Faster-Than-Light: the fundamentals of theoretical physics need to change

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Why is this important, in a nutshell

Interstellar travel is the uture of human kind, assuming it ever happens. It could. But with the accepted view of Relativity, it may never do so. Consider that modern version of Relativity has been around for over a 100 years. In that time, it has been implied that it will unlock the potential of human race to spread across the Galaxy and moderate the grave dangers we face here on Earth. How many exciting movies have been made on the subject? How many big names in physics have supported Einstein's Relativity as a way to move forward? Yet, we have gone nowhere with the concepts of warp drive, wormholes and such. And it seems we are as far away from crossing the space to other stars as we ever were. Perhaps it really cannot be done. Or, perhaps it is time to cast a shadow of a doubt on the core of the issue: Relativity itself and the disappointing effect it had over the past century.

Let's begin with some background on the new way of thinking. Relativity is a local theory: it holds well near large celestial bodies, like Earth or the Sun. We happen to live and perform experiments in those astronomically-speaking tiny places. Away from large bodies, the physics is different, but we cannot see it from here. We are stuck with Relativity just like our ancestors were stuck with the idea of everything revolving around Earth for 1400 years. Because of this, we believe we cannot achieve practical interstellar travel. This is because we have concluded that the speed of light is the maximum velocity – and it is here on Earth, but it is not in deep space. We could have been building large ships and reaching other star systems in the past 100 years, but we spent them believing Relativity to be the ultimate truth. If we continue with that belief for another 100 years, there may be no one to talk about the "Relativity Mistake" because we are increasingly at odds with an encroaching extinction event, be it a nuclear war, climate change, bio weapons, hostile artificial intelligence, asteroid strikes or super-volcanoes.

What is this theory about?

This theory is about the alternative to General Relativity, called Information Physics. It reduces to contemporary physics, including General Relativity, but it does not use the idea of Relativity at all - not even Galilean Relativity.

What is Information Physics?

Without information, any decision is a random one. The premise of Information Physics is that *reality functions the same way: physical laws aren't random because particles use information*. How's that for simple?

Where is Information Physics in relation to contemporary physics?

Classical, relativistic and quantum physics emerge. We derive the results of General and Special Relativity, the necessity for light and mass to exist. Note that we do not need any concepts of mass, light, gravity and relativity to begin with. All we need is a premise that physical matter is informational. From that, we do the math.

What are the results of Information Physics?

Aside from explaining all known experiments (such as Michelson-Morley, de Sitter etc.), Information Physics predicts that practical interstellar travel can be achieved right now, without needing wormholes or exotic matter.

Why should I be excited about this?

#1: Faster-Than-Light technology can be developed from this.

#2: New space propulsion and space shielding technologies can be developed from this.

#3: For #1 and #2 you don't have to wait for a thousand years.

...

#99: Relativity is complicated and hard to follow. Reality is complex, but need not be complicated!

#100: Relativity is unnecessary.

Does the idea come from the computer age we live in?

Not at all. The basic premise could have been explored hundreds of years ago. The idea that the number of all possible combinations from two data sets with A and B members is A*B has been used in mathematics and physics for ages.

Other than such trivial notions, nothing related to the Information Theory (also known as Shannon's theory) is used. It is also unrelated to the well-known "it from bit" proposal. It could have been brought forth way before Einstein's Relativity.

So why wasn't it? Who knows? Why did people believe Earth was the center of the Universe for 1400 years? Maybe because experimental data suggested it, and maybe because they didn't want to go beyond what the guy with the loudest voice said, in this case Ptolemy. When it comes to experiments like Michelson-Morley, the voice of Einstein is quite loud today, but just like in Ptolemy's case, maybe we should go beyond the first try.

How exactly to achieve FTL (Faster Than Light)?

Don't bother with tiny particles. Think more of a massive vessel (millions of tons).

Go far from the Sun and the planets.

Use electromagnetic fields applied to heavy liquid metals (mercury?) to get artificial gravity, propulsion and shielding in deep space. Specifically, the effects are tied to heavy mass in high-speed motion. So for example, rotation and counter-rotation of heavy mass (to avoid the machinery being torn-apart) may be one technical implementation. Usage of strong electromagnetic fields applied to atoms and molecules of heavy liquid or gaseous materials can be another.

Physics says it can't be done

Physics is a work in progress. Physics we have is developed mostly on Earth and we are really not experienced at all when it comes to the Universe at large. Time to think bigger and on a larger scale.

The theory says we need to go to deep space to find new physics. If we want first a local proof (here on Earth) before we commit to deep space, we will be stuck in a Catch 22 forever, because the proof can be obtained only in deep space.

The dogma of the day during the medieval explorations on Earth was that if you sail your ship far enough, it will fall off the edge of the ocean. Someone had to take a chance and just do it.

Today, the dogma is that nothing, under no circumstances, can travel faster than light. We show that to be patently false, and again, someone will have to take a chance and just do it.

While most people will say that Einstein's theory stands in the way, keep in mind what we are saying here: Einstein's Relativity is ultimately wrong in the general case, and Information Physics is an alternative to it that explains everything that Einstein's Relativity does, but is also more general and allows practical interstellar travel.

Also, keep in mind, that for the method of interstellar travel we specify here, Einstein's Relativity has never been tested. For the purpose of what we are talking about, it is just a theory, nothing more.

Why is Relativity troublesome?

Relativity deeply personifies Nature. It centers around the observer, not the physical matter itself. Much of modern physics has taken a cue from Relativity. This may have been a knee-jerk reaction to puzzling experiments from the late 1800' and the early 1900's. There is a better way to explain them.

It should go without saying that objectifying Nature is better than personifying it, but here we are in the rut, anyway. Nearly 100 years after the wrong turn, we're still going full speed ahead in the wrong direction.

Informational approach is better than Relativity: Why?

It is objective. It is easy. It doesn't read like a mind bending detour from common sense. It produces the math that matches experiments. It has predictions that already match some "puzzling" observations that mainstream physics conveniently ignores. Enough said.

Okay, you are ready for more, and here is a formal:

Welcome to Information Physics!

Learn more about why we think that effects such as time dilation are not best served with the theory of Relativity, and why examining the information content of physical matter is a simpler and more general approach. The result is a possibility of traveling to nearby stars in a much shorter period of time, with the level of technology conceptually similar to what we have today.

From a practical standpoint, one consequence of the theory is that practical interstellar travel is possible without wormholes, exotic matter or enormous energies.

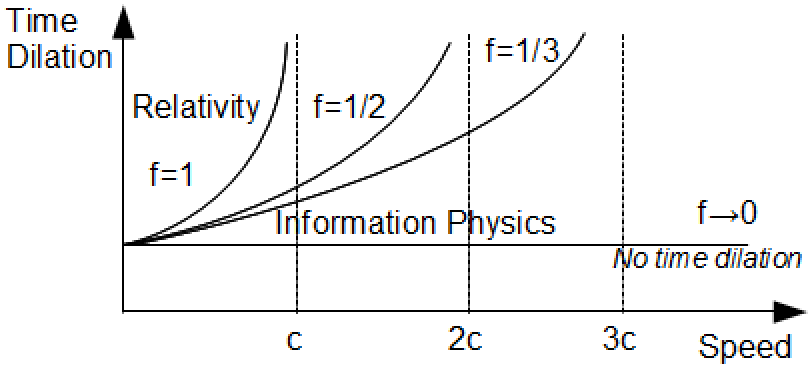
Information physics starts from scratch, before the very first principles of physics. This is why elaborate knowledge of contemporary physics is not needed. The idea is simple and intuitive. What is the idea? It is that all physical effects are the result of information use. Or, if you will, physical matter works by using information, much like anything else we know. From this idea alone we can derive General Relativity, the constancy of the speed of light, concepts of mass and force, the basis of Quantum physics, i.e. pretty much the very foundations of modern physics.

Intrigued? Read on.

The fundamental problem in physics today is the disconnect between General Relativity and Quantum Physics. Physical reality is obviously a single phenomenon, but we have two theories that do not talk to each other. Equally obviously, those theories must be wrong on a deeper level, even if individually they have success in covering their own pieces of the greater puzzle. This is not an attempt to tweak Relativity to work with Quantum Physics, or the other way around. That simply will not work. The two are too far apart.

The key is information contained in physical matter, and as we will see, this information must be non-local. This apparently points to the Quantum piece of reality, but surprisingly, it delivers the alternative to General Relativity. The theory here focuses on explaining the relativistic phenomena by using such informational approach, while covering both pieces of the puzzle.

The diagram below summarizes this in an approximation involving two isolated objects: a massive point of departure (such as Earth) and a departing object of significant mass (such as a ship).



Information Influence: $f = \frac{1}{1 + m/M \times R^2}$

m: ship's mass
M: Earth mass
R: distance to Earth

Time Dilation: $t/t_0 = 1/\sqrt{1 - (v^2 \times f^2)/c^2}$

This web site, and the papers on it, show, among other things, why we think the above diagram trumps Einstein's Relativity for the scenario presented. In a nutshell, just as Relativity generalized Newtonian physics, so is Information Physics purported to go beyond Relativity.

More specifically, just as Relativity is evidently different from Newtonian physics at high speeds, so is Information Physics different from Relativity away from large mass, such as Earth.

What diagram above says is that FTL (faster-than-light) motion is impossible near large mass such as Earth. However, far from large mass, FTL is possible.

Consider this: the Faster-Than-Light trip far from massive bodies has never been tried, and no one on this planet can say the diagram above is wrong. Contemporary science assumes that Relativity will work anywhere, even though we only a had a chance to thoroughly and directly test it only nearby large bodies in our Solar system. That is a spectacular assumption, one based on the unquestioning faith in Einstein's Relativity.

Relativity may not hold in deep space the same way as it does here on Earth, as contemporary scientists assume. Insisting on assumptions of such enormous magnitude based on indirect evidence have often been proven wrong.

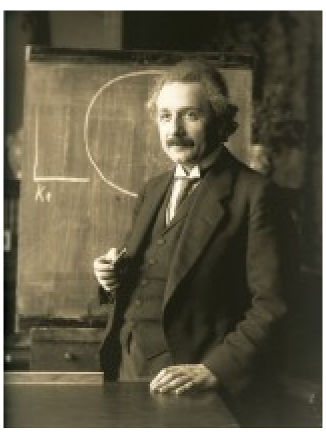
A steady stream of confirmations of Einstein's Relativity is solidly built around the circumstances under which it always holds. At the same time, evidence that it does not hold is essentially ignored. And those situations under which it may not hold, such as what we described above, are not even remotely of interest to experimental physicists today, probably because Relativity does not predict anything interesting, as we do. The way physics stands today, only something unexpected or accidental may serve to test and confirm the predictions of the theory presented here.

To the point, the prediction of the theory with regards to Faster-Than-Light travel is this: the speed of light, which is approximately 300,000 km/s, is not the maximum speed in Nature. However, it is the most commonly found speed limit, and it is always so near large mass such as Earth or the Sun, which is where we obtained most of our knowledge.

The theory shows that maximum speed is local. It depends on the mass of an object, and contrary to what seems obvious, the maximum speed increases with the mass of an object. The speed of photons near large mass such as Earth, which is about 300,000 km/s, is the lowest possible maximum speed, and this is where the theory reduces to Relativity. This circumstance is also the reason no direct experiment can show the difference. A large object, for example a few million tons, can accelerate past the 300,000 km/s relative to Earth in deep space, according to the theory. The pillars of Relativity, such as Michelson-Morley and de Sitter experiments, are easily explained by the theory, covering the existing body of relativistic experimental evidence.

Relativity is shown to be a very *local* theory, astronomically speaking. It should hold nearby large mass, such as Earth or the Sun. By far the most conclusive experiments have been done in that setup, which leaves a large experimental coverage gap when it comes to testing Relativity on the scales beyond Solar system. Some anomalies have been noted, such as superluminal galaxies, for which the theoretical construct proposed is a metric expansion of space. This notion may be unnecessary, just as much as it may be superfluous. Relativity may need to be superseded for larger scales, much like Relativity superseded Newtonian physics for high speeds.

Back in 1905, Albert Einstein unveiled his famous Special Relativity. But, is it necessary?



Relativistic effects do not need Relativity in order to receive full theoretical coverage. At the same time, Quantum effects now can be viewed in a different light. The premise of physical matter possessing information content, yields relativistic effects, and is turning waves of probability into the real waves of physical matter.

$$t_1 = \frac{t_2}{\sqrt{1 - v^2 / c^2}}$$

This is so-called "Gamma" factor, as derived in Special Relativity. We show it to be a corner-case of a general equation, just as we do with the equations of General Relativity. It can be derived without Relativity and the notion of light.

Why focus on information?

All the physical laws we know of, tell us that quantifiable values are the sole driver of those laws. Without intrinsically having certain properties, no physical system would evolve into anything else but pure chaos. These properties, or values, in the final abstraction are nothing but information.

Regardless of how this information is used in natural processes, there is one fact that is indisputable: it is used. Information is used on a most fundamental level in Nature to convey matter from chaos to a degree of order. We know of no other way in which a natural conveyance of physical systems unfolds. There is no magic wand that makes them run. This is so, even if we would think of natural systems being mathematics with physical consequences.

In the end, though, the mathematics and the labels we use to describe physical matter and their interactions, are nothing but an acknowledgement that physical world is one in which everything unwinds by means of information use.

Consider a possibility that the Universe is indeed informational, and with it, a possibility that interstellar travel may be a reality starting with the tools we have today.

Information

Information describes something. It is not a physical building block of anything. Information is what we feed to a reason in order to make one choice over the other. In other words, there is always a certain logic, i.e. a "reason", and certain facts, i.e. "information", that work together.

Physics in general tends to explain phenomena by a generic notion of "natural laws". For example, after an experiment we try to find a solid idea as to why the experiment turned out like that. Then, we mold the numbers and the idea into a mathematical expression. Then we call this a physical law, if most people agree with it. It sounds reasonable.

However, the main flaw in this process is easy to miss. This flaw is simple: we assume that physical matter does what it does just because it does. We rarely ask a question, why an experiment produces anything but random measurements? In other words, why is there something other than chaos? The stand of contemporary physics is that the phenomena we encounter is "natural", and thus we describe it with natural laws. Which is another way of saying that Nature is not a complete chaos because that is natural. This is the basis of physics as we have it today. In that regard, we do not have greater knowledge about the issue than medieval sorcerers did. When we say that an electron is attracted by a proton and have math to show for it, we are not saying why would an electron do that. For that matter, why would anything do anything other than chaos? This is where the buck stops with contemporary physics.

Apparently, physical matter is not made of information. On a purely conceptual level, such a statement is meaningless. However, physical matter houses information and uses it to do something other than chaos. This is the point we are making.

The point is, thus, very simple: contemporary physics says, even if does not really say anything but implies it, that reduction in chaos in Nature, which we call natural laws, exist because they are natural. On the other hand, we are saying that this reduction in chaos happens because physical matter acts upon information that is available to it. The two statements are fundamentally different, and we show how to draw mathematics and testable predictions from this difference.

What is, then, physical matter made of? Who knows. But whatever it is, it has information in it, and it uses information. There is another way to come to the same conclusion. If you think about it, we can all agree that particles have some information. Otherwise, we would not be able to measure anything about them. But if particles have information, why do they have it? Would physical matter have information and not use it? Would information be there so we can measure it? What if we are not here? Preposterous line of thinking that leads to anthropomorphic bliss of self-delusional proportions, is what that kind of pondering is. Inevitably, physical matter has information for the purpose of using it.

So, if physical matter contains information, it uses it to prefer one outcome over another. On its face this may sound very reasonable, even if it is practically unheard of in contemporary physics. It is the starting point of Information Physics.

Visualizing information content of physical matter

Imagine two particles, with nothing else existing. Suppose they are at some distance. Here is the question: would anything change if this simple system were to inflate, say to double its size? Meaning, the distance would double, and the particles themselves would double. No, nothing would change, physically it would remain the same system. The particles would have no idea that everything, including themselves, just doubled. We can say that physical space has no preference for scale. There is no "preferred measuring stick", according to which, everything gets a fixed size.

Now instead of the two particles, imagine there are two spheres with some information scattered on them. For example, each sphere has 1,000 facts randomly scattered on it. If we perform a mental exercise as above, or the "thought experiment" as it is customary to call such things, we would find that each sphere can be made to occupy any space whatsoever, if we just imagine that the two-sphere system has inflated enough. Since neither sphere would know how big it is, it could be arbitrarily big or arbitrarily small, as long as our rules of inflating everything at the same time hold. It means that information residing on each sphere really can reside on any sphere around it. Since there is no way to tell which sphere is the "right" one, this information resides on virtually any such sphere. This way, no matter what is the scale of the system, i.e. how much it is "inflated" or "deflated", the information of each sphere is where it is supposed to be.

By reasoning in this informal manner, we can come to the conclusion that the information of a particle is replicated on virtually every sphere around it. This information is associated with a particle and moves with it. In other words, it does not move at all relative to a particle, because it is intrinsically tied to a particle, even though it is not the same as a particle. You could say that every part of a particle moves the same way as the rest of it, only in this case we are talking about its informational contents.

A particle is the container of information, however, since this information exists beyond a particle, on virtually any sphere around it, this information is non-local. Why we think that particle's information can exists everywhere, but a particle itself is limited to a volume it occupies? The reason is simple and has to do with prohibiting infinite values for information resources, and this is discussed a bit more in the paper. In fact, this whole thought experiment is here to give you a visual of what the basic premise of the theory is. Which is, that physical matter is a container of information, that such information is non-local, and that as such, it can be used by other physical matter. Once information of a particle exists in space far from it, other particles that happen to be there, can now use this information since it exists where they are. This means, each physical particle uses information exactly at its location. It doesn't need to reach out, or exchange anything. Exchange of particles is fine, but ultimately, even those "courier particles" such as photons, possess and use the same non-local information footprint as we described here.

The important take-away is that information of a particle is accessible to other particles, since just like other particles, it exists somewhere else. Information of a particle A exists at the location of particle B, and vice versa. Each particle does not need anything else but the information that exists at its location, with this information coming from all other particles in existence. This means that a particle always operates locally, at its own location. We say that all physical laws then, are local, and it turns out, we do not need external observers any more to formulate the laws of Nature.

So, the information of physical matter is non-local, and the use of this information is local for each particle that uses it. If you will, this is upside-down from the way contemporary physics looks at things. It thinks of information being local, traveling from place to place, and as such it is non-local to particles that use it. In this scheme of contemporary physics, Relativity and Quantum physics are not talking, and never will. In our scheme, the "upside-down" one, both emerge naturally, without forcing the explanation with out-of-place postulates, clearly designed simply to ratify unexpected experimental fact as fundamental laws.

And now, for a bit more formal view of the same discussion, keep reading below. The point is the same - it is about physical space not having informational preference for scale.

Non-local nature of information in physical matter

A physical particle contains some information. We can imagine a number of facts, comprising this information, spread randomly on some sphere around a particle. However, what particular sphere around a particle are we talking about? Can we single out one such sphere where this information resides? We cannot, because if we could, it would mean that physical space would have preference for a particular scale. This scale, or a unit of physical space that is somehow preferred, would be determined by the radius of this sphere. In other words, physical space would have a dimensional unit in which fundamental information content exists, even if particle itself exists in a given fixed volume of space. We have no reason to accept such a preference for information content. This distinction between a particle and its information content is important, and the conclusion we reached is crucial.

This means that virtually any surface around a particle has the same information, because no sphere is preferred. The information a physical particle has, cannot be limited to a given volume of space. It exists on virtually every sphere around a particle, with its density declining away from a particle, the way surface of a sphere does in N-dimensional physical space. There is no need to assume 3 dimensional space, the necessity for it can be deduced. This information is exactly the same at any moment, be it at a particle itself, or many light years away. It is like an information cloud around a particle, its density declining with distance. Every particle in existence can use this information to interact. Change in a fact associated with a particle anywhere changes this fact everywhere else, instantly.

Additionally, we assume there is no preference for direction in physical space. This means that any fact has equal chance to be found anywhere on a given sphere around a particle. In physical terms, this is akin to saying that electric field around an electron will be most likely not only to the left of it, or only to the right of it, but more or less everywhere around it.

This is the basic model of the theory of Information Physics. From this, mathematically, we can derive General Relativity, including time dilation formulas, the concept of mass, as well as the necessity for a speed limit, which in many cases is equal to the speed of light. Other than the assumption that physical matter contains information and physical space has no preference for scale or direction, nothing else is needed - we do not need Relativity, or postulating the constancy of the speed of light, or the Equivalence Principle. We can derive all those mathematically, as corner cases, starting only from the initial assumptions we mentioned, which are, compared to the non-intuitive premises of Relativity and Quantum Physics, fairly straightforward.

The very nature of informational premise lends itself to Quantum Physics, including the uncertainty, wave nature of light and matter, and entanglement. Those need not be taken as fundamental.

The aforementioned outlines, in very brief notes, why Quantum and Relativistic are one and single phenomenon.

Is there proof that Faster Than Light motion is possible?

Current theories, most notably Einstein's Relativity, predict that motion faster than the speed of light is impossible. This has been verified in great many experiments conducted near Earth or the Sun, but never far from astronomically significant bodies.

Is there proof that faster than light motion is possible?

Superluminal motion of galaxies is still an open question. There is some "embarrassing" evidence that things in the sky do indeed move faster than light (see Some contrary evidence on Wikipedia).

For further considration, please visit this Science Channel video. In it, Bob Williams, former director of Hubble Space Telescope, as well as other physicists, describe thousands of galaxies (or other objects) moving faster than light, as observed by Hubble.

Related to this is the accepted notion of metric expansion of space, where the space itself can stretch. Without going into whether such a model serves a purpose or not, it is a complex and unnecessary construct. We can observe the motion of far away objects, but we cannot observe the expansion of space. It is an assumption that is more of a mathematical construct then a satisfying physical explanation. It is, however, an accepted point of view in today's physics. We show that such a reach into abstract modeling is not needed.

Another issue to consider is the lack of time dilation in quasars. While hard to explain with current theories, we predict that time dilation is a local effect that is dependent on the size of an object, and on relevant masses. The aforementioned lack of observed time dilation is in accordance with the theory presented here.

True or False? A straightforward way to find out

Here is an experiment to confirm the theory: send a massive probe into deep space, on a trajectory as far from celestial bodies as possible. Measure time dilation of an onboard clock upon the return of the probe. It will be lesser than predicted by Einstein's Relativity. Alternatively, probe can be made to accelerate towards a close-by star, and if its propulsion system allows, it will eventually move faster than 300,000 km/s and will reach the star in a shorter period of time.

Most people do not realize the maxim of "nothing can travel faster than light" has not been proven in deep space with any sizeable object. It is assumed to be true, based on the theory from Albert Einstein circa 1905. Virtually all the proof for Einstein's theory comes from experiments with very small particles and performed nearby large celestial bodies.

The way to find out for certain is rather straightforward. If confirmed, there is a useful application for it: practical interstellar travel.

Q&A: physics without Relativity

- Is this an attempt to find problems in Relativity?

No. The theory presented here has nothing to do with Einstein's Relativity.

- What are the differences between Einstein's Relativity and this theory?

A better question would be 'what are the similarities', and the answer is: none. The two theories share next to nothing, except of course, the final mathematical equations that seem very similar to each other. This theory reduces to Einstein's as a special case. It is a fully fledged alternative to Relativity.

- What is the "main question" posed in this theory?

The main idea is that physical matter has information in it. This is very different from the so-called 'observable' information. For example, we can gather data about how a particular electron moves - this is information to us. But, what is information to an electron?

- How does the theory work?

We examine the throughput of information use in physical matter. This is taken as a goal for a reason, because the throughput is something that doesn't depend on knowing exactly how matter works inside. It is a generic quality we can examine regardless of the exact nuts and bolts operating within physical matter.

- What are the results?

We deduce virtually the same results Einstein did in his Special and General theories of Relativity.

- Why "virtually" the same results as Einstein's?

Because the results are the same for all the experiments we performed to date. However, we predict differences in some other situations, and in those situations

Einstein's results should not hold, while the results of this theory should.

- What are the differences and how come no one has seen them yet?

The differences appear when we move away from massive bodies like Earth. We have not yet progressed that much as a species, so we have never had a first hand experience with being far away from large celestial objects.

- What is the simplest way to find the confirmation?

Send a probe that accelerates away from Earth to substantial speeds, and have it return back to Earth. The reading of the clock onboard should be higher than according to Einstein's Relativity. The probe has to take a path as far away as possible from Earth and other celestial objects.

- All things being equal, why would this theory be true, and Einstein's not?

This theory requires less to begin with. It does not require even Galilean Relativity, let alone Einstein's. If you believe that the simpler explanation is more likely to be true, then this theory is more likely to be true as well.

- What about Quantum Mechanics?

This theory is inherently the theory of information, and as such, its basic premise is in accordance with the elementary notions of Quantum Mechanics, such as quantization. Being less restrictive than Relativity, it neither requires nor denies the presence of the medium in which light (and matter) waves propagate. As such, it allows the waves of Quantum Mechanics to be real. In short, this theory presents a viable path to the unification of Relativity and Quantum Mechanics. That's not done in this paper - after all, it is just one paper.

- What about the Standard Model and Higgs?

Nothing much, really. This theory does not require any specific model of particles. It does talk about the origin of mass, and it concludes that the the finite and declining throughput of information usage is responsible for it. Whether it is Higgs, or something else, is irrelevant from the perspective of a theory that concerns itself with the flow of information alone, and not with how exactly is this information organized. That's actually a good thing.

- If this theory is true, what are the implications in physics?

It goes like this: we have been living in a fish bowl, and examining the laws of Nature from a fish bowl. If we grow bold and leave the fish bowl, we will find that physical laws are different than what we think they are, and that we were wrong about some things. The view that Earth was the center of the Universe held for 1400 years, and it wasn't because our ancestors were silly. Rather, they didn't have access to a broader view of the Universe, and they were unwitting victims to some rather remarkable coincidences in the night sky. Similarly, all the observations via telescopes that we do today won't mean much without direct observations in deep space.

- .. and what are the general implications?

Faster Than Light speeds in deep space are achievable without any special propulsion method. The current narrative in physics is that this is not possible, even if the direct evidence has never been furnished. Simply put, an average intelligent species residing anywhere in the Universe, is not barred from exploring the Universe at faster-than-light speeds, and in principle, no special propulsion methods are needed.

The Idea of physics without Relativity

We consider physical matter to be an information container, regardless of its underlying physical nature.

We explicitly remove Relativity (Galilean and Einstein's alike) from any role in formulating the laws of Nature.

The removal of Relativity from playing the central (and indeed any role) in physics presents the possibility of a major simplification of contemporary physics. Considering the physical matter to be an information container is the next step in unifying quantum and relativistic effects under the same theoretical construct. The information of a physical particle is non-local in nature, accounting for both relativistic and quantum foundations.

Ultimately, physics is the study of physical matter accelerating, i.e. changing its state of motion. So the appropriate question to start with would be:

What causes physical matter to change its state of motion?

We can reasonably say that it involves internal properties of physical matter, with such properties ultimately being information, and so the involvement of internal properties of matter is equivalent to the use of this information. We will focus on this kind of information and its usage, regardless of what physical substantiation takes hold in order for it to exist, and we will focus on the simplest possible way in which this information operates within physical matter.

This is in contrast to the concept of observable information, wherein the observer catalogs the behavior of physical matter, which ultimately amounts to contemplating its state of motion over periods of time, and does not amount to examining the information within physical matter that actuates this change of motion.

We consider only a small, local frame of reference, in which information is used within physical matter, to be the principal place of equality of physical laws. Physical laws are the same only in such local frames of reference. External observers are, in principle, banned from participating in the foundational setup of Natural laws, even if by definition, external observers are the sole basis for verifying such a setup. We call this locality, as it removes the notion of Relativity from the foundational role in physics.

What problems does the theory address?

There are several issues the theory addresses. Some of them are practical, i.e. experimental in nature, and some are theoretical. We will start with experimental problems.

Firstly, the theory addresses the issue of faster than light motion. Contemporary physics considers that a non-problem, because Relativity prohibits it in any practical sense. You will not find anywhere the problem of faster-than-light motion to be of any importance, even though persistent evidence exists to attest otherwise, and contrary to the established theory of Relativity. The question of practical FTL, and the supporting theoretical construct, is very important for obvious reasons.

Secondly, an important problem addressed by the theory is establishing the viable path to unification of relativistic and quantum phenomena. Note that relativistic effects, such as time dilation and mass increase, do not imply Relativity in any way. Relativity, as a theory, is one of potentially many ways to explain said phenomena. Historically, Relativity was the first theory to be accepted as their explanation, hence the name "relativistic" attached to them. The important result of the theory is that the medium for matter and light waves can be physical, i.e. can be made of physical matter. This is in contrast with Einstein's Relativity, where the existence of a physical medium was ruled out based on the premise of the constancy of the speed of light. We can explain the same experimental results, including Michelson-Morley, de Sitter, and the experiments involving time dilation and mass increase, without Einstein's premises about Relativity, the constancy of light speed, and gravity. The medium can consist of physical matter that is, as of now, unidentified. What we can tell however, is that this physical matter can serve either as a carrying or pilot medium for the waves of Quantum Mechanics. The maximum propagation speed of the physical matter comprising such a medium, just like any other physical matter, varies, and the end result (un)fortunately coincides with Einstein's assumptions in some important cases, leading to a conclusion of their correctness.

Another important problem is that of complexity. Relativity introduces unnecessary postulates. Regardless of personal or professional opinions about the physical worthiness of those postulates, it is not in dispute that less assumptions is better. Each additional assumption represents a potential critical point of failure. Even if such assumptions are not shown incorrect as of now, the chances of being right are better if such potential points of failure are not introduced to begin with. Removing Relativity means that we eliminate the quasi-scientific approach of external observers in formulating the laws of Nature.

The simplification is best seen in the very fabric of reality: space and time. Space-time as a unified concept does not exist in the theory, but rather stay on the level at which we can experimentally and conceptually process it in the simplest form: as separate entities. We show that space has to be 3-dimensional.

Introduction of an informational approach to the areas of fundamental physics, such as Relativity, represents a potential for a significant shift from phenomenon-based foundations to those based on axiomatic underpinnings. For example, postulates such as those of Relativity (Galilean or Einstein's alike), or the Principle of Equivalence, are based on life experiences and physical experiments. Informational approach is based on a truism that any physical action must come from applied information content, in whatever shape or form - which is a slightly more focused way of saying that for everything, there is a reason, and behind any reason there is an implied usage of information.

Information-based physics is simpler, for another important reason: the flow of information within physical matter can be mathematically examined without the need to know the precise structure of matter. The results hold whether particles take one shape or the other.

From the premise that physical matter possesses information we can derive Newton's 3 laws and the law of gravitation, as well as deduce the generic answers as to why most forces decline with square of distance, but some do not.

And finally, the derivation of equations that reduce to Special and General Relativity is news, if the method of doing so explicitly disavows Relativity and the knowledge of gravity and light. Imagine you live in a box without light, gravity and the ability to measure time, let alone measure the slowing down of a clock due to motion or gravity. Could you deduce all of them, while living in such a box, starting from elementary logic? Yes, you can, and that is ultimately, what this theory is about.

Understanding the theory from analogies

Using analogies to explain fundamental physical concepts is unreliable at best and tautological at worst. But it is also popular because it gives a quick a-ha moment to anyone who is pressed for time. While analogies have value, keep in mind never to get carried away with them.

With that in mind, here are some analogies to provide an incentive for considering the theory in more detail.

Kinematic time dilation

Imagine a computer that processes some data. For example, an on-board computer drives a car, and the data processed is collected via sensors and cameras. At 40 mph, the ride is smooth, and the car is responsive. But at 60 mph, there is more data collected by the sensors. The on-board computer now has more information to process. As a result, the computer will respond slower, and the car will respond slower too. Its reaction time will decrease, as if seemingly, time itself has slowed down for it.

If we think of a car as a fundamental particle, and of an on-board computer as its inherent way to change motion in the physical world, then like a car, we may think that a particle in motion will appear as if time slows down for it.

Gravitational time dilation

In an analogy with a car, think of driving in the desert, where very little is going on. Sensors do not have to process a lot of information. But when approaching a big city, there is lots of new information to processes, and the on-board computer will respond slower. Again, its reaction time will decrease as if time itself slows down for it.

If, again, we think of a car as a fundamental particle, it follows that nearby large mass, a particle will appear as if time slows down for it.

Inertial mass as information content

In our car analogy, the ability of the car to stop depends on how fast an on-board computer can execute the change in motion. Similarly, for a fundamental particle, the throughput of information use determines its inertial mass.

Maximum attainable speed

From the aforementioned, we conclude that the maximum possible speed of a car depends on how responsive its on-board computer is. If it's too busy, it won't be able to accelerate any more. And when it doesn't have much to process, it can keep accelerating, and attain a higher maximum speed.

From this we can figure out that a fundamental particle (an analogon of the car) will have lower maximum speed when it's near a large information source, which we deduced, is a large mass, because there will be more information to process. The speed limit varies, much like it varies for a car.

Further from a large mass, its maximum attainable speed will be higher, because there will be less information to process. This translates into the variable maximum speed limit, with the speed of light just one of such speed limits - much like there is no single speed limit on roads either.

Going back to the tentative original assertion that analogies may help understand a subject, it also goes without saying that once you take in an analogy, you should not take it too far, because at some point (and very soon at that), what a theory rests on and what a theory concludes diverges from an analogy in a major way.

Is Einstein's Relativity not proven right?

Yes, but only under specific circumstances.

The kind of experiments performed to date, which are situated on or near celestial bodies like Earth, may not reveal any issues with Einstein's Relativity. Given that this theory produces the same equations for that kind of experiments, any proof rendered for Einstein's Relativity is also proof rendered for this theory as well.

This theory is a call to conduct a principally new class of experiments, such as measuring the slowing down of clocks aboard an object with significant mass and away from large celestial bodies. Such an experiment has never been performed. It was never done because Relativity predicts it will be a non-event, but it can disprove Relativity, if performed.

Until then, neither theory is proven right nor wrong, because for all experiments performed to date, and likely for great many of new (yet still principally the very same) experiments, Einstein's Relativity and this theory produce exactly the same results.

Exercising the new class of experiments, where the differences could be found, is important. With Einstein's Relativity, achieving faster than light speeds when departing Earth is impossible. With the theory presented here, motion faster than light in deep space is possible, without the need for new propulsion systems. In short, we could start the journey to another star today, and reach it faster than a photon would.

Until a different kind of experiment is performed, one involving large objects in deep space, we will not know the truth. Another 1,000 experiments performed on, or near large celestial bodies like Earth, may not make a difference. But another 1,000 such experiments will probably take place anyway.

Speed of light

We show that the speed of light on Earth, which is 300,000 km/s, is not the limit in general and especially in interstellar space, as it is in Relativity. We conclude in the paper that what we measure today as "the speed of light" is simply the maximum possible relative speed of a very small particle nearby large isolated mass, such as Earth. However, in general, the speed limit depends on the distribution of mass and the mass of an object itself. The light in interstellar space can move faster or slower than 300,000 km/s relative to us, and so can other objects.

We find that the larger the mass, the higher its maximum speed. For any practical purposes, the mass has to be macroscopically large, i.e. likely would need to measure in millions of tons, or more, for maximum speed of such an object to be beyond 300,000 km/s. However, accelerating such mass can be done by any means, including conventional, and a new kind of propulsion system is not necessary.

Special and General relativistic results are found to be the corner-case of more general equations. These equations are based on the premise that physical matter has finite information content. We explicitly disavow any use of external frames of reference in formulating the laws of Nature, the result of which is that the issue of simultaneity of events now has no use, as it does in Relativity. In other words, the theory presented removes the notion of Relativity, and as such, has no common points with Relativity. Thus any "crossover" of statements from one theory to the other is meaningless.

In conclusion, we can say that the theory herein shows that motion faster than 300,000 km/s is possible in general, under circumstances that, unfortunately, we have not had a chance to examine experimentally thus far, due to the very specific, and uncommon, type of location in which we reside - namely Earth.

Warp drive and the implications for the future

Alcubierre drive is often presented as a possibility of faster than light travel, and is based on one of the solutions of Einstein's equations. However, many problems remain with this concept, and at best, the requirements of exotic matter and even the viability of the solution of physical equations are unclear.

In our approach, the possibility is a simple consequence of the theory proposed here. If it is correct, a large mass, such as a space vessel in the range of a few million tons or more, away from celestial bodies, can accelerate past the 300,000 km/s. No special requirements, such as exotic matter or negative energy, are needed. This is where our theory diverges from Relativity, in which this is impossible. Given its practical potential, it is also conceptually the best class of experiment to confirm the informational approach. It is also worth noting that speeds greater than 300,000 km/s are possible on a very small scale as well under some cirumstances, due to information field being a scalar discrete physical field (see the paper for more details). This presents additional obfuscation for researchers who may believe to have produced a "warp field" of sorts, if such results are ever confirmed.

Because Einstein's theory and our theory explain the same phenomena, both cannot be right, because in such a case, the observations of time dilation and mass increase would be doubled, and that is not observed.

Thus, we consider warp drive impossible, however as mentioned above, faster than light travel in a much simpler form, would be possible. The theory presented here also predicts that ultra fast rotation of microscopic matter, such as induced with electromagnetic field, can produce artificial gravity, which is enough to produce artificial gravitational acceleration without the "crushing bones against the back wall" effect, and to eliminate the debris in front of the vessel, thus potentially addressing the two greatest issues with practical interstellar travel: the propulsion method and the problem of shielding the vessel.

On a practical note, what this means is that a hypothetical intelligent alien culture would not need greater knowledge or superior intellectual capacity to create practical faster-than-light technology, and reach us in real time from another star system in the Galaxy. It is possible that such an alien culture would have never even had an equivalent of Einstein's theories, as they are not necessary to explain relativistic effects.

Speculations aside, the ability to reach other star systems in a practical manner is a make-or-break for the human race, even if no other, potentially hostile, alien races find their way here. In that regard, which theory is true, ours or Einstein's, is ultimately what matters.

Probably the biggest issue in pursuing the answer to this question is the level of consensus that exists in fundamental physics today. Aside from the general notion of consensus not being the healthiest of scientific affairs, there is essentially a flat dial tone resonating the circles of theoretical physics when it comes to the possibility of an alternative to Relativity, be it from an overall lack of viable alternatives, lack of interest, or both. Such state of affairs likely resulted from the initial euphoria from Einstein's results, which turned the common sense into an unreliable guide, and which appealed to sensationalism in mass media. After that, for over a hundred years, no theory was claiming to explain relativistic effects without relying on Einstein's ideas in one form or the other, as we do here, henceforth solidifying the foothold of Relativity to the point of being beyond questioning, with maintaining its correctness being a safe career path for most physicists. As a result, there exists little but consensus in the correctness of Relativity, and disinterest in examining the alternatives. This may have unfortunate consequences for our ability to secure long term future beyond Earth, or to be an equal partner to a hypothetical alien race reaching Earth.

"It From Bit" and Relativity

The general informational idea in physics is not new, with the popular one known as "It From Bit", brought forward by the late physicist John Archibald Wheeler. Another example is Zuse's work of the Universe being a huge cellular automaton. No approach involving information would be complete without a look at Shannon's information theory, one of the pillars of the modern computer and communication science.

What is new though, is deriving relativistic effects from a purely informational premise. That has eluded all previous theories with the information spin at their core. The reason is that Quantum theory in many ways naturally lends itself to an informational approach. However, relativistic effects were impossible to predict with such an approach, until now.

The theory espoused here bridges this gap by considering that resources for information use, however they may be physically represented, cannot be infinite. This simple premise is missing from previous information-based theories of fundamental physics. Once taken into account, it produces equations similar to those of Relativity, both Special and General, with some notably different predictions that will be, hopefully, one day experimentally tried. If proven correct, the informational approach would become the new basis for fundamental theoretical research, with remarkable practical implications that include practical interstellar travel.