15 Inaccuracies Found In Common Science Illustrations - mental_floss on YouTube (Ep.48)

List Show
https://youtube.com/watch?v=fsERIapYj0Y
https://nerdfighteria.info/v/fsERIapYj0Y

Hi, I am Michael Stevens from the YouTube channel Vsauce and this is Mental Floss

1. And this is what an atom looks like ... kind of. It's actually the Rutherford model of the atom, but electrons don't move around a nucleus in the same way a planet orbits around the sun. It's very difficult to diagram an atom with a simple illustration. Here's a slightly more accurate model of an atom. The important thing to remember is that the circles are not orbits but rather the depictions of energy levels. The electrons with the lowest amount of energy are closer to the nucleus, but we're not really sure how electrons move around the nucleus. In fact we're not really sure where they are. They're not necessarily balls moving around, sometimes they're waves. Another way to think of it is to imagine the atom as a probability cloud of where you might find an electron.

It turns out that a bunch of the science illustrations you grew up studying in books, magazines and encyclopedias weren't exactly accurate. This type of things have been going on for centuries and today let's geek out and look at some of the reasons they're wrong and learn from it.

(Intro music)

2. We've seen illustrations like this one before. It's a famous scene from American history. Benjamin Franklin's experiment with the kite and a key in a thunderstorm, but it probably didn't happen the way we all think it did if at all.
Flying a kite in the middle of a thunderstorm, waiting for a bolt of lightning to hit it, would almost certainly have killed Franklin. Now he wrote about a theoretical experiment like this in 1752 but some historians believe he conducted a similar experiment that year, flying his kite into a cloud before a thunderstorm collecting electricity from the clouds, not from a big bolt of lightning.

3. Raindrops, as I've mentioned before, do not look like what you've always thought they do. It's actually less sad. They don't look like a teardrop. Small raindrops are spherical in shape, but larger ones look more like hamburger buns. For this you can thank a tug-of-war between the surface tension of the water and the air pressure pushing up from the bottom.

4. Now we all recognize this misleading depiction of human evolution. It's called the march of progress. The illustration was done by Rudolph Zallinger. It was commissioned by *Time-Life Books* in 1965 for inclusion in its Life-Nature Library series.
But this is a gross over-simplification implying that we humans are the final product of the millions of years of directed evolution, and that nature is not random.

5. We have to talk about world maps now. You have been looking at world maps in books for years. The fact is it's difficult for them to ever be accurate. The Mercator projection is the most common, but you don't need me to tell you that Greenland is not the same size as Africa. There's just no accurate way to convey a three dimensional object like our planet in two dimensions. Translating the Earth's curved surface into a flat map is no easy task, but people keep trying. Whether it's the Albers map or the Gail-Peters projection, there will always be inaccuracies. My advice: go buy yourself a nice globe.

6. How about maps of even larger things, like our solar system. Well here's the problem with space illustrations: scale is nearly impossible. Mainly because there is a lot of distance, a lot of space in between planets in our little neck of the galaxy. Here's a map of the solar system that will look pretty familiar to you. It's beautiful right? But yet it's so misleading. For a true-to-scale model of our solar system I suggest you check out the link in the description. They shrunk the sun down to this size and spaced out the eight planets and Pluto using the average distances from the Sun. The webpage, on a normal monitor, is over half a mile wide.

7. Staying within our solar system, the asteroid belt is often illustrated as looking something like this or this, giving the appearance that flying through it would entail one near collision after another as you dodged space rocks. The truth is that while there are at least 100.000 asteroids in the belt, larger than a kilometer in diameter, the average distance between them is about five million kilometers. Unfortunately the reality just doesn't make for a very exciting looking map or a science fiction movie.

8. If we're talking about celestial bodies we better talk about the Moon and its, often inaccurate, illustrations. This first illustration attempts to show the phases of the moon and it does so by incorporating two different viewpoints in the same illustration. The Earth and the Moon's orbits are pictured as they would appear from outer space. Now, while the point of view for the different Moon phases is illustrated as we would see it from Earth, the Earth is shown from a different angle.The second diagram appears to imply that the tidal bulge from the Sun is equal to that of the Moon. The Sun's gravity does affect tides but on a much smaller scale than that of the Moon.

9. Everyone knows what a velociraptor looked like, right? I mean we all saw Jurassic Park. Except new evidence suggests our scary friend the velociraptor probably had more feathers than previously thought.

10. Science illustrations aren't just misleading in textbooks. Advertisers also occasionally screw up the science, especially when it comes to gears. I love this one personally. Marketers enjoy using gears in their ads because they symbolize, erm, teamwork or innovation, but they don't symbolize movement. The graphics department don't always come up with gear-systems that could actually operate. In a 2002 print ad for Hitachi they included a closed loop of six gears, that would work fine if not for the seventh gear they stuck in the middle. Adobe had a similar problem in a 2005 ad that looked like this. Engineers were quick to point out that these won't work due to the three locked gears in the top left, that "work together better" tagline isn't exactly accurate.

11. It seems unfair to point out inaccuracies in science illustrations from centuries past, I mean they didn't exactly have the same tools that we have today for measuring, observing and documenting. But some of these are pretty funny. Guys, I hate to break it to you, but your sperm does not look like this.

12. This is the widely recognized 18th century symbol for Phlogistan. You've never heard of Phlogistan because it wasn't actually something that existed, but according to Phlogistan theory a fire-like element existed within combustible materials like wood or coal, and Phlogistan was released during combustion. the theory also attempted to explain rusting metals, which we now know as oxidation. Needless to say this illustration isn't accurate, but a neat symbol.

13. Given that he died in 1519 the scientific illustrations of Leonardo Da Vinci was generally considered to be several hundred years ahead of his time. I'd say he was kind of far off when it came to female anatomy, especially the reproductive system. The image seen here is... I don't even know what's going on here.

14. Not surprisingly some of the most inaccurate science illustrations of yesteryear come from the animal world. In an era without cameras the public was left to accept the observations of explorers and other scientists. That's like illustrations like this, this, this and this all ended up in natural history and science books. This one was published in 1658. The unicorn is described as having a

flat face, lion's mane, cloven hooves in the front and chicken feet in the back.

15. Like Da Vinci, Carolus Linnaeus is remembered for his huge contributions to science, especially the classifications system we still use today, but he made some mistakes. Especially when it came to illustrating apes. I'm not sure what we're looking at here, but it was published in 1758 and it is neither an ape, or a man, or really anything that has ever existed.

Thanks for watching Mental Floss on YouTube. It is made possible by all of these people. They're really nice. Today's question comes from Lawsuitup who asked: 'Why do we get a brain freeze?' It has to do with the anterior cerebral artery. When the upper palate of the root of your mouth encounters something cold the artery constricts, and that constriction causes the pain known as a brain freeze. If you have a mind-blowing question, leave it in the comments below and we'll pick one to answer next week.

I am Michael Stevens from the channel Vsauce and as always thanks for watching and don't forget to be awesome.