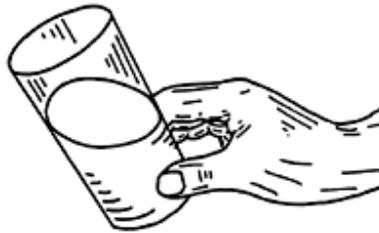


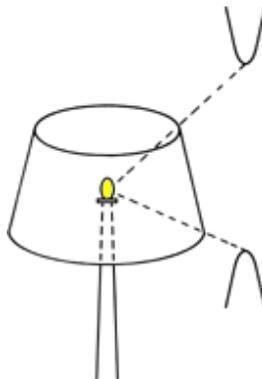
## Mathematics Around Us

There is mathematics all around us; we just have to observe and think about it. It is hidden in a glass of water, in lamp shades and in tree leaves.

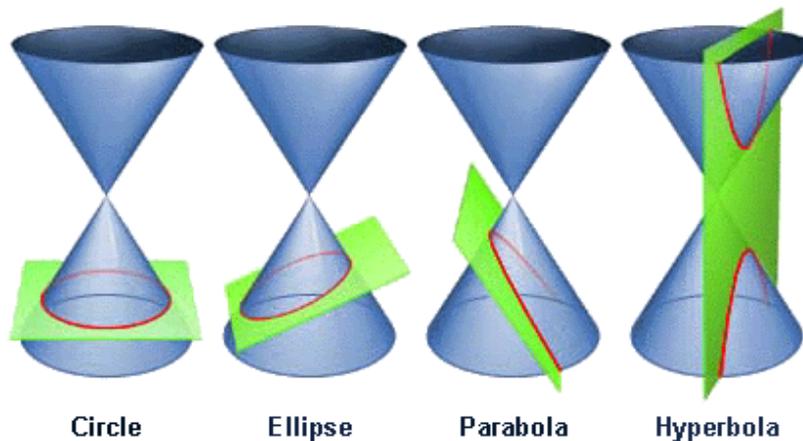
Take a glass of water and tilt it. What do you see?



Do you notice anything familiar about the shadow cast by a lamp shade?



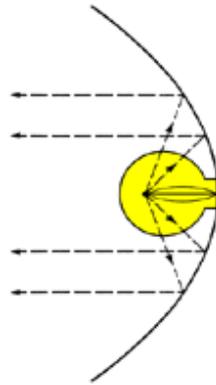
The mathematician Apollonius of Perga (born in 262 BC in Perga, modern Antalya in Turkey) studied the mathematics of these figures. These are conic sections.



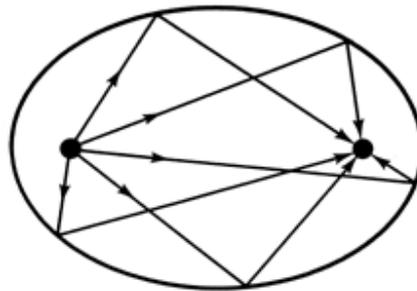
Let us see hear in his own words why he studied them ‘*They are worthy of acceptance for the sake of demonstrations themselves, in the same way as we accept many other things in mathematics for this and for no other reason*’.

But why should you care about these figures.? Here is why:

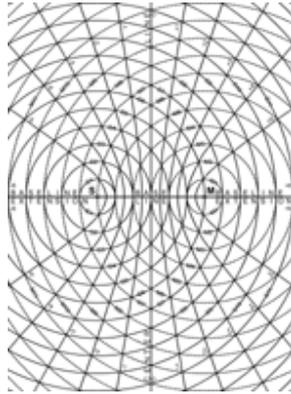
These figures have remarkable reflection properties. The head lights of your car use this: the mirror is made from a parabolic surface and the rays emanating from the focus all become parallel.( Show it).



A modern treatment of kidney stones- called lithotripsy- uses the reflection properties of the ellipsoids. Here rays from one focus are reflected back to the other focus. This allows for safe transport of waves from one point to another.( Show picture with narrative).



*Lithotripsy, a medical procedure for treating kidney stones. The patient is placed in an elliptical tank of water, with the kidney stone at one focus. High-energy shock waves generated at the other focus are concentrated on the stone, pulverizing it.*



*A modern system of navigation- LORAN- uses hyperbolas: a signal is sent to the ship from two fixed sources and the time difference is measured. This puts the sources at the foci of a hyperbola and the ship is somewhere on this hyperbola. This procedure is repeated with a second set of transmitters, which determines another hyperbola. Their intersection determines the position of the ship.*

The mathematics hidden in tree leaves is very new. It is called fractal geometry. Its inventor- Mandelbrot – is alive and works with IBM. He asked himself the question “What is the geometry of tree leaves and clouds and coastlines?” His ideas are used for the design of software in your computers where they are used in image compression.

These examples, which span an interval of two thousand years –and we could give you many more- show the vitality and relevance of the art of mathematical thinking: discoveries having no immediate use turn out later to have great practical and theoretical uses in technology and science.

New discoveries are constantly being made by talented young people from all races and nations. Perhaps one will be made by you.