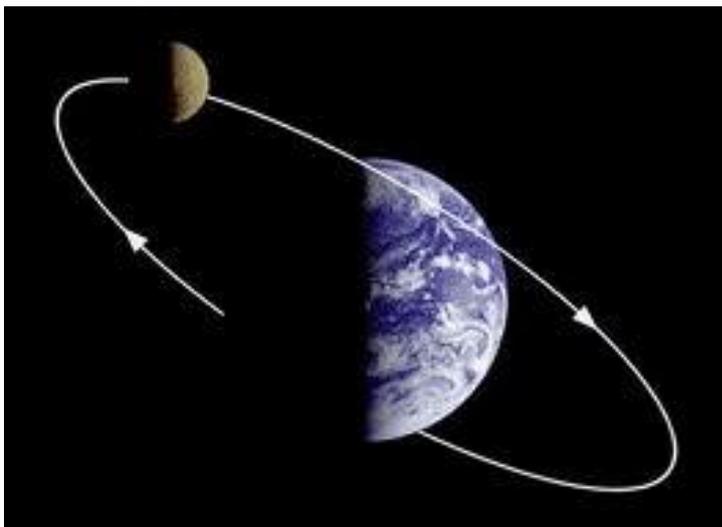


Some facts and theories about our moon and its age

Dr Michael Jarvis



Our Moon over Cape Town during May 2012 when it was closer than its average distance from us. It has an elliptical orbit around the earth and so it occasionally comes closer than its average 400,000 km distance. This distance varies between about 363,300 km and about 405,500 km from us, depending on predictable and cyclic variations in its orbit.



The Moon has an elliptical orbit, resulting in slight variations in distance from Earth

The moon always shows its same side to us on earth because it takes the same time to spin once on its own axis as it takes to complete one orbit of the Earth (about 27.3 earth days). This means that the only time humans have seen the other side of the moon was when astronauts circled it.

The illuminated part of the moon varies when viewed from earth due to its changing position relative to the earth and sun. We see Full Moon when the sun is directly behind us and the whole Moon surface is in sunlight and we see New Moon when the moon is almost directly between earth and sun.

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One amazing 'co-incidence' is that the Sun is 400 times the Moon's diameter when viewed from Earth, but the Sun is 400 times further away. This means that the Sun and Moon appear to be the same size when viewed from Earth. As a result, a total solar eclipse, in which the Moon is exactly between the Earth and Sun, usually totally blocks the bright light from the sun's photosphere, allowing us to see the faint glow from the corona, the Sun's outer atmosphere. However. When the moon is periodically at its furthest point from earth we can see the rare event of an 'annular eclipse' in which the moon only partially blocks out light from the Sun.



At left, a total eclipse, showing the glow from the illuminated atmosphere of the Sun

Below, an 'annular eclipse' showing part of the sun.



How was the Moon formed?



Rock samples collected from the moon by astronauts, suggest that our earth and Moon share a very dramatic event. Dating of moon and earth samples suggests that we share the same age, namely about 4.6 billion years old (For summarised evidence for the 'age of our Earth', see the free download DVD segment on our webpage www.factandfaith.co.za)

One scientifically favoured theory of the Moon's origin suggests that at some point in the Earth's early history, another planet larger than Mars, struck the Earth a glancing blow at enormous speed. This resulted in most of the impacting object and much of the earth being instantly vaporised. From known speeds of other planets in our solar system, it has been calculated that this vaporised cloud could have risen to at least 22,000 km altitude above the Earth, where it condensed into numerous solid particles that orbited the Earth. Due to gravitational attraction these

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smaller particles joined together over time into larger moonlets which eventually combined to form our Moon. This is at present the most likely scientific explanation for how our Moon was formed.

Changing facts about our Moon

The moon's gravitational pull on the earth is the main cause for the rise and fall of ocean tides and it is this movement of water in the oceans, combined with complex gravitational interactions, that exerts a small force causing the moon to move a little bit further away from us each year. The present rate of movement away from Earth has been very accurately measured by bouncing laser light off a mirror that was left on the moon surface by Neil Armstrong on July 21, 1969.

This mirror has enabled scientists to make a variety of important experiments. Not only have they determined that the moon is moving away from us at 3.8 cm per year, but the mirror has also been used to confirm the speed of light. Laser light sent from earth and bounced back, took exactly the time it should have taken if light travels at close to 300,000 km each second!

Neil Armstrong and other astronauts who have visited the Moon, have also sent back stunning photographs of earth, as viewed from the lifeless lunar surface.



The present speed, at which the Moon is moving away from the Earth, is no longer a theory. This is an established fact (3.8 cm/year). This tiny annual increase in average distance between Earth and Moon enables us to calculate how long it takes to increase this distance by one kilometre. Since one kilometre equals 1000 meters and each meter equals 100 cm, this means that it would take 100,000 divided by 3.8 = 26,315 years for the Moon to move one kilometre further away from Earth.

Clearly, from calculations like this we should be able to determine the likely time it has taken for the Moon to move out to its present average distance of about 400,000 km from the earth. However, this calculation will depend on several unknowns.

These unknowns include our ignorance about exactly how far the Moon was from Earth, once it had consolidated into one structure. The initial distance from the Earth and the

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speed of Earth's rotation, will affect our calculations of how long it has taken for it to reach its present distance from Earth. We do know from other lines of scientific study that the speed of Earth's rotation has slowed over time. However, the interactions between Earth and Moon are very complex.

Although it may seem to most of us that the Earth-Moon system is fairly simple, this is an illusion. In fact many years of study by competent scientists have shown that these interactions are very complicated. It takes computer models and complex mathematics to get us anywhere near understanding all these interactions. One thing does seem to be well established, namely that the speed of movement of our Moon away from Earth has changed over time.

These interactions between our Earth and Moon cause tides in the oceans and friction on earth between the oceans and the ocean bed. This has the effect of very slowly reducing the speed of earth's rotation on its own axis. At the same time the Earth's gravity and various complex interactions between gravity and the rate of Earth rotation, combine to cause the Moon to increase its speed of forward movement around the Earth and this in turn causes the Moon to move slowly further and further from Earth. Clearly, when the Moon was closer to the Earth these and other gravitational forces were stronger and studies of continental drift on earth shows that the effects of tides were also different in the past when there was only one continent, rather than today's variety of land masses.

Nevertheless, in spite of all possible variations in gravitational and tidal effects, it seems clear to most people that, for the Moon to have reached its present average distance from Earth of about 400,000 kilometres, it would have taken billions of years. **As seen in the previous calculation, to move only one kilometre further away will take about 26,000 Earth years.**

One 'Young Earth Creationist' article by Thomas G. Barnes (D.Sc) in 2012, from the Institute for Creation Research web page, claims that, I quote, *'If one multiplies this recession speed by the presumed evolutionary age, the Moon would be much farther away from the earth than it is, even if it had started from the earth'* (www.icr.org). The article then concludes, *'Here is as simple a proof as science can provide that the moon is not as old as claimed'*.

Another 'Young Earth Creationist' article by Dr Jason Lisle (2008), available from the web site www.answersingenesis.org also refers to the Moon as support for his conclusions that the universe is not as old as science claims. His article contains remarks such as *'The simplest explanation is that the moon hasn't been around for that long. The recession of the moon is a problem for a belief in billions of years, but is perfectly consistent with a young age'*.

We can look at these 'Young Earth Creationist' claims.

The Scientific evidence points to the moon originating some 4.6 billion years back. If we divide this calculated age by the number of years that it takes for the Moon to move 1

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kilometre further away from us (at the current measured speed of 3.8 cm/year), namely about 26,000 years for one kilometre, this means that in 4.6 billion years the Moon could have moved 4,600,000.000 (4.6 billion years) divided by 26,000 years (to move one kilometre) = 176,923 km further from the earth. It is therefore hard to understand how the above mentioned authors reached their conclusions.

In other words, if the speed of movement away from Earth remained more or less as it is now, the Moon would have only moved approximately half the present distance from the Earth in 4.6 billion years. The scientific evidence accepts that the speed at which the Moon recedes from the Earth does change according to known laws of gravity, laws of motion, the effects of friction caused by oceanic tides on Earth and other observable factors. Thus, although all these interactions are still only partly understood, science can still reconcile the observable facts with the conclusion that the Moon is at least billions of years old.

In addition we have the radiometric dating of Moon rocks that point to billions of years old. 'Young Earth Creationist' articles often dispute the reliability of radiometric dating. I can recommend an analysis by a Christian physicist who very ably counteracts suggestions that radiometric dating is unreliable. This 42 page article is by Dr Roger Wiens (2002): 'Radiometric Dating: A Christian Perspective'. It gives in depth analysis of various claims made against this dating method. See <http://www.asa3.org/aSA/resources/Wiens.html>

If we look at web pages and articles by 'Young Earth Creationists', we find other references to various features of our earth that might seem to suggest a young Earth. However, these examples are all controversial cases and the really strong counter arguments in favour of an ancient Earth are not given in these Creationist articles.

Readers of 'Young Earth Creationist' articles can easily get lost in the controversial examples, especially if readers are not scientists. These examples are given in ways that minimise or even ignore their controversial nature, and so readers of these articles often fail to realise that a vast amount of scientific evidence against a young Earth has been left out. It is also disturbing that theories, that are not backed by any main-stream scientific research, are often quoted as if they are acceptable evidence in support of a young earth, or to try and counteract scientific evidence for other evolutionary processes.

In this regard, it is very interesting that one 'Young Earth Creationist' webpage www.answersingenesis.org has found it necessary to publish a list of previously used arguments, that they now admit should no longer be used. Why should these arguments no longer be used? Simply because it has been demonstrated that they are without merit and some have been shown to be fraudulent, such as the NASA computer story and some of the others listed below are also fraudulent. The list will certainly increase.

This list of previously used 'Young Earth Creationist' arguments, that they now admit should no longer be used, includes the following:

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- Moon dust thickness proves a young moon.
- NASA computers, in calculating the positions of planets, found a missing day and 40 minutes, proving Joshua's long day and Hezekiah's sundial movement in Joshua 10 and 2 Kings 20.
- Woolly mammoths were snap frozen during the flood catastrophe.
- The Castenedolo and Calaveras human remains in old strata invalidate the geological column.
- Dubois renounced Java man as a missing link and claimed it was just a giant gibbon.
- The Japanese trawler Zuiyo Maru caught a dead plesiosaur near New Zealand.
- The 2nd Law of Thermodynamics began at the Fall.
- If we evolved from apes, why are there still apes today?
- Women have one more rib than man.
- Archaeopteryx is a fraud.
- There are no beneficial mutations.
- No new species have been produced.
- Earth's axis was vertical before the Flood.
- Paluxy tracks prove that humans and dinosaurs co-existed.
- Darwin's quote about the absurdity of eye evolution from Origin of Species.
- Earth's division in the days of Peleg (Gen.10:25) refers to catastrophic splitting of the continents.
- The Septuagint records the correct Genesis chronology.
- There are gaps in the genealogies of Genesis 5 and 11 so the Earth may be 10,000 years old or even more.
- Jesus cannot have inherited genetic material from Mary; otherwise He would have inherited original sin.
- The phrase "science falsely so called" in 1 Timothy 6:20 (KJV) refers to evolution.
- Ron Wyatt has found Noah's Ark.
- Ron Wyatt has found much archaeological proof of the Bible.
- Many of Carl Baugh's creation evidences.
- Canopy Theory.
- There was no rain before the flood.
- Natural selection is tautology.
- Evolution is just a theory.
- The speed of light has decreased over time.
- There are no transitional forms.
- Gold chains have been found in coal.
- Plate tectonics is fallacious.
- Creationists believe in microevolution but not macroevolution.

I must emphasise that the above is not my list. **It is a list put out by one of the most prominent Young Earth Organisations www.answersingenesis.org .**

In the light of our considerations relating to the Moon, I suggest that this web page should add to their list the following:

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'Do not argue that the speed of recession of the Moon from Earth is evidence for a Young Moon'.

For a summary of some of the very strong scientific evidence for the great age of our Earth and universe, I again urge you to look at the Free DVD downloads from my web page. Click on 'Free Downloads' and then on the DVD extract called 'Size and age of the universe', 'Quantum physics and Timeless Dimension', 'Creator' and 'The Age of our Earth'.

The other free downloads from the web page explain how our belief in the God of the Bible can be fully reconciled with acceptance of scientific discoveries relating to the Big Bang Creation, our expanding universe and many other evolutionary processes that operate in the universe. These are all reconcilable if our concept of God is great enough.

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