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In Vacuo

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In Vacuo

The *saying*, nature *abhors* a vacuum, had become a major *contemplation* object for natural philosophers by the early 17th century. They were holding it up to the light trying to see what it *revealed* about the nature of things. Nature demonstrates her *abhorrence* clearly enough when you use a drinking *straw*. Nature tries to get rid of the vacuum by driving liquid up the straw.

The story is told about a group of Florentine engineers trying to suck water up from a deep *sump*. Try as they would, they couldn't get the water to rise more than thirty-two feet. You and I know that atmospheric pressure can't push water any further; but seventeenth-century engineers had no way of knowing that. So they went to Galileo and asked what was going on. Galileo *wryly* replied that nature's abhorrence didn't appear to extend beyond thirty-two feet.

Actually, Galileo had, himself, been trying to understand air pressure and vacuum by then. In 1641, three months before he died, he'd hired a young assistant named Evangelista Torricelli to help him. Two years later Torricelli invented the barometer, and he gave us a good *estimate* of atmospheric pressure. We honour Torricelli today by naming the Torr, a unit of pressure, after him.

Meantime, Otto von Guericke, an influential citizen of Magdeburg in Saxony, had grown increasingly interested in the atmosphere. Von Guericke had studied both Galileo's and Torricelli's work, but he was also involved in the administration of the city of Magdeburg. In fact, he was elected its *mayor* in 1647. About that same time he invented a vacuum pump, and what he did with it was spectacular.

In 1654 he gave the citizens of Magdeburg a *remarkable* lesson in the force of the atmosphere. He machined two hollow *hemispheres*, twenty inches in diameter, so they fit *snugly* into a sealed *sphere*. He pumped the air out of it. Then he put sixteen horses, eight on each side, to the task of pulling the halves apart. The horses couldn't, of course. It would've taken a force of over two tons to separate the halves.

That may look more like *showmanship* than science. But it served its *purpose*. Von Guericke showed the world that seemingly *insubstantial* gases could *exert* astonishing forces -- forces that could probably be *harnessed*. Down through the rest of the seventeenth century, people *struggled* to find a way to make use of these forces. In 1698, Thomas Savery finally

made a workable pump driven by the vacuum created when steam condensed. Just a few years later, Thomas Newcomen made a steam engine on the same principle, and the power-generation game was *afoot*.

Our big power plants today generate more than a gigawatt -- well over a million horse-power. That's a long way from Otto von Guericke's *startling* little sixteen-horse demonstration. But that's where the seed was *sown*. That's where we saw the potential of gases, which, at first, seemed no more real than ectoplasm. ■

Prof. Dr. John Lienhard, University of Houston



<i>abhor, to</i>	verabscheuen, zurückschrecken
<i>abhorrence</i>	Abscheu
<i>afoot</i>	im Gange
<i>contemplation</i>	Betrachtung
<i>estimate</i>	Schätzwert
<i>exert, to</i>	ausüben
<i>harness, to</i>	nutzbar machen
<i>hemisphere</i>	Halbkugel
<i>insubstantial</i>	substanzlos
<i>mayor</i>	Bürgermeister
<i>purpose</i>	Zweck
<i>remarkable</i>	bemerkenswert
<i>reveal, to</i>	offenbaren, aussagen
<i>saying</i>	Redwendung
<i>showmanship</i>	geschickte Zurschaustellung
<i>snugly</i>	behaglich
<i>sow, to</i>	säen
<i>sphere</i>	Kugel
<i>startling</i>	überraschend, verblüffend
<i>straw</i>	Strohalm
<i>struggle, to</i>	kämpfen, ringen
<i>sump</i>	Sickergrube
<i>wryly</i>	ironisch

Horror Vacui, die Angst vor der Leere, ist eine der treibenden Kräfte in der Natur. Ein Mann aus Magdeburg war einer der ersten, der diese Angst bezwungen und sie sich zu Nutze gemacht hat.

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