The Matter Myth

Paul Davies and John Gribbin

There are three areas of concern from the book. The first area has to do with biology, the next with black holes and the third with special relativity.

The authors speak of Lamarck's theory of evolution. Quoting from the book as was given as an example "The son of a blacksmith, according to Lamarck, will be born with a tendency to develop large muscles, because his father has used the equivalent muscles in his working life." The authors go on to say "Nevertheless, the theory is wrong. Experiment and observation show that the characteristics acquired by an organism during its lifetime are not passed on genetically to its offspring." They conclude that Darwin was correct. That was not what the chapter in the book was about. This was just given as an example of the chapter’s main point.

The next paragraph in the book gets to the subject matter of the chapter. The first line of the paragraph is "The philosopher Thomas Kuhn believes that scientists adopt certain distinct paradigms that are tenaciously retained". Perhaps the real example is Davies and Gribbin discounting Lamarck's theory by tenaciously holding onto Darwinism. A problem man has is that knowing a little he assumes knowing a lot and knowing a lot he assumes knowing everything. Whatever man knows about the beauty and complexity of nature, nature is more beautiful and complex. Male sperm is constantly being made. What if the makeup of the sperm is influenced in some way by the environment? That would seem to be in character with the cleverness and beauty of nature. Then Lamarck’s Theorem would be somewhat correct. Has this been considered or looked at or does everyone tenaciously hold onto Darwinism?

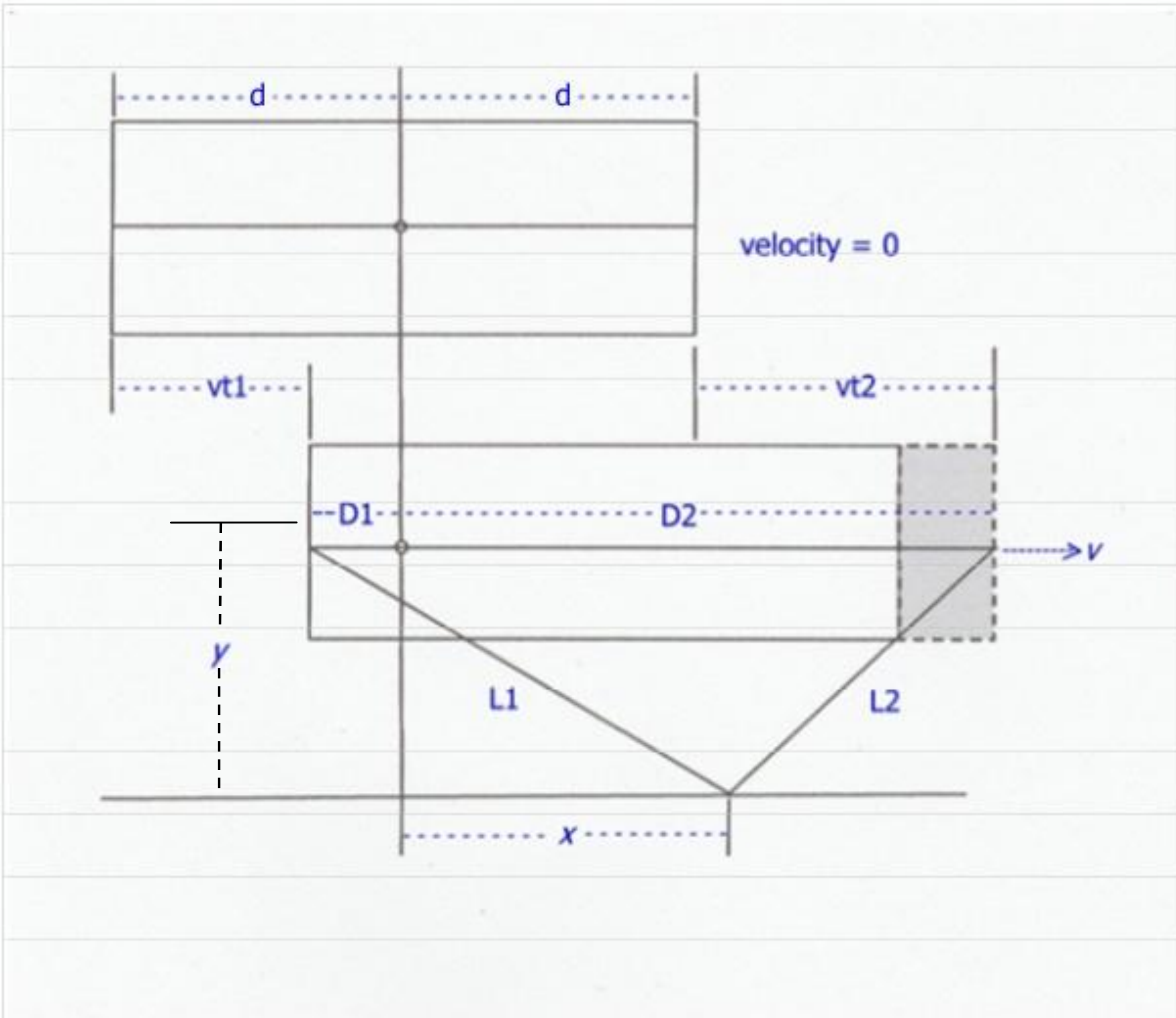
The authors comment on black holes "To an outside observer, it will appear to take you forever to reach the event horizon". That is time stops at the event horizon. If that is the case then nothing ever enters a black hole as observed by anything outside the black hole after the black hole forms. So, black holes should be encrusted with gases, rocks, planetoids, stars and whatever is out there. The wavelength of a star being sucked into a black hole will be forever more red shifted owing to gravity but never disappear. Once a black hole forms its event horizon will never get any bigger because the mass within the event horizon never gets any greater as observed from outside the black hole. Could it be that as mass accumulates just outside the event horizon the event horizon is observed to get larger encompassing the mass and it is observed to disappear into the black hole. But how could any change happen at the event horizon if time stops there? Is all this observing being done by seeing or by measuring?

For those Mathdroolers who walk the lower hills of the math world, time is a parameter making equations easier to write and solve. If all first year physics can be expressed in aspects of the physical world that are experienced such as space, mass, momentum and energy without time, then time need not be real at least in first year physics. If those who hike the mountain tops of the math world can give a mathematical description of all that is known of the physical world without using the parameter time, then time is not real. It is an illusion brought about by space and movement through it. Maybe one of these mountain dwellers in the math world will put in a book for the masses that mortals read a physical phenomenon that cannot be expressed mathematically without time.

Getting back to black holes, if time has stopped at the event horizon for all observers away from the event horizon, how could there be Hawking radiation. Those who hike the mountain tops of the math world have a tool mathdroolers do not have. That tool is mysticism. Perhaps time stops at the event horizon of a black hole only when someone is looking. Things stop happening when someone is looking and happen again when that someone, and all someones, look away. How else could black holes grow and time stop at the entrance to them.

As mentioned above, perhaps one explanation is that gasses, planets, stars and other objects conglomerate just outside the event horizon and the event horizon expands beyond them. To an observer the black hole has changed. Change assumes the passing of time. The problem may not be the physics as much as confusion in books on physics for the masses. The authors say time stops at the event horizon for an outside observer and that the event horizon changes as observed from outside without explaining the apparent contradiction.

Moving on, the authors make the mistake that most all writers of physics for the masses make. When talking of special relativity they speak of what one sees. But they actually persent what one measures. Measuring and seeing are not the same. The eyes are measuring tools but not the same measuring tools used when speaking of relativity. One measuring tool for relativity is a set of rods and clocks. The rods are all say one meter long and set up in a cubic pattern. The clock at the origin is set to start at say zero. A light beam is set out from that clock to set the other clocks. When the light beam gets to the clock that is horizontally one meter away, that clock is set to one meter of light time. That is the time it took the light to get there. All other clocks are set tlikewise. The tool has been constructed at least on paper. The authors give a thought experiment of a moving train with a light in the center of a train car. The authors speak of what an observer on the platform sees, experiences or measures not explaining what experiencing and measuring are. What seeing is does not need to be explained. Consider seeing. A person is on the platform observing the train go by. Where on the platform does the person have to be to see the flash at the same time from the light as reflected off each end of the train boxcar? This will be looked at classically with the speed of light being the same for all observers. The position on the platform, $x,$ is to be found in relation to the train speed v and boxcar length, $2d$, given the other constants.



The top rectangle represents a train boxcar stationary to the platform. A flash of light originates at the center of the boxcar. It arrives at each end of the boxcar at the same time as measured from a stationary position on the platform. After reflecting off the ends of the boxcar the flashes of light will arrive simultaneously to any position on the platform perpendicular to the center of the boxcar. What if the train is moving? Where on the platform would someone see the flashes arrive at the same time? This will be an arithmetic exercise hiking in the lower hills of the math world.

$$D_1 = ct_1 = d - vt_t \qquad and \qquad D_2 = ct_2 = d + vt_2$$

$$t_1 = \frac{d}{c+v} \qquad and \qquad t_2 = \frac{d}{c-v}$$

$$giving \qquad D_1 = \frac{cd}{c+v} \qquad and \qquad D_2 = \frac{cd}{c-v}$$

$$Let \qquad \beta = \frac{v}{c}$$

$$Then \qquad D_1 = \frac{d}{1+\beta} \qquad and \qquad D_2 = \frac{d}{1-\beta}.$$

$$L_1 = \sqrt{(D_1+x)^2+y^2} \qquad and \qquad L_2 = \sqrt{(D_2-x)^2+y^2}$$

$$Let \qquad A = \frac{d}{1-\beta^2} \qquad and \qquad w = -\frac{d\beta}{1-\beta^2} + x$$

$$then \qquad D_1 + x = A + w \qquad and \qquad D_2 - x = A - w$$

$$giving \qquad L_1 = \sqrt{(A+w)^2+y^2} \qquad L_2 = \sqrt{(A-w)^2+y^2}$$

For the person on the platform to see both flashes at the same time

$$L_1 + D_1 = L_2 + D_2$$

$$\Rightarrow \quad L_1 - L_2 = D_2 - D_1 = \frac{d}{1-\beta} - \frac{d}{1+\beta} = \frac{2d\beta}{1-\beta^2}$$

$$\Rightarrow \quad L_1 - L_2 = 2\beta A$$

$$\Rightarrow \quad L_1^2 = L_2^2 + 4\beta A L_2 + 4\beta^2 A^2$$

$$\Rightarrow \quad L_1^2 - L_2^2 = 4\beta A L_2 + 4\beta^2 A^2$$

$$\Rightarrow \quad (A+W)^2 + y^2 - (A-w)^2 - y^2 = 4\beta A L_2 + 4\beta^2 A^2$$

$$\Rightarrow \quad 4Aw = 4\beta A L_2 + 4\beta^2 A^2$$

$$\Rightarrow \quad w = \beta L_2 + \beta^2 A$$

$$\Rightarrow \quad \beta L_2 = w - \beta^2 A$$

$$\Rightarrow \quad \beta^2[(A-w)^2 + y^2] = w^2 - 2\beta^2 wA + \beta^4 A^2$$

$$\Rightarrow \quad \beta^2 A^2 - 2\beta^2 wA + \beta^2 w^2 + \beta^2 y^2 = w^2 - 2\beta^2 wA + \beta^4 A$$

$$\Rightarrow (1-\beta^2)w^2 = \beta^2 A^2 - \beta^4 A^2 + \beta^2 y^2$$

$$\Rightarrow \quad (1-\beta^2)w^2 = \beta^2(1-\beta^2)A^2 + \beta^2 y^2$$

$$\Rightarrow \quad w^2 = \beta^2 A^2 + \frac{\beta^2}{1-\beta^2} y^2$$

$$\Rightarrow \quad w^2 = \beta^2 \frac{d^2}{(1-\beta^2)^2} + \frac{\beta^2}{1-\beta^2} y^2$$

$$\Rightarrow \quad w^2 = \frac{\beta^2}{(1-\beta^2)^2}\left(d^2 + (1-\beta^2)y^2\right)$$

$$\Rightarrow \quad w = \frac{\beta}{1-\beta^2}\sqrt{d^2 + (1-\beta^2)y^2}$$

$$\Rightarrow \quad -\frac{\beta s}{1-\beta^2} + x = \frac{\beta}{1-\beta^2}\sqrt{d^2 + (1-\beta^2)y^2}$$

$$(1) \qquad \Rightarrow \quad x = \frac{\beta}{1-\beta^2}\left[d + \sqrt{d^2 + (1-\beta^2)y^2}\right]$$

To see both reflections arrive at the same time, the position of the person on the platform, x , is related to the perpendicular distance to the center of the train car, y, the length of the train car, $2d$, and the speed of the train, $\beta = v/c$.

If the length of the train car is zero, $d = 0$, both reflections will be seen as one flash anywhere on the platform, x, at any distance from the train car y. However, setting $d = 0$ in Equation 1 gives one particular position for any perpendicular distance y.

$$(2) \qquad x = \frac{\beta y}{\sqrt{1-\beta^2}}$$

With $d = 0$ the person on the platform will see no difference at the position given in Equation 2 than any other position on the platform. Is there something special about the position given on Equation 2 that is not clear form how it was obtained?

It may be of interest to investigate the difference in time arrival of the reflections for any train boxcar length, $2d$, and position on the platform, x and y.

The time of the left reflection to the position on the platform is

$$T_1 = \frac{D_1 + L_1}{c}$$

The time of the right reflection to the position on the platform is

$$T_2 = \frac{D_2 + L_2}{c}$$

Let $\tau = c(T_1 - T_2)$

$$= D_2 - D_1 + L_2 - L_1$$

$$= \frac{d}{1-\beta} - \frac{d}{1+\beta} + \sqrt{\left(\frac{d}{1-\beta} - x\right)^2 + y^2} - \sqrt{\left(\frac{d}{1+\beta} + x\right)^2 + y^2}$$

$$\tau = \frac{2\beta d}{1-\beta^2} + \sqrt{\left(\frac{d}{1-\beta} - x\right)^2 + y^2} - \sqrt{\left(\frac{d}{1+\beta} + x\right)^2 + y^2}$$

If $d = 0\ then\ \tau = 0\ for\ any\ x$ as would be expected. There is little of interest here. What may be of interest is the rate at which τ approaches zero at some position x as the boxcar strinks in length, i.e. $d \to 0$

Resorting to calculus

$$\frac{\delta\tau}{\delta d} = \frac{2\beta}{1-\beta^2} + \frac{1}{2}\frac{2\left(\frac{d}{1-\beta} - x\right)\frac{1}{1-\beta}}{\sqrt{\left(\frac{d}{1-\beta} - x\right)^2 + y^2}} - \frac{1}{2}\frac{2\left(\frac{d}{1+\beta} + x\right)\frac{1}{1+\beta}}{\sqrt{\left(\frac{d}{1+\beta} + x\right)^2 + y^2}}$$

$$\frac{\delta\tau}{\delta d} = \frac{2\beta}{1-\beta^2} + \frac{\left(\frac{d}{1-\beta} - x\right)\frac{1}{1-\beta}}{\sqrt{\left(\frac{d}{1-\beta} - x\right)^2 + y^2}} - \frac{\left(\frac{d}{1+\beta} + x\right)\frac{1}{1+\beta}}{\sqrt{\left(\frac{d}{1+\beta} + x\right)^2 + y^2}}$$

To find the rate of change of the time difference for a train boxcar of length zero, take $d = 0$.

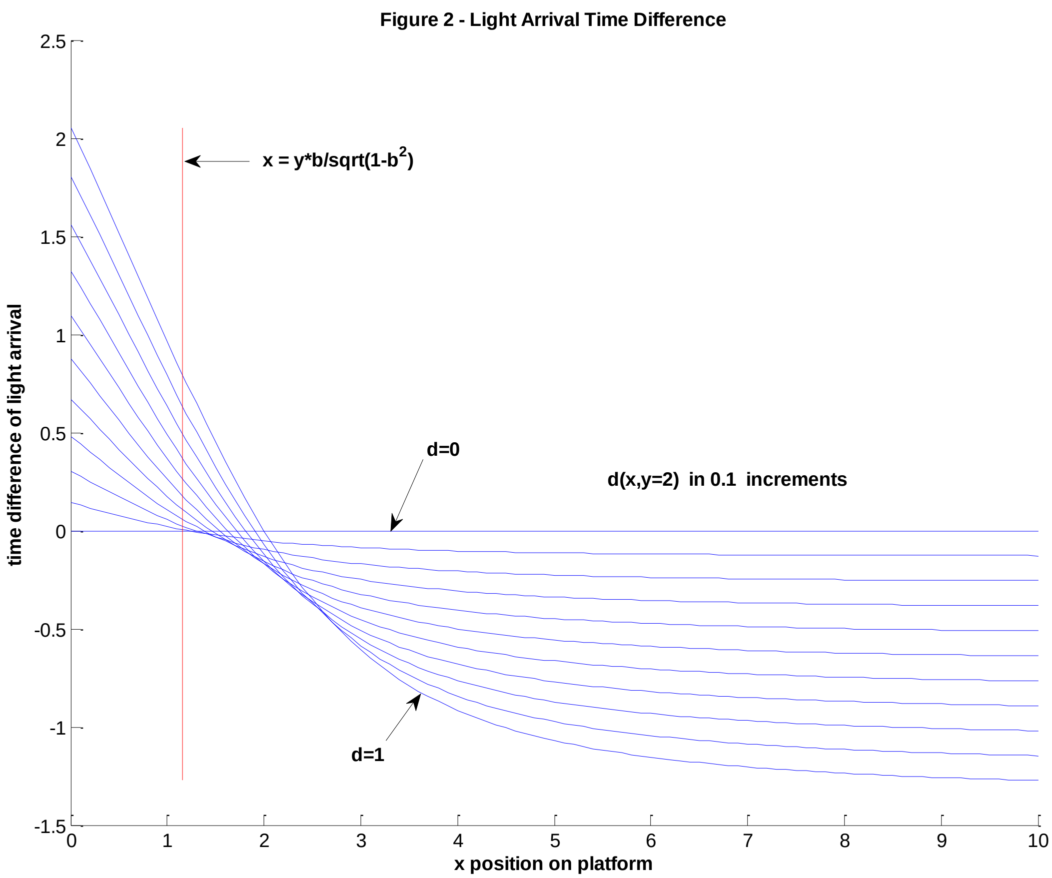
$$\left.\frac{d\tau}{dd}\right|_{d=0} = \frac{2\beta}{1-\beta^2} - \frac{\frac{x}{1-\beta}}{\sqrt{x^2+y^2}} - \frac{\frac{x}{1+\beta}}{\sqrt{x^2+y^2}}$$

$$(3) \qquad \boxed{\left.\frac{d\tau}{dd}\right|_{d=0} = \frac{2\beta}{1-\beta^2} - \frac{2x}{(1-\beta^2)\sqrt{x^2+y^2}}}$$

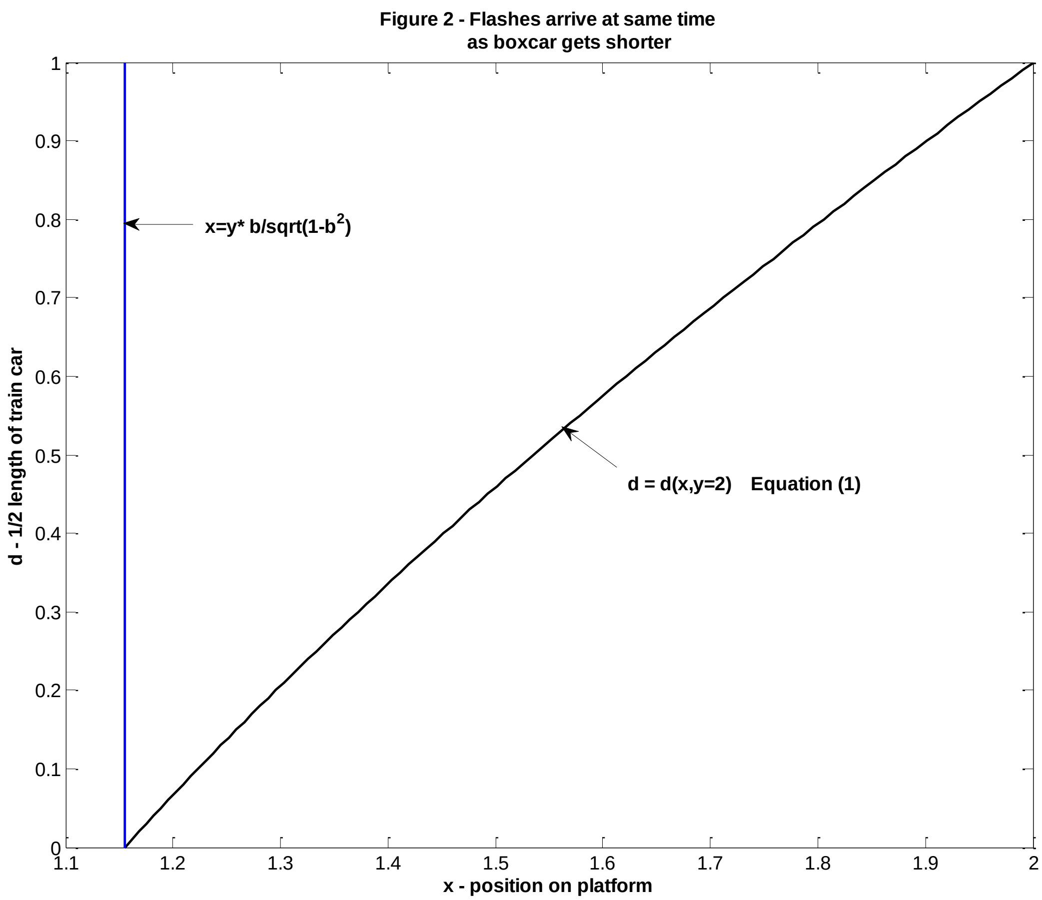
Setting Equation 3 equal to zero and solving for x gives

$$(4) \qquad \boxed{x = \frac{\beta y}{\sqrt{1-\beta^2}}}$$

This is the same as Equation 2, which seemed to be an anomaly. Figure 1 may give some insight.



The length of the train car is $2d$. As the length gets shorter, the position on the platform where both light reflections are seen simultaneously, curve crosses x-axis, approaches the position given in Equations 2 and 4. However, at $d = 0$ the reflections will be seen as one light flash at all positions on the platform. Figure 2 shows the position on the platform approaching that given in Equations 2 and 4 as the train car length gets shorter.



Information was given in Equation 2 that was not requested, not sought after and not seen. The one particular position given by Equation 2 is the last unique position for a given perpendicular distance, y, from the center of the boxcar where only one flash is seen as the length of the boxcar shortens to zero length before all positions see a single flash. Some meaning has been given to Equation 2 satisfying at least a little curiosity.

This has been a fun hike in the lower hills of the math world whether anything lasting is brought back other than memories.

Mathdrooler 23 Oct 2020