Study explains science of soccer

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With the attention of sports fans worldwide focused on South Africa and the 2010 FIFA World Cup, U.S. scientist John Eric Goff has made the aerodynamics of the soccer ball a focus of his research.

In an article appearing in the magazine *Physics Today* this month, Goff examines the science of soccer and explains how the world's greatest players are able to make a soccer ball do things that would seem to defy the forces of nature.

Goff's article looks at the ball's changing design and how its surface roughness and asymmetric air forces contribute to its path once it leaves a player's foot. His analysis leads to an understanding of how reduced air density in games played at higher altitudes -- like those in South Africa -- can contribute to some of the jaw-dropping ball trajectories already seen in some of this year's matches.

"The ball is moving a little faster than what some of the players are used to," says Goff, who is a professor of physics at Lynchburg College in Virginia and an expert in sports science.

For Goff, soccer is a sport that offers more than non-stop action -- it is a living laboratory where physics equations are continuously expressed. On the fields of worldwide competition, the balls maneuver according to complicated formulae, he says, but these can be explained in terms the average viewer can easily understand. And the outcomes of miraculous plays can be explained simply in terms of the underlying physics.

Goff also is the author of the recently published book, "Gold Medal Physics: The Science of Sports," which uncovers the mechanisms behind some of the greatest moments in sports history, including:

- How did Cal beat Stanford in the last seconds with five lateral passes as the Stanford marching band was coming on to the field?
- How did Doug Flutie complete his "Hail Mary" touchdown pass that enabled Boston College to beat Miami?
- How did Lance Armstrong cycle to a world-beating seven Tour de France victories?
- How did Olympic greats Bob Beamon (long jump), Greg Louganis (diving) and Katarina Witt (figure skating) achieve their record-setting Olympic gold?

More information: The article "Power and spin in the beautiful game" appears in the July, 2010 issue of Physics Today and is available at www.physicstoday.org/beautiful_game.html

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