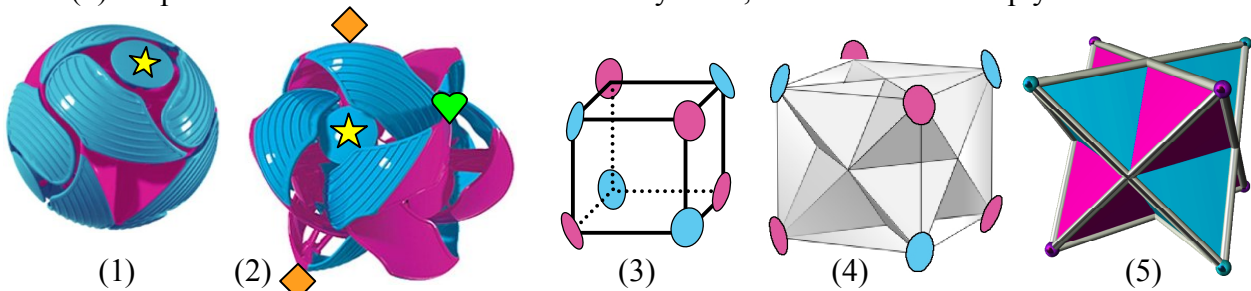


## The Mascot of *The USF Fusion Project*

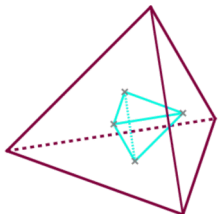
This marvelous ball, the *Hoberman Switch-Pitch™*, switches colors when tossed in the air with a slight spin. The ball embodies several different geometrical shapes. Foremost, it is an “inflated” *tetrahedron*, a three-sided pyramid—think of the pyramid having a rubber skin and being blown up like a balloon. Of course, that means the ball also looks like a *ball*, or solid sphere. Well, it’s not quite solid, but has a lot of stuff on the inside. We need to look at that too.



The balls come in two colors, here blue and pink. When mostly blue is showing, it resembles a tetrahedron with blue faces. Find the small blue disks in the faces (one is labeled with a gold star in (1) and (2) below). These mark the positions of the corners of the hidden pink tetrahedron. The large pink dents are where the hidden faces will emerge. If you gently pull the ball apart, you will see how this happens. But stop right in the middle (2), letting the ball hang from one of the internal struts (see the gold diamonds in (2)). Look at where the blue dots plus the now visible pink dots are. Do you see that they are on the corners of a small cube (3) deep inside the ball? The cube is not really there, but the dots can help you visualize it.

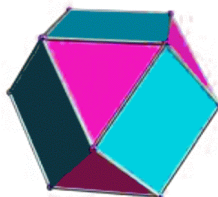


In (4), the blue dots on the cube mark one tetrahedron and the pink ones mark another. This symmetric melding of two tetrahedra (5) is called the *stella octangula*.



The drawing at the left shows that when you connect the midpoints of the triangular faces of this pink tetrahedron, you get a smaller blue tetrahedron, called its *dual*. The stella octangula results when the blue one expands. The tetrahedron is *self-dualizing*, and the stella shows it—and so does the ball!

Letting the ball hang open, look at what’s on the outside. There are eight places like the green heart in (2), where four “petals” come together. These are corners of an *octahedron*, a double Egyptian-type pyramid made from eight triangles (right).



Now, look at the points above the strut ends (like the gold diamonds). They are the corners of a *cuboctahedron* (left), a shape that has both the six square faces of the cube and the eight triangles of the octahedron. This ball shows off a lot of geometry; it makes artists happy too.



Why does the ball work? The construction is simple: a dozen struts are each hinged to two dots of different colors (each dot hinges with three struts), and that’s all there is. There are no springs—the ball closes by gravity alone. And it can go either way from the hanging position, so toss it up, watch it fly open, and take a chance on which way it lands, the blue or pink dual!