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ASTRONOMY

There are times when the light bulb really does go on

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BY TOM STATLER

This time of year, my thoughts always turn to conic sections. I know that's weird, but bear with me.

It's been nearly 500 years since Johannes Kepler realized that the key to the motions of the planets was not the circle. That model of geometrical perfection is only one member of a family that includes ellipses, hyperbolas and parabolas and is collectively known as conic sections.

Earth is orbiting the sun on a path that's an ellipse -- nearly a circle, but not quite. About 7 p.m. on Jan. 2, we'll be at perihelion, the point where that path comes closest to the sun.

Objects on elliptical or circular orbits, such as planets, retrace their paths over and over again. Objects on parabolic or hyperbolic orbits, such as some comets, don't. They swing around the sun once and are gone forever.

The fascinating part is that all of the possible paths for bodies orbiting the sun are exactly the curves that you can make by slicing a cone.

One of the "Aha!" moments from my teenage years (which, as if you hadn't already guessed, were pretty geeky) came one Christmas vacation while I lazily pondered the shadows on the wall.

We had a lamp with a dark, barrel-shaped shade whose top rim cast a curved shadow, swinging down toward the lamp and back up again. I wondered what that curve was.

And suddenly I saw it: a conic section! The bulb was at the tip of the cone, which just fit into the lampshade. Light streamed upward, filling the cone, which was sliced by the vertical wall. Just like in the math books, only real.

"It's a hyperbola!" I said.

"No more eggnog for you," my dad said.

But isn't it thrilling that the light bulb and lampshade in your living room can create the same curve as a comet swinging around the sun? Geometry isn't confined to your 10th-grade math book; it's something that we live in all the time.

Tom Statler is the director of the Astrophysical Institute at Ohio University in Athens.

statler@ohio.edu