UNDERSTANDING TOP-SHELF VERTIGO

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Top-shelf vertigo (*Benign Paroxysmal Positional Vertigo, BPPV*) is the most common cause of vertigo and dizziness in people over the age of seventy. It is believed that top-shelf vertigo is caused by calcite particles floating freely in the semicircular canals of the vestibular organ.

The semicircular canals are the primary sensors for angular motion. They are filled with a fluid called the *endolymph*. Movements of the head induce a flow of the endolymph. This flow deflects a flexible gelatinous structure (*cupula*). The deflection of the cupula triggers nerve signals resulting in the perception of angular motion. Healthy semicircular canals do not contain particles. But if particles are present then the flow of the endolymph is disturbed and the cupula sends out erroneous signals.

In this talk we will derive a model for the particle-laden fluid flow in a semicircular canal. Based on this model we will explain the mechanism of top-shelf vertigo. It turns out that the vertigo is caused by a gravity driven flow which is induced by the falling particles. Furthermore our model provides us with explicit formulas for the strength and the duration of the vertigo. Numerical solutions of the model are shown to be in good agreement with clinical experiments.