From Chapter Two of 'E=mc²', looking at the science Einstein was taught:

... [By the mid-1800s] all the world's seemingly separate forces were slowly, majestically, being linked to create a masterpiece of the Victorian Age: the huge, unifying domain of Energy.

It's easy to miss how extraordinary a vision this was. It's as if when God created the universe, He had said, I'm going to put X amount of energy in this universe of mine. I will let stars grow and explode, and planets move in their orbits, and I will have people create great cities, and there will be battles that destroy those cities, and then I'll let the survivors create new civilizations. There will be fires and horses and oxen pulling carts; there will be coal and steam engines and factories and even mighty locomotives. Yet throughout the whole sequence, even though the types of energy that people see will change, even though sometimes the energy will appear as the heat of human or animal muscles, and sometimes it will appear as the gushing of waterfalls or the explosions of volcanoes: despite all those variations the *total* amount of energy will remain the same. The amount I created at the beginning will not change. There will not be on millionth part less than what was there at the start.

Expressed like this it sounds like the sheerest mumbo jumbo - something like Obi-Wan Kenobi's description in *Star Wars*: "The Force is the energy field created by all living things; it binds the galaxy together."

Yet it's true! When you swing closed a cupboard door, even if it's in the stillness of your home at night, energy will appear in the gliding movement of the door, but exactly that much energy was removed from your muscles. When the cupboard door finally closes, the energy of its movement won't disappear, but will simply be relocated to the shuddering bump of the door against the cupboard, and to the heat produced by the grinding fiction of the hinge. If you had to push your feet slightly against the floor to keep from slipping when closing the door, the earth will shift in its orbit and rebound upward by exactly the amount needed to balance that.

The balancing occurs everywhere. Measure the chemical energy in a big stack of unburned coal, then ignite it in a train's boiler and measure the energy of the roaring fire and the racing locomotive. Energy has clearly changed its forms; the systems look very different. But the total is exactly, precisely the same.

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This concept of energy conservation is what the science teachers in Einstein's cantonal high school in Aarau, in northern Switzerland, had taught him when he arrived there for remedial work in 1895, twenty-eight years after Faraday's death.

[Faraday had been an English researcher important in the notion of conservation of energy.] Einstein had been sent to the school not because he'd had any desire to go there - he had already dropped out of one perfectly good high school in Germany, vowing that he'd had enough - but because he had failed his entrance exams at the Federal Institute of Technology in Zurich, the only university that offered a chance of taking a high-school dropout. One kindly instructor there had thought he might have some merit, so instead of turning him away entirely, the institute's director had suggested this quiet school - set up on informal student-centered lines - in the northern valleys.

When Einstein did finally make it into the Federal Institute of Technology - after his first delicious romance, with the eighteen-year-old daughter of his Aarau host - the physics lecturers there were still teaching the Victorian gospel of a great overarching energy system. But Einstein felt his teachers had missed the point. They were not treating energy conservation as a live topic, honestly hunting for what it might mean, trying to feel for those background religious intimations that had driven Faraday and others forward. Instead, energy and its conservation was just a formalism to most of them, a set of rules. This matched a great complacency through much of Western Europe at the time. European armies were the most powerful in the world; European ideas were 'clearly' superior to those of all other civilizations. If Europe's top thinkers had concluded that energy conservation was true, then there was no reason to question that.

Einstein was easy-going about most things, but he couldn't bear complacency. He cut many of his college classes, for teachers with that attitude weren't going to teach him anything. He was looking for something deeper, something broader. Faraday and the other Victorians had managed to widen the concept of energy until they felt it had encompassed every possible force.

But they were wrong.

Einstein didn't see it yet, but he was already on the path. Zurich had a lot of coffee houses, and he spent afternoons in them, sipping the iced coffees, reading the newspapers, killing time with his friends. In quiet moments afterward, though, Einstein thought about physics and energy and other topics, and began getting hints of what might be wrong with the views he was being taught. All the types of energy that the Victorians had seen and shown to be interlinked - the chemicals and fires and electric sparks and blasting sticks - were just a tiny part of what might be. The energy domain was perceived as very large in the nineteenth century, but in only a few years Einstein would locate a source of energy that would dwarf what even the best, the most widely hunting of those Victorian scientists had found.

He would locate the hiding place for this further vast energy where no one had thought to look. The old equations would no longer balance. The amount of energy God had set for our universe would no longer remain fixed. There could be more.

But where would it be?

And then we go on to see where he ended up looking. That leads, to the 'm' symbol in his great equation, which the next chapters in the book explain...