Utilizing Hydrostatics to Describe the Paleoecology of Orthoceras, an Extinct Fossil Nautiloid

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Orthoceras is an extinct genus of Nautiloids, characterized by a straight, conical shell. These inhabited seas 450 million years ago, and are related to cephalopods, which are keystone species in decline. These elusive species are hard to study as a result of the depths they inhabit, and paleoecology can thus be an alternative to protect them from extinction. This project intends to determine the extent to which mathematical models, fluid dynamics, and hydrostatics can be used to determine the paleoecology of Orthoceras . It is hypothesized that Orthoceras had a horizontal living orientation, and used water in a system of jet propulsion to move, as a result of similarities between Orthoceras and extant Nautilus . To test the hypothesis, Pyplot was used to create contour plots to generate a hypothetical Orthoceras . A vertically-sliced shell of Nautilus pompilius was measured. Curves were generated for septal thickness, positioning, and chamber size, relative to shell diameter; these were used to plot septa on the hypothetical shell, and then find the sizes of the body, shell, and phragmocone. Center of mass and center of buoyancy equations were created for Orthoceras , and were then used to calculate the stability index. Volumes of water were then added to the apex of the shell, which moved up the center of mass, eventually creating a stability index of 0 when the water volume was 470 cm^3. The increased stability of the shell with water supported the conclusion that Orthocones used siphuncular water in a system of jet propulsion to move.

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