



HERE.



THERE.



EVERYWHERE.



Boat.

As this boat powers through the water, each motion in its direction of progress pushes on the water. However, the boat is moving faster than the waves can move away. The result is the build up of a bow wave in the direction of its motion. If this wave were seen from above, it would have the shape of a “V.”

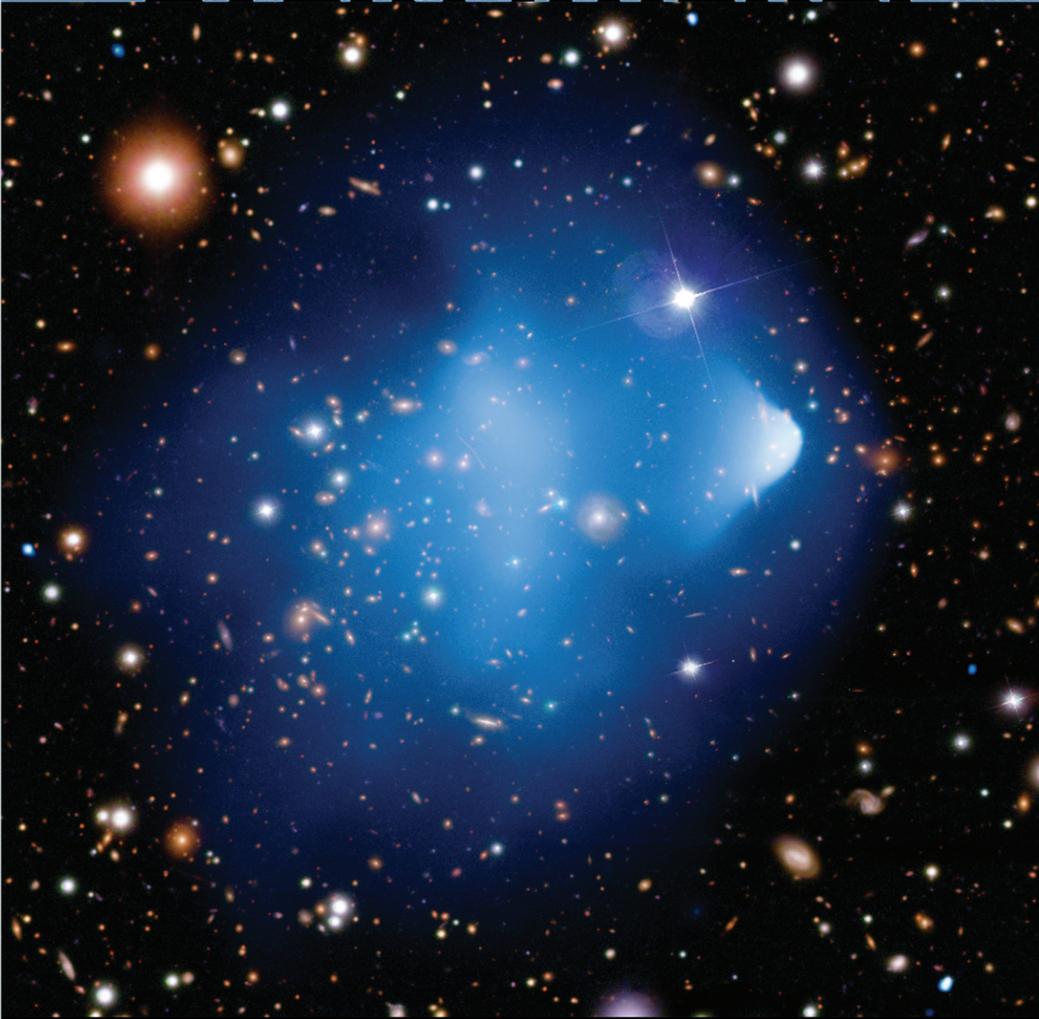
(Credits: Wikimedia Commons)



Supersonic Jet.

As an airplane moves through the air, it pushes on the air in front of it, creating sound waves. If the airplane is moving faster than the speed of sound, a bow shock is created. When this shock wave passes by our position on the ground, all of the sound waves that would have normally propagated ahead of the plane are combined together so at first we hear nothing, and then we hear the boom created by the accumulated sound waves.

(Credits: Wikimedia Commons)



Merger of Galaxy Clusters.

Galaxies are often found in large groups, called clusters, which are held together by gravity. The galaxies in clusters are immersed in huge clouds of multimillion-degree gas. Here two clusters are merging together, with one cloud of gas plowing through a larger one at a supersonic speed. This creates sound waves that merge into a bow shock. The cone of increased pressure produced by the bow shock makes it detectable by an X-ray telescope.

(Credits: X-ray: NASA/CXC/CfA/M.Markevitch et al.; Optical: NASA/STScI; Magellan/U.Arizona/D.Clowe et al.)

THE SHAPE OF SPEED As a duck paddles across a pond, it creates ripples or waves that move out in front of it. If the duck paddles fast enough, the ripples will merge into a cone-shaped wall of water called a bow wave. Bow waves are familiar sights in front of boats as well, and can also be formed in the atmosphere and in space when objects move more rapidly than the speed of waves in their liquid or gas environments.

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<http://hte.si.edu/waves>

**BECAUSE WHAT HAPPENS HERE,
HAPPENS THERE,
HAPPENS EVERYWHERE.**

