

## The Rotating Soccer Stadium

*Frederick David Tombe*  
*Belfast, Northern Ireland,*  
*United Kingdom,*  
[sirius184@hotmail.com](mailto:sirius184@hotmail.com)  
*2<sup>nd</sup> May 2026*

**Abstract:** This satire highlights a conflict between two widely accepted but mutually exclusive ways of understanding inertial forces. One view holds that these forces arise from inertial motion itself. The other treats them as artefacts of observing motion from a rotating frame of reference.

At the Tennessee Institute of Advanced Rotational Studies, a match is about to begin in its newly built rotating soccer stadium. Colonel Sherburn—best remembered for facing down a lynch mob in *The Adventures of Huckleberry Finn*—steps forward to address the crowd.

“Gentlemen—

I am Colonel Sherburn, of Arkansas, and I am informed this institution considers itself a center of natural philosophy. Very well. Let us then speak as philosophers, and not as men who take shadows for substance.

First, you must understand precisely what has been attempted here. In England, where this game of association football was first played, the pitch is fixed. A ball there behaves according to ordinary expectation; nothing beneath it conspires to confuse the matter.

But here in these United States of America, we are not content with the plain virtues of simplicity. No, gentlemen. We have seen fit to set the entire pitch rotating at two revolutions per minute, so that every principle of mechanics must be earned rather than assumed.

Now upon such a turning field, a player is no longer a free and independent agent. He is carried bodily along with the spinning earth by friction, and must contend with two familiar companions of rotating motion.

The first is centrifugal force, which drives him outward from the center whether he will or no. He leans inward like a man balancing himself on the edge of a slowly tilting roof, lest he be carried away from the middle of things.

The second is Coriolis force, which appears whenever he attempts to move toward or away from the center of the pitch. It throws him sideways, upsets his footing, and turns what ought to be a simple sprint into something resembling a political dispute conducted at speed.

These forces belong rightly to the player, for he is bound to the rotating pitch and must accept its consequences.

Now attend carefully to the ball—for here is where most men begin to reason badly.

Once the ball leaves the foot, it is no longer bound to this revolving contrivance. In its natural motion it travels through space under the influence of gravity and its initial impulse.

You may, if you are so inclined, write down centrifugal and Coriolis terms for it in polar coordinates. Very well. But if your arithmetic is honest, you will discover something less romantic than your expectations. The centrifugal contributions, taken in their proper pairs, cancel among themselves; and likewise the Coriolis contributions, likewise paired, fall away against one another. Nothing remains to bend the ball's path.

And yet you will swear you see a curve. You will insist the ball behaves as though it shares the player's troubles.

But that is not the ball's doing. It is yours.

For the player is compelled to share the rotation, and so he experiences the inertial forces in their proper form. Friction at his feet cancels only one half of each cancelling pair of terms; and therefore the remaining halves do not cancel. The result is a net centrifugal force and a net Coriolis deflection.

The ball, however, is not so bound. Its horizontal motion remains straight, and it only appears to curve when judged from the spinning stand upon which you insist on placing your feet.

Compare the two and say, 'It is the same influence at work,' and you are not being subtle at all, gentlemen.

England plays upon a still field and is spared this confusion entirely.

We, in our enthusiasm, set the ground itself spinning at two revolutions per minute, and then express surprise when reality refuses to look as simple as it once did.

But the truth remains plain enough:

The player is governed by real inertial effects of the rotating stadium.

The ball is not. Its apparent deflection arises only from the motion of the platform beneath it, while its motion is otherwise unaffected by the rotation.

And if that offends your intuition, gentlemen, the fault lies not in the laws of motion.”

### **Conclusion**

When a body is undergoing uniform straight-line inertial motion, it experiences equal and opposite pairs of centrifugal forces, and equal and opposite pairs of Coriolis forces, relative to any chosen point of origin. In a physically rotating system in which that body is constrained to co-rotate, the constraints cause an imbalance in the inertial forces, and so a net centrifugal force acts to draw the body away from the centre of rotation. In the case of a body constrained to move along a radial line, a net Coriolis force acts to push it sideways in the transverse direction.

However, when a system is merely observed from a rotating frame of reference that has no physical interaction with the system, the rotating frame serves only to superimpose an apparent circular motion on top of the existing motion. This transverse deflection, which is purely fictitious, is often confused with the Coriolis force.

(ChatGPT assisted with presentation but not for content)