Welcome to Interactive Physics

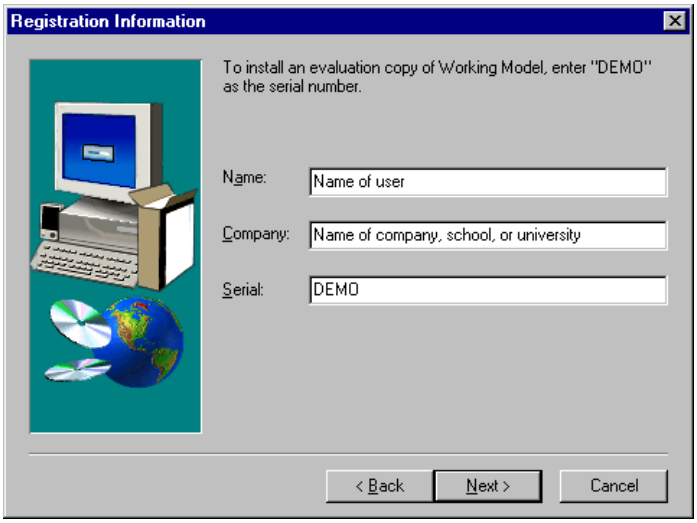
Interactive Physics is the result of a 15-year collaborative effort between physics instructors and software engineers. It is correlated with National Education Curriculum Standards and it teaches your students the same motion tools used by professional scientists and engineers. We are confident that Interactive Physics is a valuable tool for your classroom and laboratory.

To begin, install Interactive Physics and go through each step of the demonstration described below.

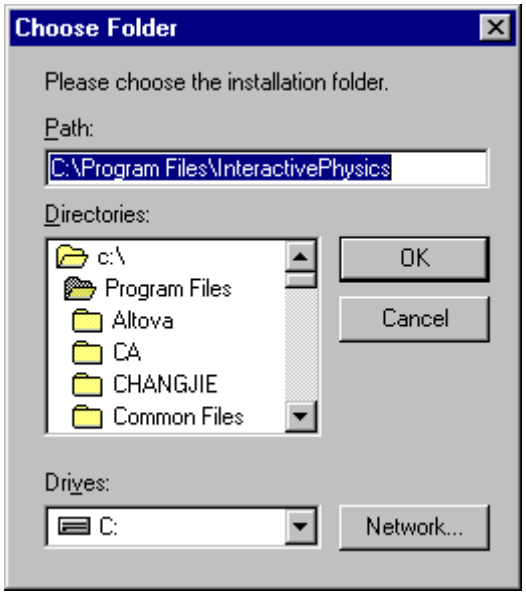
Step	Related Physics Concepts
1. Creating a falling block	Mass; freely falling objects; laws of motion; linear kinematics
2. Adding a velocity vector	Vector and scalar quantities; vector components; unit vector
3. Making a pendulum	Oscillatory motion; frequency and amplitude; rotational kinematics; centripetal force
4. Graphing the pendulum's motion	Graphs and measurements; motion diagrams
5. Changing gravity	Law of gravity; Newton's second law
6. Adding air resistance	Air resistance; non-conservative forces
7. Adding a spring	Spring oscillation; conservative forces; conservation of energy; kinetic and potential energy
8. Controlling the spring constant	Spring constant; natural spring length; equilibrium spring length
9. Collisions with a circle	Collision; elasticity; frictional forces; impulse and momentum
10. Attaching a picture to an object	Attaching pictures makes physics experiments realistic and fun
11. Adding sound	Sound waves; speed of sound; Doppler effect; sound frequency and intensity
12. Adding a curved slot joint	Roller coaster physics; motion in two dimensions; conservation of energy and momentum
13. Adding a force	Concept of force; Newton's first law; work and energy
14. Running demo files	Interactive Physics allows you to explore other essential physics topics, including: electrostatics, evaporation and condensation, gears, kinetic theory of gas, machines, magnetism, particle dynamics, projectiles and rockets, pulleys, rotational dynamics, static equilibrium, superposition of waves, and many more.
15. **Curriculum workbook**	Correlated with National and State Standards and Objectives, new interactive experiments explore speed, distance, time, acceleration, force, weight, mass, gravity, and air resistance

Installing Interactive Physics

Windows users:
1. Insert the Interactive Physics CD into the CD-Rom drive and follow the installation instructions
2. When prompted for a serial number, enter "**DEMO**" or enter your licensed serial number
3. When the "Choose Folder" window appears, click [OK].
4. For a step-by-step introductory tutorial, turn to the next page.



Mac users:
1. Insert the Interactive Physics CD into the CD-Rom drive. Double-click on the InteractivePhysics CD-icon
2. Double-click on the DoubleClickToInstall icon in the interactivePhysics window. Follow the installation instructions
3. For a step-by-step introductory tutorial, turn to the next page.



http://www.interactivephysics.com
Phone: **650.381.3395** or **800.766.6615**
Fax: **650.574.7541**

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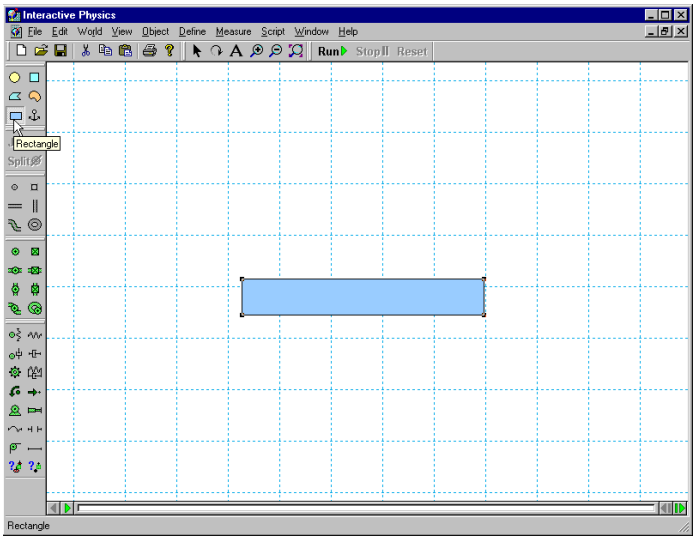
Starting Interactive Physics

1. Ensure that Interactive Physics is installed on your computer.
2. From the Windows Start menu, click on Programs and then InteractivePhysics and then InteractivePhysics. This opens a new experiment.

1 Creating a Falling Block

1. The first simulation is Newton's first experiment, dropping a block.
2. To draw a rectangle, click on the Rectangle tool, then click in the workspace and draw a long thin rectangular block.
3. To run the experiment and see the block fall due to gravity, click Run.
4. Click Reset to reset the experiment.



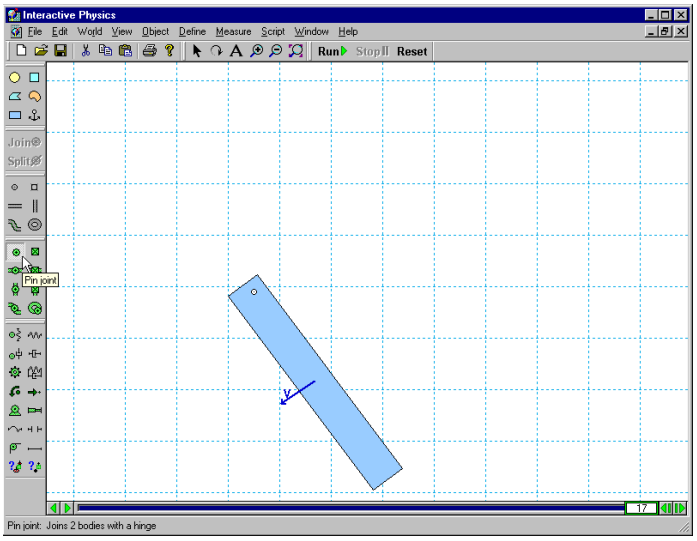
2 Adding a Velocity Vector

1. To add a velocity vector, click on the rectangle.
2. From the Define menu, click on Vectors and then Velocity.
3. Click Run and observe that the vector changes magnitude as the block falls.
4. Click Reset.

Optional: To add a numerical value to the velocity vector (or its components), click on the Define menu, select Vector Display, and check the Value box.

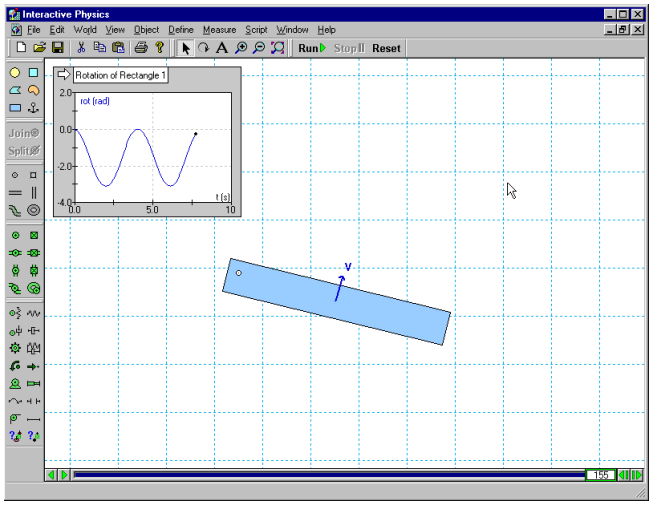
3 Making a Pendulum

1. To make a pendulum, click on the Pin joint tool and then click on the upper left-hand corner of the rectangle.
2. Click Run and observe that the vector changes magnitude and direction as the pendulum moves. Click Reset.



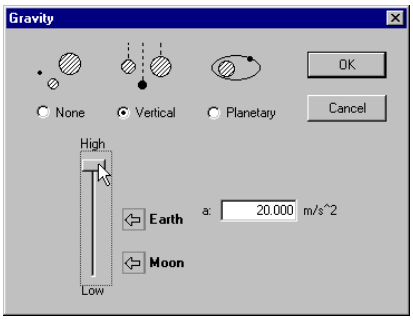
4 Graphing the Pendulum's Motion

1. To graph the pendulum's motion, click on the rectangle. Under the Measure menu, select Position, then select Rotation Graph.
2. To collect data, click Run. Note: Data can be displayed as a graph, bar chart, or number, and can be changed while running the experiment. Click Reset.
3. The graph shows the pendulum's amplitude and frequency. To make the graph larger, click on the graph and drag its lower right-hand corner to the right.



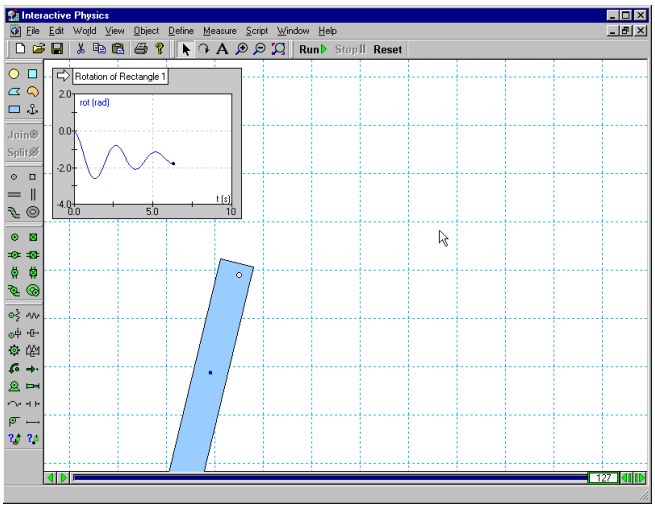
5 Changing Gravity

1. To change gravity, click on the World menu, select Gravity, slide the slider to the top for the value 20 m/sec^2, and click [OK].
2. Click Run and observe that, in agreement with theoretical and experimental predictions, the pendulum has a higher natural frequency. Click Reset.



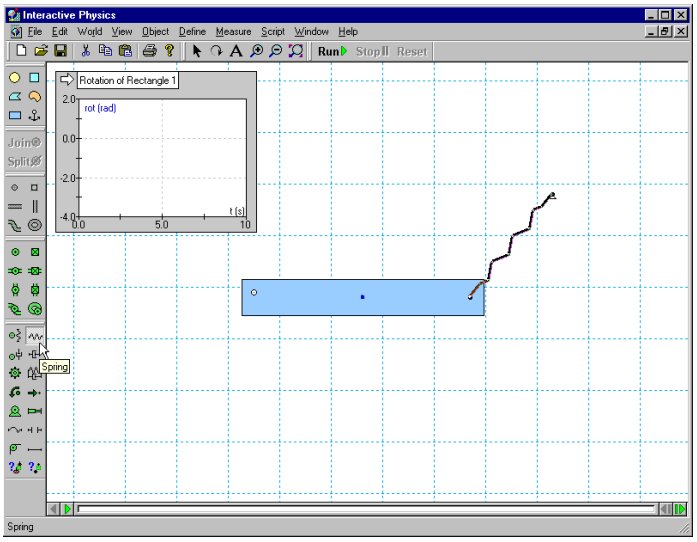
6 Adding Air Resistance

1. Under the World menu, select Air Resistance, click on Low Speed, and accept the default air resistance value of 0.3 kg/(m*s) by clicking [OK].
2. Click Run and observe the exponentially decaying oscillations. Click Reset.



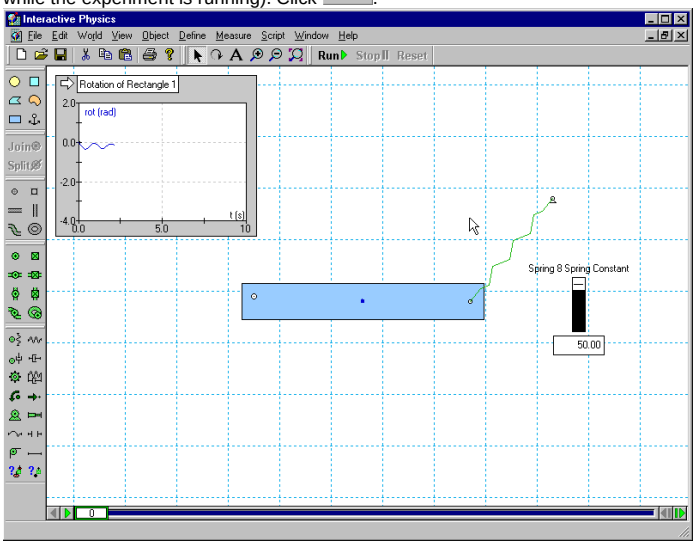
7 Adding a Spring

1. To add a spring, click on the Spring tool. Click on the upper right-hand corner of the block and stretch the spring up and to the right.
2. Click Run and observe the pendulum's higher natural frequency and new equilibrium position. Click Reset.



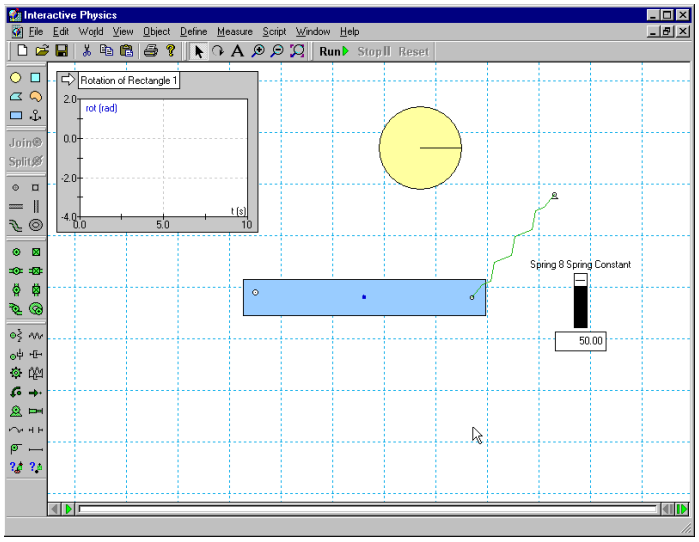
8 Controlling the Spring Constant

1. To control the spring constant, click on the spring. Under the Define menu, select New Control, then select Spring Constant.
2. The slider that controls the spring will appear in the left-hand side of the workspace. To move the slider's location closer to the spring, click on its **title** and drag it next to the spring.
3. To see the effect of varying the spring constant, click Run and observe that the pendulum angle is a function of the spring-constant (move the slider up and down while the experiment is running). Click Reset.



9 Collisions with a Circle

1. To create a circle, click on the Circle tool, then click in the workspace and draw a circle. (If your rectangle is high on the screen, click to zoom to extents.)
2. Click Run to start the experiment and observe that the circle bounces and rolls on top of the rectangle. Automatic collision and contact is a very useful feature in Interactive Physics (even the elastic and frictional properties of objects may be varied). Click Reset.



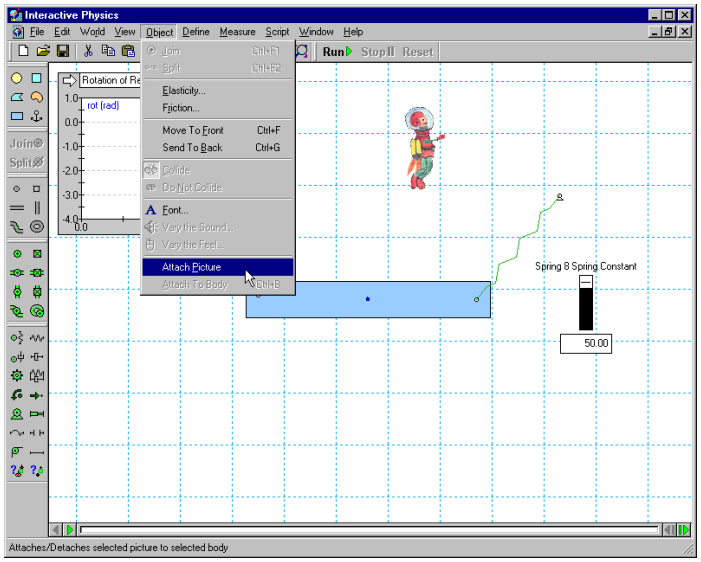
10 Attaching a Picture to an Object

1. To find the spaceman picture on Windows, select Start menu, then Programs, then InteractivePhysics, then the IPIntroduction folder.

Note: Mac users browse to Interactive Physics, then Picture Library, then People.

2. Double-click on the bitmap file "Spaceman.bmp." This should open the bitmap in a program such as Paint.
3. In Paint, select the Edit menu and then choose Select All.
   Next, select the Edit menu again and then choose Copy.
4. Go back to Interactive Physics and select its Edit menu and then choose Paste.
5. To attach the spaceman bitmap to the circle, click on the spaceman, then hold down [Shift] while you click on the circle.
6. Select the Object menu and then Attach Picture. Notice that the circle object has disappeared and has been replaced by the spaceman image.
7. Click Run to run the experiment. Click Reset.

Note: Interactive Physics was designed to be easy-to-use. In this exercise, the only time you need to touch the keyboard is to hold down the [Shift] key.

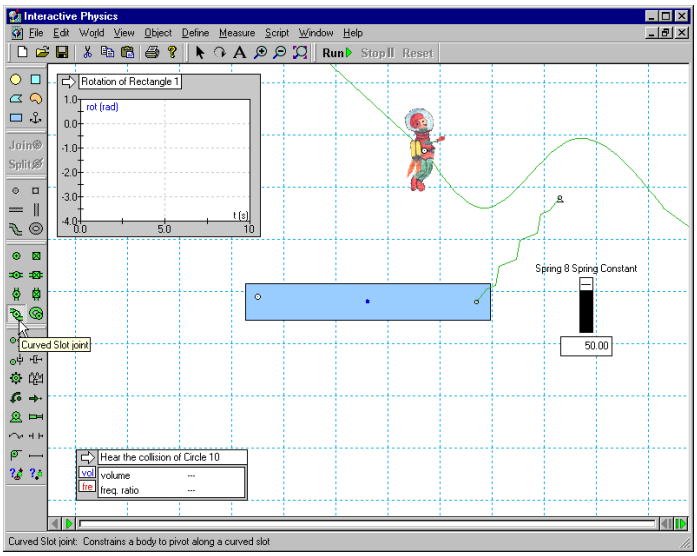


11 Adding Sound (Windows only)

1. Click on the spaceman, select the Measure menu and choose Hear the Collision.
2. Click Run to start the experiment and hear the sound when the spaceman contacts the block. Click Reset.

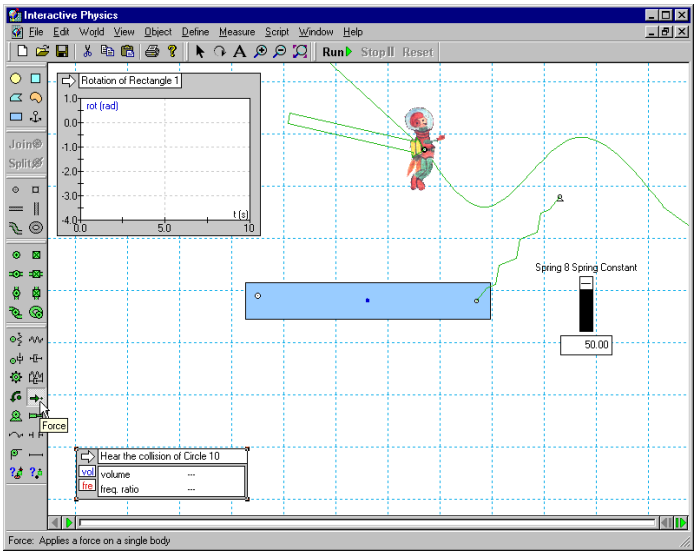
12 Adding a Curved Slot Joint

1. To add a Curved Slot Joint, click on the Curved Slot joint tool.
2. Click on the spaceman and then click on a couple of other places to the right of the spaceman, and then double-click to complete the slot (see figure below).
3. Click Run to start the experiment and observe that the spaceman slides down the curved slot. Click Reset.



13 Adding a Force

1. To add thrust to the spaceman to overcome air resistance, click on the Force tool, then click on the spaceman, then move the mouse to the left and click again.
2. Click Run to start the experiment and observe that the spaceman overcomes air resistance and moves more quickly along the curved slot. Click Reset.



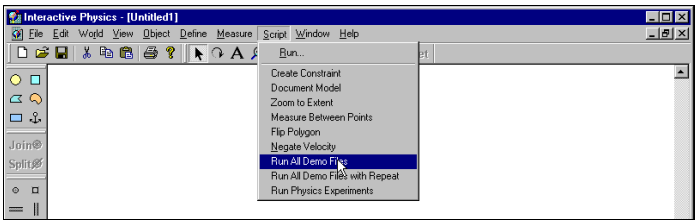
14 Running Demo Files

Windows users:

1. Under the Script menu, click on "Run All Demo Files."
2. Sit back and enjoy a series of demos on a variety of physics topics.
3. To quit, select the File menu and choose Exit.

Mac Users:

1. Browse to the For Demo Users folder installed with Interactive Physics.
2. Double-click on each of the files, then click Run.
3. To quit, select the File menu and choose Quit.



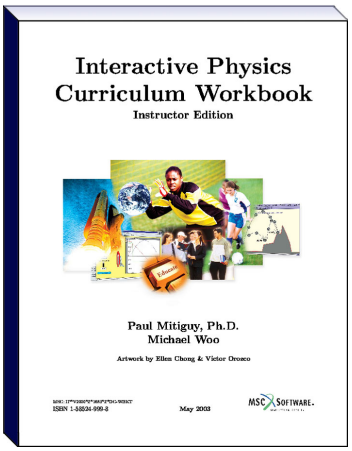
15 Curriculum Workbook

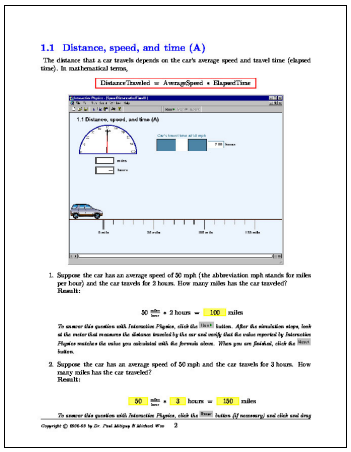
Supplementary workbooks with Interactive Physics exercises of varying difficulty are available with purchase. To try the instructional curriculum:

Windows users: Go to the Windows Start, then Programs, then InteractivePhysics, then click on StartCurriculum.html, then choose **Demo Users**.

Mac users: Open the installation CD and double-click on each of the files in the IPCurriculum folder. Follow the on-screen directions.

Note: The Demo Edition can open **only** Demo files. The Full Edition must be purchased to open the curriculum and additional 150+ physics experiments.





- New curriculum workbook correlated with National and State Educational Standards and Objectives
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