

The weight of weight

From time immemorial people have understood the meaning of this sentence. The apple falls downward, not upward or sideways. The moon does not vanish into outer space, nor does it crash down into the earth. No one can fly, not under his or her own power in any case. Nobody, nothing tumbles off the earth. We know all of this from experience. Only imaginative children and the world of fairy tales defy the laws of nature. Only characters from children's books bound off from the roof, believing that an umbrella will suffice as a parachute. Levitation is reserved for magicians and gods. As modern, enlightened people, we know that we are subject to something called gravity, but do we understand the full import of

F
=
G
m
1
m
2

r

2

2

{\displaystyle F=Gm_{1}m_{2}/r^{2}}

? Of course, as everyone knows, there are other forces attraction than those emanating from the mass of bodies. For example, gravitation is not the main force that causes lovers to come together.

The title of the science fiction film *Gravity* (2013), which in 3D depicts a space walk that goes awry, makes use of the double etymology of the English word. The word's Latin root is gravis, which means heavy, weighty. Another root comes from the German and Proto-Indo-European words for dig, grave, engrave. The heroine, who is played by Sandra Bullock, winds up in a situation that is simultaneously weightless and gravely serious.

"After dinner, the weather being warm, we went into the garden and drank tea under the shade of some apple trees, only he and myself. He told me he was just in the same situation when the notion of gravitation came into his mind. 'Why should that apple always descend perpendicularly to the ground,' thought he to himself, occasioned by the fall of an apple as he sat in a contemplative mood. 'Why should it not go sideways or upwards, but constantly to the earth's centre?'"

The legend of how Isaac Newton discovered gravitational force has been widely disseminated. The quote is taken from one of the sources of the legend: *Memoirs of Sir Isaac Newton*, which friend and archeologist William Stukeley penned in 1752. In connection with its 350th anniversary in 2010, the Royal Society made a digital version of Stukeley's manuscript available.

Source critics have pointed out that the meeting between Stukeley and Newton took place a quarter of a century before it was written down in 1725, when the latter was 80 years old and had only one more year to live. The apple revelation itself would have occurred as far back as the late summer of 1665, when the University of Cambridge had been closed because of ravages of the plague and the 22-year-old science student had travelled home to his parents in Lincolnshire.

As a young academic, during his long career Newton became embroiled in prestige conflicts with colleagues in his own country and abroad, which could have led him to contribute to the formation of myths about himself. Consequently, there are good reasons to take the apple legend with a grain of salt.

In one version Isaac sits populating under the apple tree when he suddenly is awakened by a fruit falling on his head. In popular culture it often happens that flashes of genius are triggered by a blow to the head, a causal connection that in reality probably is difficult to verify empirically. Sudden insight into the nature of things has many names in many languages. Greek has Eureka (εὕρηκα), "I've found it!", which Archimedes (287–212 BC) is said to have cried out when he came upon his displacement principle in the bathtub. Swedish has "Lidner's knäpp", an expression poet Bengt Lidner (1757–1793) used to describe how one morning in bed he suddenly and loudly was transformed from a stupid student to a smart one.

What Newton saw was not really the falling apple, but rather the possibility that it had to do with something else. That caused him to ask questions. Why does the apple behave as it does? Why doesn't the moon do the same thing? Why does the moon neither fall down to earth nor vanish into outer space?

The power of the legend about Newton and the apple is about seeing, and about perceiving."

Albert Einstein saw, or rather foresaw, something else. On September 14, 2015, two observatories in Washington and Louisiana detected for the first time the minute ripples in space called gravitational waves. The signal has been determined to originate from two black holes that merged 1.2 billion light-years away. Einstein predicted the existence of gravitational waves in 1916. They are a consequence of his general theory of relativity from the year before. According to this theory, a falling apple's movement, for example, is represented by a straight line in a warped space-time. If you hold an apple in your hand, the gravitational force is balanced, according to Newton, by the force of your hand. According to Einstein, the force from your hand holding the apple bends the space-time line outward. When your hand releases the apple, the space-time line straightens out. The shape of space-time means that the straight line soon (after 25 minutes) reaches the centre of the Earth and then continues.³

Free fall and levitation are aspects of the same force: without gravitation, no body can either fall or rise, just hover. Like angels? In Himmel över Göteborg ("Heaven above Gothenburg") (2015), a theater performance inspired by Wim Wenders's film Der Himmel

über Berlin (1987), an angel appears to want to become human, in contrast to the refugees who are dehumanized in the performance by the prevailing bureaucratic system. The angel wants to be mortal, i.e., alive: *"I don't want to hover in eternity; I want to feel my own weight."*⁴

On pottery from 630 BC found in an Etruscan grave in Cerveteri outside Rome, there are two mythical figures portrayed, both of them possessing attributes coveted by humanity from time immemorial. One is the sorceress Medea, who was said to be able to restore youth to the elderly. The other is a man who is depicted on the pottery with wings and called Taitale. To all appearances, he is the same figure known to posterity as Daedalus, thanks to Roman authors.

Daedalus, whom the Greeks called Daidalos, was an ingenious inventor from Athens. It was he who discovered the wedge, the axe, the windlass, the lever and the sail. He constructed statues that moved and looked completely alive, a kind of ancient robot. King Minos on Crete assigned Daidalos the task of building a labyrinth in his palace. Because Minos neglected to sacrifice to the gods a splendid white bull they had given him, the gods caused his wife Pasiphaë to fall in love with the bull. She charged Daidalos with building her a cattle enclosure in which she could receive her beloved. The fruit of this intercourse was the Minotaur, half man, half bull, a horrendous, man-eating monster that Minos locked into the labyrinth with Daidalos and his son, Icaros. The only way out of the labyrinth was through the air. Using bird feathers and wax, Daidalos fashioned wings for himself and Icaros. Icaros became so enraptured about being able to fly that he defied his father's admonitions and flew so close to the sun that the wax melted and he crashed into the sea near the island of Icaria, which was named after him. Daidalos continued his flight to Sicily, where he put aside his wings and built a temple in honor of Apollo.

Romanticism made Daidalos a symbol for the classical artist, the skilled craftsman, whereas Icaros became a symbol for the romantic artist: ingenious, passionate, rebellious, someone who ignores all rules and laws.

*Elevation
Above the lakes, above the vales,
The mountains and the woods, the clouds, the seas,
Beyond the sun, beyond the ether,
Beyond the confines of the starry spheres,
My soul, you move with ease,
And like a strong swimmer in rapture in the wave
You wing your way blithely through boundless space
With virile joy unspeakable.
Fly far, far away from this baneful miasma
And purify yourself in the celestial air,
Drink the ethereal fira of those limpid regions
As you would the purest of heavenly nectars.
Beyond the vast sorrows and all the vexations
That weigh upon our lives and obscure our vision,
Happy is he who can with his vigorous wing
Soar up toward those fields luminous and serene,
He whose thoughts, like skylarks,
Toward the morning sky take flight
- Who hovers over life and understands with ease
The language of flowers and silent things!
Charles Baudelaire⁵*

One of the earliest sensations to which a small child is subjected is being hoisted or thrown up in the air: the tickling sensation in the stomach when the force of gravity

4.Himmel över Göteborg, which was performed at Angered, Teater in the autumn of 2015, was written by Nicolas Kollivas and directed by Elinetha Gerofoka.

and zizzens people distinguish between vertigo or acrophobia on one hand and dizziness on the other. The latter can arise from low blood pressure, fatigue, lack of fluids or irritation of the inner ear. The cause of vertigo, on the other hand, is shrouded in mystery. Doctors cannot explain why certain people who have climbed up on a ladder or a roof or just gone out on a balcony suddenly feel their legs begin to tremble and a sinking feeling in their stomachs. Strangely enough, these physical feelings of discomfort often are accompanied by a compulsive and simultaneously euphoric thought: imagine if I were to jump and free fall to the ground! The thought dissects the person who experiences it and causes her to hang more tightly onto something solid. She fears for herself. Am I capable of doing something that I don't want to do? Why do I want to throw myself down when it is sure to lead to my destruction? Can't I control myself? Don't I know who I am?

One hypothesis asserts that the eye requires time to adjust to heights—when stepping out on a high balcony, for example, if the eye is allowed time to adjust, the person can then enjoy the beautiful view. If the person instead is gripped by discomfort at the great height and hurries inside, the discomfort remains, is stored up and can in the worst case grow into a phobia.

As a remedy, doctors suggest taking the bit by the horns: that is, subjecting yourself bit by bit to heights together with a therapist and training yourself to cope with them.

Incidentally, speaking of bulls, in our latitudes the ox is a heavy animal, one of the heaviest. Whether weight is incompatible with quickness and humor is an old controversial question. Johan Henrik Kellgren concurred with the Roman poet Horatius, who contended that usefulness can very well be combined with enjoyment, a position he elaborated on in *Filosofen på landsvägen* ("Philosopher on the Highway") (1792):

"There is, namely, a common and equally inaccurate belief among my dear countrymen that a work's profundity should be demonstrated through its tediousness, and that an author who smiles necessarily is wrong. On the contrary, I dare to assert that rationality and truth are the natural friends of joy, that enjoyable usefulness is double usefulness and that gravity in writing as well as in countenance, in gait and in gesture is more often a mask for an empty head. The gravest animal on earth is, as everyone knows, the ox: but what do you think about his profundity?"

Light and heavy are fundamental distinctions of existence along with light and darkness, life and death, movable and fixed. They seem to be needed to bring order to diversity.

Certain epochs are lighter than others. Rocco is light, baroque heavy. The Middle Ages heavy, the Renaissance light. The literary 1950s were light, at least in Sweden, while the painterly 1980s were heavy in the same country. Different countries have different weights. Germany is heavy, while France is light. Of art forms, music without a doubt is the lightest and the lightest of all is Mozart, but what is heaviest? Being a heavyweight is to really count for something while lightweightes are relegated to the margins. While the history of art forms seems to alternate between lighter and heavier periods, the evolution of media seems to be moving toward ever more light and transitory forms: ure stones, handwritten flyers, printed books, brochures and calendars, magazines, newspapers, radio, TV, the Web, social media...

"The predominant movement in the world of ideas in the West has an aspirational nature and places positive values and har-

7.Bedlam was an institution for the mentally ill in London in those days. A "dun steed" is gray with a black mane and tail and a dark dorsal stripe. In the King Charles XI Swedish translation of the Bible, such a horse is described in the book of Revelations' description of the riders of the Apocalypse. See The Chymistry of Isaac Newton: http://www.baptistlib.Indiana.edu/newton/index.jsp (read Oct 27, 2015).

8.Keynes, J.M., "Newton, The Man": Proceedings of the Royal Society, New York: Contemporary Celebration, 15–19 July 1946; Cambridge University Press (1947). The commemorative words are available on several sites, including this one: http://phys.columbia.edu/~mills/900Spring04/Supplemente-ry/John%20Maynard%20Keynes_%20%22Newton%20the%20Man%22.pdf (Read Oct 25, 2015). In the original, the quote reads: "Newton was not the first of the age of reason. He was the last of the magicians, the last of the Babylonians and Sumerians, the last great mind which looked out on the visible and intellectual world with the same eyes as those who began to build our intellectual inheritance rather less than 10,000 years ago. Isaac Newton, a posthumous child born with no father on Christmas Day, 1642, was the last wonderchild to whom the Magi could do sincere and appropriate homage."

9. See the fascinating documentary about James Randi, An Honest Liar (2014), http://anonestliar.com/wp/ (Read Oct 15, 2015)

A Werner Herzog documentary, The Great Ecstasy of the Woodcarver Steiner (1974), is about Walter Steiner, Switzerland's foremost ski jumper of his day and also a woodcarver. As is the case with several of the film director's heroes—Aguirre, Kaspar Hauser, Nosferatu, Fitzcarrald, Grizzly Man—the film depicts an eccentric, an exceptional person, someone who puts himself above social rules and the laws of nature. The almost hour-long TV documentary tells its story with few words, accompanied only by synthesized-based music by the krautrock band Popol Vuh. In one scene Steiner talks about his work as a woodcarver, in another scene about how he had taken care of a young raven.

The film provides very little background and context for Steiner's achievements on the ski jump, which reinforces the impression of a person who transcends nature's laws and human capability. A ski jump consists of various parts: the in-run, where the skier picks up speed; the take-off, from which the flight begins; the landing slope, where the jumper lands; and the transition and outrun, where speed slows down. The starting point is a dramatic, unsuccessful jump in the Austrian town of Oberstdorf in 1973. Steiner flew too far and fell upon impact, a scene that recurs in the film. If he had jumped ten meters farther, he would have landed on the outrun and probably killed himself. Such a jump would have corresponded to a free fall from a height of 10 meters.

The following year Steiner executed the perfect jump in Planica in what was then Yugo-slavia. Despite the fact that he had started from a lower level than his competitors, he outclassed them and broke a fantastic world record.

In Herzog's film Steiner soars, seemingly weightless, through the air. Exceptional athletic performance often is described as defying the law of gravity: long jumper Bob Beamon's incomparable 8.9-meter jump during the Olympic Games in Mexico City (high elevation = little air resistance), basketball's Michael "Air Jordan" Jordan's improbable passages through the air toward the basket, soccer goalkeeper Thomas Ravelli's ability to fling himself in one direction—and then change course in the air!



The title of Don DeLillo's novel *Falling Man* (2007) alludes to a performance artist who without notice does his thing all around New York: hanging upside down from some building in the city wearing an irreproachable suit, tie and well-shined shoes. His act is a reminder of the people who were forced to jump to certain death when the Twin Towers in Manhattan were subjected to terrorist attacks on September 11, 2001. Richard Drew immortalized one of these fatal falls with a now iconic photograph that is simply titled "Falling Man." It is an incredibly beautiful image, making it doubly uncanny. It was published the day after the attacks in the New York Times, resulting in severe criticism.

Ever since the portrayal in the book of Genesis of the Fall of Man and expulsion from Paradise, the fall has had profound psychological, social, and political implications of social degradation, expulsion. Fruit also plays a key role in the biblical tale. A "fallen" woman is someone who is forced into prostitution. The fallen man can take dreadful revenge, as in *Falling Down* (1993), a film by Michael Douglas in the leading role as an average man who for seeming trivial reasons is transformed into a one-man war against society. But the opposite, elevation, also can be traced back to the Bible, and in particular the Ascension of Christ in the New Testament. For the individual the exemplary social ladder is upward, as it is for those collectively organized in a popular, labor or women's movement: "From darkness, we walk toward the light, from nothing everything we want to be" (The Internationale); "Out of the tomb of degrading servitude, up to honorable, noble achievement" (Arbetsets söner) ("Sons of Labor"). "Is a girl supposed to sit quietly/ and only hope/ that some guy/ will say what she thought/ or should she rise up/ take a deep breath/ and cry/ IF YOU JUST SHUT UP/ AND LISTEN/ then you will hear what I want to say" (Vi måste höja våra röster) ("We must raise our voices").

Is the giddy feeling you can experience on a roller coaster related to the giddiness of a transformative art experience? In any case, I was not surprised when I became aware that gravitational aesthetician Julijonas Urbonas has worked in amusement parks from childhood.¹¹ Does contemporary interest in the connection between gravitation and aesthetics have anything to do with that fact that the late capitalist middle class perceives natural laws like gravitational pull as an affront? Research shows that people in luxury cars to a greater degree than others disregard traffic rules and consideration for fellow drivers. For such a person, it feels old-fashioned to be weighed down on earth and not be able to levitate when and how he wants. When the entire world is accessible on a screen and you can fly wherever you want, shouldn't you indeed be able to escape gravity? That aversion to the body's weight and sluggishness and the friction of movement goes back a long way. It was not just because they were lazy that kings and high-ranking people of antiquity had themselves carried around. It was also a statement about social rank and political importance. For similar reasons, upper-class Chinese girls had their feet deformed into so-called "lotus feet" so they wouldn't be able to work. In Svenska Fattigdomens Betydelse ("The Significance of Swedish Poverty") (1838), Carl Jonas Love Almqvist writes about the genre's aversion to having their surroundings rub off on them, a thought that the neo-liberals adopted, inspired by Ronald Reagan. Only wimps allow themselves to be limited by laws and rules. Nothing fastens on the real Teflon people. They can levitate whenever they wish. If not with a machine of their own, then with the aid of one they have bought.¹²

What's remarkable about Newton's story and the apple isn't really that he asked why the apple fell when the moon didn't, but why (almost) nobody else asked themselves that question. Even today, 350 years after Newton is said to have had his eureka moment, most of us do not ask why natural laws operate as they do. We're blind and ignorant, not only about how things operate in nature, but also in society and daily life. Who comprehends how the Internet works? Or the cell phone? Or the LED light? Or globalization? Or the suicide bomber?

The question is, how does that blindness to everyday life affect us? Maybe it's healthy to content ourselves with knowing that things work rather than how they work. Or is it detrimental? Hungarian author Arthur Koestler (1905–1983) commented ironically in his day about modern man's lack of knowledge about how a telephone or radio works. That did not prevent him, toward the end of his life, from becoming interested in, as Wikipedia puts it, "a number of paranormal phenomena, such as extrasensory perception, psychokinesis and telepathy." Modern art and literature often agitate against being injured to our surroundings and inattentional blindness; they are modern in that respect. Russian formalists coined the term *ostranenie* (остранение), or defamiliarization, to point out what it is that makes a poem a poem. Bertolt Brecht introduced a theory about Verfremdung, or estrangement, as an expression for his aspiration to make the theater audience clear-eyed. In the first performance of *The Threepenny Opera* (1928), he put up signs instructing the audience "not to stare!" It became a success anyway.

In the introduction to Andrej Tarkovskij's film *Mirror* (1975), a woman sits smoking on a fence at the edge of a forest and looks out over a meadow. A man is coming walking along, asks for a cigarette and settles down next to the woman on the fence—which breaks under their weight. The scene is typical of Tarkovskij, who often plays with nature's forces and laws in his films: a strong wind suddenly passes through the meadow before it just as suddenly stops, rain falls indoors, a carafe falls down from the table without any external force touching it.

As if in a mirror, we see what Newton saw, only just the opposite. The apple stops for a moment on its way to the ground.

Mikael Löfgren

^[1] Acts 19:11.

^[1] http://www.nytimes.com/2016/02/22/science/ligo-gravitational-waves-black-holes-einstein.html?_r=0