The Philosopher's Stone –

Finding Peace at Rock Bottom with the Curling Problem

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The curling problem is the last macroscopic problem in tribology and may be the last macroscopic problem in physics altogether. In the winter sport of curling, the stone shows a constant deviation of roundabout one meter in a typical 28 meter shot. Most remarkably, this deviation is roughly the same for a range of one to 20 rotations and thus independent of rotation.

The key property to understanding the motion of the curling stone is the isotropic character of friction. Additionally considering mixed lubrication, the velocity difference of the retreating and the advancing side results in a self-feeding process that significantly splits up the friction coefficients. As a consequence, the delta of isotropic friction forces on both sides of the stone leads to a net lateral force. Still, this lateral force then can make the stone deviate only if the friction force on the retreating side is bigger than the centrifugal force on the advancing side.

This mechanism called split friction model on its own can only explain the deviation for up to roughly ten rotations. For faster rotations, it must be combined with the experimentally proven concept of scratch-theory. The combination of these two concepts split friction and scratch-theory then perfectly explains the constant deviation of 1 meter for few rotations that can grow up to 2 meters for 80 rotations.

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