Introduction

Any tribute to the genius of Michael Faraday is bound to be incomplete if his popularity and reputation as an outstanding scientific lecturer is not mentioned. He founded the Friday Evening Discourses and Christmas Lectures for younger audiences at the Royal Institution in London in 1826. These lectures still continue to this day and the Christmas lecture series is now televised every year.

These lectures were very popular and Faraday used to derive immense pleasure in communicating the excitement of science to the general public, especially children. He once said, in an interview, “The best members of my audience are children. They just watch and very little escapes their awareness.” Incidentally, the current British 20 pound note shows Faraday lecturing in the auditorium of the Royal Institution, and not working in his basement research laboratory.

Charles Dickens had requested Faraday on several occasions to write up his lectures. He wrote to Faraday in May 1850, “It has occurred to me that it would be extremely beneficial to a large class of public to have some account of your lectures you addressed...to children.” Faraday never complied being true to his belief that lectures and written material were two completely different things. Later on, fortunately for us, he reluctantly agreed to have a stenographic record of his lectures. The following lecture was the first in the series of Christmas lectures that Faraday gave on candles (1860). William Crookes, who attended the lecture, edited the stenographic record of the lecture.

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The Chemical History of a Candle

Lecture I.—A Candle: The Flame—Its Sources—Structure—Mobility—Brightness

Michael Faraday

I PURPOSE, in return for the honor you do us by coming to see what are our proceedings here, to bring before you, in the course of these lectures, the Chemical History of a Candle. There is not a law under which any part of this universe is governed which does not come into play and is touched upon in these phenomena. There is no better, there is no more open door by which you can enter into the study of natural philosophy than by considering the physical phenomena of a candle.

1 Excerpts from 'The Chemical History of a Candle'
Now as to the light of the candle. We will light one or two, and set them at work in the performance of their proper functions. You observe a candle is a very different thing from a lamp. With a lamp you take a little oil, fill your vessel, put in a little moss or some cotton prepared by artificial means, and then light the top of the wick. When the flame runs down the cotton to the oil, it gets extinguished, but it goes on burning in the part above. Now I have no doubt you will ask how it is that the oil which will not burn of itself gets up to the top of the cotton, where it will burn. We shall presently examine that; but there is a much more wonderful thing about the burning of a candle than this. You have here a solid substance with no vessel to contain it; and how is it that this solid substance can get up to the place where the flame is? How is it that this solid gets there, it not being a fluid? or, when it is made a fluid, then how is it that it keeps together? This is a wonderful thing about a candle.

We have here a good deal of wind, which will help us in some of our illustrations, but tease us in others; for the sake, therefore, of a little regularity, and to simplify the matter, I shall make a quiet flame, for who can study a subject when there are difficulties in the way not belonging to it? Here is a clever invention of some costermonger or street-stander in the market-place for the shading of their candles on Saturday nights, when they are selling their greens, or potatoes, or fish. I have very often admired it. They put a lamp-glass round the candle, supported on a kind of gallery, which clasps it, and it can be slipped up and down as required. By the use of this lamp-glass, employed in the same way, you have a steady flame, which you can look at, and carefully examine, as I hope you will do, at home.

You see, then, in the first instance, that a beautiful cup is formed. As the air comes to the candle, it moves upward by the force of the current which the heat of the candle produces, and it so cools all the sides of the wax, tallow, or fuel as to keep the edge much cooler than the part within; the part within melts by the flame that runs down the wick as far as it can go before it is extinguished, but the part on the outside does not melt. If I made a current in one direction, my cup would be lop-sided, and the fluid would consequently run over; for the same force of gravity which holds worlds together holds this fluid in a horizontal position, and if the cup be not horizontal, of course the fluid will run away in guttering. You see, therefore, that the cup is formed by this beautifully regular ascending current of air playing upon all sides, which keeps the exterior of the candle cool. No fuel would serve for a candle which has not the property of giving this cup, except such fuel as the Irish bogwood, where the material itself is like a sponge and holds its own fuel. You see now