Magdeburg hemispheres

A Magdeburg sphere consists of a pair of hollow hemispheres, historically made from copper or brass, with a seal around the edge that's tight enough to allow air to be pumped out of the assembled object. When air is evacuated from the sphere, the pressure inside of it is lower than the atmospheric pressure outside pushing on it from all directions, so the halves stay together. The inventor, Otto von Guericke, used such a sphere to perform a dramatic demonstration of the existence of atmospheric pressure. During the experiment, air was pumped out of the sphere, and a team of horses was attached to either side. They strained in opposite directions yet were unable to pull the hemispheres apart until air was let back in.

The demonstration was not only a scientific endeavor but a political move. Von Guericke, then mayor of the city of Magdeburg, in what is now Germany, held the demonstration during the Holy Roman Empire's diet at Regensburg in 1654 to show the city's power and its recovery. In 1631 during the Thirty Years' War, 20 000 inhabitants were slaughtered by Imperial forces in what became known as the Sack of Magdeburg. Von Guericke attracted the attention of Emperor Ferdinand III, who ordered Gaspar Schott, a mathematics teacher in Würzburg, to perform more such experiments using von Guericke's equipment. In Schott's first published book on vacuum science, *Mechanica hydraulico-pneumatica* (*Hydraulic-Pneumatic Mechanics*, 1657), he promoted von Guericke's research and instruments. This illustration was created by Schott for a large foldout page in von Guericke's major work, *Experimenta nova (ut vocantur) Magdeburgica de vacuo spatio* (*The New [So-Called] Magdeburg Experiments of Otto von Guericke*, 1672). A copy is available to view at the Niels Bohr Library and Archives. —CEM

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