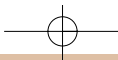
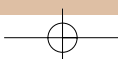


*What Lies
Beneath Your
Feet*



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Going Underground

Have you ever thought about what is going on underneath you? Under your feet, at this very moment, there is a whole world of tunnels and tubes. Inside these tunnels there are many different pipes, cables and wires which carry all sorts of things, including water, gas and electricity. In some cities there are tunnels big enough for underground railways and cars. In many parts of the world people dig mines to get coal, metal or diamonds.

There are many tunnels and pipes underground, but how do they get there? Workers can lay pipes in different ways:

- sometimes they can push a new pipe inside an old one;
- sometimes they can use a tunnelling machine called a 'Mole' to burrow a tunnel under the ground – then they push a pipe through behind it;
- at other times, workers need to dig a trench in the road and lay the pipe inside.

Over the next few pages you will read about what goes on inside some of the different sized pipes and tunnels under your feet.



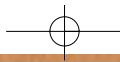
Small tunnels

Have you ever used the internet? It's a huge 'virtual world' but, to be able to use it, you need to have the correct connections. Most computers connect to the internet through telephone wires; they also need electricity.



All these wires and cables that connect the computer to the internet are found under the street. However, these cables are easily damaged so they are laid inside plastic pipes called 'trunking' to protect them. Deeper down in the earth are electricity cables that supply power to homes, shops and offices.





Many cables and wires can easily be laid in the pipes but some tunnels are too small for humans to fit inside, so a new solution has been found.

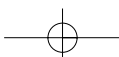
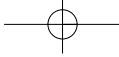
Ferrets, which are used as 'special electricians', are provided by the National Ferret Association to do these jobs. Using tiny straps, cables are attached to the ferrets. They are then encouraged to enter one end of the tunnel by putting a bit of meat at the other end.

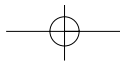
Some of these ferrets were even used to save a pop concert in London. The concert was being held in a park and the concert organisers wanted to lay power cables underground. However, digging up the grass was forbidden. So the concert organisers used the ferrets to lay TV, lighting and sound cables under the stage. This meant they could push the cables through tiny tunnels which snake about underground without damaging the grass.



A ferret ready to lay cables inside a tunnel







Getting bigger...

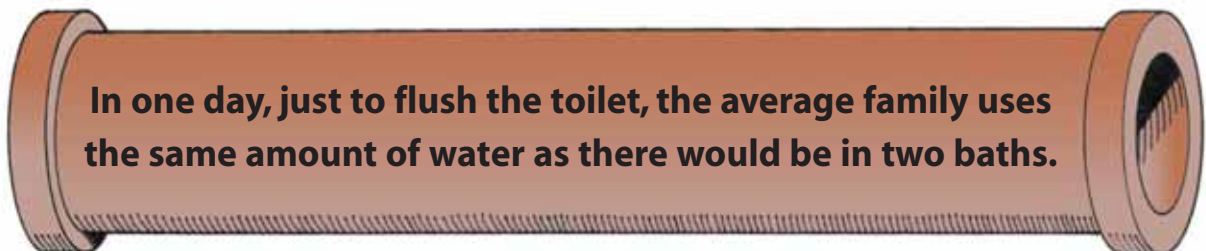
We use lots of water every day and expect to have clean running water whenever we turn on a tap. Water comes into our homes and schools along pipes under the ground and, because of the amount of water we use each day, these pipes need to be quite large. You might be surprised to know just how much water we use each day.



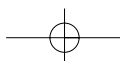
Clearly, it is very important that clean water and dirty water don't get mixed up, so different types of water flow through different pipes.

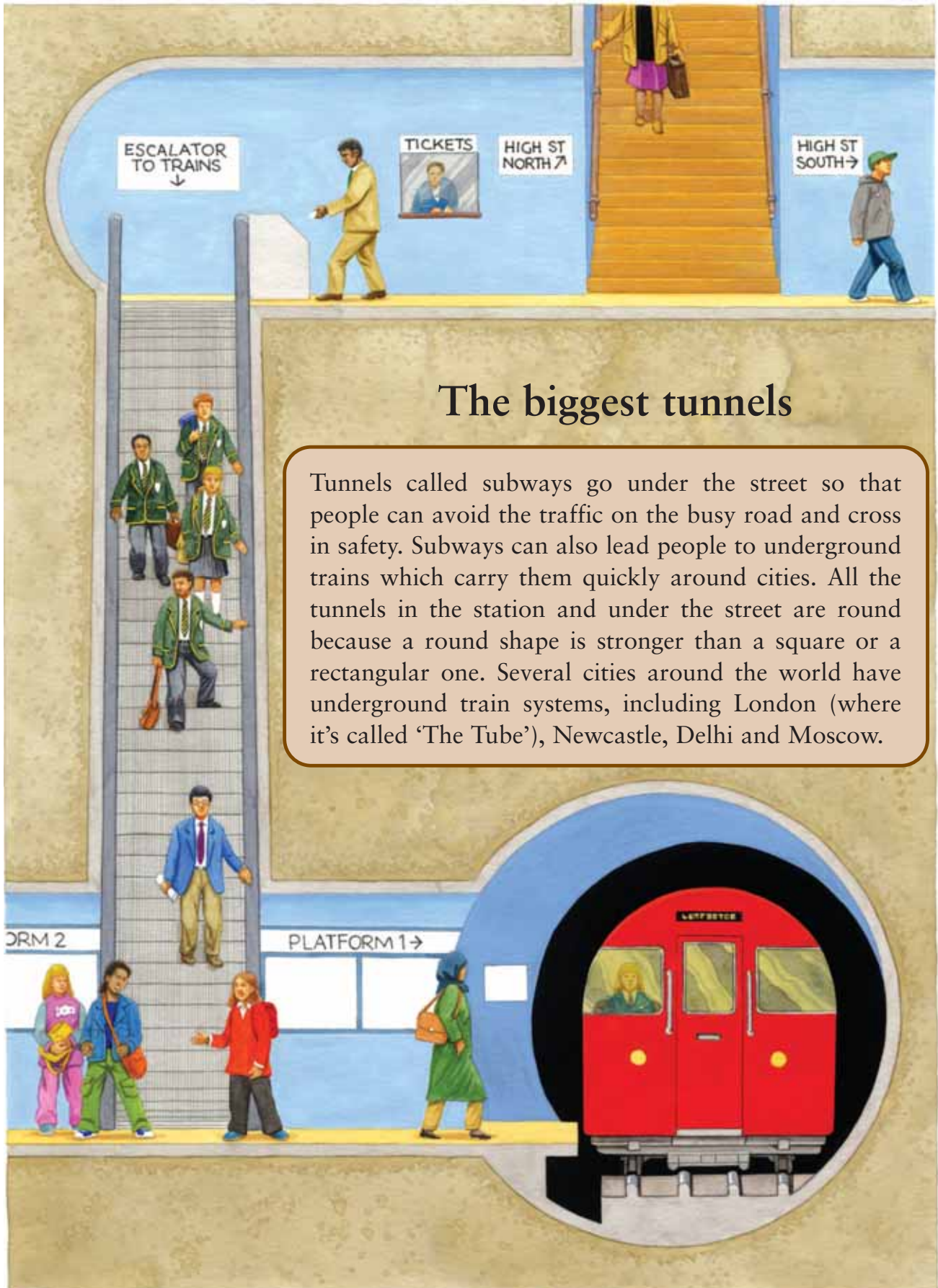
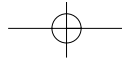


The water mains are pipes that carry clean water for people to use every day for drinking and washing. Lots more water is used for flushing the toilet and for baths, showers and washing machines. All this dirty water is carried away along the drain pipes into the sewer pipe, which then takes the water to be treated at a sewage works. The water is then cleaned. Some of it is pumped into rivers. The rest is recycled so it can be reused in our homes.



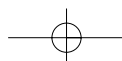
Storm water drains carry rainwater from the street into the sewer pipe so that roads aren't flooded. This water is also cleaned and returned to lakes and rivers.





The biggest tunnels

Tunnels called subways go under the street so that people can avoid the traffic on the busy road and cross in safety. Subways can also lead people to underground trains which carry them quickly around cities. All the tunnels in the station and under the street are round because a round shape is stronger than a square or a rectangular one. Several cities around the world have underground train systems, including London (where it's called 'The Tube'), Newcastle, Delhi and Moscow.



UNDERGROUND FACT

The oldest underground railway system in the world is the London Underground. Parts of it were built over 140 years ago. It opened for use in 1863, with trains pulled by steam engines.

**UNDERGROUND FACT**

Delhi, in India, has the newest underground system, which is due to be completed in 2005. It is hoped that it will ease the city's huge congestion problems and clear the air in one of the world's most polluted cities.

UNDERGROUND FACT

Moscow's underground handles nearly 9 million passengers a day, the most of any underground system. As well as being the busiest, many people think it is the most beautiful underground. There are lights made from stained-glass, bronze statues and marble columns.



Down the Mine

This is an extract from an autobiography by Homer Hickman. In it he writes about one of his childhood memories of life in a town in West Virginia, in the United States of America in the 1950s. There was a mine in the town where people dug for coal and that was where his father worked.



I was almost shaking with excitement. I'd lived in Coalwood my whole life, but had never been where Dad was going to take me. I was going down the mine!...

Dad led me to his locker and handed me a one-piece overall, hard-toe boots, a black foreman's helmet and a leather belt. When I joined him at the lift, he showed me how to clip a lamp battery pack onto my belt and the lamp on my helmet. With the lamp attached, the helmet felt heavy. I moved it around until it felt comfortable. He looked at me and readjusted my helmet and then my belt, until the buckle was squared in the front and the battery hung exactly off my right hip. I felt like a soldier under inspection. 'Now you look like a mine foreman,' he said. 'Let's go.'



The attendant swung the gate aside, and for the first time in my life, I stepped onto the wooden plank platform of the lift. I thought of all the times when I was a small child and had watched the miners descend into the darkness. Now it was my turn! I could feel my heart speed up.

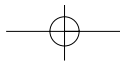
The boards in the floor were set apart enough that I could see between them. There was nothing beneath us but a dark gaping hole. I had a brief twinge of fear that we were going to fall. The bell rang three times, to let us know that we were about to be let down. I took a deep, gasping breath. The machinery began to creak and the lift dropped quickly, my stomach rising up around my throat. I grabbed Dad's arm, then quickly let go in embarrassment. He said nothing, and I watched the solid rock of the shaft slip past. Men had hand-dug the mine shaft, but I couldn't imagine how.



Through the gaps in the floor, I started to see lights far below. Above us, the square of light at the top of the shaft had shrunk to a tiny twinkling star. We were being swallowed by the earth, and I hadn't decided yet whether I liked that.

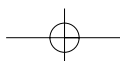
When we neared the bottom, the lift slowed, jerked a few times, and then settled level with a rock platform. I switched on my helmet light.

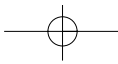




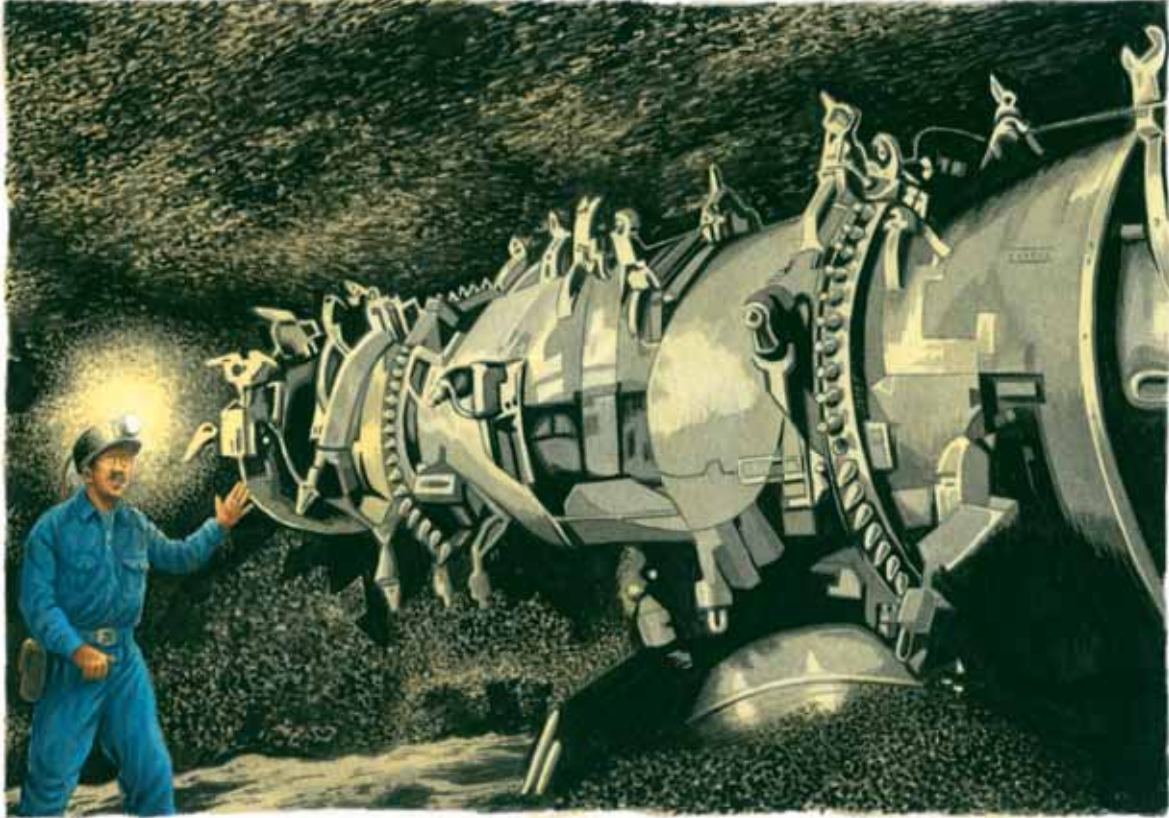
Solid grey walls surrounded us. I felt almost as if I was on some alien planet. All the things I'd ever known that were familiar to me – trees, the sky, mountains – none of them were around. The air even smelled different, like wet gunpowder.

I stood up and slammed my helmet into the roof so hard it almost knocked me to my knees. I staggered, then looked up to see what I had hit and saw slabs of rock with roof bolts jammed into them every few feet. Dad ignored my trouble and took off at a fast pace, never looking back. I took off after him, hitting my head every so often. Every time I thought I had found a rhythm to my walk, I hit my head again. Once I hit my head so hard it knocked me off my feet. I landed on my back, my helmet flying, saved only by the lamp cord attached to the battery on my belt. I scrambled after it. By the time I got my helmet back on, Dad had disappeared around a corner. I could see the jumping reflections of his lamp on a far wall. I hurried after him, my helmet still knocking against the roof. Pretty soon, he was so far ahead of me that I knew I would never catch up. I was close to panic. What if I got lost? If my lamp went out, nobody would ever find me again!





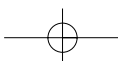
Then I heard a noise, like the mine was tearing itself apart. I felt like running away, but where would I go? I turned a corner and I saw an amazingly huge machine, spotlights bolted to its side, tearing at a wall of coal. Dad was off to the side, watching it. He saw me and waved me over.



‘That’s a continuous-mining machine!’ Dad yelled over its roar. It looked to me more like some kind of great prehistoric animal.

The noise was deafening. Dad yelled in my ear, explaining what I was seeing. Then he went to talk to the foreman of the work party. I wandered away, trying to get a better angle on watching the continuous-mining machine.

Turn over

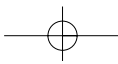
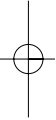
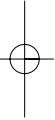
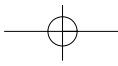


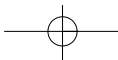
Uncle Robert came and got me. 'That's not a good place to stand,' he said. He carried a three-foot wooden pole with him and used it to poke at the ceiling. A big, ragged rock came loose and hit the floor with a heavy *thump* right where I had been standing. I jumped and whacked my helmet once more against the roof. Uncle Robert chuckled. 'A man has to be thinking every second down here, Homer.'

Soon Dad led me back to the lift. I was thinking about all that I had seen. Then Dad suddenly started to talk. 'I love the mine,' he said. 'I love everything about it.'

I listened, amazed that he would share such thoughts with me. I felt proud, grown-up. Dad took off his helmet and rubbed his head, scratching around it where the sides of the helmet had pressed in his hair. 'I love going to the coal face. I go every day even though I don't have to. I was born to lead men in the profession of mining coal. You're my boy. Maybe you were too.'







Acknowledgements:

'Down the Mine' adapted from *October Sky* by Homer Hickman, Fourth Estate.

Photograph of Delhi (page 9) by Ali Sewell.

Photograph of Moscow's underground (page 9) by Bee Flowers.

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