Importance of a non-real intermediary to solve the nervous system

Kunjumon Vadakkan, 5th November, 2021; modified 14th July, 2025

Since findings from different levels of the nervous system functions as so constraining, there can only be one unique solution for the system or cannot provide testable predictions. One way to solve the system is to synthesize/derive solutions and rule them out if they are wrong. Repeating this process very frequently will allow us to reach the correct solution fast. Since the most important and unique function of the nervous system is generation of first-person inner sensations, it is necessary to first arrive at a theoretical solution and then test for the predictions that it can offer. In this approach, it is necessary to take certain important steps. First one is to assume that there is a unique solution. Second one is not to keep any bounds to the method by which we arrive at a solution. Thirdly, since first-person inner sensations are virtual in nature, the solution is expected to contain a non-real intermediary.

It is necessary to find an occasion where a non-real intermediate step was necessary to solve a real problem that cannot otherwise be solved using observations that are real. For this, we can examine a popular problem in math. It says, *"Divide 10 into two parts. Then, the product of these two parts is 40"*. This was solved by Girolamo Cardano. There was no quick solution possible. Cardano divided 10 into two equal parts of 5, which provides the maximum value for the product of two parts of 10 (see 5x5 =25; 6x4=24; 7x3=21). He then squared them (product of them, which is 5x5 = 25) and subtracted 40 from it, which left him with -15.

Mathematically, it can be written as

x + x = 10 (Since x and x are equal, the value of x = 5)
x . x = 40 (Now, we have a problem to solve)

It is necessary to find out find the value of squire root of the difference between 25 and 40 to solve the problem.

Since 25 – 40 = (25 – 40) = –15, Cardano came to a conclusion that by adding or subtracting the square root of -15 from 5, two parts are obtained.

The multiplication product of these two parts is 40. This can simply be written as follows

$(5 + \sqrt{-15})\ (5 - \sqrt{-15}) = 40$

$(5)^2 - (\sqrt{-15}\ )^2 = 40$

$25 - (\sqrt{-15}\ )^2 = 40$

Note: $-(\sqrt{-15} = -(\sqrt{-1}\ )\ (\sqrt{15}\ )$

Now the problem is that it is not possible to find square root of a negative number. So imaginary unit was invented to solve the problem. The imaginary unit i is defined by its property $i^2 = -1$.

Because $\sqrt{-1} = i$, further operation can be carried out as follows

$25 - (\sqrt{-1})^2\ (\sqrt{15}\ )^2 = 40$

$25 - i^2\ 15 = 40$

$25 - (-15) = 40$

$25 + 15 = 40$

$40 = 40$

A beautiful visual (geometrical) explanation of this is explained in the following video. You will be able to really appreciate the problem by watching how a negative area comes into the problem https://www.youtube.com/watch?v=cUzklzVXJwo Presenter Dr. Derek Muller says "Cardano's method does work, but you have to abandon the geometric proof that generated it in the first place. Negative areas which make no sense in reality must exist as an intermediate step on the way to the solution" (watch 17.06 to 17.24).

This example underscores the importance of accepting the presence of a non-real intermediary while finding a solution for the nervous system that generates first-person inner sensations. If incorporation of such an intermediate step can solve the system and the solution can provide explanations for all the findings from different levels of the system in an inter-connected manner, then the solution must be correct.

The next important step is to examine whether the solution can provide testable predictions. If this is possible then it becomes an exceptional opportunity for us to verify them, which will confirm the solution.

References

1. Branson W. Solving the cubic with Cardano. https://ve42.co/Branson2014 Very good pictorial explanation is given)
2. Merino O (2006) A short history of complex numbers. University of Rhode Island.

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3. Rothman T (2013) Cardano v Tartaglia: The Great Feud Goes Supernatural. arXiv preprint

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