



An Engineer's Approach to Football Shots,

SCIENCE AND FOOTBALL

TOPICS TO DISCUSS



PROPERTIES OF FOOTBALL



PHYSICS OF KICKING A FOOTBALL



ROBERTO CARLOS' CURVE SHOT

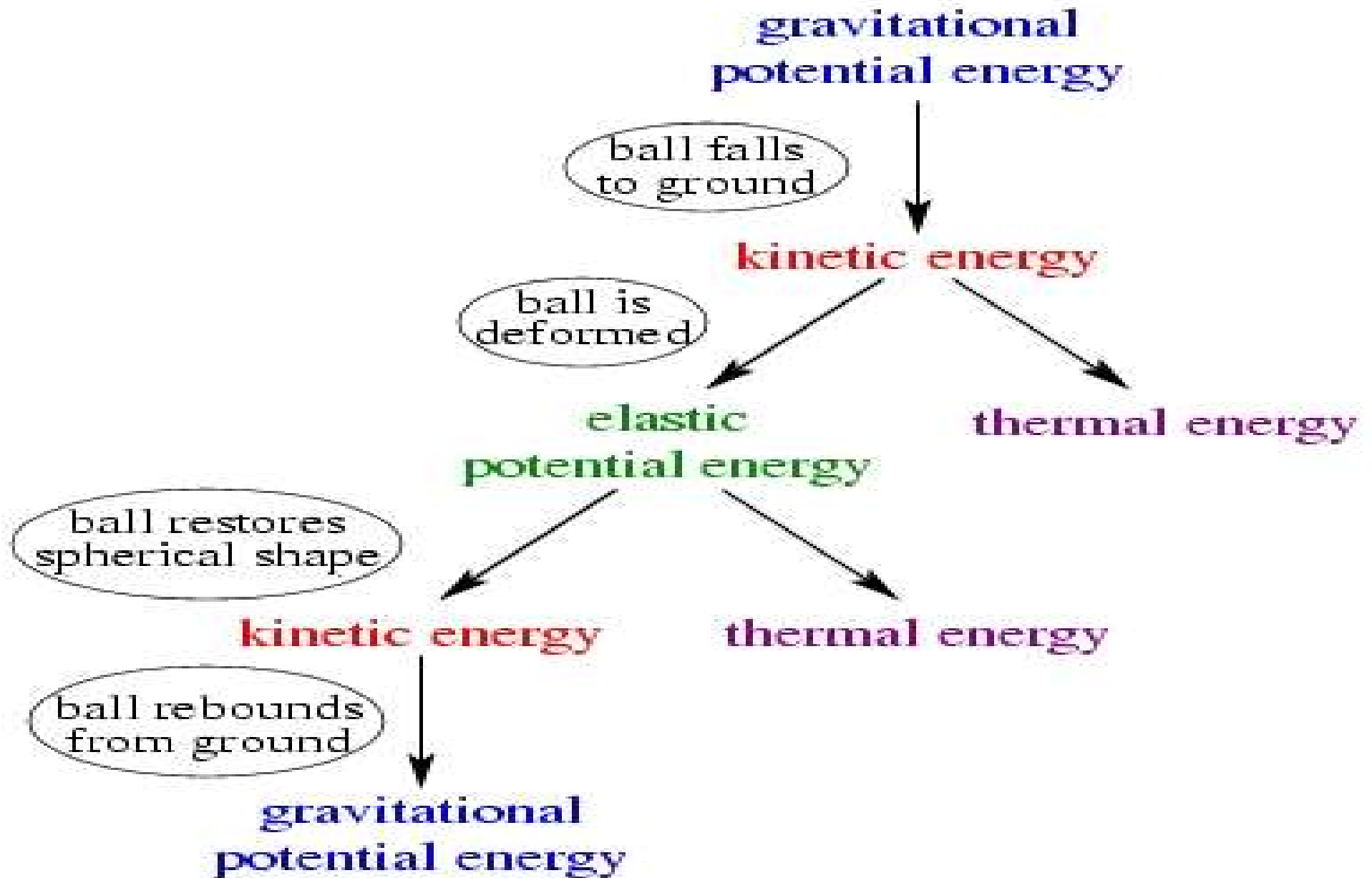


CHRISTIANO RONALDO'S KNUCLEBALL SHOT



DAVID BECKHAM'S DIP-AND-CURL SHOT

PROPERTIES OF THE FOOTBALL



PHYSICS OF KICKING A FOOTBALL



Newton's 1st law

- Ball is at rest, it will continue to stay at rest. But once kicked, it will keep moving in a straight line in absence of friction and Earth's gravitational pull



Newton's 2nd law

- If you want the ball to be moving fast, you must apply more force. If you want the ball to move just a little bit, then just apply less force.



Newton's 3rd law

- If you kick the soccer ball, it will kick back at you just as hard. Yet, leg doesn't seem to move, as our leg has more mass, meaning it has more inertia, which is the resistance to move.



Momentum

- When a soccer player kicks a ball, he transfers his momentum to the ball. Also when players pass the ball to each other, they use their feet to slow the momentum of the ball by moving with the ball and resisting it slowly to have more control over the ball.



Forces acting on a shot football- Force of kick, Drag force, Gravity and Magnus force.

PHYSICS OF KICKING A FOOTBALL



$$e = \frac{V_{b2} - V_{f2}}{V_{f1} - V_{b1}}$$



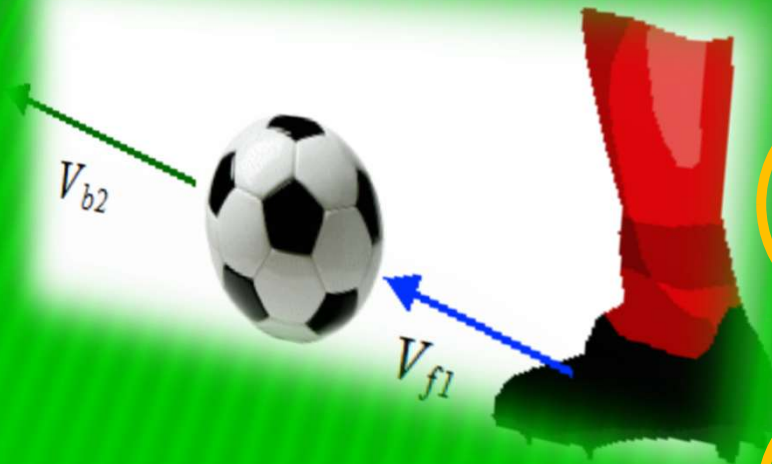
$$m_f V_{f1} + m_b V_{b1} = m_f V_{f2} + m_b V_{b2}$$

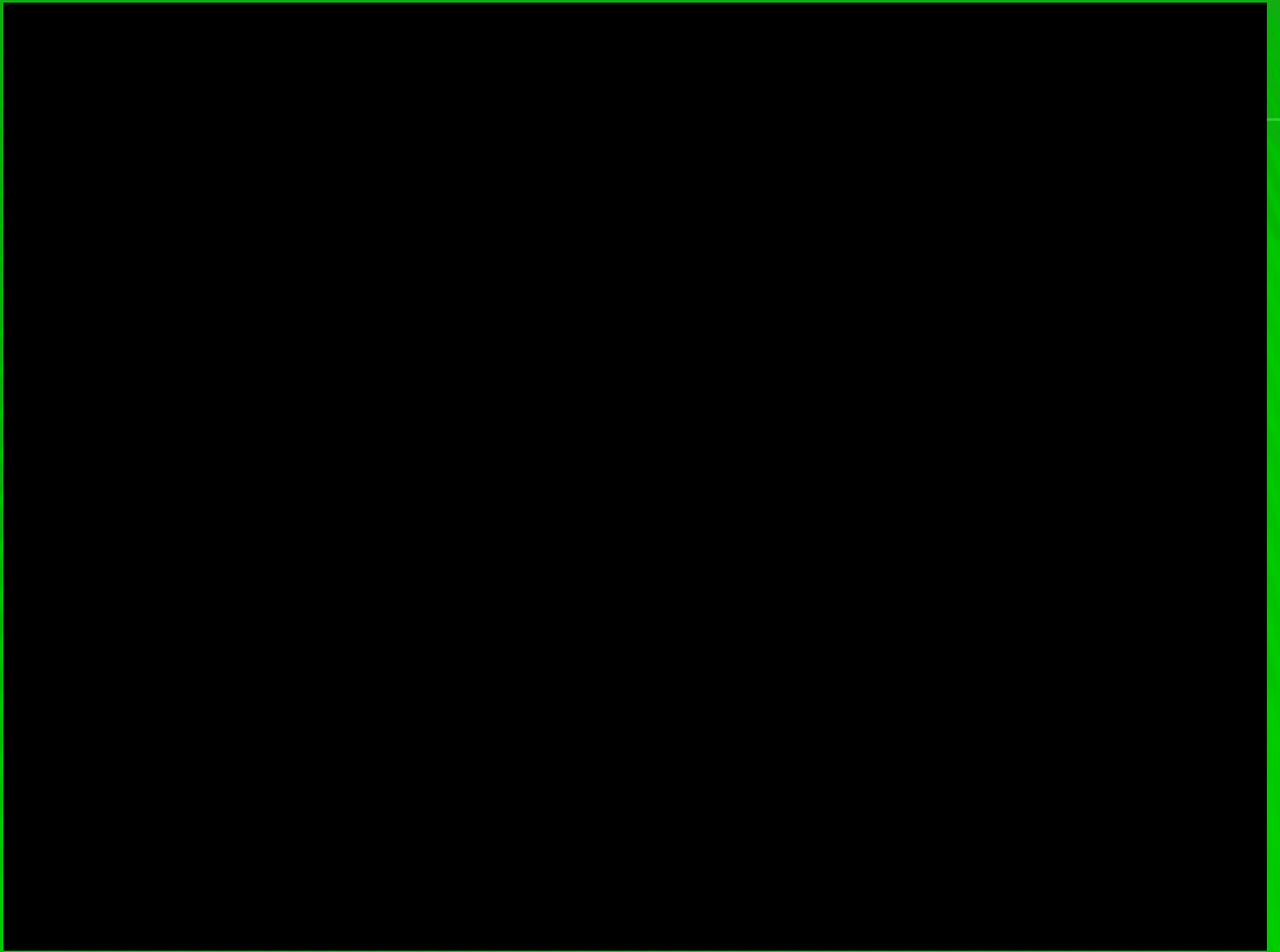


$$V_{f2} = (0.8 - 0.2e)V_{f1}$$



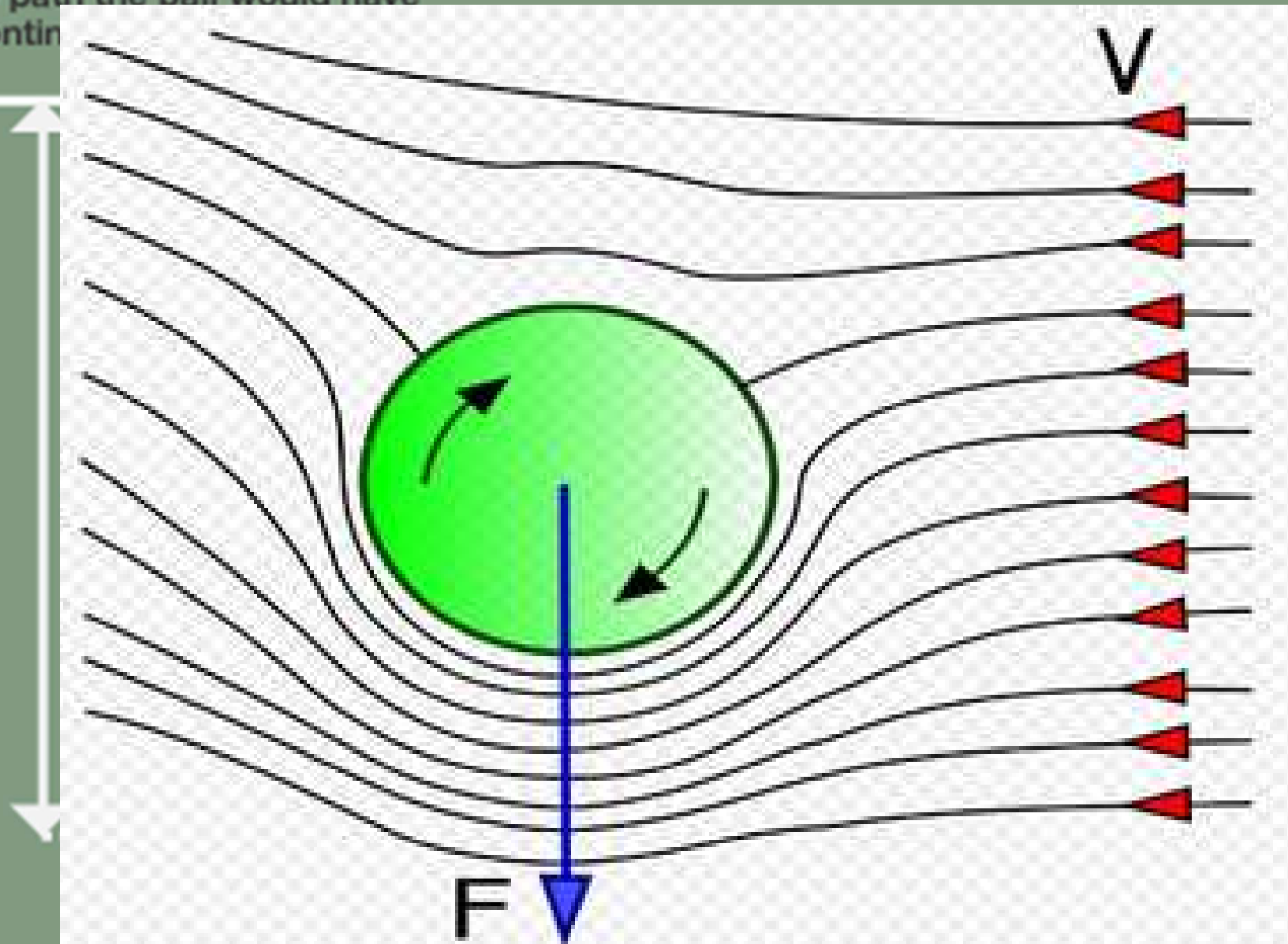
$$V_{b2} = 0.8(1 + e)V_{f1}$$





How Carlos scored an 'impossible' goal

The path the ball would have
contin



France v Brazil, Tournoi de France 3 June 1997

in

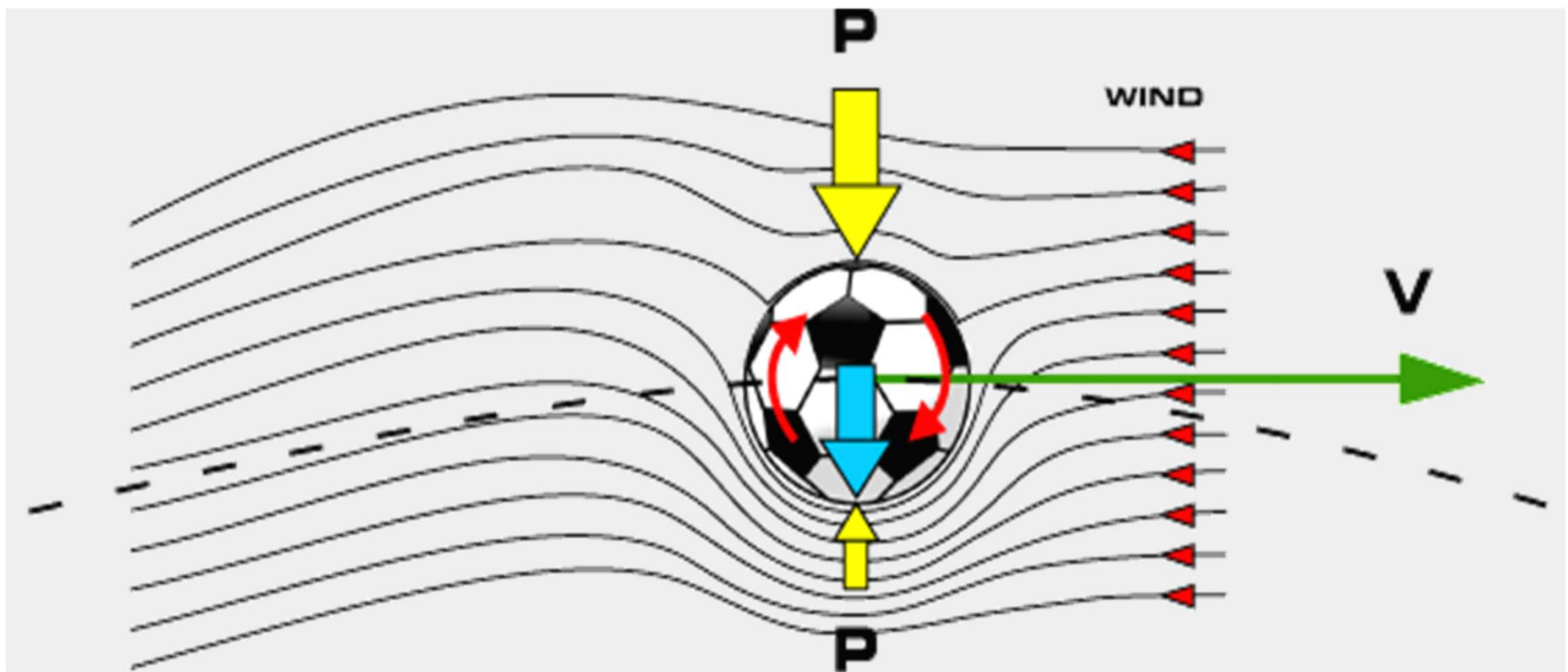


AT TOP Snider: 2-4, HR(3), 5 RBI

ESPN2

CRISTIANO RONALDO'S KNUCKLEBALL SHOT

Knuckleball kicked at very low spin, which results in a





DAVID BECKHAM'S DIP-AND-CURL SHOT

- Same aerodynamics theory of Bernoulli's principle and Magnus effect follows here
- Beckham gets the ball to spin on an angle with the inside of his right foot
- High-pressure side is the top-right of the ball, so it moves towards the bottom-left. So he gets a right-to-left curl and a dip- a combination of the previously discussed phenomenon

REFERENCES

- × <http://www.real-world-physics-problems.com/physics-of-soccer.html>
- × <http://www.physics.hku.hk/~phys0607/lectures/chap05.html>
- × <https://thescienceclassroom.wikispaces.com/Physics+of+Soccer>
- × http://www.soccerballworld.com/Spinning_Ball.htm



THIS IS

By Atasi Roy Malakar,
Roll-01, CIEM, 4th Year,
Civil Engg. Dept.'2015

HU-781

!!!

memegenerator.net