

live properties of water and mercury, gives rise to great differences in the phenomena that the two liquids exhibit."

While Rollo's father was saying this, he observed that Rollo was dipping the pen in and out of the mercury, and was not paying much attention to what he was saying. In fact, what he was saying was rather too difficult for Rollo to understand, without attending pretty closely.

"Put the pen down a minute, Rollo," said his father, "and listen to me; and presently you may try experiments."

So Rollo put the pen down at once, and looked up at his father.

"I want to tell you what great differences there are between water and mercury, arising out of this fact, that water coheres to other things, and mercury does not. It follows from it that, if you dip anything into water, the water rises around it, and spreads over its surface; and some water comes up with it, when you take it out. But if you dip anything in mercury, the mercury is depressed around it, instead of being raised, and it does not come up with it at all, when you take it out. For the same reason, if you pour out a little water upon a table, it spreads around upon it, and you cannot take it up again. If you pour out a little mercury, on the other hand, it does not adhere to the table, but rolls about in little balls, and you can take it up clean with a spoon."

"O, let me try, father," said Rollo.

"Presently," replied his father. "Another different result is, that if you pour water upon anything that has small pores or interstices, like sponge, or cloth, or earth, it penetrates to every part, and coheres to every part, and keeps it all wet. But mercury would remain in a mass at the top, if the pores were very small; and if they were large enough to allow it to penetrate at all, it would all run off below, leaving the whole dry."

"How?" said Rollo.

"Why, if you were to make a little heap of earth and gravel-stones, with a hollow place upon the top, and then pour water upon it, it would gradually soak in, as we call it; that is, it would diffuse itself all through the heap, and make it all wet. But if you were to pour mercury into the hollow, it would either remain there without going down at all, or else, if the spaces in the gravel were great enough to let it pass down, it would all run down together, entirely through, and would not cohere to the gravel at all."

"Where would it go to?" said Rollo.

"Down as low as it could get; and there you would find it, all together, or as much together, as it could be."

"Rollo's father then took up a little of the mercury, with the tea-spoon, though it was difficult to do it; for it cohered to itself so strongly, and had so little attraction for the silver, that it seemed to be actually repelled. This, however, was owing to the fact, that the silver was not perfectly bright and clean. Rollo had been handling it, and, though it looked clean, it was really covered with a very thin and invisible film of moisture from his fingers, which kept the mercury from coming into actual contact with the metal. At length, however, his father succeeded in taking up a small portion, and he then poured it out gently upon the sheet of paper; it rolled out like a sort of liquid ball. Rollo amused himself for some time in pushing it about, and dividing it into parts with the knitting needle. He observed that when he divided it into small parts these parts were always round, like little balls; his father called them *globules*. When he brought two of these globules together, they would instantly unite into one ball, perfectly round and bright; unless it was a pretty large one, and then it was flattened a little at the top. His father explained to him that the reason why the mercury always took that form, was because the particles attracted each other strongly, and consequently they were all drawn in from every side towards the centre; and from this resulted the globular form."

"Father," said Rollo, at length, "I think the reason why the mercury does not stick to the pen and to my fingers, like ink, is because it is so heavy. When you take the pen out, the mercury is so heavy that it falls directly back again."

"No," said his father, "that cannot be the reason, because that would not prevent its spreading out over the paper, or upon the table, and cohering to that. It is true it is a great deal heavier than water, but that does not occasion these different effects. It is the nature of the substance, in not cohering to other substances. Now, there are some things that water does not cohere to."

"Are there?" said Rollo; "what?"

"Only substances, the feathers and fur of some animals, and some plants. Water rolls off from a cabbage leaf, just as mercury does from paper. So it does from feathers. A goose does not get

wet by floating on the pond; and a duck's head comes up from the mud as bright and dry as it went down."

"Yes, I have seen it, father," said Rollo.

"And so with the furs of animals that live in the water."

"Yes," said Rollo, "Jonas says that he has seen a water rat come up out of water as dry as mother's muff."

"And then, again," continued his father, "there are some substances that mercury will adhere to. For instance, if, instead of this sheet of paper, I had taken a sheet of perfectly clean and bright tin, and put a globule of mercury upon it, it would have spread itself out upon it, and wet it, as it were like water upon wood."

"But now, Rollo," continued his father, "I must go. You may play with this mercury a little while, and then your mother will put it away for me."

"Yes, but, father," said Rollo, "you were going to tell me of some terrible consequences which would come from there being no cohesion."

"Yes,—no cohesion between water and other substances," said his father rising, and standing by his chair, ready to go. "Well, I will tell you."

"First," said he, "we could never write with pen and ink; for if the water had no attraction for the pen, it would not come up from the inkstand; and then, if it had no attraction for the paper, it would not leave the pen and go to the paper when we move the pen along."

"Yes sir," said Rollo "you told me that before."

"Then, secondly," continued his father, "we could never wash any thing. Suppose, after you have been painting, some day, you wanted to wash off the paint that is left upon the saucer. You dip it into water. The water adheres to the paint and to the saucer, and when you rub it a little, the water and the paint move together, and fresh water poured on carries it all off. So, if the paint were upon a cloth, the water would penetrate among all the fibres of the cloth, and unite with the particles of paint there, and bring them out. But you could not wash anything out with mercury."

"Nor can you wash anything out with water, unless it is of such a nature that water has cohesion for it. For instance, you cannot wash out a spot of oil, because water and oil do not cohere. The water does not take hold of it, as it were. And so, if water had no cohesion for any thing but itself, nothing could be washed. Your hands would come out of it just as they went in. If it were poured upon clothes, it would all run off directly. You could not take it up with a sponge, or wet anything with it whatever."

"But, in the third place, the worst consequence of all would be this. The water is retained in the ground by the attraction between it and the particles of earth. If it were not for this, it would not remain up near the surface, but would all run down through the strata of earth to the lowest place it could get to, and leave the upper part of the ground entirely dry. After a heavy shower of rain, the earth would be as dry as before; a great part of the water would run off in little dribbling streams, like a stream of mercury; and the rest would go down through the ground at once, as a shower of shot would, through a heap of large stones. Of course all plants would die, the earth would be parched up, and men and animals famish. Were it not for this property of water to cohere to itself, and to adhere to other things, every plant and tree would wither and die for want of water in twenty-four hours, even if it were raining all the time."

"What! if it rained all the time?" said Rollo.

"Yes, every moment," said his father. "The rain would come down upon the plants and their roots, as this mercury would upon a quill top. It would roll off in globules, and not wet them at all."

Here Rollo's father began to move away, saying to Rollo that he had better observe carefully all the cases of cohesion that he might meet with, and he would tell him more about it some other time. He had, however, not gone far from the table before Rollo called him back, saying, in a voice of great interest and surprise,

"O father, see how bright your spoon is!"

His father turned round suddenly, and said, "Where?"

Rollo handed him the spoon. In the middle of the bowl, there was a large bright patch,—very bright indeed. He took it, looked at it a moment, and said, in a low tone, as if he were talking to himself,

"Why!—how foolish I was! How foolish I was!"

"What!" said Rollo. "What! What is it?"

"I might have known better than that," said his father, still musing.

"What is it, father?" said Rollo, eagerly.