

LITTLE BOOKS OF  
BIG FACTS

# PHYSICS

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*Heat*



*Liquid*



## What is physics?

The field of physics is about understanding matter and energy and how they interact.

*Solid*



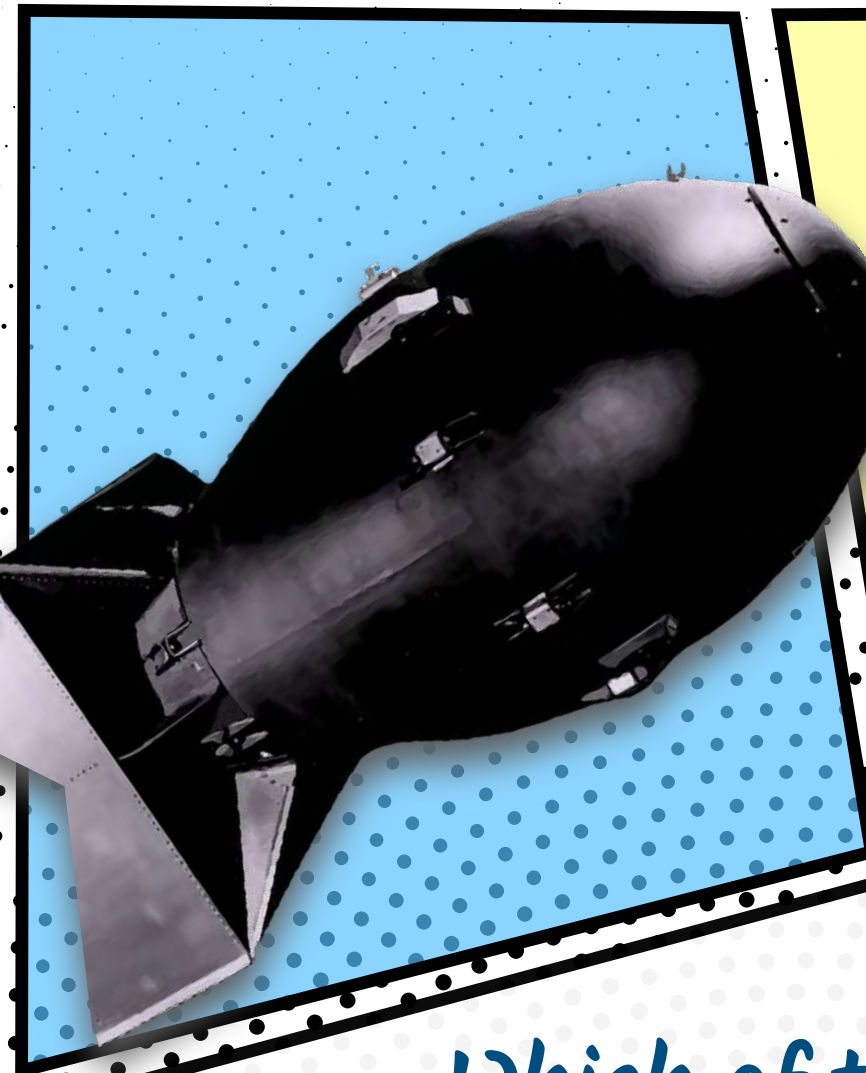
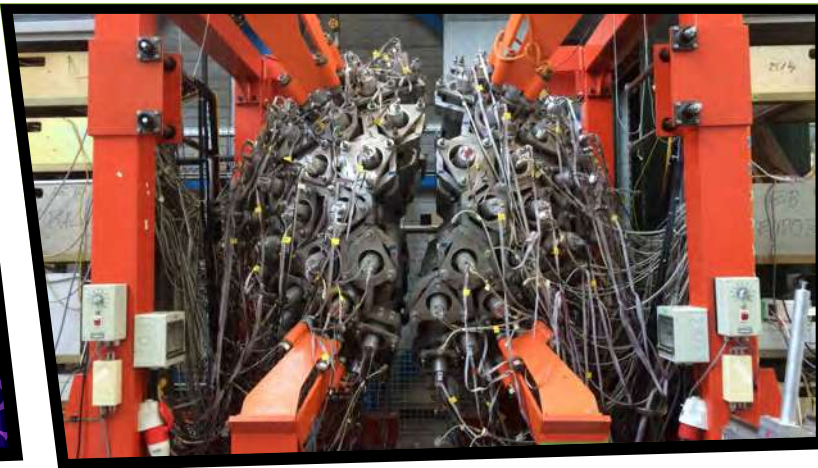
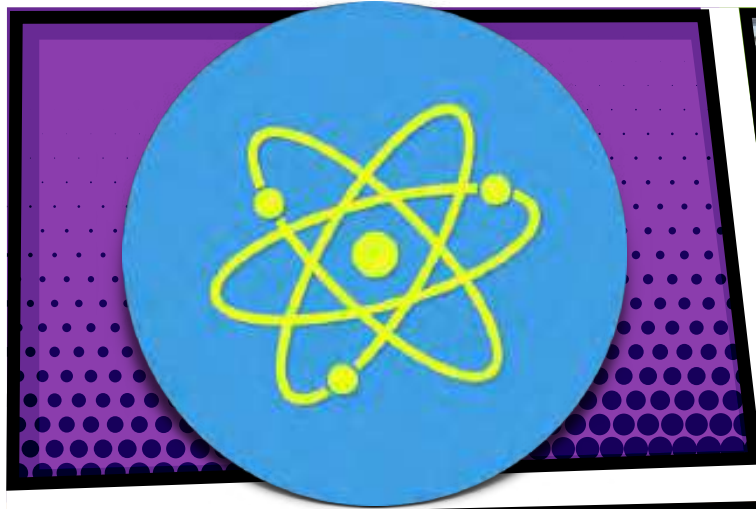
Matter is all things that take up space, which includes all liquids, solids, and gases. Energy is something that can be transferred between matter, like heat. Work happens when energy is transferred from one bit of matter to another.



*Do you think that light is matter or energy?*

Light is a form of energy.

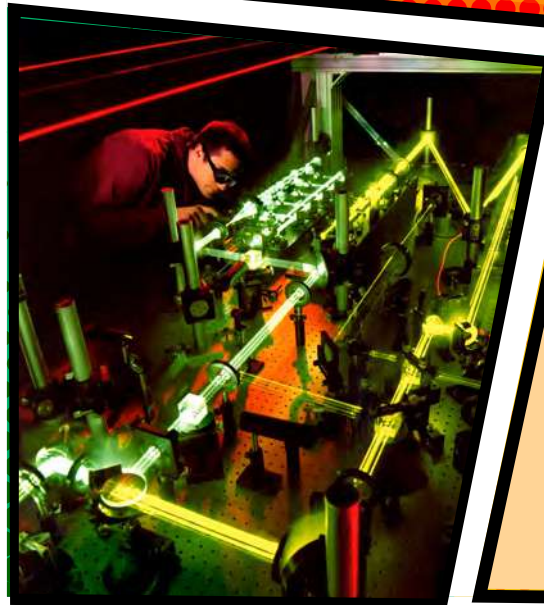




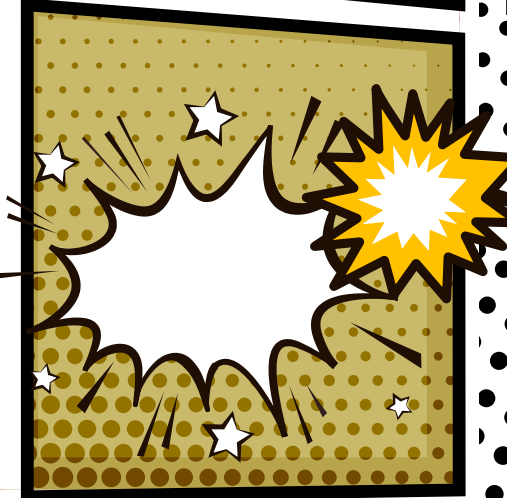
Some of these things, like bombs, have been destructive. Other research has revealed things about our universe and helped us to improve technology.

**What is an atom?**

It is a unit of matter. Different elements have atoms with different structures. ★



Understanding the structure of atoms has helped us to do amazing things.



*Which of these are made up of atoms: your bones, water, our atmosphere?*

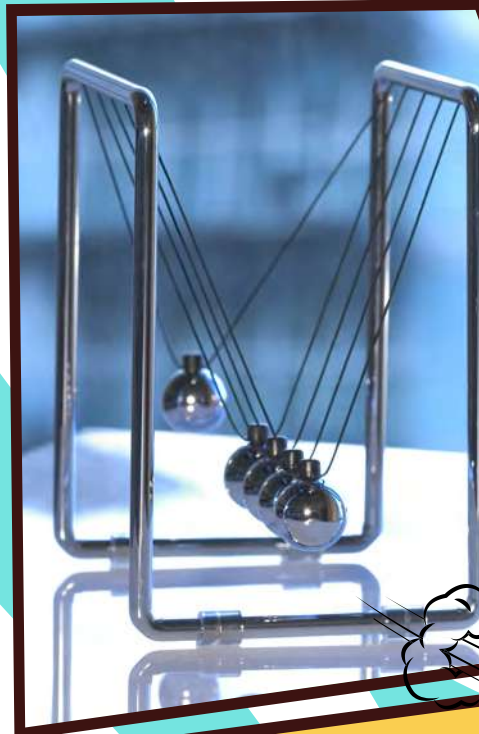
All of these things are made up of atoms!





# Why are time, mass, and distance important in physics?

If physics is all about the ways that matter interacts and how energy transfers between this matter, we need ways to record energy transfers and transformations.



By observing time, mass, and distance in physics experiments, we can calculate the work that is done, the energy that is transferred, and how it transforms.



*What is the difference if you lift the first ball of Newton's cradle a little or a lot?*

How far you lift the first ball changes the work that it can do and the energy that is transferred. If you lift the ball a little, it gently taps the others. If you lift it a lot, it sends the end ball flying.



# What are heat and work in physics?

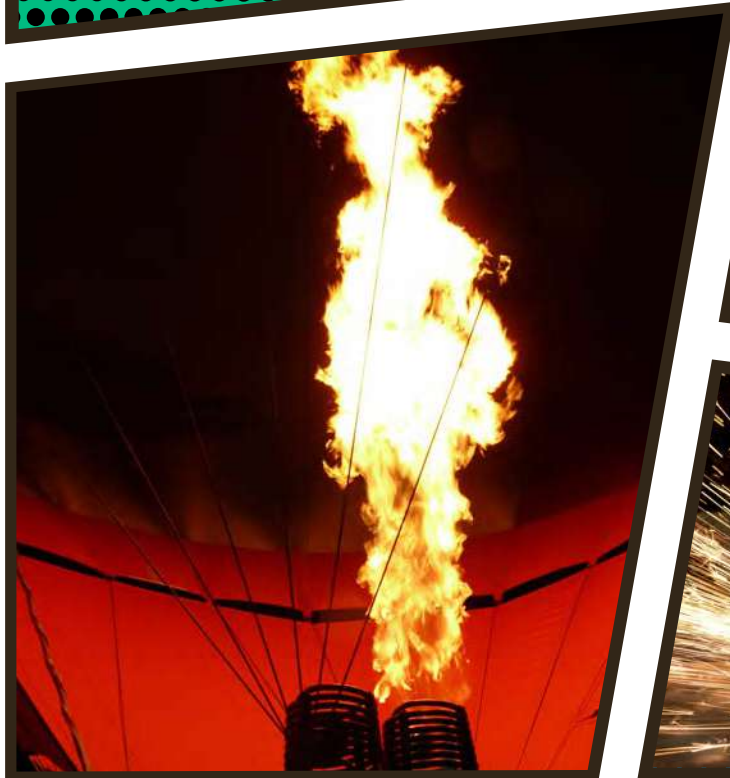
Heat and work are forms of energy transfer.

Heat is transferred from one bit of matter to another, from hot to cold, like how you can be warmed by a hot water bottle.

Work is all about when something is moved by force, such as bike pedals. Heat can be transferred to work, and work can be transferred to heat.

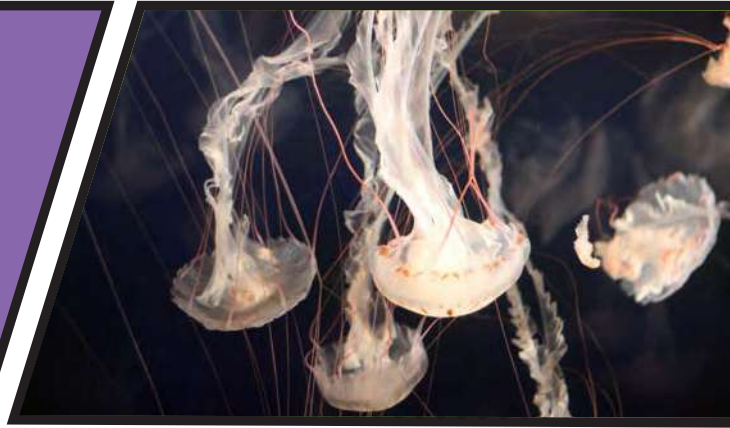
*When you rub your hands together, is heat causing work or is work causing heat?*

Work is transferring to heat.

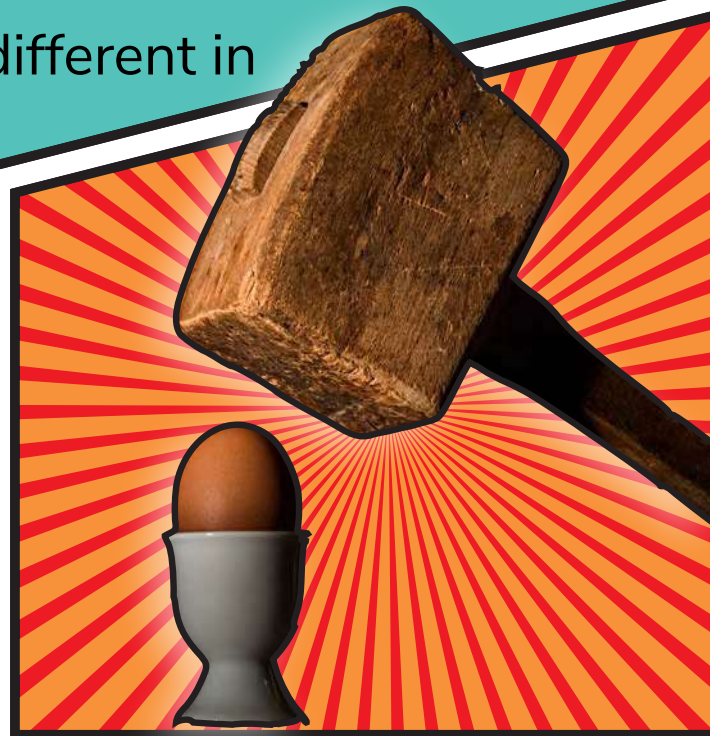




# What are forces?



They affect objects in different ways, depending on things like mass. The power of the force also changes the outcome. One very important force is gravity. We track gravity by the mass of something, how it speeds up as it falls, and how this is different in other environments.



## *Why can some things float in water?*

Only things with a mass denser than water will have gravity drag it down.





# How do we see light and color?



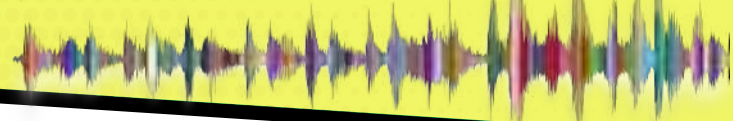
## Why can't you touch a rainbow?

Physics also helps us to understand how light works, including how we see colors. When we see colors, our eyes are catching different wavelengths of light. The wavelengths range from short to long. Different objects absorb and reflect different wavelengths, and this is why we see things as different colors.

It is made up of light reflecting off mist. The mist is matter, but the light is not.

# How do we hear sound?

Just as our eyes pick up wavelengths of light, our ears pick up waves of sound. They start from the vibration of an object and are picked up by our ears.



Understanding how sound works has let us make different instruments and music.



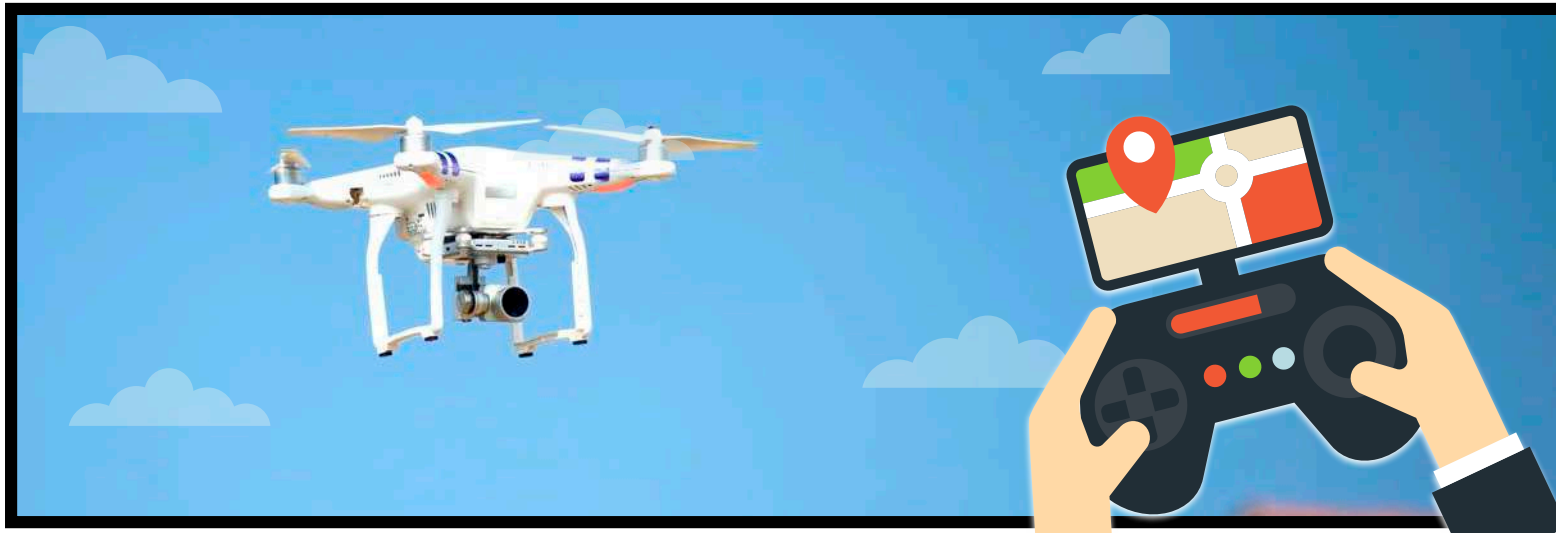
*How did Beethoven continue to compose music after he went deaf?*  
Beethoven worked with vibrations.



It also lets us understand how sound affects us, other animals, and plants.







**What does physics have to do with computers and other machines?**

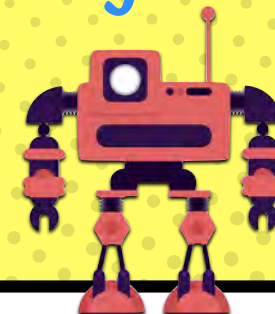


Physics has also been important as we have made computers, video games, and robots. Not only does physics explain how technology is powered, an understanding of it lets us keep improving our machines.




Knowledge of energy transfer lets us make machines that can do faster and more complex jobs.

*Why do we do physics tests on robots?*



We need to see how well a robot can interact in our world.



A close-up photograph of an astronaut in a white space suit floating in space. The astronaut's gloved hand is visible, and the Earth's blue and white clouds are in the background. The astronaut's helmet is reflective, showing a distorted view of the surrounding environment. A patch on the suit sleeve reads "NOWAK LINDSEY KELLY".

# What parts of physics can be explored in space?

Physics doesn't just apply to our planet, but to everything in our universe. Physicists explore changes in gravity, find new planets by looking at light from stars, and even think about things that we cannot yet understand - like black holes and dark matter. There is a lot of work to do, but it is fascinating.

*Why is our gravity different to other planets in the Solar System?*

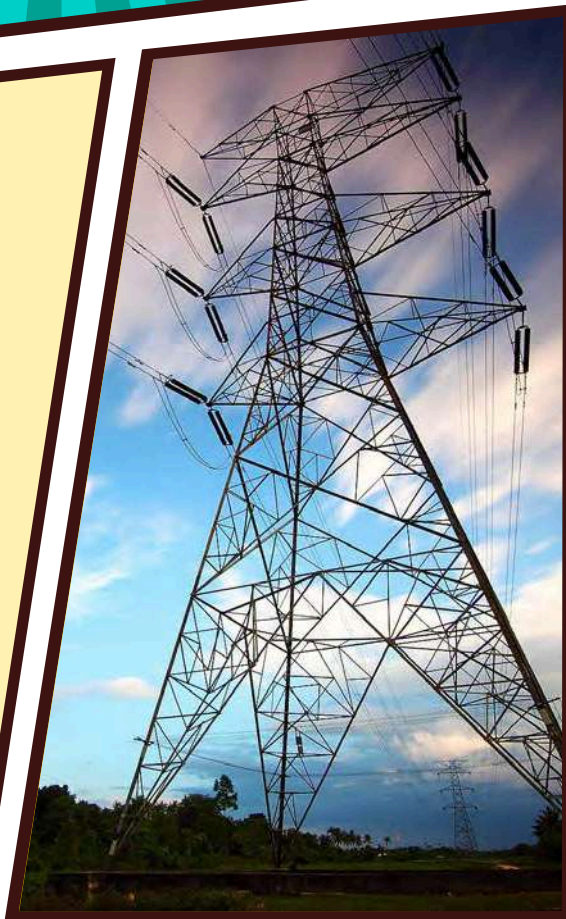
The mass of a planet affects the gravity on it.





# How can physics help us with power and energy?

Physics also helps us understand how we can turn things in our environment into energy, how things are powered, and how much energy different homes, cities, and countries use or need.

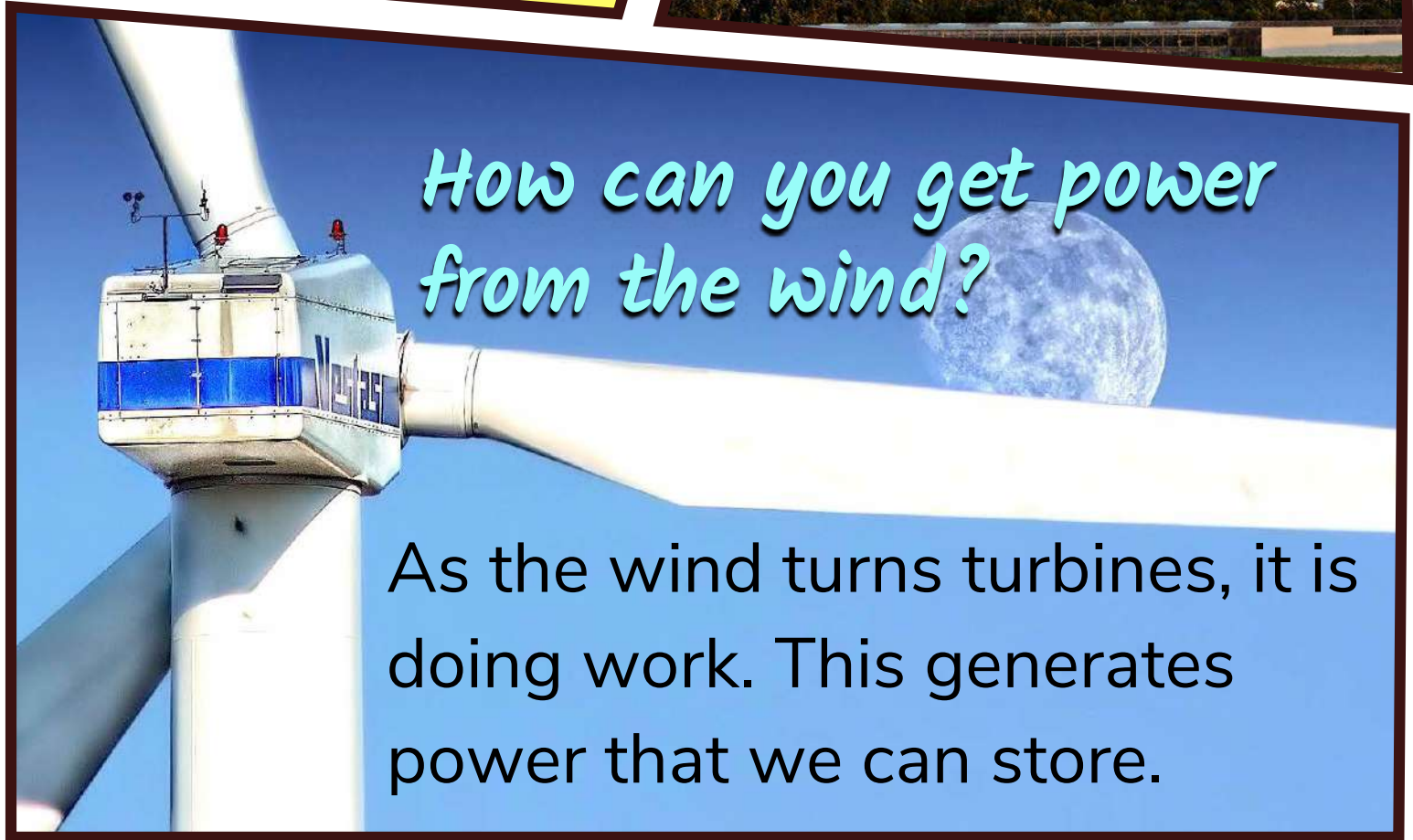


Now that we are running out of fossil fuels to make electricity, physics is also helping us to find new ways of making power with renewables.



## *How can you get power from the wind?*

As the wind turns turbines, it is doing work. This generates power that we can store.

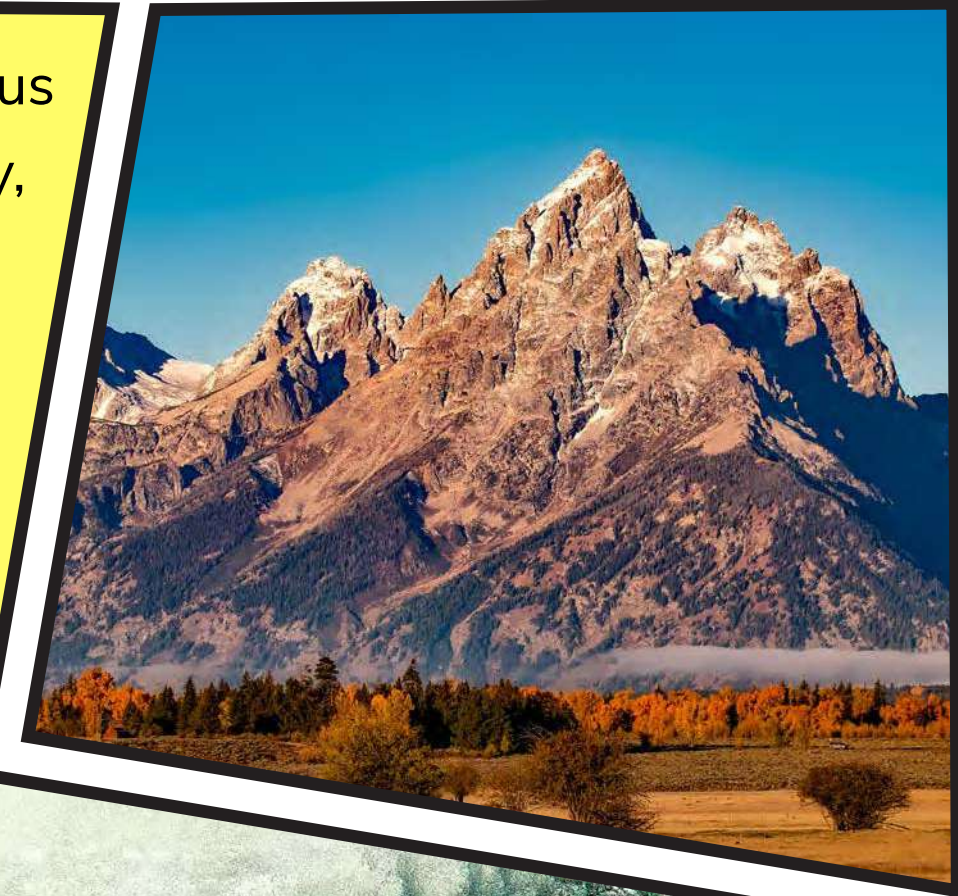




# Why can natural forms and disasters be explained by physics?



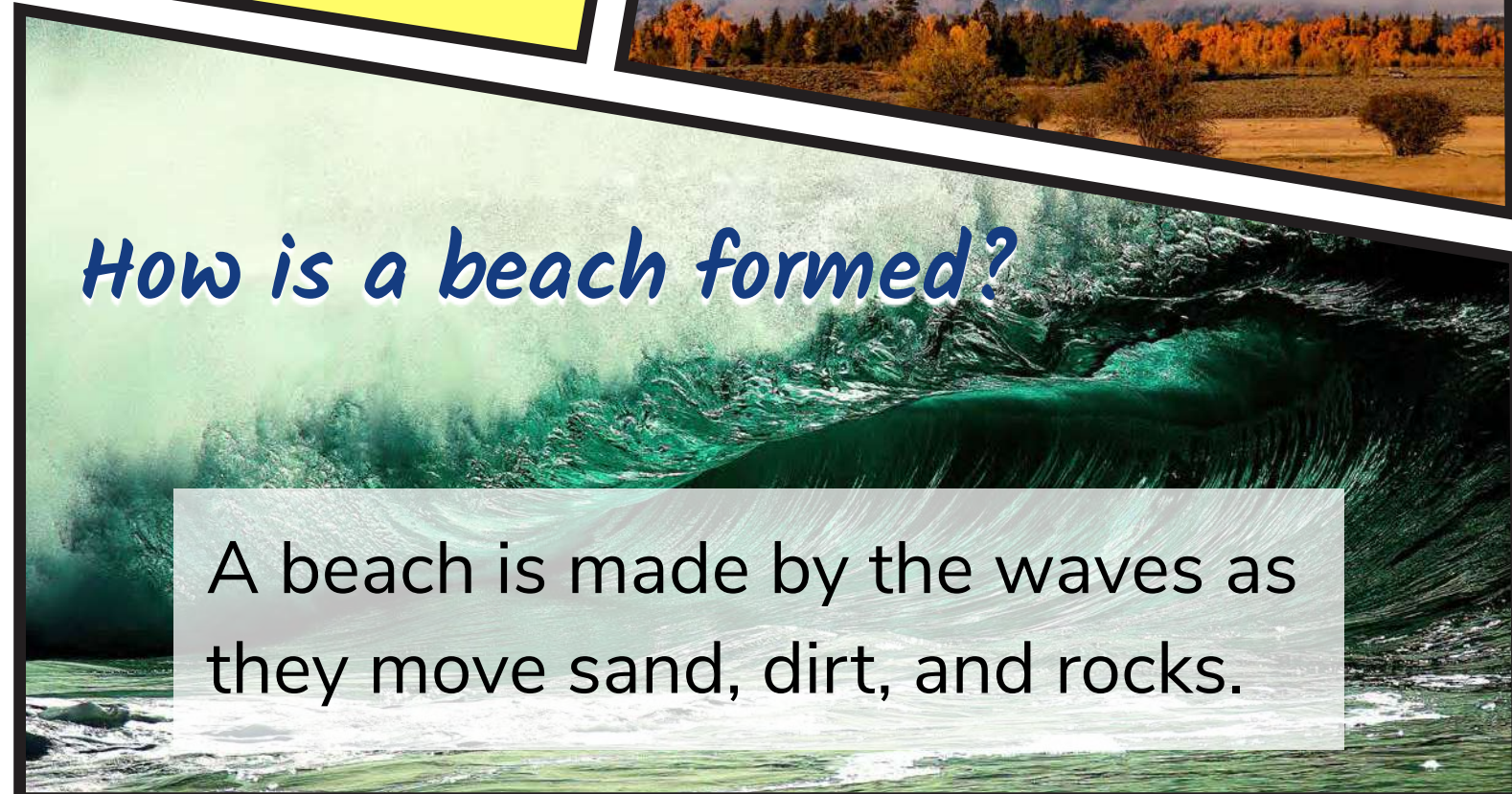
Physics can also help us to understand geology, such as how our landscapes were formed and how they might change with time.



We can also understand natural disasters like earthquakes and tropical storms with physics by predicting how severe these disasters will be and when they might occur.

## *How is a beach formed?*

A beach is made by the waves as they move sand, dirt, and rocks.





# What will physics do in the future?



There are endless things to study in physics. From energy efficient structures and engines to advances in medical science, our understanding of physics will make new and wonderful things a reality.

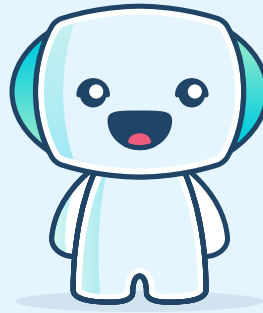
Just imagine all of the amazing things you might see in a lifetime.

*What is a good way to hear about what is happening in physics?*

Reading science and technology news can keep you informed.







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