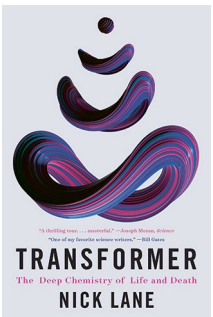
https://doi.org/10.1038/s41570-023-00545-3

The cycle that sculpted evolution



Transformer: The Deep Chemistry of Life and Death
By Nick Lane
Profile Books (2023)
400pp, £25.00

Conveying intricate and sometimes technical scientific principles to a general audience, albeit one interested in science, is always a daunting task. This challenge amplifies when delving into concepts that are still forming or are contentious within the research community. Furthermore, distancing oneself from, or at least acknowledging, the historical biases inherent in each scientific discipline is an immense challenge.

In *Transformer: The Deep Chemistry of Life and Death*, Nick Lane masterfully navigates these challenges. He delves deep into the significance of the Krebs cycle, a metabolic pathway that is central to biochemistry, both because of the role of its intermediates in the build-up and breakdown of various cellular building blocks, but also because of the rich history around elucidating the basic mechanisms of metabolism. Lane explores the Krebs cycle in the context of the annals of biochemical history, the evolutionary trajectory of life, and its crucial position within the biosynthetic metabolic network. Lane's exploration spans a wide range of scientific disciplines, including carbon fixation in plant biochemistry and diverse microbial species to the origins of life and the chemistry of hydrothermal vents. He even ties these themes to recent findings in gene regulation, oxidative stress research, and their implications for fields such as neurobiology and cancer research. Despite covering such broad ground, Lane avoids superficiality. His book brims with well-researched chemical details, presented in an accessible and lucid manner. Whenever the intricacies of biochemistry become overly dense, Lane livens the discourse with historical anecdotes, often cantered on pioneering researchers. For instance, few might know that the entire world supply of the first radioactive carbon isotope, ^{14}C, once rested in a single person's possession and was nearly lost on two occasions. Martin Kamen, one of the researchers behind the isotope's creation, was barred from continuing scientific work during World War II due to (unfounded) security concerns. After his name was cleared post-war, he shifted his focus to other scientific subjects. Tragically, the colleague of Kamen in this research, Sam Ruben, perished in a lab accident involving liquid phosgene. It wasn't until after the war, specifically on the day of Japan's surrender, that Ernest Lawrence advised a new member of his team, Melvin Calvin, that "now would be the time to do something useful with radioactive carbon." Such anecdotes not only captivate readers but also illustrate biochemistry's evolution as a field.

Lane adeptly addresses intense debates, significant oversights, and even the occasionally contentious actions of historic figures in the realm of biochemistry. For instance, while Calvin is often solely credited for the discoveries that led to the identification of what's now termed the 'Calvin cycle', the vital contributions of some colleagues, notably Andrew Benson, were overlooked. Similarly, Otto Warburg, an undeniably brilliant mind, appears to have overlooked certain discoveries due to being perhaps often too reticent in acknowledging not just his findings but those of his peers. Lane highlights these older tales in juxtaposition with contemporary discussions in the origins-of-life domain. Decades on, bridging the divide between organic chemists and biologists remains essential; both factions stand to gain considerably from collaborative dialogue rather than mutual dismissal.

As someone deeply involved in metabolism research, I often find myself explaining the pivotal role of metabolism in shaping numerous facets of our existence, from evolution and genetics to therapeutic advances. Lane's ability to convey this message to a general audience is both refreshing and commendable. However, *Transformer* isn't solely for laypersons. Indeed, owing to its multidisciplinary approach, specialists can glean valuable insights too. I personally discovered the challenges faced in interpreting early data, some of which still linger in textbooks. Now, having more information about the historical events that shaped these discoveries, I have a clearer understanding of their origins. As scientists, we often become highly specialized in our daily work. Multidisciplinary endeavours can be stymied not just by our inability to "see the forest for the trees," but also due to the challenge of navigating the distinct languages and cultures across disciplines. *Transformer* serves as a poignant reminder of the innovation that can arise from interdisciplinary convergence. For those championing scientific investment, Lane provides compelling narratives on how seemingly unrelated research, such as studies on the origins of life, can lead to breakthroughs in areas like cancer therapy. For instance, the Krebs cycle, which might have empowered early carbon fixation, has become a prime target for metabolic anti-cancer therapies.

Some of the most riveting discussions in *Transformer* revolve around the origins of life as a primary research interest of Lane. However, specifically by being multi-disciplinary, *Transformer* also highlights some reasons for slow progress in this discipline. While many biological fields now boast vast datasets, modern methodologies, and increasingly embrace a systems-based approach, origins of life research seems slightly lagging. *Transformer* underscores that when attempting to unravel one of biology's greatest enigmas, we often have limited data at our disposal. Consequently, discussions in this research can be swayed more by anecdotal evidence or dominant personalities. One can only hope that *Transformer* nudges this discipline to increase its collaborative, multidisciplinary spirit, learning from other fields that have successfully navigated similar challenges, eventually leading to a better reconstruction of the events that led to life's origins. Driven by Lane's enthusiasm I'm confident that the future will tell, whether or not, the Krebs cycle has been at the centre of the origin of life.

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Published online: 18 October 2023

Competing interests
The author declares no competing interests.