Higgs in the Standard Model and More
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The following text comes from the following link. Italics and any font modification are added for emphasis.

https://en.wikipedia.org/wiki/Higgs_boson#The_problem_of_gauge_boson_mass

The problem of gauge boson mass

Field theories had been used with great success in understanding the electromagnetic field and the strong force, but by around 1960 *all* attempts to create a *gauge invariant* theory for the weak force (and its combination with fundamental force electromagnetism, the electroweak interaction) had *consistently failed, with gauge theories thereby starting to fall into disrepute as a result*. The problem was that the *symmetry requirements* in gauge theory predicted that both electromagnetism's gauge boson (the photon) and the weak force's gauge bosons (W and Z) *should have zero mass*. Although the photon is indeed massless, experiments show that the weak force's bosons have mass.[15] This meant that *either gauge invariance was an incorrect approach, or something else – unknown – was giving these particles their mass*, but all attempts to suggest a theory able to solve this problem just seemed to create new theoretical issues.

In the late 1950s, physicists had "no idea" how to resolve these issues, which were significant obstacles to developing a full-fledged theory for particle physics.

Symmetry breaking

By the early 1960s, physicists had realised that a given symmetry law might not always be followed under certain conditions, at least in some areas of physics.[c] This is called symmetry breaking and was recognised in the late 1950s by Yoichiro Nambu. Symmetry breaking can lead to surprising and unexpected results. In 1962 physicist Philip

Anderson – an expert in superconductivity – wrote a paper that considered symmetry breaking in particle physics, and suggested that perhaps symmetry breaking might be the missing piece needed to solve the problems of gauge invariance in particle physics. *If electroweak symmetry was somehow being broken, it might explain why electromagnetism's boson is massless, yet the weak force bosons have mass, and solve the problems. Shortly afterwards, in 1963, this was shown to be theoretically possible, at least for some limited cases.*

Higgs mechanism

Main article: Higgs mechanism

Following the 1962 and 1963 papers, three groups of researchers independently published the 1964 PRL symmetry breaking papers with similar conclusions: that the conditions for electroweak symmetry would be "broken" if an unusual type of field existed throughout the universe, and indeed, some fundamental particles would acquire mass. The field required for this to happen (which was purely hypothetical at the time) became known as the Higgs field (after Peter Higgs, one of the researchers) and the mechanism by which it led to symmetry breaking, known as the Higgs mechanism. A key feature of the necessary field is that it would take less energy for the field to have a non-zero value than a zero value, unlike all other known fields, therefore, *the Higgs field has a non-zero value (or vacuum expectation) everywhere. It was the first proposal capable of showing how the weak force gauge bosons could have mass despite their governing symmetry, within a gauge invariant theory.*

Although these ideas did not gain much initial support or attention, by 1972 they had been developed into a comprehensive theory and proved capable of giving "sensible" results that accurately described particles known at the time, and which, with exceptional accuracy, predicted several other particles discovered during the following years.[d] During the 1970s these theories rapidly became the Standard Model of particle physics. There was not yet any direct evidence that the Higgs field existed, but even without proof of the field, the accuracy of its predictions led scientists to believe the theory might be true. *By the 1980s the question of whether or not the Higgs field existed, and therefore whether or not the entire Standard Model was correct, had come to be regarded as one of the most important unanswered questions in particle physics.*

Higgs field

According to the Standard Model, a field of the necessary kind (the Higgs field) exists throughout space and breaks certain symmetry laws of the electroweak interaction.[e] Via the Higgs mechanism, this field causes the gauge bosons of the weak force to be massive at all temperatures below an extreme high value. When the weak force bosons acquire mass, this affects their range, which becomes very small.[f] Furthermore, *it was later realised that the same field would also explain, in a different way, why other fundamental constituents of matter (including electrons and quarks) have mass.*

For many decades, scientists had no way to determine whether or not the Higgs field existed, because the technology needed for its detection did not exist at that time. If the Higgs field did exist, then it would be unlike any other known fundamental field, but *it also was possible that these key ideas, or even the entire Standard Model, were somehow incorrect.[g] Only discovering that the Higgs boson and therefore the Higgs field existed solved the problem.*

Unlike other known fields such as the electromagnetic field, the Higgs field is scalar and has a non-zero constant value in vacuum. The existence of the Higgs field became the last unverified part of the Standard Model of particle physics, and for several decades, was considered "the central problem in particle physics".[17][18]

The presence of the field, now confirmed by experimental investigation, explains why some fundamental particles have mass, despite the symmetries controlling their interactions implying that they should be massless. It also resolves several other long-standing puzzles, such as the reason for the extremely short range of the weak force.

Although the Higgs field is non-zero everywhere and its effects are ubiquitous, proving its existence was far from easy. In principle, it can be proved to exist by detecting its excitations, which manifest as Higgs particles (the Higgs boson), but these are extremely difficult to produce and detect. *The importance of this fundamental question led to a 40-year search, and the construction of one of the world's most expensive and complex experimental facilities to date, CERN's Large Hadron Collider,[19] in an attempt to create Higgs bosons and other particles for observation and study. On 4 July 2012, the discovery of a new particle with a mass between 125 and 127 GeV/c2 was announced; physicists suspected that it was the Higgs boson.[20][21][22] Since then, the particle has been shown to behave, interact, and decay in many of the ways predicted for Higgs particles by the Standard Model, as well as having even parity and zero spin,[6][7] two fundamental attributes of a Higgs boson. This also means it is the first elementary scalar particle discovered in nature.[23] As of 2018, in-depth research shows the particle continuing to behave in line with predictions for the Standard Model Higgs boson.* More studies are needed to verify with higher precision that the discovered particle has all of the properties predicted, or whether, as described by some theories, multiple Higgs bosons exist.[24]

Let’s copy-paste a particular section from near the top:
This meant that either gauge invariance was an incorrect approach, or something else – unknown – was giving these particles their mass or BOTH.

How could I possibly bring that up at this stage of the game? In private detective work, we'd call the bulk of text above a "false lead". Let's back up to the beginning:

1. assumption W & Z mediate the weak 'force'
2. they're massive so we need a symmetry breaking thing – let's label that SBT, symmetry breaking thing
3. historically, we've labeled that 'the Higgs' for respectable reasons
4. we've found something that resembles the SBT and its required characteristics, so 5
5. we believe we're on the right track since we found something of appropriate mass and characteristics for an SBT that combined with assumption 1 makes us believe 1 and 5 .. wait .. that seems like circular logic? O.O

What if 1 is incorrect? What if W & Z mediate nothing? What if they're simply transient decay products that are associated with another transient decay product we label the Higgs? O.O

Any *real* scientist would *have* to agree that the three questions above, answered positively, are *not impossible*. Which suggests the parts of the Standard Model dealing with weak 'force' and mass need reexamination and credible replacement.

Classically, $x'(t) = v(t)$ and $v'(t) = a(t)$ so $x''(t) = a(t)$; in words, the rate-of-change of position, as a function of time, is velocity; the rate-of-change of velocity is acceleration; so, the rate-of-change of the rate-of-change of position is acceleration. So differential calculus is *core* to classical mechanics. The independent variable that connects position, velocity, and acceleration is *time*.

$F = ma$ is Newton's 2nd law of motion and is *valid even for relativistic accelerations* when it is adjusted for such.

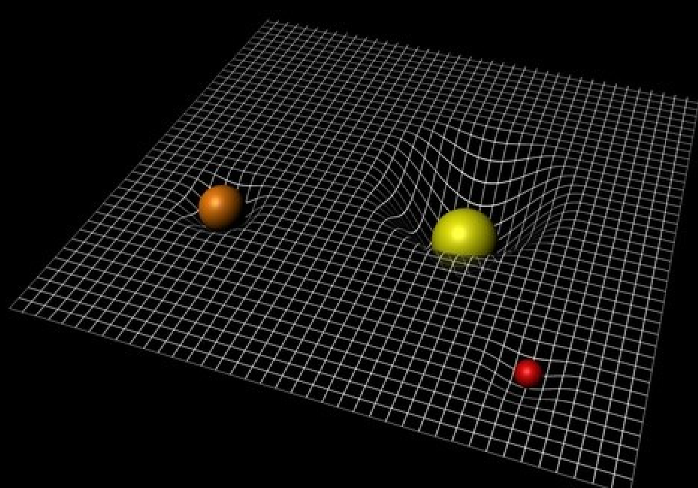
$F = Gm_1m_2/d^2$ is Newton's law of universal gravitation which is *valid regardless of scale and mass*.

We’re not going to combine them; we’re going to explain them:
Newton’s 2nd law is about – you want a *desired acceleration* for a particular mass, you must *apply a certain force* in order to achieve that acceleration.
Newton’s law of gravitation – you want to know the gravitational force between any two masses? First give me the values of the masses and also – the separation between them (center of masses), then I can tell you the gravitational force between them.

So in practical terms, acceleration is a function of force applied – and – gravitational force between masses is a function of distance.

But recall that position, velocity, and acceleration are all tied together by time. So even though Newton formulated gravitational force in terms of distance, that equates to position which is a *function of time*.

Now change-gears in your mind and start to think about viscosity and dilatants, shear-thickening fluids. The faster you try to stir them, the more stirring sticks you’ll break. Visualize flat-time in three dimensions as empty space with no masses present BUT with a kind of dilatant viscosity that increases as you approach c, the speed of light in vacuum. Between and surrounding masses, dilated temporal ‘fabric’ that is easier visualized as such:



So visualize time as a dilated temporal fabric between and around masses – and – as a dilatant fluid that has increasing viscosity as masses approach c.

Of course, this is for understanding and clarity rather than accuracy in concepts. For the longest time, I have used the notion of elasticity associated with time in order to accurately deal with combining General and Special Relativity, but have had difficulty relating the elegance and simplicity inherent in the concept. So there are times when we need to draw upon other relevant analogies.

Let's return to F=ma, but in a relativistic framework. Let's say we want to accelerate from 0 m/s to .5c m/s. Initially, our 'relativistic mass' is our rest-mass and constant force implies constant acceleration .. *initially*. But, as we approach .5c, we have to apply more and more thrust to compensate for our relativistic mass. So we could legitimately call this 'relativistic force'. But recall we're visualizing time as a dilatant fluid at these velocities. So the correct analogy is pumping relativistic energy into the temporal fluid we call time.

One more analogy and we'll finish: visualize a rocket pushing a piston down a tube filled with an ideal gas. The piston all the way forward represents c. Obviously, no amount of thrust will *ever* push the piston *all* the way forward. The heat generated during compression would be analogous to relativistic energy. The more and faster you compress, the more heat you generate – that opposes compression. So it's not just the ideal gas opposing compression/thrust, it's relativistic energy in temporal warp.

The same thing that puts a cap on speed – is the same thing that causes a pull between masses. As we understand the basics of mechanics, an acceleration gradient is equivalent to a temporal gradient; we don't need the Higgs to explain mass *nor* the forces between them. We just need temporal elasticity.