

## How to Use These Magnetic Disks and Wedges

1) Make sure you put magnets on the top side of the disk. The top is the side with the sharp edge. The bottom is the side with the smooth edge, this is the edge the disk rolls on.



2) Simply put either of the three disks on the top of the Euler's Disk™ and let it roll. One can also put any combination of the wedge shaped disks on top of the metal disk in any pattern you want. Some of our favorite patterns are these:

3) Try putting other magnets on the disk. You will be amazed at how they are transformed when they spin into action!

## PHYSICS

### How does Euler's Disk™ work?

The secret to the unusual properties of Euler's Disk™ is its very low energy loss due to friction. Like a magnetically-levitated train, a small amount of energy produces a surprising amount of motion.

If laid end-to-end, these 100,000 Euler's Disks™ would stretch out for 4 MILES and weigh 50 tons, which is the weight of one typical battle tank or 15 full-size SUVs!

Power used by  
one 100 watt  
light bulb

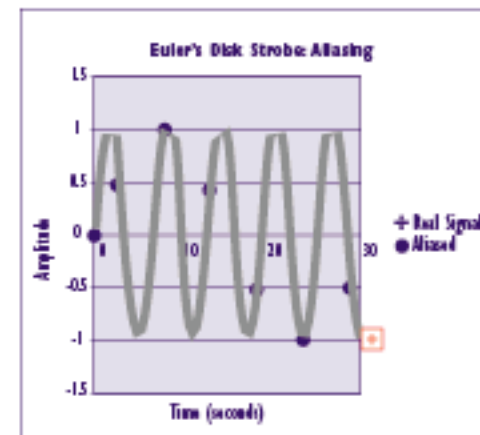
equals



Power used to keep  
100,000 Euler's Disks™  
spinning continuously

### Aliasing

When a periodic event like Euler's Disk™ is "sampled" (strobed) at a rate that is slightly different from the spin rate, the disk appears to spin much slower than it is actually spinning. This effect is important in electronic circuits which sample changing signals, and is referred to as "aliasing" because the apparent behavior is different from the actual behavior. A similar effect can be seen in the spokes of a TV wagon wheel, which sometimes appears to be moving very slowly or even backwards.



### To Infinity

Using Euler's equations of motion - and several assumptions - one can show that as the disk loses energy, the soaring pitch produced by the rolling point of contact increases towards infinity, as the inverse square root of the angle alpha. This result, is a beautiful example of the rather subtle and elegant motion of the toy. The curious student will be amazed at the number of interesting problems one can solve concerning the motion of this little toy.

