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GRAVITY
A Mechanistic Explanation

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As its title suggests, this paper will present a mechanistic explanation of gravity. Its primary aim, however, is not only to recommend the benefits of this explanation to the reader, but also to propose the theory as the basis for an alternative to relativity, and even as the basis for a theory of everything (TOE).

On eight pages, of course, this is not a full scientific treatise. But it is an eye-opener and an appetiser.

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The idea that will be explained is not "just some notion". In fact, it has the very best credentials. To appreciate this we will have to go back in time to its early days.

The English physicist, mathematician, astronomer, natural philosopher, alchemist and theologian Isaac Newton (1643-1727) was long credited in the English-speaking world with having "discovered" gravity. There is the story of his sitting under an apple tree when an apple fell ...

The fact is that many years earlier Galileo Galilei (1564-1642), the Italian physicist, mathematician, astronomer and philosopher, had already experimented with rates of fall (supposedly using the leaning tower of Pisa for comparisons of falling bodies) and had written a treatise on the centre of gravity in solids (1589). While in Padua, where he remained from 1592 until 1610, he gave a proof (around 1604) that falling bodies obeyed the law of uniform acceleration.

In the end it's not really all that important who set the ball rolling. What is important in the context of this paper is the perception behind the concept. Both of these scientists lived in the age of the horse and carriage. And did the carriage push the horse? No, the horse pulled the carriage.

Now I will make a startling claim: except in a trivial sense, *nothing in this world ever pulls or is pulled!*

"Absurd!" you many say.

Okay, here (for those who wish to work their way through it) is an example showing how a railway locomotive pushes the wagon behind it:

> The main components in this example are the locomotive, the wagon, and the hooks between the two vehicles, one on the locomotive and one on the wagon. The hooks can also be seen as the essential elements here, since without them no pulling would occur. So let's take a closer look at the hooks.
>
> If the pulling locomotive is situated to the left and the wagon to the right, the hook on the locomotive is to its (the locomotive's) right and the hook on the wagon is to its (the wagon's) left. Only when the two hooks make contact, however, can "pulling" occur. So now let's look more closely at the point of contact.
>
> The hook on the locomotive, situated to the right of the locomotive, makes contact with the hook on the wagon, which is situated to the left of the wagon, on its (the locomotive's hook's) left side. The hook on the wagon, by contrast, makes contact with the hook on the locomotive on its (the wagon's hook's) right side. And since the "pulling" takes place in the leftwards direction, it can now be seen that the hook on the locomotive is actually pushing in a leftwards direction at the point of contact of the two hooks, the wagon's hook being pushed at this contact point.
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> And since the hooks are attached to their respective vehicles, these vehicle can also be said to be behaving as their hooks behave, i.e. the locomotive is actually *pushing* the wagon behind it. [1]
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> We won't, of course, now revert to *saying* that the locomotive (to the left of the wagon) is pushing the wagon in a leftwards direction, but it *is* important that we stop deceiving ourselves into thinking that pulling and pushing are intrinsically different.

This now prompts the question, "Do we have any valid concept of pulling at all?"

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We will take up this point again shortly. But first, back to Newton.

His real achievement, as far as gravity is concerned, was in quantifying it in his mathematics. In this respect, however, even Newton, a member of the illustrious Royal Society, is said to have had his problems.

Hardly surprising, therefore, that he should enlist the assistance of other contemporary mathematicians. One in particular, a Swiss mathematician by the name of Nicolas Fatio de Duillier (1664-1753), also a member of the Royal Society, is said to have played a decisive role here.

Newton's problem was that he didn't know how to calculate for forces of *attraction*. Nor did Fatio. The latter, however, had a gravitational theory of his own based on the

[1] This is still easier to envisage in the case of a leftwards-travelling motorized vehicle with a U-shaped swing arm attached to its middle, which it can use to push a wagon in front of it, i.e. to its left. If the wagon is then placed to behind it (i.e. to its right) and the swing arm is swung to behind the wagon, we now have a "pulling" situation. For both (pushing and pulling) situations, however, the direction of motion of both vehicles remains the same and the contact point between the vehicles remains the same (given a rotating push-part on both vehicles, for example). In other words, the only difference between pushing and pulling is the position of the motorized vehicle with respect to the wagon, a trivial difference. (The rigidity of the pushed/pulled body admittedly also plays an important role here, but is just as important for pushing as for "pulling", e.g. you can't push with warm butter!)
Friction can always be shown to represent a case of pushing. And anyone inclined to propose magnetism or electricity as counterexamples should note that these can also be accounted for in terms of the push theory.

concept of pushing. So he simply applied the mathematics he had used for his push theory to Newton's "pull" theory. And it worked!

Now the importance of the above claim relating to "pulling" should begin to be more clear. When it comes to gravity, the proofs associated with the theory presented in this paper are older than those for Newton's!

Newton's physics has meanwhile also been demoted, of course, to a "special case" of relativity at low velocities. Should we ever be forced to relinquish relativity theory, however, we would probably have to fall back on Newtonian physics.

This said, the step to accepting the theory of gravity we are about to introduce is not, after all, *such* a large one.

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So what is this push theory of gravity - or "push gravity" for short - and how does it work?

As conceived by Fatio de Duillier, push gravity was a particle-bombardment theory. Tiny particles travelling in all directions in space were believed to collide with the matter of (say) a planet from all sides, pushing it together. Given two planets close to each other, each of these would block out some of these particles in the direction of the other planet (this is referred to as shadowing), with the result that a net force of bombardment would push each planet in the direction of the other, as indicated in figure 1, below.

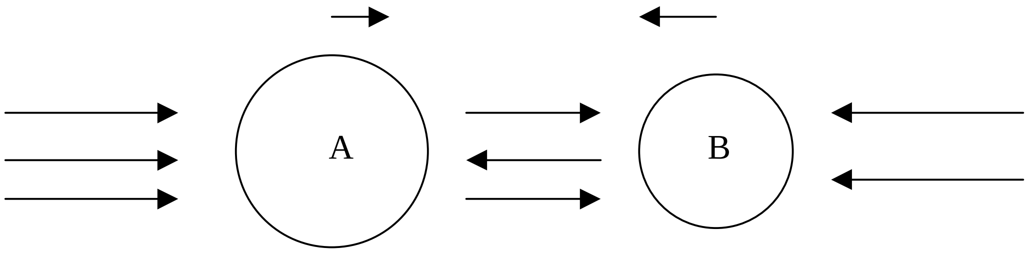

Fig. 1

There are, of course, particles that do behave such as those outlined in the particle-push-gravity theory proposed by Fatio. The most obvious examples are light photons, which - those from the sun, at any rate - bombard the earth and the other planets of the solar system reflecting off them or "landing" and thereby losing their energy (as warmth). But can these account for a gravitational effect?

Although at one time a widely accepted theory, push gravity eventually came into disrepute because calculations showed that such a particle-based account would have to give rise to far higher levels of heat energy than could in fact be detected.

We can get around this problem by simply reverting to a *non*-particle-based account!

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Before expanding further on our push theory of gravity, let's take a *very* quick look at the latest theory of pull gravity - which goes by the name of "string theory" - in terms of a few quotes taken from the introductory paragraph of "Wikipedia, the free encyclopaedia":

... String theory posits that the electrons and quarks within an atom are not 0-dimensional objects, but rather 1-dimensional oscillating lines ("strings"), possessing only the dimension length, but not height or width.

... String theories also require the existence of several extra, unobservable dimensions to the universe, in additional to the three spatial dimensions (height width and length) and the fourth dimension of time.

... first proposed in 1969 by Gabriele Veneziano ...

... since that time *string theory* has evolved to incorporate any of a group of related superstring theories.

... five major string theories were developed

... the main differences between each theory were principally the number of dimensions in which the strings developed, and their characteristics (some were open loops, some were closed loops, etc.)

... In the mid-1990s, string theorist Edward ... Witten's resulting M-theory, a proposed unification of all previous superstring theories, asserted that strings are really 1-dimensional slices of a 2-dimensional membrane vibrating in 11-dimensional space.

... prominent physicists such as Richard Feynman ... have criticized string theory for not providing any quantitative experimental predictions.

... it is widely believed that testing the theory directly would require prohibitively expensive feats of engineering.

Without any further comment, I would only say to adamant supporters of pull gravity, this is what you (are required to) believe, whether you like it or not.

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If I personally find, in string theory, one of the best arguments *for* push gravity, we will nevertheless make no further mention of it here. Instead we will try to identify some other properties that push gravity - as the basis for a theory of everything (TOE) - would have to be able to account for.

The approach adopted will therefore be to ask what is needed for a TOE, and then to ask if and how push gravity provides it.

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Starting on the universal scale, can push gravity account for the motion of the stars and planets?

Yes, it can. Figure 1 shows how the apparent attraction between bodies of mass can be accounted for by shadow. If two bodies "attracted" in this way fail to collide, as they usually do, the result is that they orbit each other, under the perpetual influence of their gravitational shadows. This provides a readily understandable and mechanistic explanation.

One major distinction between push and pull gravity is apparent in this account: *push gravity moves*.

Pull gravity is intrinsically bound up with matter. It is not stationary in space, but *is* stationary with respect to the matter with which it is associated.

Push gravity, by contrast, is an entity in its own right. It can - and does - exist without matter. This requires us to make a clear distinction between *matter* and *gravity*.

Notice, however, that push gravity accelerates matter only when and where it is present as a *net* force. Looking at figure 1 again, there would be no acceleration of either of the "planets" shown if this planet was alone in space.[2] Only when shadowing occurs is there also acceleration (or deceleration, or orbiting).[3]

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And can push gravity explain the motion of *light*?

Light would appear to be a very special case. If we attribute its motion to push gravity, we are allowing something that we do not allow for any other type of matter, namely acceleration without shadow.

To understand this, think of a star as the source of a photon of light. This photon has mass, though its mass is extremely low.[4]

Given that push gravity is responsible for the motion of the photon, therefore, it follows that its (the photon's) initial velocity must be zero. In view of its low mass, however, we can envisage it - and this is presumably what makes it so special - as being accelerated to light velocity almost immediately.

But why to light velocity and not to some higher or lower velocity? This question begs the obvious answer: "Because light velocity is also the velocity of push gravity."

[2] Notice, though, that every planet is itself an example of *internal shadow*, if one can speak in such terms. And since each planet "absorbs" some push gravity, it is clear that the magnitude of push gravity in space must vary from place to place.
[3] Notice too that since the acceleration caused by gravity is always equal, regardless of the mass of the matter accelerated, this implies that it must act on each and every single "basic unit" of matter equally. Exactly what such a basic unit is, however, remains unknown.
[4] Most experimenters decline to put a figure to the mass of a photon. Some even deny that it has a mass.

So here we have a force that is separate from matter but accelerates this matter - in a shadow environment - at a constant rate in each case, this rate being equivalent to the amount of shadow. In the case of light, however, this shadow seems to be 100% at all times, keeping the light photons in motion, all at the same speed.

So how might we account for this? One could, for example, say that nothing greater than the speed of light can affect matter. If we then envisage light photons already travelling at the speed of light, push gravity coming towards them with a motion component of its own is effectively travelling at a greater net speed than that of light - and so cannot affect them! Only *push* from behind can do so, *should* they begin to slow down.

As for the bending of light - an effect predicted by the German-American theoretical physicist Albert Einstein (1879-1955) and confirmed some years later[5] - this *can* be accounted for in terms of shadow from the side, since in this direction the photon has zero velocity.

So theoretically yes, push gravity can account for the motion - and the speed - of light.

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And can it account for anything else?

One might well argue that if push gravity can hold our stars and planets in orbit, why should it not be responsible for doing the same at the atomic and subatomic levels?

And when one thinks that electricity also travels at the speed of light, why should this not be *moved* by push gravity?

One might even make a good case in favour of the argument that push gravity is responsible for *time*.

> Imagine a planet travelling at (say) 70% the speed of light. The push gravity coming from the direction in which it is travelling would have a relative velocity, with respect to the planet, that is greater than the speed of light, i.e. (as said above in connection with light) this will be unable to affect the planet. That coming from behind it, on the other hand, will reach it with only 30% the speed of light.
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> Neurobiological findings made over the past decade or two strongly suggest that "life" is a form of interaction with external stimuli. One neuro-biologist recently described humans, for example, as "perpetual photon processors". Even the factor of "self-identity" has been experimentally confirmed, in this

[5] This was actually also noticed by Newton, whose calculations were essentially identical to those of Einstein in 1911, until the latter realized they contained an error, which he corrected in 1915, thereby doubling his previous result - just in time for *its* verification in 1919!

connection, as identification with certain bodily responses to stimuli that occurred milliseconds earlier.

Given that our rates of perception and interaction to such external stimuli determine our "time", it is not difficult to imagine that these could remain perceptually unrecognized - even at only (in this case) 30% of the comparable rates on a more slowly travelling planet.

The *influx reduction* would not be restricted to affecting only our perception, however, but would also effect (as one says) "our clocks".

In other words, one doesn't need relativity for "twin paradoxes" or time dilation!

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The push gravity theory is still largely untapped. It certainly strikes me as having the potential for explanations in many fields that can still be saved from the relativists, who can these days account for just about anything, provided they are permitted to add another mathematical dimension or two, and to begin each explanation with the words, "To understand this we must, however, abandon the belief that ..."

Here, at the end of this short introduction, some comparisons with pull gravity:

QUESTION	**PULL Gravity**	**PUSH Gravity**
When did gravity first come on the scene?	Together **with**, or **after** the creation of matter.	Possibly **before** and **with** the creation of matter.
Explanation	Since pull gravity by definition is matter-dependent, its existence without matter is inconceivable.	The same applies to the shadow element of push gravity, but the "time" element could be older.
Consequence	Cannot be responsible for the creation of matter.	Could be responsible for the creation of matter.
Does gravity travel?	**No** - action at a distance.	**Yes**.
Consequence	Could be expected to exert an influence - e.g. on the earth - today that has nothing to do with what is seen, especially the further back in time one goes, since pull gravity acts NOW. On the other hand, such action at a great distance is arguably too weak to detect.	Gravitational travel is similar to that of light - but not identical as regards direction, since light's trajectory can alter, but push gravity's can't. [Note: it is "shadow" that alters light's trajectory: this has no effect on gravity itself, however.]
Where is gravity weakest?	Where there is **little** matter.	Where there is **more** matter.
Explanation	The less matter there is the less gravity there should be.	Matter diminishes gravity. The less matter, therefore, the more gravity: the more matter the less gravity. When it comes to the *force exerted* by gravity, however, the more matter there is in close proximity, the more (accelerating) force.
Where is an atmospheric planet's effective force of gravity strongest?	**Under** its atmosphere, and under - though near to - its surface.	**At the top** of its atmosphere.
Explanation	Because the density of a planet is much higher than that of its	Because push gravity at this point has maximum shadow, even though

	atmosphere, and all of the *planet* is still attracting in one direction on a better distance basis (inverse square law).	the atmosphere contributes little towards diminishing this.
Where is an atmospheric planet's effective force of gravity weakest?	At its **centre**.	At its **centre**.
Explanation	Because there is no matter here to attract "inwards", all gravitational attraction being in an outwards direction - and balanced out (speaks against the black-hole theory).	Since at this point push gravity - i.e. shadow gravity - is balanced from all sides.
Does gravity always exert the same force at the same distance?	**Yes**, this is dependent on mass (matter) and can't otherwise be influenced.	**No**, this is dependent on "shadow", which can be influenced.
Explanation	Has no counter-component and acts at a distance, so it cannot be influenced.	Whereas push gravity exerts the same force as pull gravity in any given case, it nevertheless has the potential to exert a greater force.
Where *is* gravity?	**In** matter.	Primarily **outside** matter.
Consequence	Difficult to explain mechanistically and difficult or impossible to influence.	Easier to comprehend mechan-istically, and possible to experiment with.
Are there black holes?	**Probably**.	**Probably not**.
Explanation	Because it's otherwise difficult to account for the absence of light from certain areas of space in which gravity can be "seen" to exist.	Because there are easier alternative explanations, e.g. that there is so much (normal) mass, or matter, in the region that push gravity is fully absorbed by it, leaving nothing to accelerate any light photons. Or that there are no (longer?) stars in this region
How does gravity affect today's universe?	As a force of **contraction**.	As a force of **contraction** and of **expansion**.
Consequence	It should serve to slow down the expansion of the universe, though perhaps less and less as time goes by and the distances between matter increase.	It should slow down the expansion of the universe near the "centre", where more matter may be postulated, but expand it near the outskirts, since more shadow can be expected to exist here - in an outwards direction! - due to there being less push coming from the outskirts than from the centre.
Does the gravity of a planet accele-rate or decelerate light?	**Yes**.	**No**.
Explanation	Given that the photon has mass, as evidenced by the bending of light, a planet's gravitational field will accelerate (or decelerate) mass in the direction of (or away from) its centre.	(Except for right at the start.) The reason is that the light approaching or leaving the planet is already travelling at the speed of gravity.

A Prediction

On this very last point, if gravitational acceleration or deceleration of light can be tested for, the results would reinforce (or cast doubts on) the one theory or the other.

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