Quantifying the transcriptome of a human pathogen

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Acknowledgements

Successful research, I have learnt as a doctoral candidate, is made of three components: serendipity or luck, scientific strategy, and tenacity. Unfortunately, the first is few and far in between; luck is Alexander Fleming’s serendipitous discovery of the first antibiotics. While the impact of penicillin is scientifically unmistakable, the manner of its discovery is nothing short of a miracle. Therefore, one may better improve the probability of success by manipulating the latter two components (Fig. 1). Additionally, there are interaction between the components, for example, more trials may shift the direction closer to ideal, alternatively a good direction may incite more trials.

\[
P_S = X \cdot \theta \cdot n
\]

- \(P_S\): Probability of success
- \(X\): Serendipity, luck
- \(\theta\): Accuracy of strategy
- \(n\): Number of trials, tenacity

**Fig. 1.** Optimizing success. A. The model highly simplifies the probability of success and the relationship between its components: serendipity (\(X\)), accuracy of strategy (\(\theta\)) and number of trials (\(n\)). Grey arrows were not included into the model. B. Accuracy is defined as the angular proximity between a chosen direction, or strategy to ideal path to scientific findings. Value ranges from 0 to 1. C. The “best” path to maximize the probability of success, \(P_S\), requires a high accuracy of strategy (\(\theta\), purple) and high luck (\(X\), big circle). Nevertheless, since serendipity is not easily persuaded, the conservative estimate should assume low luck (\(X\), small circle). Then, probability of success depends on tenacity, the number of trials (\(n\)) by drawing a simple projection from the X-axis to the Y-axis. Finally, one can compensate low (scientific) luck by manipulating the accuracy of strategy and the number of trials (see purple, small circle). The model assumes independence from resources, including time and caffeine.
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Returning to the model, I suspect serendipity as an emerging property, made out of other, intermingling constituents, further complicated by our ignorance to the presence and interaction of these components. In Fleming’s story, the serendipitous discovery of penicillin was the perfect combination of a universe of factors: his research interest, the split chance of a Penicillium spore lands on an penicillin-susceptible bacterial plate, his
decision of not cleaning the plates before his holiday, his time that fateful morning to observe the dirty old plates, maybe because the coffee was running late; the list of factors goes on including inherently undefinable ones. It is, then, tempting to deduce that when one can map and optimize all the factors, one holds a certain key to luck. Alas, we do not have the computing power nor the resources to model the universe of luck before starting every new research project. Consequently, one should be content to wish the best of luck to someone who is stepping forward towards uncharted research direction.