

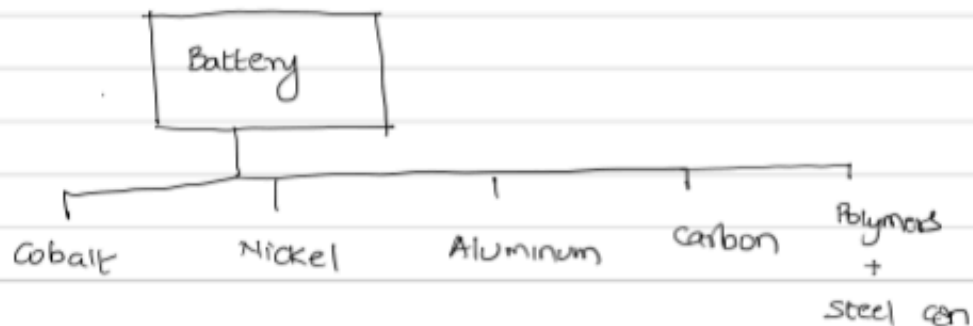
Break-it-down-and-reason-up

Few weeks back I was watching Jeff Bezos being interviewed by Charlie Rose. In it Bezos explained why space travel is expensive and what needs to be done to make it affordable. Bezos explained it by breaking down the constituents of rocket. And reasoning up by using first principles, which is the physics way of looking at the world. His explanation made me speechless.

While reflecting on it my associative brain pulled another example in which Elon Musk will reduce the cost of battery by 7.5x. Like Bezos he will solve the problem by breaking-it-down-and-reasoning up. I collected few more examples of this kind of thinking. And the effort resulted in this post.

How Elon Musk reduced the cost of battery by 7.5x

Batteries historically costed \$600 per kilowatt hour. Most of us would conclude that the cost can't be reduced further. Elon Musk approaches the problem in a different way. He approaches it by breaking down the battery into its material constituents.

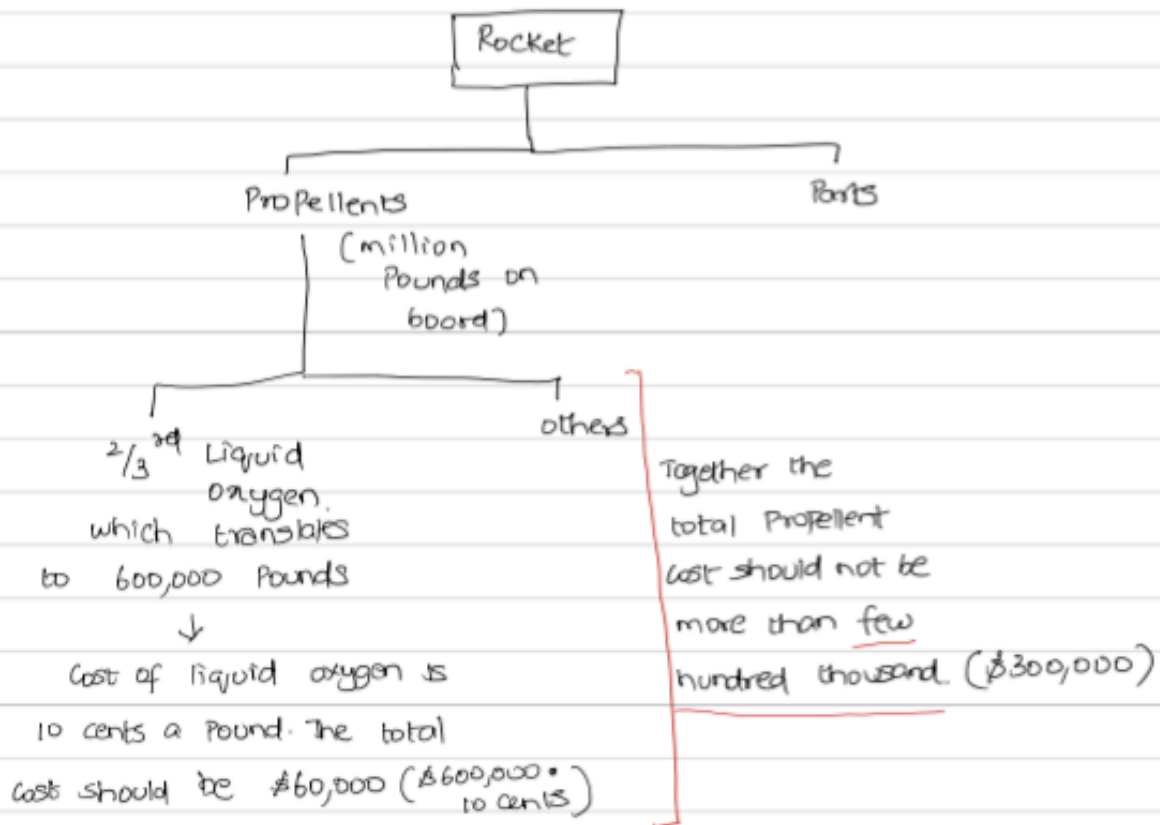


If we bought each of the constituents in London Metal Exchange what would each of those cost? Turns out that the cost would come down to \$80 per kilowatt hour.

He solved the problem by breaking it down and reasoning up (first principles; physics way of looking at the world) and reduced the cost of battery by 7.5x.

Jeff Bezos explains why space travel is so expensive

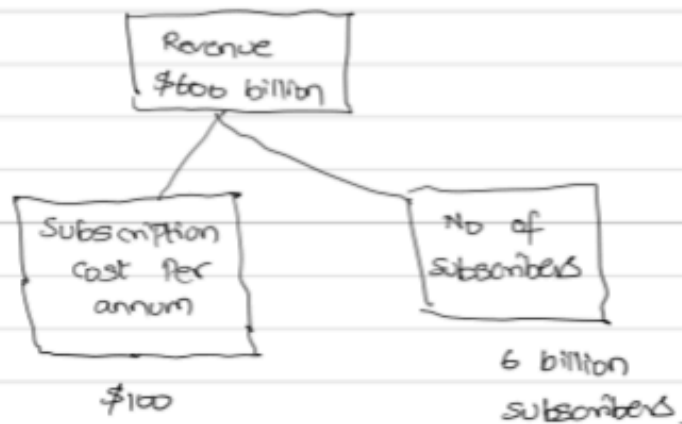
There is one reason why space travel is so expensive. We are throwing the hardware away after single use of the rocket. Jeff Bezos proves this by breaking down the constituents of a rocket.



In the launch the cost of a rocket is somewhere between \$60 to \$150 million. How do you explain the gap from \$300,000 to \$150 million? We are throwing the hardware away. To reduce the cost of space travel we need to reuse the hardware. By breaking it down and reasoning up (first principles) Jeff Bezos found the solution.

Aswath Damodaran dismisses Netflix impossible valuation

one student of Aswath Damodaran valued Netflix at \$500 per share. At that time Netflix was trading at \$120 per share. Damodaran was flabbergasted with his student estimate. why is that? For that valuation to materialize Netflix annual revenue should be \$600 billion. This is how Aswath Damodaran dismissed the valuation story to be 'impossible'



There are 7 billion People on the Planet. For the student valuation to materialize 86 Percent of the People on the Planet should have a subscription. unless there's a law that makes every man, women, and child to have a subscription this story is impossible to happen.

By breaking it down and reasoning up (first principles) Damodaran dismissed the impossible valuation of Netflix.

How many beds does Narayana Health needs to justify an IRR of 15 Percent in 10 years?

Last month I posted my analysis on Narayana Health. I did a poor job in writing the valuation section. I am going to break it down and reason up in terms of # operating beds.

To achieve an IRR of 15 Percent in 10 years the market cap of Narayana Health should go from 6,500 to 27,000 crores. At 20 times the profit after tax should be 1350 crores. If 10% Profit margin is possible then the total sales should be 13,500 crores.

Current ARPDB is 64 lakhs. At 6% inflation this should grow to 1.14 crores [As of today Apollo and Fortis have an ARPDB of 1.02 crores and 1.31 crores. Also in the last 3 years Narayana Health compounded ARPDB at 10.3 Percent]

$$\text{ARPDB} = \frac{(\text{Revenue} - \text{other income})}{\# \text{Beds} \cdot \text{utilization rate}}$$

$$\# \text{Beds} = \frac{13500 \text{ crores}}{1.14 \text{ crores} \cdot 0.6}$$

$$\# \text{Beds} = 19,731 \text{ beds}$$

currently Narayana has 6,700 beds. To reach the target it needs to compound the number of beds at 11.4 Percent. Can they

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do it? I do not know. But by breaking it down and reasoning up (first principles) I know the key metrics to keep my eye on. Without these key metrics I will be a one legged man in an ass kicking contest.

	worst case	Base case	Best case
ARPOB	1 cr	1.14 cr	1.7 cr
utilization rate	0.59	0.6	0.7
# Beds	22,881	19,737	11,345

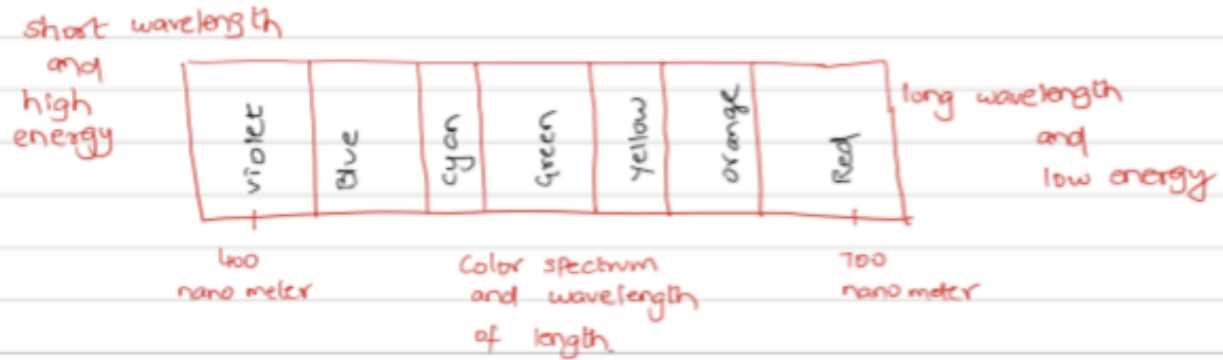
over the next few years I will keep an eye on ARPOB and utilization rate to see how the

thesis is playing out.

↓
Higher the # Beds
harder it is to reach
the IRR of 15 Percent.

Why deep sea fishes have eyes sensitive to blue light?

Most deep sea fishes have eyes that is sensitive only to blue light. why is that? Sunlight contains all of the colors of our visible spectrum (red, orange, yellow, green, blue, and violet). These colors combined together appear white.

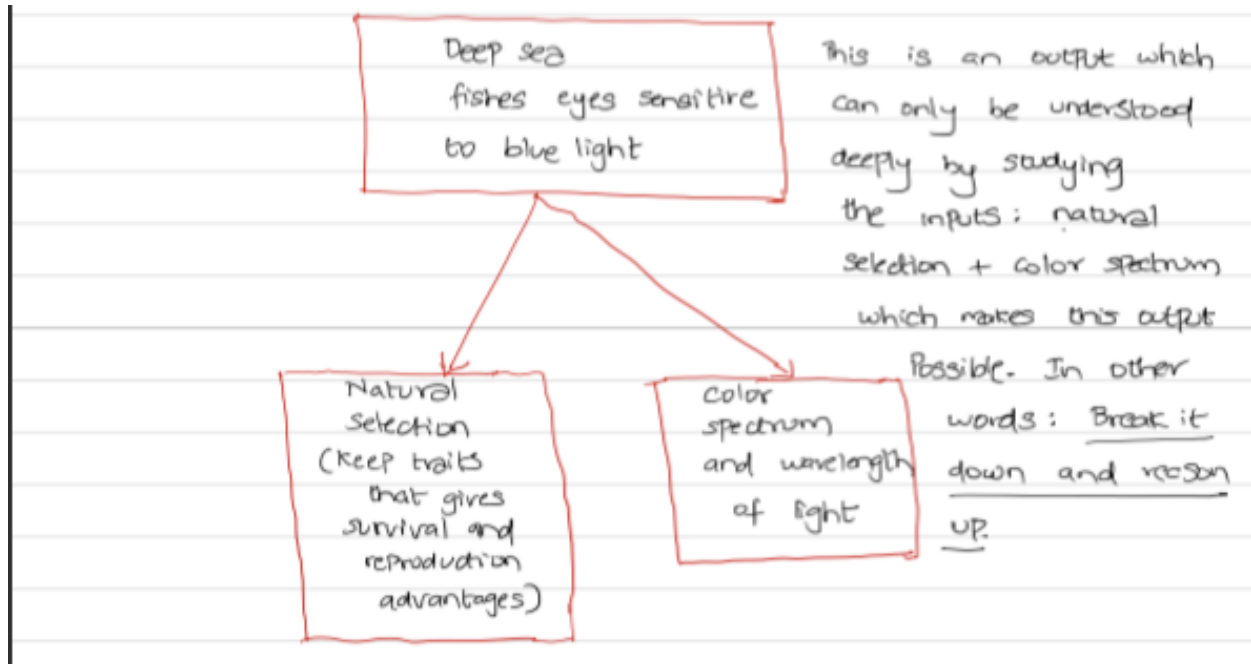


Red light has longer wavelength and low energy. Blue light has shorter wavelength and high energy. Shorter wavelength and high energy light (blue) penetrate water better than longer wavelength and low energy light (red).

As water depth increases red light gets filtered out. Blue light is the only available light as the ocean depth increases. It is therefore no surprise that most deep sea fishes have eyes that are only sensitive to blue light. Natural selection only keep traits that give survival and reproduction advantages. There is no point in wasting energy trying to detect light that is not there.

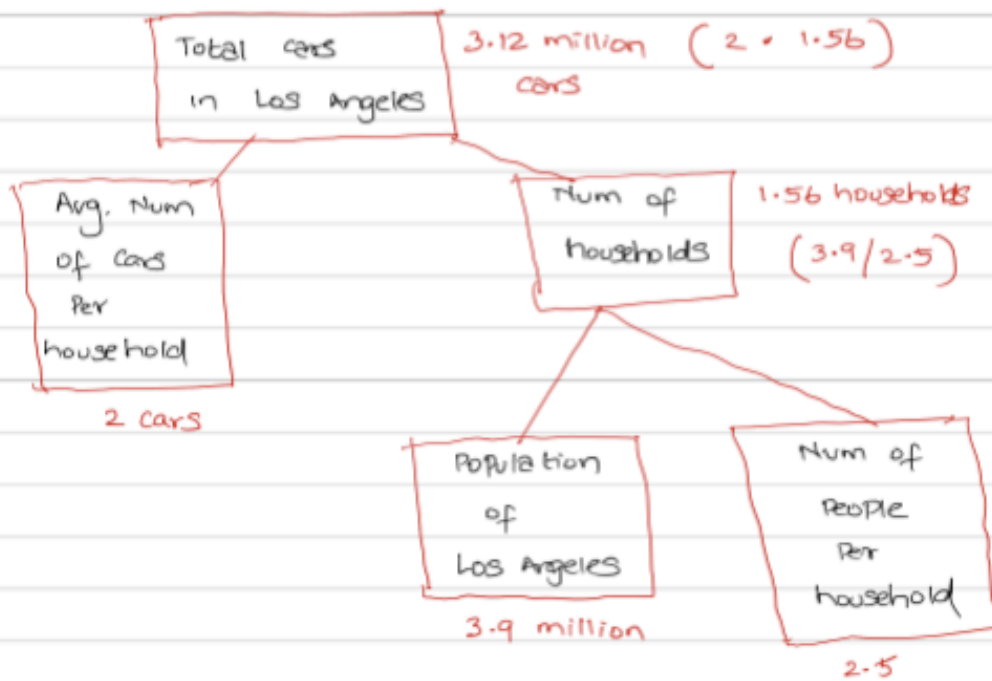
why am I writing about deep sea fishes and natural selection in a post about Break it down and reason up?

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How many cars are in Los Angeles?

The idea of break it down and reason up is really powerful. It lets you answer questions which at first glance might seem impossible. Consider the question: How many cars are in Los Angeles?



References

1. [The First Principles Method Explained by Elon Musk](#)
2. [A conversation with Amazon's founder and chief executive officer, Jeff Bezos](#)
3. [Aswath Damodaran: The Value of Stories in Business](#)
4. [Fermi Problems: From toilet paper to housing the world](#)
5. Few Books: [The Thinker's Toolkit](#), [Interview Math](#), and [Guesstimation](#)

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