

## Learning More About Resonance

"Some objects, whether natural or man made, have a tendency to 'ring' when acted on by an external force. They momentarily trap energy from these forces and resound with vibrations characteristic of their internal structure. When the frequency of the external force and that of the internal structure match one another it's as though a key has been presented that unlocks and opens a hidden door. Energy gushes into that door and the object is at great risk ... of flying to pieces. "

*Borrello on Resonance*

### Wiki on Resonance

<http://en.wikipedia.org/wiki/Resonance>

### 2-Dimensional Resonance - the Chladni Effect

<http://www.freesciencelectures.com/video/resonance-phenomena-in-2d-on-a-plane/>

### Mind Over Matter Pendulums

Try this simple and inexpensive 'magic trick' using the principles of resonance

[http://www.arborsci.com/CoolStuff/New\\_CoolStuff\\_Articles/cool20.aspx](http://www.arborsci.com/CoolStuff/New_CoolStuff_Articles/cool20.aspx)



### Thermal-Acoustic Resonance - the Rijke Tube

[http://en.wikipedia.org/wiki/Rijke\\_tube](http://en.wikipedia.org/wiki/Rijke_tube)

### Information on Tesla Coils

Wiki on the Tesla Coil

[http://en.wikipedia.org/wiki/Tesla\\_coil](http://en.wikipedia.org/wiki/Tesla_coil)

Extensive information on Tesla, Tesla coils; how to build your own:

<http://www.eskimo.com/~billb/tesla/tesla.html>



### Examples on the Destructive Power of Resonance

See the historical **Tacoma Narrows Bridge** collapse to the music of Queen. (No it wasn't the music, it was the wind that led to the collapse!)

<http://www.youtube.com/watch?v=pl0vzOMYsUU>

Helicopters may be stable in flight, but see what can happen when a helicopter is lashed to the ground. This video a good illustration of **ground resonance**:

<http://www.youtube.com/watch?v=RihcJR0zvfM>

A **seiche** is a standing resonant wave that can develop when the motion of a surrounding container or tractional forces of wind match the natural frequency of the body of water within. Historical accounts have recorded destruction of entire lakeside villages during earthquakes. See what happens to this swimming pool during an earthquake:

<http://www.youtube.com/watch?v=GHZ4nW3xyU0&NR=1>

Questions? Email Mike Borrello at [stablesystems@ieee.org](mailto:stablesystems@ieee.org)