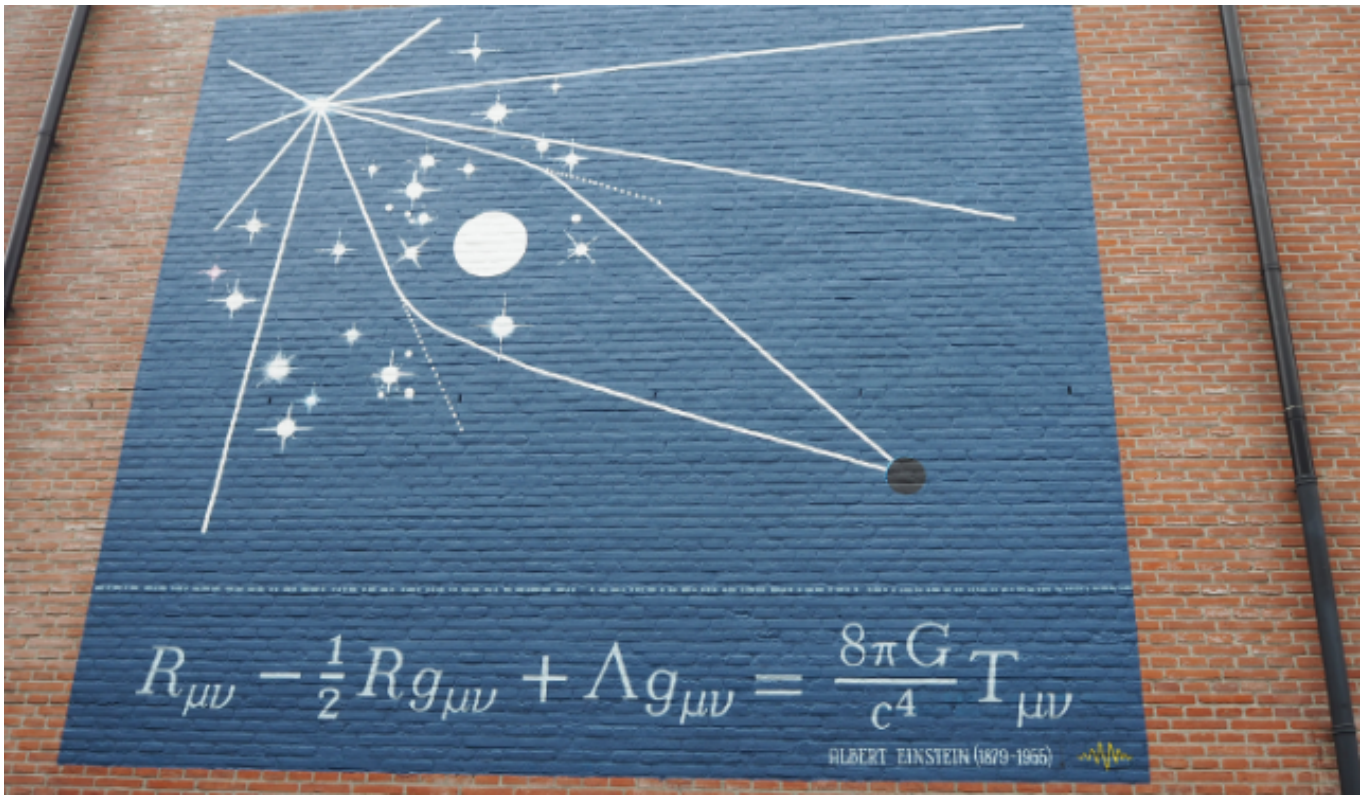
A VIEW FROM THE BRIDGE

# Maths and murals: Leiden's wall formulae

November 22, 2017 | 1:12 pm | Posted by Barbara Kiser | Category: Arts, Mathematics, Physics

***Posted on behalf of Quirin Schiermeier***



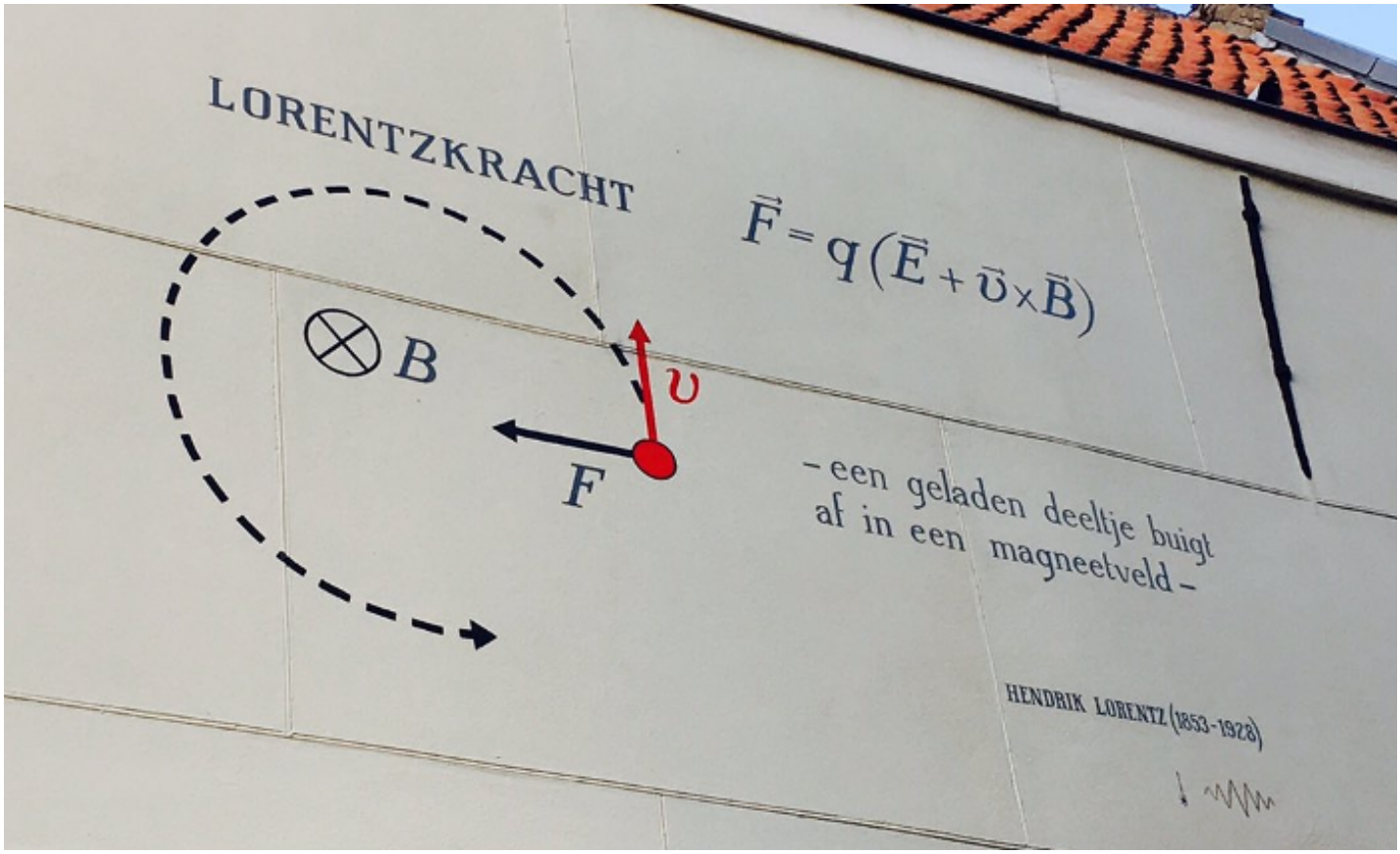

One of Einstein's field equations – part of the Leiden wall formulae project.

*IVO VAN VULPEN AND SENSE JAN VAN DER MOLEN. PHOTOGRAPH BY HIELCO KUIPERS.*

Albert Einstein's field equations from his theory of general relativity combine wonderful scientific intuition with the honed concision of poetry. Yet relatively few of the culturally inclined marvel at the shape of a mathematical equation in the way they might at a line from Shakespeare. Now, however, the Dutch university town of Leiden is giving its citizens a chance to try, through iconic formulae by physicists and astronomers painted on walls throughout the city.

The formulae join 100-plus murals of poems, painted by artists over more than two decades as a way of highlighting

Leiden's long connection with the arts, not least as Rembrandt's birthplace. These celebratory artworks, some in delicate Japanese calligraphy, have become part of an urban aesthetic. But the city is also a crucible for discoveries such as superconductivity, by Heike Kamerlingh Onnes, in 1911.




The Lorentz force formula.

*IVO VAN VULPEN AND SENSE JAN VAN DER MOLEN. PHOTOGRAPH BY HIELCO KUIPERS.*

The idea of 'wall formulae' arose a few years ago, when physicists Ivo van Vulpen and Sense Jan van der Molen convinced municipal authorities (and house-owners) to embrace the scheme as a way of celebrating science in the city. Dutch artists Jan Willem Bruins and Ben Walenkamp were first in, painting Willebrord Snellius's law of refraction (Snell's law), Hendrik Lorentz's force formula, and Einstein's field equations. These were unveiled in 2016. Three more – the Oort constants, the Lorentz contraction and electron spin (discovered by Lorentz's students Samuel Goudsmit and George Uhlenbeck) – are officially unveiled today.


Oort constants.

*IVO VAN VULPEN AND SENSE JAN VAN DER MOLEN. PHOTOGRAPH BY HIELCO KUIPERS.*

Van der Molen notes that the equations, like poems, distil realities and are "beautiful to behold and inspiring". To help convey their meaning to non-mathematicians, the artists add a simple graphical representation of the physical phenomenon described. Thus the Lorentz contraction, which expresses how objects shrink to an observer travelling near speed of light, is illustrated by a circle and a series of 'squeezed' ellipses. The Oort constants, which refer to the angular velocity of the Sun around the centre of the Milky Way, are symbolized by a spiral galaxy (with a dot showing the Sun's position). And to picture Einstein's field equations – which describe how space is deformed by big objects – we see a ray of starlight's curved path around a heavy mass, known as gravitational lensing.

By inviting comparison between these and more familiar lines of beauty, Leiden is leading the way in inspiring its citizens about physics and maths on the hoof.

**Quirin Schiermeier is a senior reporter for *Nature* based in Munich.**

**The** Leiden wall formulae **feature on city-centre buildings including the** Boerhaave science history museum**. Tourists can visit the sites on a leisurely 90-minute walk. Guided tours and an app for smartphones, developed by Leiden physics students involved in a science communication project, will be available by the start of 2018.**

**For *Nature*'s full coverage of science in culture, visit www.nature.com/news/booksandarts.**