- 120 cm Steel Rod (2) (ME-8741)
- 45 cm Steel Rod (ME-8736)
- Multi Clamp (2) (SE-9442)
- Chaos/Driven Harmonic Accessory (CI-6689A)
- Mechanical Oscillator/Driver (ME-8750)
- Power Supply (18 V DC, 5A) (SE-9720A)
- Rotary Motion Sensor (CI-6538)
- Photogate Head (ME-9498A)
- Basic Digital Multimeter (SE-9786A)
- Banana Plug Cord-Red (5 Pack) (SE-9750)
- Chaos Experiment Manual
- DataStudio File for Chaos Experiment

Also Required:
-- ScienceWorkshop 750 Interface
-- DataStudio Software

Classic Physics Experiments:
This is one of many **classic physics experiments** offered by PASCO. Some of the experiments are computer-based and others are stand-alone experiments. Each experiment includes the physics apparatus, sensors, accessories and manuals needed. An electronic version of the manual is included for modification by the teacher. DataStudio support files are included for computer-based experiments. (Interfaces and the full-version DataStudio application not included).

For more information or to contact a PASCO representative,
send e-mail to **Customer Support**, or call 800-772-8700 (in US) or 916-786-3800.

Prices and specifications subject to change without notification.
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