Importance of a non-real intermediary in solving the nervous system

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Since findings from different levels of nervous system function are highly constraining, there can only be one unique solution for the system that can provide testable predictions. One way to solve the system is to synthesize or derive solutions and rule them out if they are wrong. Repeating this process frequently will allow us to reach the correct solution rapidly. Since the most important and unique function of the nervous system is the generation of first-person inner sensations, it is necessary to first arrive at a theoretical solution and then test the predictions that it can offer.

In this approach, it is necessary to take certain important steps. The first step is to assume that there is a unique solution. The second step is not to impose limits on 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 identify an occasion where a non-real intermediate step was required to solve a real problem that could not otherwise be solved using observations that are themselves real. For this, we can examine a popular problem in mathematics. It states: "*Divide 10 into two parts such that the product of these two parts is 40*." This problem was solved by Girolamo Cardano. There was no quick solution available. Cardano divided 10 into two equal parts of 5, which provides the maximum possible product obtainable from two numbers that sum to 10 (for example, $5 \times 5 = 25$; $6 \times 4 = 24$; $7 \times 3 = 21$). He then squared them (that is, calculated their product, $5 \times 5 = 25$) and subtracted 40 from it, leaving −15.

Mathematically, this can be written as follows:

$x + x = 10$ (Since x and x are equal, $x = 5$)

$x \times x = 40$

It is necessary to find the value of the square root of the difference between 25 and 40 in order to solve the problem. Since $25 - 40 = -15$, Cardano concluded that by adding and subtracting the square root of −15 to and from 5, two numbers are obtained. The multiplication product of these two numbers is 40.

This can be written as follows:

$$(5 + \sqrt{-15})(5 - \sqrt{-15}) = 40$$
$$(5)^2 - (\sqrt{-15})^2 = 40$$
$$25 - (\sqrt{-15})^2 = 40$$

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

At this point, the problem becomes that it is not possible to find the square root of a negative number within the real number system. Therefore, the imaginary unit was introduced to solve the problem. The imaginary unit i is defined by the property $i^2 = -1$.

Because $\sqrt{-1} = i$, further operations 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) presentation of this idea is provided in the following video. The problem becomes especially clear when one sees how a negative area enters into the derivation: https://www.youtube.com/watch?v=cUzklzVXJwo

In the video, Dr. Derek Muller states: "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" (17:06–17:24).

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

The next important step is to examine whether the solution can provide testable predictions. If this is possible, then it provides an exceptional opportunity to verify them experimentally, thereby strengthening confidence in the proposed solution.

References

Branson W (2014) Solving the cubic with Cardano. https://ve42.co/Branson2014 (A good pictorial explanation is provided)

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