

for completeness. And then, how many letters did the Romans have to express numbers? Only seven, I, V, X, L, C, D, M. If they were able to get through all their mathematics with seven little letters, we ought to be satisfied with seven beautiful inexhaustible colors. Will you promise to remember their names if I tell them to you?"

"Yes, yes," they cried eagerly.

"I learned them by a name their initials spell, it may make it easier for some of you, Vibgyor. Violet, indigo, blue, green, yellow, orange and red. Scientific men always begin their explanations with the red and run up to the violet. Perhaps because the red is the strongest. Now you know what the colors are, and I will blow a new bubble so you can see them begin to form. Compare them with those on the wall, you see they follow the same order. Harry, tell me which way do the colors go?"

"Around the bubble. I can see them very plain, they make rings," answered the boy quickly.

"Yes, they make rings, zones is another name for them, and they are called sometimes Newton's rings. Some of you have heard about Newton, who worked out wonderful things from the fact that an apple fell to the ground, instead of out into the air somewhere, when it shook off from the tree. After this you can remember something else about this great man who lived years and years ago, remember that he blew soap bubbles. He used to spend a great many hours doing just what we are doing this afternoon, not when he was a little boy, though for that matter we do not know what he did when he was a boy, but when he was a grown man, he blew soap bubbles. What do you think for? Just to learn all he could about this wonderful light, and these seven colors into which it can be dissolved. From his discoveries other men have gone on working out truths, till they can tell you just how much light is in every color. And on this bubble they could tell you just how thick each color is. Now is that not worth blowing bubbles for?"

They all agreed that it was. "Is not the bubble all the same thickness?" asked Edna Strong.

"No. It is thicker at the bottom, all the time, for it stretches or grows thin from the top. A beam of light strikes it here on this side, watch my bubble carefully, and you will see the color immediately appear, in little bands or rings. If the bubble was all one thickness it would be all one color, but it is variable, and each part of it is constantly varying, so these little bands sink downwards, and new ones constantly appear finer and finer at the top; finer, because the film is growing so much thinner, till at last a plain gray tint begins to show, in faint streaks, and then the bubble bursts. The scientists have found a way to stretch the molecules of water beyond the grey film, but the soap bubble will not bear any more pressure. But the grey film is only four millionths of an inch thick, so you can get an idea of how little there is of it to break."

He made the children all blow bubbles, and trace out the colors for themselves, and then when they were ready to hear more about them, he continued:

"You have all watched waves rise and fall on the water; on similar waves of ether, or you will understand better if I say air, sound travels up to your ears; and on similar waves light reaches your eyes. Sound travels at the rate of 1,100 feet a second. Light goes 192,000 miles a second. This light, beside holding these bright colors, has considerable heat. So, when it is separated, each color has heat of its own. The violet has the least, the red has the most. Some one of you tell me what black or blackness is?"

"It is no color," answered one of the boys.

"It is no color to your eye, because it is greedy; when the light with all the beautiful colors falls on it, it absorbs them all and gives nothing back. I do not know that I have told you that the color we attribute to objects, is the color they reflect back, that is, will not absorb. This piece of red cloth keeps all the other colors and rejects red, and we only see the color it throws out. Watch, while I put this black paper on the colors of the spectrum, it quenches them all. Now I will put the red; in the red it is brighter, because it throws all the more red out to us; in the blue or green it is black. In this way you get an idea of what black is. It is rather selfish, for it keeps all the light bestowed upon it to itself."

"What is the bubble any way, Mr. Will?" asked little Kitty, with her dark, solemn eyes opened wide with wonder.

"It is a delicate film of soapy water, into which we have blown air. I will make some in this tumbler, and you can see the little cells fill with air, pushing each other up and out of the way. I draw out the pipe and you see this film over the end of the bowl. If you look carefully a moment you will see all the colors come and go in bands, the same as they would be on the bubble, should I blow some air through the