

# Gravity

*A light hearted exploration of the ideas of the modern theory of space, time and gravity.*

**A Play for a Whole Class**

**duration 15 minutes**

**David Blair**

## **Characters:**

**Asteroid kids** wearing balloon asteroid hats,

**Smartypants** kids wearing big Smartypants labels,

**Know-all kids** wearing Harry Potter glasses in school uniform

**Question Kids** wearing question marks in school uniform

**All Scientists** wearing big name tags,

**Pythagoras**, with whitened face like a marble statue

**Aristotle** looking like a trickster/magician

**Euclid** whitened face and dark glasses

**Newton** with long hair wig,

**Einstein** with a wild grey wig and moustache and good Einstein accent,

**Gauss** sounding German,

**Professor Ross** in a suit and tie (dinner suit best)

**Francis Everitt** sounding very British with a posh accent,

**Bob Vessot** sounding American

**Stephen Hawking** in wheel chair and glasses, computer voice

**Asteroid Boy 1:** Hi, I live amongst the asteroids. I float from rock to rock, I grow space flowers and I play space ball with my friends

**Question Boy 1:** Asteroid? What's an asteroid.

**Asteroid Girl 1:** Don't you know? Our home is the best place in the solar system. We have a billion rocks in a ring a billion kilometres around the sun. We love our floating rocks. We float from rock to rock. Visiting is easy. Just a gentle push and you float over to your friends place. The scenery is always changing as our asteroids float around.

**Question Girl 1:** But isn't it annoying to have hardly any gravity.

**Asteroid Boy1:** Gravity? What's gravity?

**Know-all Boy1:** You know! That thing that makes you feel heavy.

**Asteroid Girl 2:** We don't have that here. You don't mean the gentle force that floats us back home if we kick off too slowly?

**Know-all Boy 2:** Gravity is that force that pulls you down.

**Asteroid Girl 3:** What is down? We don't have down. Nothing pulls us down. We push off with a finger and we float back to our own rock. If we push a bit harder we can float across to visit our cousins hundreds of rocks away. When we float back home our landings are always gentle: we never feel pulled and nowhere is down.

**Newton:** Did I hear someone say "What's gravity?" I'll tell you what is gravity. I invented gravity! It's mine! Haven't you heard of Newton's Law of Gravity. That's me and it's mine, mine mine!

**Euclid:** Its not all yours Mister Newton! You only managed it because I taught you geometry. I told you how to measure space. I told you about the angles in triangles and about parallel lines.

**Pythagoras:** Mister Newton and Mister Euclid! For goodness sake! You try to take all the credit. You couldn't have got anywhere if it wasn't for my theorem. I found the secrets of measuring triangles.

**Galileo** (*turning to Euclid and Pythagoras*) Euclid! Pythagoras! You guys were so sure you were right. I suppose it was you who told that clown Aristotle to say all those ridiculous things about how fast things fall.

**Aristotle:** Ha ha ha ha! You say it was ridiculous. I had everyone believing me for nearly 2000 years. I hypnotised the entire world. No one even thought to question my teaching until that annoying smartypants Galileo started asking those questions. The Pope was on my side and punished him for his impudence.

**Know-all Boy 3:** Look at these old codgers. They think they know everything. Galileo is the only one who wasn't wrong.

**Gauss:** Hi everyone, my name is Carl Gauss. Galileo is my best friend because we both believe in testing things. It must have been cool fun dropping pies off the Leaning Tower...especially when you dropped them on your friends...or was it your enemies?

**Galileo:** But what I *discovered* was the coolest thing! I found out that all things fall the same. Ah! And it was great to show that Aristotle was completely wrong!

**Gauss:** I tried to prove that Euclid was wrong. I made triangles with sunbeams. I didn't succeed but at least I showed everyone how you *could* find out the shape of space.

**Question Girl 2:** The shape of space! That's a crazy idea. How can you measure the shape of space?

**Know-all Girl 3:** Well, its not so hard. Like Gauss said, you can draw triangles and see what their angles add up to.

**Question Girl 3:** But you can't draw triangles in empty space.

**Smartyants 1:** No but you can make the straightest triangles possible with laser beams.

**Question Girl 3:** Do you have to draw triangles?

**Smartyants 2:** No, of course not! There are lots of ways. You could set up pairs of parallel laser beams and see if they cross.

**Smartyants 1:** Or you could measure the perimeter of a circle and see if it equals pi times the diameter.

**Question Girl 2:** Well, if you know all that, tell me what is the shape of space?

**Smartyants2:** Oh, dear! We had better ask Mr Einstein. Hey Albert! We've got a question!

**Einstein:** Goot avternoon ladies and gentlemen!

**Smartyants 2:** Mr Einstein, what is the shape of space?

**Einstein:** Vell it is like zis. Matter tells zee space how to curve and space tells zee matter how to move.

Zee space, it is curved, and zee time, it is warped. More matter makes it curve more and warps zee time more. And because matter is everywhere space is curved everywhere.

**Smartyants 3:** Get that everyone! Matter tells space how to curve and space tells matter how to move! That's worth remembering! Come on everybody, lets say it all together.

**Everyone (shouting):** MATTER TELLS SPACE HOW TO CURVE AND SPACE TELLS MATTER HOW TO MOVE!

**Einstein:** yes zat is right. *(Now in rap style with a couple of kids joining in)*

Zee space, it is curved, and zee time, it is warped.

And I tell you again cos its true

Zee space, it is curved, and zee time, it is warped.

And geometry is not what you thought

Zee space, it is curved, and zee time, it is warped

And Newton...well he's in the poo.

**Question kid 1:** How did you find that out Mr Einstein.

**Einstein:** Vell, Carl Gauss gave me the idea. Then I worked out a *cool, cool* equation to calculate it.

**Smartyants3:** But how do we know this is true and you are not just tricking us like Aristotle did.

**Professor Alexander Ross** (*Prof of Physics at UWA in 1922*) I can tell you that! I am Alexander Ross and I proved that Einstein was right. I led an expedition to Wallal Downs Station up at 80 Mile Beach near Broome in 1922. We went there in ships with wagons and bullock carts. We took telescopes to look at the stars during an eclipse of the sun.

**Question Kid 2:** What did you see, Professor.

**Professor Ross:** The stars were in the wrong place. The curved space from the sun made the beams of starlight seem to come from the wrong place, so the stars seemed to have moved.

**Smartyants 4:** Does that mean that a laser beam triangle around the sun would be distorted too?

**Francis Everitt:** Smartyants is right! But he is not the only one! I did a seriously cool experiment! It cost NASA a Billion bucks! I measured the shape of space around the Earth with a little spinning crystal ball. I found that the perimeter of a circle around the Earth is wrong by 28 millimeters which was just what Einstein predicted! Einstein was right again.

**Smartyants 2:** Wow, Mr Everitt! So it was you who proved that all those other guys are wrong. Newton is wrong, Euclid is wrong. Pythagoras is wrong!

**Francis Everitt:** Yes, of course!

**Smartyants 4:** Wow! 28 millimeters for a billion dollars...that's expensive! Now Mr Einstein, can you tell me, what is gravity?

**Newton:** I told you what is gravity. It is mine! mine! mine!

**Smartyants4:** I wasn't asking you Mr Newton, Your theory is dead and so are you!

**Einstein:** Vell, gravity does not exist! Newton got it all wrong! What you call gravity is zee pushing you have to do to stop zings from following zee curves of space and zee warps of time. I told you zat already – space tells zee matter how to move!

**Question Kid 3:** So the earth pushes us upwards to stop us falling down to the centre of the earth.... just like I have to push up harder when I carry my kid brother!

**Smartyants 5:** I see! The Asteroid kids just float. If you jump from a tower really you are just floating the same as if you were in space. The only trouble is that the Earth gets in the way after a few seconds and that's not very nice!

**Einstein:** Very good! You are right! Zee asteroid kids just float slower because their asteroids are so small compared with the Earth.

**Newton:** See, they have teeny weeny gravity. I'm right!

**Einstein:** Vell, you are welcome to keep thinking in that old way! But I bet you didn't think of this one! When you push on things to stop them floating freely, you change zee time. Time goes slower zee more you push. Zee Earth pushes us upwards and slows time. We all live a bit longer because by holding us up, the Earth slows time.

**Bob Vessot:** And I proved that you were right Albert. I put a clock in a rocket and I sent it 10,000 kilometers into space. I measured the time difference when it was far above the earth. Time was warped just like you said!

**Smartypants 6** (*imitating Einstein's accent*) Wow! Zat is amazing. So zee Earth it is a time machine.

**Smartypants 5:** (*also imitating Einstein's accent*) Does zat mean zat when we are floating or falling we are going in straight lines but zee space and zee time are both warped. Zat is very weird.

**Einstein:** You are right. But please stop making fun of me!

**Asteroid Boy1:** Floating free, we live fastest and we will die first. That's not fair! not fair! NOT FAIR!

**Stephen Hawking** (*in wheel chair, paralysed, speaking with a computer voice*) Don't you worry Asteroid Boy! Come with me to a black hole where we can slow time as much as we want! I will bring you back five years younger than all your friends! Let's go! Byebye!

*Hawking and Asteroid Boy pretend to fly away by releasing a balloon rocket.*

*All line up and bow to the audience*

*The last line refers to the Stephen Hawking 5 minute YouTube video Black Hole Time Travel in which they take a trip to the black hole at the centre of the Milky Way.*