

Two Boys and a Can of Coca-Cola

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Fred is a physics student who is not allowed to drink Coke at home. But he loves it! So, he invents a trick to fool his parents. He puts a can of Coke on the ground under his second-floor window. Then he takes a long, rigid straw, opens the window, and sips Coke through the straw.

“That’s cool,” said his physics classmate Jeff. “I’ll use this idea!”

“It won’t work for you because you live two stories higher,” said Fred. “Let’s go to my place and drink it together.”

“Hmm ... But if I create enough sucking power,” insisted Jeff, “I’ll be able to drink it from my apartment.”

In response, Fred offered an argument based on an analogy with a mercury barometer. He showed Jeff the section in their physics textbook^{1,2} having to do with the height of a liquid column that can be supported by atmospheric pressure. “Look,” he said, “no amount of sucking power will create a column of water higher than around 10 meters: Your window is more than 12 meters above the ground. Jeff, the Coke is simply beyond your reach.”

Fred’s proof was quite convincing, and it took Jeff quite some time to come up with an idea that would work. His solution was based on pure physics and he intended indeed to sip Coke through a long tube (straw) from a can standing on the ground beneath his fourth-floor window.

Although narrow enough, the tube can’t be considered a capillary. Jeff achieves his goal using only the straw, his hands, and his head. The task is performed from his window, without help from anyone else. And to dispel your skepticism, this was accomplished in New York, not in the Land of the Lilliputians. Can you figure out what his solution was?

Solution:

Jeff’s idea was triggered by his recollection of the funny transportation system that he had seen at Niketown — a vision of a small cylindrical box moving through a transparent pipe. His dad told him that it was driven by the pressure of the air. Suddenly, he saw a little cylinder of Coke moving through the straw. It was the solution!

“I can drink it!” he shouted with excitement. “It’s that simple! After a slug of Coke enters the straw, I will lift the straw a little, removing it from the can. The weight of the slug won’t be sufficient to compensate for the pressure difference. And then nothing would prevent the slug of Coke from reaching my mouth, even at the fourth floor!”

With the problem solved, both boys went to Jeff’s apartment and, after some practice, drank all the Coke they wanted through the long straw. Now, can you suggest another solution? Good luck!

In my experience, withholding the solution leads to a heuristic back and forth and makes the problem perfect for class discussion.

Acknowledgment

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References

1. Eugene Hecht, *Physics: Calculus* (Brooks/Cole Publishing, Pacific Grove, CA, 1996), pp. 398–401.
2. Douglas C. Giancoli, *Physics*, 5th ed. (Prentice Hall, Upper Saddle River, NJ, 1997), pp. 281–282.