# EINSTEIN BEYOND RELATIVITY

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Abstract -
A little over 4 centuries ago, Galileo concluded - and possibly confirmed by experiment - that different weights hit the ground at the same time when dropped from a height (discounting air resistance). This agrees with Albert Einstein's general theory of relativity; which proposes that gravity is the curvature of space-time pushing objects towards, say, the surface of a planet. It says this curvature acts equally on all bodies, making massive and less massive ones fall at equal rates. However, Einstein published a paper in 1919 (four years after General Relativity) asking if gravitation plays an essential role in formation of matter's particles. If it does, there would be more gravity acting on a massive body and it would fall slightly faster. The rate at which different objects fall is the subject of a French-backed space experiment called Microscope. Einstein's 1919 paper did more than suggest limitations of his general relativity. It seems to have been the launching pad for his Unified Field Theory; which occupied the last 30 years of his life, sought to unite gravitation with electromagnetism, and proposed that this unified field connected all parts of time and space. While the unified field theory is generally considered a failure, my own conviction is that it could transform into a world-changing success through the application of quantum mechanics, something Einstein didn't approve of because he regarded it as incomplete.

Article -
"In the late 1500s, the Italian scientist Galileo Galilei (wondered) what would happen if two spheres with different weights were dropped at the same time from the Leaning Tower of Pisa. The Greek philosopher and scientist Aristotle attributed the speed of a falling object to its proportional weight, with heavier objects falling faster than lighter ones. Galileo believed that mass was immaterial to an object's falling speed. All would hit the ground at the same time no matter how much they weighed. From that he deduced that in a vacuum, all bodies would fall at the same speed, an idea that underpins Albert Einstein's general theory of relativity, published 100 years ago. The concept, called the equivalence principle, has been well tested on Earth; but scientists wonder if it breaks down when measurements are precise enough." (1)

Relativity proposes that gravity is the curvature of space-time pushing objects towards, say, the surface of a planet. It says this curvature acts equally on all bodies, making massive and less massive ones fall at equal rates. However, Einstein published a paper in 1919 (four years after General Relativity) asking if gravitation plays an essential role in formation of matter's particles. (2) If it does, there would be more gravity acting on a massive body and it would fall slightly faster, Aristotle would have been correct, and the equivalence principle indeed "breaks down when measurements are precise enough".

"Putting the principle under a proverbial microscope is the goal of a French-backed space experiment called, appropriately, Microscope. Microscope lead scientist Pierre Touboul said: If the equivalence principle breaks down, the door opens for new physics to complement general relativity, maybe a new type of interaction or a new type of particle for this interaction." (1) Should Einstein's paper asking if gravitation plays an essential role in formation of matter's particles be correct, there would be no new particle. The complement to Einstein's general relativity would be another paper written by Einstein a mere 4 years after publishing general relativity.

How is the Microscope satellite faring? According to https://presse.cnes.fr/en/microscope-satellite-first-results-looking-very-promising, "The science phase of the mission has now begun and will last for at least 18 months to obtain the most precise measurements possible."

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* To be more specific - the existence of both advanced waves (which travel backwards in time) and retarded waves (which travel forwards in time) as admissible solutions to James Clerk Maxwell's equations about electromagnetism was explored in the Wheeler–Feynman absorber theory in the first half of last century, as well as the more recent transactional interpretation of quantum mechanics (TIQM). Einstein's equations say gravitational fields carry enough information about electromagnetism to allow Maxwell's equations to be restated in terms of these gravitational fields. This was discovered by the mathematical physicist George Yuri Rainich (3). Therefore, gravitational waves also have a "retarded" component and an "advanced" component. They can travel forward or backward not only in space, but in time too. 17th century scientist Isaac Newton's idea of gravity acting instantly across the universe could be explained by gravity's ability to travel back in time, and thereby reach a point billions of light years away not in billions of years, but apparently instantly.^

^ Instantaneous effect over large distances is known as entanglement and has been repeatedly verified experimentally. Though the effect is measured for distances in space, the inseparability of space and time means that moments of time can become entangled too. (4)

References

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(3) "Transactions of the American Mathematical Society" 27, 106 - Rainich, G. Y. (1925)

(4) "Quantum Entanglement in Time" by Caslav Brukner, Samuel Taylor, Sancho Cheung, Vlatko Vedral
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