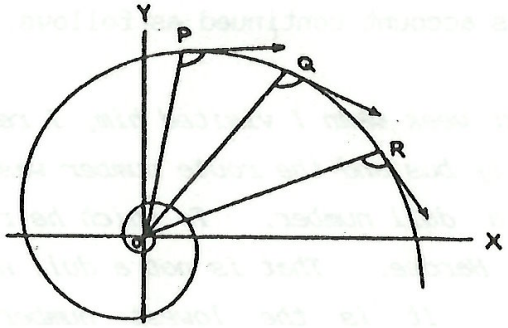
THE NAUTILUS SPIRAL

The diagram on page 24 features a cross-section of the shell of a Pearly Nautilus, showing a remarkable example of a curve known as the equiangular, or logarithmic, spiral. This spiral was first investigated in 1638 by the French philosopher and mathematician René Descartes, who viewed the curve as the path traced out by a point P moving away from the fixed point O, so that the direction of motion is always at a constant angle to the line OP. The name "equangular spiral" is suggested by this description.



The spiral may also be described by means of the equation $r = a^{\theta}$, where a is a constant, r is the distance OP and θ = $\angle$POX. Since this equation is equivalent to $\theta = \log_a r$. the curve is often called a "logarithmic spiral". Why does the Pearly Nautilus have a growth pattern based on the logarithmic spiral? If P, Q and R are three points on the spiral such that $\angle$POQ = $\angle$QOP then OP, PQ and OR are in geometrical progression, since $\frac{OQ}{OP} = \frac{OR}{OQ}$. The sectors OPQ and OQP are therefore geometrically similar figures, and the successive chambers in a Nautilus shell thus keep the same shape while increasing in volume.

The Pearly Nautilus is only one manifestation of the equiangular spiral in nature. You can read more about it in *On Growth and Form*, by D'Arcy W. Thompson, a facinating book which shows the importance of a knowledge of mathematics to the understanding of biology

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