Relativity, Part 2: General
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Topic: Blinded by Science

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Gravity strikes without warning. It is the silent killer, the thief, the undertaker. It can be completely unpredictable, despite the fact that it has been doing the exact same thing for around 14 billion years. The human race has lost countless lives to the merciless will of gravity, and even today, it looms as an ever-present threat to all things that are made of matter, which most things are.

Human beings have feared gravity since the tragic realization that babies do not bounce. It was only a short time before prehistoric man related gravity to such disconcerting events as sharp pain, falling sensations, disfigurement, and, of course, sudden, traumatic (though occasionally hilarious) death. As civilization developed, we learned to cope with gravity more professionally. We built stairs and ladders, and we learned to climb ropes and cargo nets in gym class.

Early on, humankind cultivated a basic understanding of what gravity does. The question that dogged our ancestors, and sometimes jabs us today, is: *When* will gravity do what it is so fond of doing?

Gravity comes and goes. It only exists when we pay attention to it, or when we don't and it gets bored and grabs someone to play with. This seemingly random effect was first noticed by the ancient Chinese, who probably said something profound about it, as did the Greeks, Egyptians, Mayans (most likely), and, of course, Galileo, but who cares? It took a familiar, English-speaking Anglo-Saxon to come up with anything worth teaching in public schools.

Sir Isaac "Fig" Newton was, for all intents and purposes, the first person to say anything about gravity that wasn't completely stupid and obvious, and that by a hair. Fig described gravity using equations stolen from a mathematics textbook he bought from Barnes and Nobles. Despite his flagrant plagiarism, Fig pioneered a brilliant and accurate method of predicting the behavior of falling bodies.

Fig's greatest contribution to our understanding of gravity was to prove that gravity is always "on." Fig asserted that, even though an object may not be falling at the moment, it would be, and right soon.

Fig's gravitational laws also helped to explain the movements of the stars and planets. He calculated that the orbits and rotations of planets resulted from a force created by matter. This understanding was, functionally, at least, correct.

Fig's formulas are still in use today for general ballistics and engineering purposes. The problems with Fig's formulas became apparent when people began using them to finely calculate the vast forces and distances of the cosmos.

Anvils, cannonballs, flying nuns, and tossed midgets all conformed to classical Newtonian concepts of gravity. Things go up, and then they come down. Understanding gravitational acceleration on our familiar scale of perception is as easy as falling. However, astronomical observations of stars, planets, X-wing fighters, and the Silver Surfer revealed discrepancies in predicted velocities and distances. Physics was at a loss to explain these phenomena and, for a short time, considered employing Karl Rove to convince everyone they had something to do with homosexual Iraqis. Unfortunately for physics, Karl Rove was not born yet. Without a sufficiently brilliant liar to fabricate a plausible explanation, physics was forced to turn to the only man yet born who would ever approach the genius of Karl Rove.

Albert Einstein was a bad liar, he had a poor memory, he was a weak orator, he disliked engaging in meaningless discourse, and in general, he lacked all the necessary qualities a person needs to convince people of things that are not true. With this handicap, Einstein found it necessary to pursue truth and meaning vigorously in order to compensate. Einstein found the growing evidence of the flaws in Newtonian gravitation very troubling, and he sought to correct the situation the only way he knew how: by thinking about it very, very hard.

Einstein's considerable power of thought had once led him to compelling deductions about light, energy, and relativistic motion which shocked and awed the world of physics. Only ten years after authoring the revelation that would propel the world into the nuclear age, Einstein dropped another bomb. (Einstein did not have anything to do with nuclear weapons! He hated the very idea! I'm sorry I used that phrase; it just happened.)

In 1915, Einstein unveiled his radical new understanding of gravity. The general public responded with a unanimous "What?" 1915 went on record as having the most reported cases of death by instantaneous brain failure in human history. Though his findings were initially met with blank stares, drool, and occasional seizures, over the years, Einstein's theory of general relativity has withstood scientific scrutiny. It remains the accepted and practiced theory of gravitation. For this feat of intuition and logic, Einstein stands in the front row of the pantheon of great human minds, right in between da Vinci and Antisthenes, who keep making fun of his German accent.

General relativity provides equations that define gravity as a geometric link between matter, energy, and four-dimensional space-time. Loosely interpreted, general relativity describes gravity as a curving of space-time caused by the presence of matter. The curving of space-time results in the lovable effect known as "falling." Falling becomes a very complex concept when you redefine your notion of "down."

Everything is falling. We are falling, except the Earth is conveniently located under our feet and is agreeable enough to perpetually catch us. We feel this effect as "weight." The Earth is falling towards the Sun. Fortunately, we are traveling on the exact vector we need to perpetually fall around the Sun instead of into it, which would hurt, briefly.

Gravity makes everything fall, even light. Light follows the curvature of space-time, so it, too, falls. The fact that light falls is just plain weird. The effects of falling light are straight-up crawfish-bananas.

Gravity's interaction with light gives you pretty much everything you need for a riveting sci-fi plot: black holes, quasars, red- and blueshifts, gravitational lensing, time dilation, and conceptual warp speeds. The interaction of gravity and light is so impressively complex and counterintuitive that it is fully deserving of its own article, which I hope to write, but probably won't very soon.

What do you want from me? I just wrote two articles on relativity. Seems like I should move on to other branches of science for a while. It's "Blinded with Science," not "Blinded with Physics."

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