

What are clouds made of?

CHAPTER 1

It was a hot day, but Natasha and Marc were cold! They were at the beach, lying on their backs, staring up at the sky, and watching a bird soaring back and forth. They had just come out of the water and were waiting for the sun to dry them off.

"Where does the water go when we dry off?" asked Natasha. She was always asking questions.

"It doesn't go anywhere," her brother Marc said. "It just disappears."

"It can't just disappear!" said Natasha, frowning. "Things don't just disappear."

"What about that rabbit?" asked Marc.

"What rabbit?"

"The one that disappeared into the hat when the magician waved his wand at that show."

"That's different," said Natasha. "That was magic."

"Well, maybe the water disappearing is magic, too."

"I don't think so," said Natasha. "Mom said that magic isn't real."

"You never know," said Marc with a knowing look. Actually, he wasn't sure where the water went, but he didn't want Natasha to think he didn't know something as simple as that.

To change the subject, Marc said, "That cloud looks like an elephant!" He pointed. "See, that's its trunk and that's—"

"What are clouds made of?" asked Natasha.

"Cotton candy," said her brother, with a sigh. Natasha's questions could be awfully annoying sometimes!

"Are you sure?" said Natasha, doubtfully. "You mean like we had at the fair?"

Marc was just about to tell Natasha to quit asking all these dumb questions when a shadow fell across them both. Turning his head to one side, he saw a tall lady standing over them.

"I wouldn't be so sure about that," said the lady, "though I do admit that some clouds look like cotton candy."

What do you think clouds are made of?

CHAPTER 2

Marc and Natasha sat up. They squinted into the sun to see the tall lady who had spoken to them.



She was dressed very strangely. For one thing, she didn't have a swimsuit on like everyone else on the beach. Instead she was wearing a long purple dress that reached all the way down to her ankles. She wore an enormous hat and big, dark sunglasses, and she had a small pack on her back. But the most peculiar thing of all was her shoes. They had high heels and they sparkled in the sun as though they were made of gold!

"Where did you come from?" asked Marc.

"And why aren't you wearing a swimsuit?" asked Natasha. "And how can you walk on the beach in those shoes?" she added.

"What's the matter?" said the lady. "Don't you like my shoes?"

"Well, sure we do," said Marc, anxious not to annoy her. "It's just that..."

"I'm not wearing a swimsuit," the lady went on, "because I don't intend to swim. And I'm here because you, young man, told a fib!" She took off her sunglasses and stared at Marc with bright blue eyes that seemed to see right through him.

"What fib?" asked Marc, weakly.

"You said clouds were made of cotton candy!" answered Natasha. "I knew that sounded fishy."

"Well, if they're not cotton candy, what are they made of?" asked Marc.

"There's only one way to find out," said the lady, "and that's to go up there and see for yourselves."

"We can't do that," said Natasha. "We can't fly. We're not birds."

"No, you're not birds," said the lady. " But there are ways..."

"My name is Elvira," said the lady. "What are your names?"

"I'm Natasha, and this is my brother, Marc." Natasha was beginning to like this person. She had a feeling that if she stuck with her, she might get some of her questions answered.

Elvira said, "Very pleased to meet you both!" She shook their hands and said, "You could fly to the clouds! Oh, yes. I could teach you how! But you'd have to really, really want to. And you'd have to be very brave, of course."

Marc wasn't sure what they were getting into, but before he could say anything, Natasha piped up, "We're brave! We're brave as anything! Just show us how to fly!"

"All right then," said Elvira. "Stand up."

CHAPTER 3

"Now then," said Elvira as the children brushed the sand off their wet suits. "Hold your arms out like this. Make a 'T.'"

As Natasha and Marc did this, a curious thing happened. The sounds of the other children playing on the beach nearby seemed to fade away. So did the voices of the grownups. Even the yapping of two little dogs that were running in and out of the waves got softer and softer until they could no longer be heard. And as though a cloud were passing in front of the sun, the rest of the beach seemed to get darker somehow until it too faded away, and Natasha and Marc and Elvira were left in a little circle of sunshine all their own. It was almost as if they were the last people on Earth!

"There, that should do it," said Elvira.

"Whaa – what's going on?" asked Marc. "Where is everybody?"

"Oh, they're still there," said Elvira. "They're just not paying attention to us any more. No sense creating a sensation, you know! People are so curious!"

As she said this, Marc's shoulders started to feel itchy. It felt as though a family of ants were crawling all over them. "This is scary!" he thought to himself, but for some reason he didn't feel scared. He looked at Natasha. She didn't look scared, either. She just looked surprised. She was staring at him until her eyes nearly popped out of her head.

"You're sprouting wings!" she said. She craned her neck to look down her back. "And so am I!"

Sure enough, two little white wings were popping out from Natasha's shoulders. As Marc watched, the wings grew wider and longer. Pretty soon Natasha had the most beautiful wings he had ever seen! They looked like a bird's wings, only they were much bigger. By this time Marc's own wings had grown until they were as big as Natasha's. When he spread them out he could easily touch the ground with their tips on either side. He tried beating them up and down a few times just to see what would happen, but his feet stayed right where they were on the ground.

"What's the matter, Elvira?" he said. "Why can't I fly? What am I doing wrong?"

"You need to move your wings in little circles, not just up and down. Oh, yes!" said Elvira.

Somehow she had sprouted wings, too, while the children weren't watching, or maybe she had had them all along. "Hunch your shoulders forward when you bring your wings down, like this."

Elvira demonstrated. Slowly she rose in the air about ten feet and remained there, beating her wings and smiling down at the kids.



It took a little practice, but pretty soon Marc and Natasha could fly, too. It was great fun! They flew over the beach and then out over the ocean. They swooped down so low over the water that they got their feet wet. They tried to chase a bird, but he was too fast for them.

But it was hard work! They had to keep beating their wings in order to stay up and it was even harder if they wanted to climb. In no time at all they were out of breath and panting.

"How do the – puff, puff! – birds do it?" asked Marc. "They hardly seem – puff! – to move their wings at all."

"They use the thermals," said Elvira, who didn't seem out of breath at all. "That way the air does most of the work."

"What are thermals?" asked Marc. He didn't really care what they were, but the idea of letting the air do the work appealed to him.

"They're places where the air rises," said Elvira. "Here, let me show you." She flew toward the beach. "Let's see. They're usually found above hot places like the hot sand on the beach. Ah, here's one! Watch me!"

Elvira spread her wings way out and stopped beating them. Amazingly, she started to go up. She tipped her wings just a little and turned to the left. She kept turning and rising. It looked easy, just as though she were going up an invisible elevator in the sky! When she got to a hundred feet or so, she stopped turning and swooped down toward the children.

"Now you try it!" she said. Natasha and Marc rushed to the spot where they had seen Elvira start her climb. Sure enough they didn't have to beat their wings very much to stay up. As long as they stayed over that spot they could just keep on climbing with practically no effort.

"This is cool!" said Natasha.

CHAPTER 4

For several minutes Natasha and Marc practiced using the thermal that Elvira had found. As long as they stayed over the beach they didn't have to work very hard to climb. When they got high enough they would leave the thermal and come swooping down over the ocean. It felt just like sledding down a hill. It was really great fun and they would have kept on doing it for a long time if Elvira hadn't reminded them of something.

"Remember how all this started," she said. "Natasha wanted to know what clouds are made of."

"And you said we'd have to visit them to find out," Marc said. "Were you serious? Could we really fly that high?"

"See that cloud?" said Elvira, pointing to a small fluffy cloud directly overhead. "Those low puffy ones are called 'cumulus' clouds. I bet it's not more than a mile up. We can do it easily. Yes we can!"

A mile sounded like quite a lot to Marc, but before he could say anything Natasha and Elvira had started to climb the thermal. He followed them, wondering why Natasha seemed to trust Elvira so much. She would follow her anywhere, it seemed.

The three of them flew up and up. It hardly took any effort at all, just a nudge of their wings every once in a while to make sure they stayed inside the column of rising air. The beach below them got smaller and smaller and they could see the houses behind it and a long highway behind the houses. They had driven on that highway to come out to the beach from the city where they lived.

"Why are there ... what did you call them? Places where the air rises?" asked Marc.

"Look who's asking questions now!" teased Elvira. "They're called thermals. It's really all about energy! Energy! Energy! I love talking about energy!" Marc wondered where Elvira got all of her energy. "There are so many forms of energy in the world, and they all do work! Did you ever feel like you had so much energy that you wanted to go run around?"

"All the time!" said Marc.

"Well, running is a type of work for your body. Thermals form when some air has more heat energy than the air nearby. The air by the beach gets heat energy from the hot sand, so it has more energy than the nearby air over the water. Most people say, 'It's hotter.' I like saying, 'It has more heat energy!' With all that energy, it just has to do work, and the way hot air works is by moving up away from the earth! Isn't it amazing?"

Even though Marc didn't quite understand Elvira, he was amazed that the energy in the air was enough to lift him and Natasha so far into the sky.

Where do you think the hot sand gets its heat energy from?



As they climbed higher, the temperature became colder and colder. Pretty soon Natasha and Marc were shivering and their teeth were chattering. Elvira didn't seem to mind the cold, but when she noticed that the children were cold, she reached into her backpack and brought out two cloaks. They were made of some thin material and had holes where the wings could poke through. They were very light, but also very warm. In a minute Natasha and Marc were comfortable again.

As soon as her teeth stopped chattering, Natasha asked, "Why is it colder higher up?"

"It's like when we went up in the mountains that time," replied Marc. "Remember? There was snow all year round up there!"

"I know, but why?" When Natasha had a question she was like a dog with a bone – she just wouldn't let go till she was satisfied with the answer.

Elvira seemed to sense this. She took the time to give Natasha a good answer. "Remember how hard it was to fly high before you discovered thermals?" she asked. Natasha nodded. "So think how hard you would have had to work to make it all the way up here! It would have taken all your energy to do that, yes sir! Well, the air has to use up a lot of its energy to rise, and the energy in air is in the form of heat. That hot air down there on the beach had a tremendous amount of energy. That's how it could lift us all the way up here. But it lost a lot of its heat energy climbing and pushing us up and that's why it's gotten so cold. In fact, that's what it means for something to get cold: it has lost its heat energy."

"I love this," whispered Natasha to herself.

"Me, too," said Elvira, smiling at Natasha and Marc.

CHAPTER 5

By now they were getting very close to the cumulus cloud, which was blocking the sun and looking less and less like cotton candy. In fact, it looked vaguely familiar. Natasha was trying to think where she had seen something like this before. Then she remembered.

"It looks like a fog bank!" she said.

"A what?" asked Marc. "A bank for fog instead of money?"

"No, no," said Natasha. "Remember when we were at grandma's that time and it got foggy all of a sudden? That was because a fog bank came rolling in off the ocean. One minute it was perfectly clear and the next minute you couldn't see two feet in front of you."

"Oh yeah, now I remember," said Marc. "It was spooky!"

"Well, this may be a little spooky, too," said Elvira. "You two stay real close to me, you hear? We're about to enter the cloud. There's nothing to be afraid of. We'll just keep going up and we'll pop right out the top."

As she said this, the air around them started to get really choppy. To Natasha and Marc it felt like trying to swim in the ocean when there were lots of waves. Instead of just moving up steadily in lazy circles as they had been doing, now they were being pushed around a lot. They'd be flying nicely side by side a few feet apart and then a big gust of wind would come along and push them in different directions and they'd have to beat their wings really hard to come back together again. This went on for several minutes and then Elvira said, "Grab my hands now, we're going into the cloud!"

Natasha and Marc held very tightly to Elvira's hands. The wind was very fierce now and it was getting really foggy. Looking down, Natasha could no longer see the beach and the houses and the highway. Everywhere she looked she saw nothing but grey fog. Even Marc, who was only a few feet away holding Elvira's other hand, was beginning to disappear into the fog. Natasha's face and hands were getting wet. The wind was howling in her ears. She squeezed Elvira's hand as tightly as she could.

CHAPTER 6

"I don't like this cloud!" said Natasha.

Elvira's voice was soothing. It seemed to come to Natasha from inside her own head, cutting through the noise of the wind. "It's all right," said Elvira. "It's not dangerous. In fact, it's really interesting, oh yes!"

"Will we be in it long?" asked Marc. His voice seemed to Natasha to be coming from far, far away.

"Not very long," answered Elvira. "Cumulus clouds tend to be smaller than their tall cousins, cumulonimbus! Those clouds can go for miles! This is just a little cloud and the air is still rising inside it. We should be through it in just a few minutes."

Natasha was still a little scared, but she had to admit this cloud was indeed pretty amazing! Her curiosity overcame her fear. "Why am I getting so wet?" she asked.

"Remember your question that started this whole journey?" said Elvira. "Well, now you've got your answer."

"You mean clouds are made of water?" said Natasha. "That's really weird!"

"I knew they weren't really cotton candy," said Marc. "I was just fooling. But there's something I don't understand. If clouds are made of water, where does the water come from?"

"Aha! Caught you asking another question!" said Elvira, smiling. "It climbs up just the way we did. The rising air carries water up here, just as it carried you and Natasha."

"But I didn't see any water on the way up," said Natasha. "And water doesn't have wings. Water can't fly like a bird. That doesn't make sense!"

"Of course water can fly!" said Elvira. "Think back. What were you doing before you asked what clouds were made of?"

"We were looking for shapes," Marc remembered. "I saw a cloud that looked like an elephant, and..."

"No, before that," said Elvira. "Natasha asked a different question, remember?"

"We were drying off," said Natasha, "and I asked where the water went. And Marc said it just disappeared."

"Well, it does disappear," said Elvira. "But it doesn't go away. It just becomes invisible."

"Invisible?" asked Marc. "How does it do that?"

"When water absorbs heat energy from the sun's rays it changes from a liquid into a gas," said Elvira. "We call this change 'evaporation.' The gas is called water vapor. You can't see it, but water vapor is part of the air all around you."

How can water go from your skin on the beach to up high in the sky?



The fog that was actually a cumulus cloud seemed to be getting thinner. Looking up, Natasha could see a bit of sunlight peeking through. She was glad that they were almost out of the cloud, but she still had one more question.

"If water vapor is invisible," she asked, "why can we see clouds?"

Marc had the answer. "Because clouds aren't made of water vapor!" he said, triumphantly. "They're made of regular, liquid water! That's why our faces and hands have been getting wet."

"That's exactly right, Marc!" said Elvira. She looked at him approvingly. Marc smiled proudly.

"When the air gets cold, the water vapor in it gets cold, too," Elvira went on. "So the water vapor changes back into little liquid droplets. That's called 'condensation.' Condensation is the opposite of evaporation."

Elvira was on a roll. "You might also be curious to know that cold water vapor by itself has a hard time becoming a liquid, or I should say 'condensing,' unless it has a tiny piece of dust to cling to. At the center of each water droplet in a cloud is a tiny piece of dust."

"You mean clouds are just lots and lots and lots of little water droplets clinging to dust?" asked Natasha.

"Yes, and sometimes little bits of ice, too. You know those really high, wispy clouds? Sometimes they look like feathers? Those are cirrus clouds and they are mostly ice," said Elvira. "But I don't see any ice in this cloud. I guess it isn't cold enough."

"It's plenty cold enough for me," said Marc.

"Me, too," said Natasha.

Why can we see clouds but we can not see water vapor in the air?

Just then they popped out of the cloud. It was quite sudden. The sun shone brightly. The warmth of the sun felt good on their backs. The puffy cumulus cloud was just below them.

"You know what?" said Marc. "Even though we've just been through it and we know it's made of water, it still looks like cotton candy!"

"Notice something else?" asked Elvira. "Our thermal is gone!" Sure enough, they had stopped climbing and they had to flap their wings to keep from falling back through the cloud. "The air kept on rising and cooling until it cooled so much that it couldn't rise any more," said Elvira.

They all looked around in silence, then Elvira said, "Now that we're in this amazing place, I think you two are ready to learn a secret. If you hear people talk about clouds and you hear 'nimbo' or 'nimbus,' it means a type of cloud that makes rain," said Elvira.

Natasha wondered aloud, "You said this is a cumulus cloud. What was that other cloud you said before? Cumulo..."

Marc cut her off, "...nimbus! Cumulonimbus! I get it! It's a cumulus cloud that makes rain!"

Elvira beamed. "Welcome to the club, Marc and Natasha." Even though they usually argued, Marc and Natasha smiled at each other, but only for a second.

"How are we going to get back down?" asked Natasha, a little uncertainly. "I bet Mom and Dad are missing us!"

"Don't worry about them," said Elvira. "They won't notice a thing. As for getting back down," she went on, "we could fly down or if you two are getting bored..."

"Oh, we're not bored!" said Natasha, "It's just that..."

"I understand," said Elvira, "It's been fun, but now you'd like this little adventure to end. Of course, you would! And we can do that, too. Just hold my hands real tight and close your eyes."

Which clouds produce rain?

CHAPTER 7

There was a small popping sound. All of a sudden Natasha found that she was no longer holding Elvira's hand. The sound of the wind had gone away very suddenly, too, and in its place Natasha heard children playing and mothers calling to them not to go out too deep. She opened her eyes. She was lying on her back on the beach. Her beach towel was next to her just as she had left it. The cloak Elvira had given her was gone, though. She turned to look at Marc, who was just scrambling to his feet. His cloak was gone, too. His back was all sandy and there were no signs of wings between his shoulders.

"Where is she?" he asked. "What happened to Elvira?"

"I think she's gone," said Natasha, sadly. She checked her own back, but she knew what she would find. Sure enough, her wings were gone, too.

Marc was looking around. "Look!" he said "She didn't even leave any footprints in the sand. It's as though she wasn't real!"

"But we know she was here," said Natasha, "and we know we flew up into that cloud and got water in our faces. We know it really happened, right?"

"Uh, right," said Marc. But he sounded a little doubtful.

A drop of water hit Natasha on the shoulder. Then another one hit the other shoulder. "Children," called their mother, "it's starting to rain. Get your things together, we're going home!"

CHAPTER 8

The windshield wipers made a swishing noise as they swept back and forth. The headlights glinted off the wet road. Natasha and Marc were in the back seat of the big, dark car, talking softly to each other. Their parents were in the front, listening to the radio. They had never even noticed that their children had been gone all that time! Natasha and Marc hadn't told them what had happened. They were afraid that their parents wouldn't believe them. Sometimes they wondered themselves whether it had all been a dream.

"I'm sure it was real!" Natasha whispered to Marc. "I'm just sure of it!"

"Then how come no one noticed?" asked Marc. "We were gone a long time. How come no one missed us?"

"I don't know," said Natasha. "It was magic, I guess."

"You said there was no such thing," Marc reminded her.

"But Elvira is different," said Natasha. "She's real magic!"

"If she even exists!" said Marc, but he said it so softly that Natasha didn't hear him.

Suddenly Natasha had another question!

"Where does the water go?" she asked.

"What water?"

"The water in the clouds."

"I don't know," said Marc. "Maybe it just turns back into water vapor and becomes invisible again."

"But then sooner or later all the water in the world would end up in the air," said Natasha. "I don't get it."

Suddenly a familiar voice sounded in Natasha's head. "Look around you," the voice said. "Where do you think all that rain came from?"

Natasha looked at Marc and Marc looked at Natasha. They smiled. Natasha could tell that Marc had heard the voice, too.

"Now I see," said Natasha. "The cloud dumps its water on us and we call it rain! This could be a cumulonimbus cloud we're driving under!"

"And then the water heats up and evaporates and turns into water vapor. And then it goes up in the air and condenses and turns back into a cloud," said Marc.

"It goes round and round!" said Natasha, happily.

"The water that evaporated from our bodies this afternoon might be raining on the car right now!" said Marc, with amazement.

Their mother turned around to look at them. "What are you children talking about?" she asked.

"Oh, nothing," said Marc. "We were just wondering about clouds."

"Oh," said their mother. She had a funny expression. She shook her head and turned around to face the front again.

"And we were wondering about Elvira!" whispered Natasha. "She is real, after all!"



"I guess she is," said Marc.

THE END

What is fact and what is fiction? Make two lists and be prepared to explain your answers to the class.

First list: FACT

List everything from the story about water, clouds, and the world that you think is true.

Second list: FICTION

List everything from the story about water, clouds, and the world that you think is false.