

# Universal Physics Journal

## Question 13: How wrong is the bowling ball-rubber sheet model?

Mr. Skyler:

I often read of the following demonstration of Albert Einstein's space-time version of gravitation. A bowling ball, representing the sun is placed on top and in the middle of a horizontally stretched sheet of rubber. The weight of the bowling ball causes a circular depression to form. A marble, representing the earth, is set into motion around the stationary bowling ball. It is then pointed out that the earth marble ends up orbiting the sun bowling ball as if there exists some imaginary gravity force between them that is pulling the earth marble in the direction of the sun bowling ball.

I have read of this demonstration to explain Einstein's General Relativity theory perhaps a dozen times. In fact I have read of no other type of demonstration of his theory.

After reading through several articles on Universal Physics, I have a pretty good idea of what you think of Einstein's space-time version of gravitation. What I am really wanting to know is if you see anything wrong with this bowling ball resting on a rubber sheet model?

W.G., Philadelphia, PA, USA

Hello W.G.:

I too have read many times of a bowling ball being supported by the depressed rubber sheet as representing a good example of Einstein's forceless version of gravitation. You are right in that I am not impressed by the persuasion of this Earth-bound event. I will explain.

A fundamental difference exists between Newton's recognition of gravitation and Einstein's theory of gravitation. Newton recognized gravitation as an action force internal to the individual components of an object's matter. Later on, Einstein theorized that Newton was wrong in that gravitation was not an action force internal to matter but instead was the forceless result of a "curvature" of the path an object travels as it passes through a theoretical entity referred to as space-time. While Newton's LAW I tells us that it always takes the presence of an action force in order for the motion of an object to be changed in its direction, Einstein's forceless theory tells us otherwise in that if the path that lies ahead of an object is itself curved then no force is required in order for the object to abandon its former Newtonian straight-line path through empty space to instead begin following Einstein's curved path through the curved material of space-time.

Thus in Newtonian gravitation, the action force of the Sun's gravity being generated within the internal components of Earth's matter is recognized as the cause of Earth's curved path of orbit of the Sun. Yet in Einstein's theory of gravitation all such forces are theorized to be absent while the Sun's matter is seen to cause a curvature of a "space-time" entity that is theorized to fill all of space which leaves Earth no choice but to forcelessly follow this curved path formed in the material of space-time. It is this theoretical model that the depressed sheet of rubber is intended to represent.

There are many problems I think are being overlooked in Einstein's theory of gravitation. First in my mind is the assumption that just because the path ahead of a moving object is formed out of some material, real or imagined, that is itself curved, does not in the slightest mean that Newton's LAW I may be set aside. No, if the moving object begins its journey along a curved path, an acceleration/Action force is still required to cause the moving object to abandon its default state of rest-motion and instead begin its centripetal acceleration that is directed inward toward the required central object. No test exists that stands as proof that an object can be made to travel a curved path without the application of an internal or external acceleration/Action force. So we can right away discard this major portion of his theory as unreal. Newton's LAW I tells us in no uncertain terms that when no acceleration/Action force is present, no change can possibly occur to an object's default state of rest-motion. Conversely when an acceleration/Action force is present, a change or acceleration of an object's default state of rest-motion always occurs.

Now let us address the theory where space-time is proposed to be a material, fabric or string theory that can be fashioned to form a curve through space caused by the presence of matter located in the centripetal direction. What problem do we have here? Well no such matter, fabric or string theory, often referred to as the "fabric of space", has ever been found. When Albert Einstein was working on his theory we had yet to launch a man into the space beyond Earth's atmosphere. No space walks had taken place. So it was safe to sit on Earth's surface and predict that a theoretical material, fabric or string of space-time did indeed exist. But when NASA sent a capsule in high-speed orbit of Earth with this capsule traveling at high-speed through this imagined material, fabric or string theory of imagined space-time, no such matter or fabric or string was ever encountered. There was no buffeting of the capsule or space shuttle while in orbit. No wind whistling as it did in the window cracks of an automobile at speed back on Earth. Nothing was ever found which could be theorized to be fashioned by gravitation into a curved path for the capsule to forcelessly follow. Instead, despite the full benefit of Albert Einstein's General Theory of Relativity, it was recognized that the orbit of Earth was, after all, a forceful event. Newton's formula, with the addition of the gravitational constant that was determined after Newton's time on Earth, correctly predicted the magnitude of the gravitational acceleration/Action force acting on each component of the capsule's matter that made the curved (accelerated) path of the capsule through the empty space at that altitude possible. No "material" or "fabric" or "string" of "space-time" was ever found to exist outside the imaginations of our mathematically minded theoreticians.

Then there is the problem of orbital velocity. In Isaac Newton's (and for that matter, Galileo's) recognition of Universal Gravitation as force-based, the orbital velocity of an object, such as a satellite in orbit of Earth, is critical if the satellite's altitude above Earth's surface is to be maintained at a relatively constant value. If the satellite's orbital velocity through empty space is even slightly more than required, the mix between the satellite's velocity and its rate of acceleration toward Earth will be insufficient to cause the required curve of orbit. The orbital path will initially curve inward too slowly toward Earth's surface resulting initially in a gain of satellite altitude above Earth's surface. Conversely if the satellite's orbital velocity is slightly less than required then the orbital path will initially curve inward too quickly toward Earth's surface resulting initially in a loss of satellite altitude above Earth's surface. Thus with Newton's forceful gravitation in effect, satellite velocity is critical.

Quite the opposite is true with Albert Einstein's forceless theory of Universal Gravitation. Here the orbital path for any such satellite is already laid out in the material of spacetime at a given curve for any given altitude above Earth's surface prior to the satellite's arrival. With no forces of gravitation involved, there should exist proof that there is no particular orbital velocity requirement in order for the satellite to maintain a given altitude above Earth's surface. After all, is the satellite not simply forcelessly following along a path through the predicted material of spacetime that is preformed at the correct orbital curve for that altitude? What difference can it possibly make to the orbital path if the satellite's velocity along this preformed path is changed?

Suppose the satellite's orbital velocity is reduced to half its Newtonian value. From the satellite's perspective this curved spacetime path is straight since according to General Theory of Relativity no steering forces are required to be present to keep the satellite on this theoretical spacetime path. On any real, straight path where no steering forces are required, there are also no velocity requirements for the object. Fast or slow, the object will nevertheless remain on the path. Even stopped, as long as all steering forces are absent, there is no reason for the object to leave the straight path.

Accordingly, if the forceless gravitation of the General Theory of Relativity is real and true then there must be no velocity requirement for a satellite traveling, in the absence of steering forces, straight along the preformed curved path through Einstein's spacetime. Even stopped, with all steering forces admittedly absent, there exists no reason for the object to leave the spacetime path. No reason at all.

The problem here is that no one has ever been able to show that a satellite's orbital velocity is not critically important to maintaining a given altitude above Earth's surface. If a satellite's orbital velocity is cut in half, NASA's experience shows that the satellite will immediately abandon its former orbital path for a new one. Stop the satellite's orbit of Earth altogether and experience tells us that the satellite will immediately abandon its spacetime path as predicted to exist by Einstein and due to the presence of the well-proven-to-exist steering forces of Universal Gravitation, begin its fatal acceleration and fall in Earth's direction as correctly predicted by Newton's work.

We do not need to leave Earth's surface to verify the truth regarding the nature of gravitation. Step into an orchard in late summer, pluck an apple from a tree and hold it out at arm's length. If Albert Einstein's General Theory of Relativity is correct then this apple is already following a preformed curved orbital path through curved spacetime around Earth. With no specific orbital velocity requirement due to the predicted absence of gravitational steering forces, upon its release, this apple has no reason, according to Einstein's theory, to deviate from its preformed straight-line path through the material of spacetime that his General Theory of Relativity predicts is wrapped in a curved manner around Earth.. What is the truth of this matter? If Einstein is right then with steering forces absent, upon release the apple will hold its position before you. If Newton is right then with steering forces ever-present, upon its release, the apple will immediately abandon its former orbital path for a new one where it will proceed to accelerate and fall to Earth's surface. I have no doubt whose understanding of this event you recognize as true.

Now let us turn our attention to the stretched rubber sheet event to see if it does, in any way, prove there is still some truth to Albert Einstein's forceless theory of gravitation. In these events, I notice that the word force is usually hinted at but then left hanging by the event's end. In one such article in my possession, the author writes "In his theory, the gravitational force arises as a consequence of space and time (which together form spacetime) being curved by the presence of matter." Here the author begins with a hint that gravitation is some kind of force since he uses the word "force". But by the end he states: "The bowling ball creates a deep indentation in the rubber sheet, and the slope of this indentation causes the marble to be deflected toward the larger ball, as if some force--gravity-- were pulling it in that direction." He goes on to seal gravitation's fate as a forceless effect by referring to it as "... a phenomenon we call gravity."

Here in this stretched rubber sheet event, it is clear that a portion of the sloping rubber sheet's normal, external force against the marble, when combined with a portion of the marble's downward internal force of Earth gravitation, amounts to an inward-directed acceleration/Action force that "causes the marble to be deflected toward the larger ball...". Of course this combined a/A force is responsible for the marble's centripetal acceleration as correctly predicted by Newton's formula  $F=ma$ . So far the rubber sheet event is successful in proving the truth of Isaac Newton's work.

A portion of this combined acceleration/Action force, that is responsible for the marble's curved path of travel around the larger central ball, is an external (contact) force which will cause the marble, including its contents, to exhibit the stacking force of acceleration/Reaction weight against the rubber sheet. If the actual space event is anything like the rubber sheet event then a curved material, fabric or string of spacetime, if real, will in a similar manner cause the application of an external (contact) force against the exterior of any object in orbit, be it a capsule, space shuttle, moon or planet. If this General Theory of Relativity model is true then our astronauts will experience the stacking force of acceleration/Reaction weight in the centrifugal direction against the inside of the outside wall of the capsule or space shuttle. Instead, experience shows that our astronauts are weightless against any surface inside any orbiting space vehicle. This indicates that there exists no invisible theoretical material, fabric or string of theoretical space-time that is in place in a theoretically curved shape around the Sun or Earth or around any other space body with this material being thought to cause the deflection of an orbiting body in the inward or centripetal direction. Once again the rubber sheet event supports the forceful truth of Newton's gravitation while again providing no support for Einstein's forceless theory of gravitation.

.Why is this true? Is there some fundamental thing wrong with the rubber sheet event? There is, for if one is going to imagine an event that will demonstrate some level of reality for a forceless theory of gravitation, one should avoid imagining an event where forces are undeniably present, especially acceleration/Action forces such as the rubber sheet's inward-directed external acceleration/Action force. It simply is not possible to use an event where such forces are present to successfully demonstrate that any truth resides in a theory of gravitation where forces are predicted to be entirely absent.

Besides that, I object to the entire premise of the rubber sheet event. Notice that the downward-directed weight of the Sun bowling ball is accepted as acting as the cause of the rubber sheet's depression. In reality what can possibly exist as the cause of the Sun bowling ball's action force of weight against the support of the taught rubber sheet? Only the Sun ball's forceful gravitation toward a second massive body located in the downward direction on the other side of the rubber sheet can possibly be responsible for causing the forceful depression of the rubber sheet as theorized. This same downward directed gravitational force of a lesser magnitude must also be present within the Earth marble in order for the marble to bear with the force of weight against the rubber sheet while contributing to the cause of the Earth marble's forceful deflection along a circular path around the Sun ball. Yet in the real world of our solar system no such second massive object exists as the cause of the imagined downward-directed (sideways) forces required to be present in order for this rubber sheet model to work as predicted. Thus the rubber sheet model will only work here on Earth's surface where such strong sideways forces are present and not out in space where such strong sideways forces are absent. Yet its accuracy is claimed for the very region where it cannot possibly work. I think when all is said and done, what we are analyzing here is nothing more serious than the roll-the-penny-around-and-down-inside-the-vortex device sometimes found at an arcade or amusement park.

Is there any wiggle room left in this discussion for Albert Einstein's General Theory of Relativity to retain a claim to representing even a sliver of the truth? Possibly it could be claimed that centripetal acceleration/Action forces do exist in Einstein's theory of gravitation. But if this is so then there is no need for Einstein's theory since Newton's force-based recognition of both Universal Gravitation and the role of centripetal acceleration/Action forces already has most if not all of the bases covered. By now it should be clear to all that when it comes to gravitation, Isaac Newton's and Galileo's forceful understanding is superior in its representation of the nature of Universal Gravitation. (See Article VIII Universal Gravitation)

Where does this leave the balance of any article that uses the rubber sheet event for support? According to the Lost-Logic Principle, if one bases one's work upon an untrue foundation, then no truth will follow. To begin by accepting that the General Theory of Relativity is correct or even close to the truth, is to begin way too late in the study of this linear and unforgiving science.

Thanks for bringing this event to my attention, W.G..

Yours truly,

Ethan Skyler  
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