



**A GREEN  
NOTE**

A MESSAGE TO CHILDREN  
BY DR R K PACHAURI, CHAIRMAN  
INTERGOVERNMENTAL PANEL  
ON CLIMATE CHANGE  
JOINT WINNER OF THE  
NOBEL PEACE PRIZE 2007

*How Come  
How So?*

**THAT'S HOW**

**M** **Y** **S** **T** **E** **R** **I** **O** **U** **S**

**e** **v** **e** **n** **t** **s**

**o** **c** **c** **u** **r**

the mind-boggling natural phenomena



Terrapin

## A note from Dr R K Pachauri

**H**uman society has reached a stage of prosperity, which was not expected several decades ago. Yet, we have a large number of people living in poverty and barely able to keep alive. It appears that they have not been touched by human progress at all. At the same time, what we regard as progress has resulted in damage and destruction of our natural resources and caused serious problems such as human-induced climate change, which threatens all forms of life in the form of sea-level rise, heatwaves, floods, droughts, and melting of glaciers in different parts of the world.

All of this provides a strong reason for us to change the way we have been pursuing human activities and what we have mistakenly believed as human progress. For instance, we must now use renewable sources of energy, eco-friendly methods of production and consumption, make efficient use of water in every activity, and protect biodiversity.

It is in the hands of the children to try to change their own lives towards greater protection of the environment and all our natural resources. They can also take active part in changing the thinking of adults. Children can take a lead in organizing actions at the community level, which support conservation of resources, recycling of waste water, and greater use of renewable sources of energy.

This series of children's books is aimed of providing children knowledge on what needs to be done in all these areas. I hope those who read these books will not only enjoy them greatly but also feel inspired to implement actions that are described in these pages, so that we create a beautiful, peaceful, and healthy future for the human race.



**R K Pachauri**

Director-General, TERI

Chairman, Intergovernmental Panel on Climate Change

How Come  
How So?



THAT'S HOW



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Tel. 2468 2100/4150 4900, Fax: 2468 2144/2468 2145

India +91 ■ Delhi (0)11

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**Author:** Rekha Shipurkar

**Publishing Head:** Anupama Jauhry

**Editorial and Production Teams:** Ekta Sharma,  
Himanshi Sharma, Pallavi Sah, Yoofisaca Syngkon  
Nongpluh; Aman Sachdeva, Mahfooz Alam

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Chowdhury, Santosh Gautam, Rajiv Sharma, and  
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**Image Researcher:** Yukti Garg

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|   |           |
|---|-----------|
| <b>How does a rainbow appear?</b>                       | <b>6</b>  |
| <b>How does quicksand form?</b>                         | <b>8</b>  |
| <b>How are mud volcanoes formed?</b>                    | <b>10</b> |
| <b>How does ball lightning occur?</b>                   | <b>12</b> |
| <b>How is a mirage formed?</b>                          | <b>14</b> |
| <b>How do we see the will-o'-the-wisp?</b>              | <b>16</b> |
| <b>How does a whirlpool swirl?</b>                      | <b>18</b> |
| <b>How do leaves change colour in autumn?</b>           | <b>20</b> |
| <b>How do the polar skies light up at night?</b>        | <b>22</b> |
| <b>How do eclipses occur?</b>                           | <b>24</b> |
| <b>How do shooting stars appear?</b>                    | <b>26</b> |
| <b>How does St Elmo's fire set the sky aglow?</b>       | <b>28</b> |
| <b>How are blue holes formed?</b>                       | <b>30</b> |
| <b>How do geysers and hot springs occur?</b>            | <b>32</b> |
| <b>How do sand dunes sing?</b>                          | <b>34</b> |
| <b>How do objects defy gravity on mystery hills?</b>    | <b>36</b> |
| <b>How does it rain fishes and frogs?</b>               | <b>38</b> |
| <b>How does a day last for six months at the poles?</b> | <b>40</b> |
| <b>How do birds block out the Sun?</b>                  | <b>42</b> |
| <b>Let's make a rainbow</b>                             | <b>44</b> |
| <b>Index</b>  | <b>46</b> |

# How does a rainbow appear?

Ever seen a rainbow in the sky? It looks like a beautiful band of coloured ribbons, curved like a bow.

## How it happens

A rainbow appears only when raindrops are present in the sky on a sunny day. Sunlight may look white, but it is actually made up of rays of different colours – red, orange, yellow, green, blue, indigo, and violet. In air, these different colours stay together so that we see only white-coloured sunlight. But something happens when sunlight passes through raindrops. The different coloured rays in the sunlight get separated as they pass through the tiny drops of rain! Because of this, the white sunlight breaks up into bands of different colours – violet, indigo, blue, green, yellow, orange, and red (VIBGYOR) – and we get to see a lovely rainbow!

Sun

White light  
from the Sun

When light from the Sun enters a raindrop, it refracts, or bends, and separates into its true colours. It refracts again when coming out of the drop.

Eyes of the observer



Different colours in the light bend at different angles. For instance, red light waves bend at an angle greater than violet light waves. When these bent light waves appear together, they form an arch, making a rainbow.

Colouring  
the sky.



## Spotting rainbows

So, why can't we see a rainbow every time it rains on a sunny day? Well, we can see a rainbow only when the Sun is shining behind us, and it is raining in front of us. We then get to see the rainbow on the opposite side of the Sun.

Not only that, we will be able to see the rainbow only if the Sun, the eye, and the centre of the rainbow's curve are all in a straight line! This straight line can't be formed when the Sun is right above our heads. That's why we only see rainbows in the early mornings or late afternoons, when the Sun is much lower in the sky and we can turn our backs to it.

Rain drop

Rainbow

## The direction decides

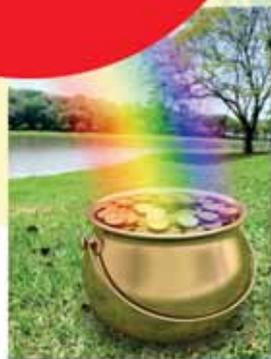
A morning rainbow appears when the Sun shines in the east, and the rain falls in the west; and an afternoon rainbow appears when the Sun shines in the west, and the rain falls in the east.

Looking for the pot of gold?



## COLOURFUL STORIES

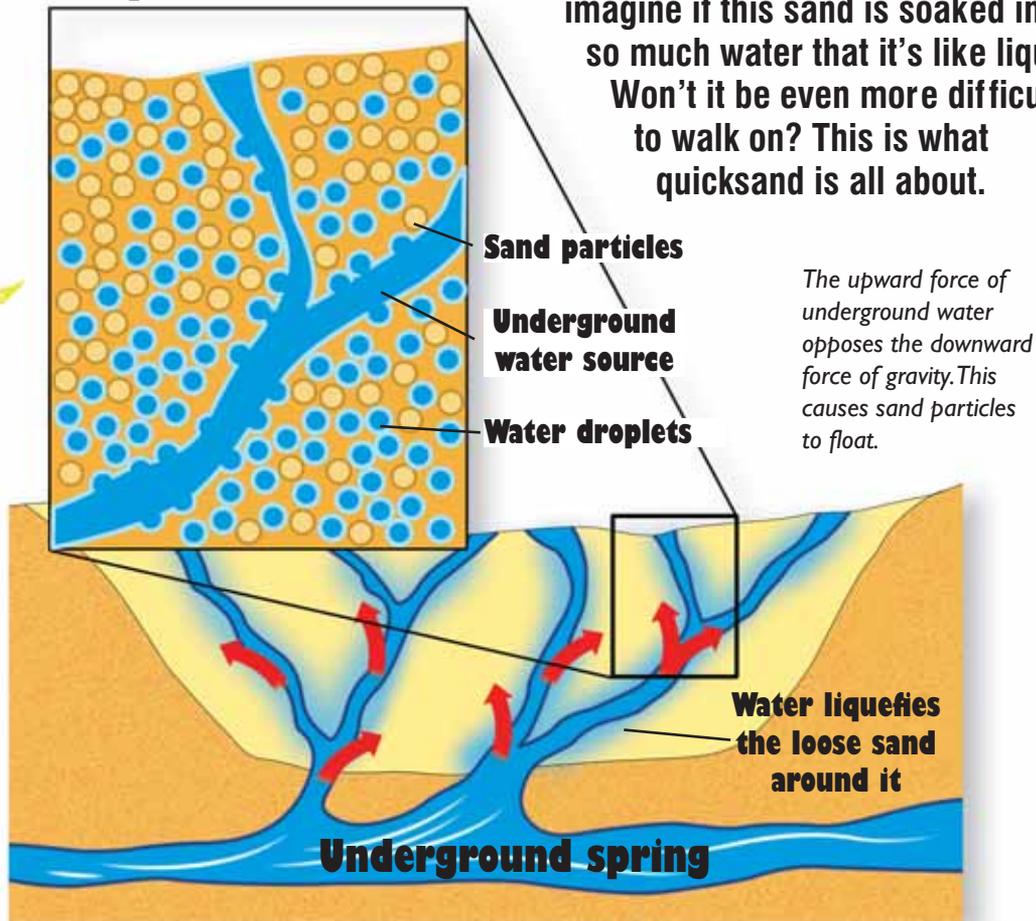
The Greeks believed that a rainbow was a sign from the gods to foretell war or heavy rain. The Irish believed that you could find a pot of gold at the end of a rainbow!



# How does quicksand form?

Have you ever walked on a sandy beach? If you have, you will know how your feet tend to sink into the sand, making it difficult to walk. Now, imagine if this sand is soaked in so much water that it's like liquid. Won't it be even more difficult to walk on? This is what quicksand is all about.

## How quicksand forms



## What is quicksand?

Quicksand is not a special kind of soil; it is just ordinary sand or some other kind of grainy soil that has mixed with water and become like a liquid paste. It is called quicksand because the sand is very “quick” to move, or shift, when it is in this semi-liquid state. In short, quicksand is a mushy mixture of sand and water, which can't support any weight for long.



I'm not that scary!

Marshes with quicksand look like a perfect setting for a scary movie, but quicksand is not dangerous.

## Where is quicksand found?

Quicksand can occur almost anywhere, as long as sand and water are present. However, there are certain areas where it is more common – river banks, beaches, lake shorelines, and near underground springs and marshes. But quicksand is not found in all these places all the time. It forms only when water collects in the sand and does not drain away.

I'm not sinking, I'm floating!

## Is it dangerous?

No, quicksand is not dangerous. If you step on quicksand, it won't suck you down, as horror movies would like you to believe. You won't sink and disappear out of sight as soon as you step on it. However, the more you struggle to

try and free yourself from it, the deeper you'll sink! In fact, if we lie very still, we will float instead of sinking. Since quicksand is denser than your

body, you can float on it.

The important thing is not to panic and move slowly, so as to give the sand time to flow around the body. Once it does this, it will act like water and you can float to safer grounds!

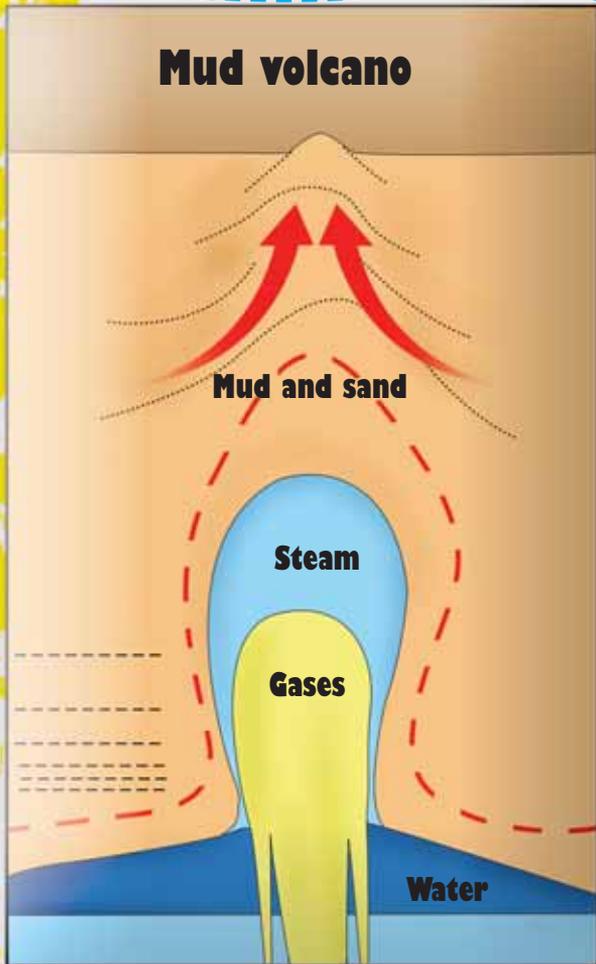
## Did you KNOW?

Quicksand has a density of about two grams per cubic centimetre, and the human body has a density of less than a gram per cubic centimetre. The differences between these densities allow the human body to float on quicksand.



# How are mud volcanoes formed?

What comes to mind when you think of volcanoes? Eruptions of burning lava, isn't it? Surely you wouldn't want to be anywhere near them. But there is one kind of volcano you wouldn't mind being next to – the mud volcano.



*Mud volcanoes are channels for releasing pressurized gases and water. Mud and sand beneath the Earth's surface are squeezed upwards and thrown out.*

volcanoes. They may be close cousins of magmatic, or normal, volcanoes. Most mud volcanoes are quite safe to visit, but a few, called “fire mountains”, can suddenly erupt just like normal volcanoes! They spew out huge amounts of hydrocarbon gases and mud, and the gases sometimes catch fire and hurl flames to great heights.

## Volcanoes that spew mud?

Yes, these volcanoes throw up mud and gases instead of lava. You can even have a nice roll in the mud, since it is not hot; in fact, it's quite cool. Most mud volcanoes are very much like a normal volcano in their appearance and behaviour. They are actually outlets that let out pressurized gas and mineral water from the Earth, sometimes with traces of oil. They behave a lot like the pressure cooker at home, which releases steam. The mud and water are released with great pressure; and this mixture forms mounds five metres to five hundred metres high!



## A distant cousin!

Mud volcanoes are also known as sedimentary volcanoes or gas-oil

# How come? How so? That's how mysterious events occur: the mind-boggling natural phenomena



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