## Gravity

#### History, Problems, and Dissident Theories Bob de Hilster, June 23, 2015

## Agenda

- Introduction
- History
  - Aristotle to Einstein and Beyond
- Problems
  - Motions of the Moon to Pioneer Slow Down
- Dissident theories
  - Particle theory to Electrostatic theory
- Observations

#### Bob de Hilster

- 10 years on gravity
- I still don't know what gravity is!
- No direct evidence
  - Need a gravity scope
- Only indirect evidence, i.e. motion
  - Things that cause motion:
    - Gravity, magnetics, electrostatics, nuclear....

# Which One is Right?

#### • Each theory has:

- Good points
- Bad points
- An equation that works most of the time
- But not all of the time

#### **The Scientific Method**

- Observation
- Theory and equation
- Experiments

#### Aristotle

- Fourth Century BC
- Aristotle observes that objects move toward the center of the earth because of an inner gravitas or heaviness.
- http://en.wikipedia.org/wiki/History\_of\_gravi tational\_theory

## Newton's Observation

- The apple falling toward the center of the earth.
  - From the tree in his yard
  - From a tree in the mountain
  - From a hot air balloon
- Could the force that causes the apple to hall towards the earth be the same force that causes the moon to fall to the earth?
- He calls this force gravity.

#### Newton

- ▶ 17<sup>th</sup> Century The Plague
  - Newton leaves Cambridge to avoid the plague.
  - In 1665-66 Newton at age 25, works on gravity, light and fluid dynamics.
- Newton was a member of the Royal Society of Natural Philosophers. They were looking to prove that gravity reduces by the inverse square of the distance.
- Edmund Haley (Haley's comet) goes to Newton and asks: "If gravity reduces by the inverse square of the distance, will the orbits of the planets be elliptical?
- Newton answers: I have proved it!

## Deriving the Equation

- Newton used four statements to develop his equation:
  - Kepler's 3<sup>RD</sup> Law:  $T^2 \propto A^3$ Huygens's Law:  $a = v^2/R$

  - Newton's 2<sup>ND</sup> Law: F = ma
  - Logic

 $F \propto M$ 

• 
$$F \propto \frac{Mm}{R^2}$$

- To do this Newton modifies Kepler's 3<sup>rd</sup> law from elliptical to circular.
- Newton's equation is an approximation

#### **R** Squared Law

Physicists decide that R Square is precise and treat it as a precise equation by adding a constant 'G'.

$$\blacktriangleright F = \frac{GMm}{R^2}$$

- If R squared is precise, then G is an absolute constant.
- If R squared is an approximation, then G is not precise.
  - Any money spent to find a precise value is a waste.

## Motions of the Moon

- Newton tried to use his equation to explain the motion of the moon. He wanted good data. Flamsteed had data, but would not give it to Newton.
- Newton finally got the data, but it did not work out very well.
- Newton wrote a booklet titled "Motions of the Moon". His equation does not appear in the booklet. Not one word of R squared. Oddly R cubed is mentioned.

#### **Testing the Inverse Square Law**

- Mark Ander and others measured gravity in a bore hole in the ice cap of Greenland.
- The results showed that:
  - An anomalous gravity gradient was observed"
- They did say that there must be an effect caused by the sub mass.

#### Anomalies

- There are documents that describe events as anomalies of nature.
  - Allais anomalies
  - Wang Eclipse
- There are no anomalies in nature!

• Many scientists use the word anomaly to ignore the event and the data.

- There are only discrepancies between measurements and calculations.
  - When our models and equations are not precise, we cannot expect precise answers.

#### Georges Louis Le Sage

- ▶ 18<sup>th</sup> Century
- Le Sage found a book that stated all astronomy could be explained using mechanical means. In 1747 he found a way for this to happen.
- He was successful in getting theory out, but it had many people arguing against it.

# **His Pushing Theory**

- Particles come at us from all directions.
- Most of them pass right through us.
- A few interact and push us.
- There are fewer particles leaving us.
- Gravity
  - The particles moving up through the earth are reduced.
  - The particles coming down on us are not reduced. Hence, there are more pushing us down than there are pushing us up.

#### Le sage's Drawing

40 40 4040 ------+0 +4 +0 Drop Orto + ++ ++ 0+ -0 0-0-0 -0 0+0 0-2000 -------0 Op-0 0 × 0 0+0 -0+0 0-0+0+0 0+0 +0 +0 0-+ 0+ 0

Fig. 2. Pairs of macroscopic bodies traversed by currents of ultramundane corpuscles. From Le Sage's Essai de chymie méchanique. Photo courtesy of the Library of the Royal Society, London.

# **Pushing Gravity**

- Le Sage points out: "That the horse does not pull the wagon, it pushes the harness".
- Newton had no theory, but many refer to it as a pull. Newton himself used the term 'attraction'.
- Question: Is gravity a pull or a push?
   Paper cup example

#### Discredited

- Today, most articles indicate that the theory is totally discredited.
  - Since the particle has mass and moves at extreme velocity:
- Three reasons
  - Drag
  - Heat
  - Aberration

#### Einstein's Observation

- Einstein noticed that when an elevator moved up, he could feel the compression that made it feel like gravity.
- From this he went on to develop General Relativity.

#### Relativity

- Special Relativity, 1915, is not about gravity
  - This involves an object at rest or moving at constant velocity.
- General Relativity, 1916, is about gravity
  - All Einstein wanted to do is include acceleration in his Relativity theory. As he did this, he realized he was moving towards gravity.

#### Not All Agreed

- A few scientists agreed with Einstein, but most of them disagreed.
- So how did it get accepted?

#### The Success of Relativity

- General Relativity predicted, that light passing by a large object like our sun would bend.
- Arthur Edington, 1919, measured the position of a distant star during an eclipse and claimed Einstein's theory was true.
- Later Einstein solved the mystery of the perihelion advance of Mercury. General Relativity accounted for 43 arc seconds of advance that were missing using Newton's equation.

#### **Two Gravities?**

#### GR's Solution for perihelion advance

Amount (arcsec/Julian century)	Cause
531.63 ±0.69 <sup>[4]</sup>	Gravitational tugs of the other planets, Newtonian
0.0254	Oblateness of the Sun
42.98 ±0.04 <sup>[5]</sup>	General relativity
$574.64 \pm 0.69$	Total
574.10±0.65 <sup>[4]</sup>	Observed

The correction by 42.98" is obtained by a 3/2 multiple of classical prediction with <u>PPN parameters</u>

Parameterized Post Newtonian formalism

### Bending Space-time

- General Relativity is a theory of gravity. The model for GR is a heavy ball bending a rubber sheet.
- Is this a pushing or a pulling theory?
- The act of bending a pencil requires the fingers to push against pencil while the thumbs push in the opposite direction.

#### Dr. Carezani

- In 1940 Dr. Ricardo Carezani thought that Special Relativity was wrong. He developed a theory called 'Autodynamics', and published a book titled "Storm in Physics".
- This has not been widely discussed.
  - It is a pushing theory of gravity.
  - David de Hilster helped Dr. Carezani.
  - Made a documentary to show the world that Relativity was wrong.
  - David got me started in gravity.

## 'Pushing Gravity' -The Book

- In 2002 a book titled 'Pushing Gravity', edited by Mathew Edwards, was published and there are 23 articles in the book concerning Le Sage's theory of gravity.
- It is not totally dead!

## **Gravity Problems**

- Motions of the Moon
- Perihelion Advance of Mercury
- Gravity Measurements in the Greenland ice cap
- Pioneer Spacecraft Slowdown
- Velocity of stars at the edge of our galaxy
  - Need Dark Matter

•  $v = \sqrt{GM/R}$ 

#### **Dissident Theories**

- Vortex Theories, Descartes, (2)
- Empirical theories, Newton, (2)
- Particle Theories, Le Sage (9)
- Electromagnetic Theories, Maxwell (1)
- Deformation of space-time, Einstein (2)
- Emission Theory, Carezani (1)

#### My Observations

The sun is not there!Gravity is not free!

#### **Observing the Sun**

Observations:

The sun is straight over head
The solar tides are at my feet.
The sun moves across the sky



#### Gravity is Instantaneous

- This suggests that the force of gravity can act over large distances in an instant of time.
- Newton's gravity is often described as Instantaneous action at a distance.
  - Most say this is impossible, but use Newton's equation anyway.

## Is Light Instantaneous?

- We are told that the yellow object in the sky is the sun.
- So the sun is straight overhead and we see it at the same time.
- In order for this to happen, the speed of light must also be instantaneous.
  - Most people are assuming the speed of light is instantaneous and don't even know it!

#### If the Speeds are the Same

- According to Newton, the speed of gravity must be instantaneous.
- Because the image in your eye occurs at the same time as the sun is straight over head, the speed of light is instantaneous.
- When the speed of light and the speed of gravity are the same, Newton's equation works.

#### **Confused**?



# The Physical Sun



#### The Visible Sun



#### It has moved west!

- Some will say that the sun does not move.
- But as we observe the sun from the surface of the earth, we can see that it moves west because of the spin of the earth.
- In 500 seconds the sun moves 2.08 degrees to the west.
  - 360 degrees x 500/(24 x 3600) = 2.08 degrees

#### The Physical Sun Moved West



## An Object Moves

- If it takes 500 seconds for the gravitational effect of the sun to move from the sun to the surface of the earth,
- There must be an object that moves.
- Is there a theory that meets this requirement?
- And what is the speed of gravity if it takes 500 second to get to the earth?

#### The Same

If the speed of gravity is the same as the speed of light then:

Newton's equation works!

#### **Different Models**

- Earth centered model with sun moving
- Earth centered model with the moon moving
- Sun centered model with the earth moving
  - Cannot determine if gravity is an object that moves

## **Direction of the Movement**

- Something is moving from the sun to the earth!
- So what causes the tides to rise, if the movement is towards the earth?

## **Direction of the Movement**

- Something is moving from the sun to the earth!
- So what causes the tides to rise, if the movement is towards the earth?
- A reduced number of particles could be moving.

#### What Theory?

Is there a theory that causes a reduced gravity field between two objects?

## Is Gravity Free?

- Motion is not free!
  - It takes gasoline to move a car
  - It takes rocket fuel to move a spaceship
  - It takes calories to lift a coffee cup
- But gravity can move galaxies all over the universe and it doesn't cost:
  - One horse power
  - One BTU
  - One calorie

#### Newton

- Equation:  $F = \frac{GMm}{R^2}$
- What is being used?
  G, M, m, R
- F is the cause and is being used up, but what is it?

#### Einstein

- Equation  $G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$
- What is being used?
   G?
- There is no force in General Relativity, so force is not being used up.

#### **Conservation of Energy**

- No matter what you are doing in physics, you must not violate the Conservation of Energy.
- Is there a theory that does not violate the conservation of energy?

#### Le Sage's Theory



Fig. 2. Pairs of macroscopic bodies traversed by currents of ultramundane corpuscles. From Le Sage's Essai de chymie méchanique. Photo courtesy of the Library of the Royal Society, London.



#### Thank You!

#### Open Discussion





#### Motions of the Moon





## **Their Most Happy Moment**

- It seems that the key people involved with gravity have a moment they remember as very important.
  - Newton nay have had that moment when the apple hit him on the head.
  - Le Sage had that moment and immediately sent a letter to his father.
  - Einstein's happiest moment was when he realized that acceleration and gravitation are related to each other, i.e. mechanical acceleration is indistinguishable from gravity.

#### Melbourne G. Evans

Mr. Evans wrote a paper in 1958 titled "Newton and the Cause of Gravity"

#### His theories

- Action at a distance; Ether, condensing toward the earth; a particle theory (Fatio)
- "Hypotheses non fingo"

#### R Squared

- Works at long distances
- But not for short distances or below the earth