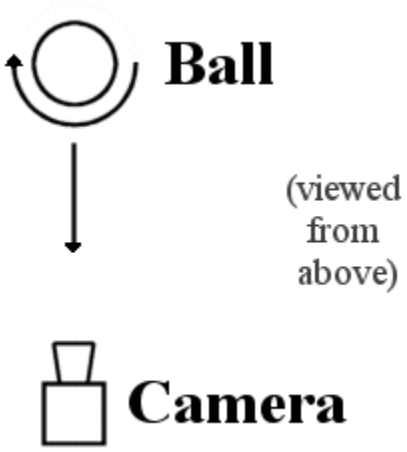
Answer #206

The answer is (a): the ball will curve off toward the left as viewed by the camera, as can be seen in an mpeg video by clicking your mouse on the photograph below. This video has been slowed down by a factor of three by using every frame in conversion of the standard video format to mpeg.



As the ball approaches the camera, spinning clockwise as viewed from above, some of the air near the ball becomes caught up by friction with the surface of the ball and moves clockwise with the ball. As this air encounters the apparent wind moving in the opposite direction (the air through which the ball moves) the layer of air moving with the ball is shed, leaving the ball and moving to the right as viewed by the camera. This motion of the shedding air vortexes has a reaction: the ball curves to the left as viewed by the camera. This phenomenon is an example of the Magnus effect.

A very nice photograph of a ball shedding vortexes in a wind tunnel can be viewed by clicking your mouse here.

Note that this does NOT demonstrate the Bernoulli effect; two assumptions of the Bernoulli effect are that (1) the fluid (here air) is incompressible and that the flow is laminar, so that the flow lines on both sides of the ball recombine to form continuous flow lines, neither of which applies.

The Bernoulli effect has been incorrectly used in explaining a large number of fluid flow experiments, such as the ball levitating on an airstream and the lift of an airplane wing. In many ways, the Bernoulli effect has become one of the real myths of contemporary science, being mis-applied in a large number of textbooks from early elementary school science through college physics. A number of good references will be found with our demonstration of the airplane wing.

Oh, yes: that peculiar, charming sound seems to happen whenever I throw my fast curve. Dead giveaway!

Archive 11

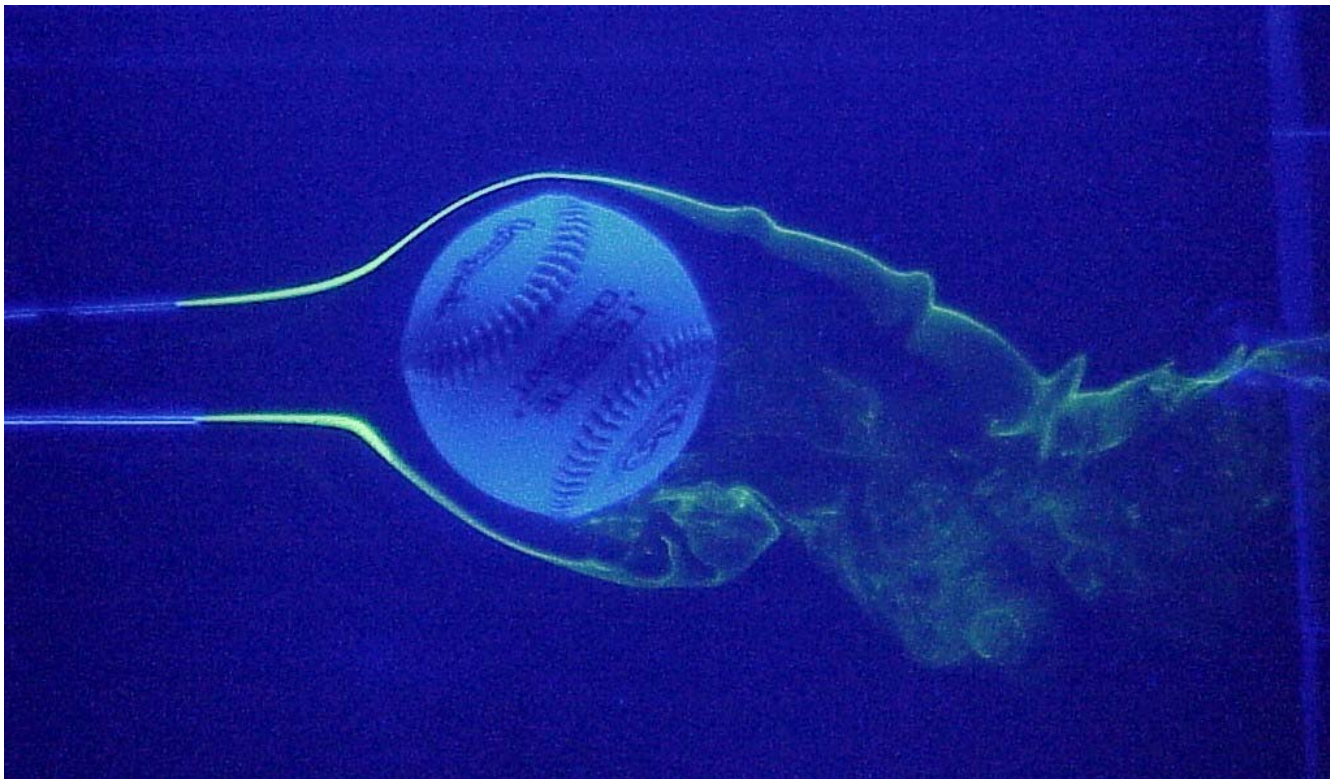
Question of the Week

Outreach Index Page

Lecture-Demonstration Home Page

For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.

Wind tunnel photograph of a "curve ball."



This picture is a view *looking downward* from above the ball, with the ball spinning clockwise as it moves from right to left across your computer screen, shedding vortices toward the bottom of the photograph so as to curve toward the top of the photograph. (A right-handed pitcher would achieve this effect by throwing the pitch side-arm and letting the ball slip off the end of her fingers as she released it.)