On bodies floating in equalibrium in every direction

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We give a negative answer to Ulam's Problem 19 from the Scottish Book asking *is a solid of uniform density which will float in water in every position a sphere?* Assuming that the density of water is 1, we show that there exists a strictly convex body of revolution $K \subset \mathbb{R}^3$ of uniform density $\frac{1}{2}$, which is not a Euclidean ball, yet floats in equilibrium in every direction. We prove an analogous result in all dimensions $d \geq 3$.