

# JAMES RENNIE BEQUEST

## REPORT ON EXPEDITION / PROJECT / CONFERENCE

**Expedition/Project/  
Conference Title:** Economic Principles in Cell Biology

**Travel Dates:** 7<sup>th</sup> July- 11<sup>th</sup> July 2024

**Location:** Paris, France

**Group member(s):** Keshav Todi

**Aims:** Learn more about metabolic network modelling and network with other scientists

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**Photography consent form attached:**  Yes  
(please refer to your award letter)  No

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### OUTCOME (a minimum of 500 words):-

I recently attended the summer school on "Economic Principles in Cell Biology" held at the Learning Planet Institute in Paris, from July 8-11, 2024. This program, now in its third iteration, provided an enriching experience that blended in-person and online participation. The summer school was organized with the aim of offering a comprehensive exploration of the economic principles that underpin cellular functions.

The curriculum was designed for students and researchers from diverse backgrounds in the natural sciences, including biology, physics, engineering, and mathematics. As someone with a background in biological sciences, I found the focus on mathematical modeling of cellular systems particularly enlightening. The absence of wet lab experiments allowed us to concentrate fully on theoretical and computational aspects, which was a refreshing change. The sessions were built around the open textbook "Economic Principles in Cell Biology," which served as a foundational resource throughout the program. This textbook, combined with the expert lectures, provided deep insights into how cells operate using principles akin to economic models, emphasizing resource allocation and optimization.

Each day was packed with engaging lectures. We started with an overview of the economy of the cell, discussing the fundamental economic principles at play within cellular systems. Subsequent lectures delved into the inventory of cell components and optimality problems in cells, where we explored how cells manage resources efficiently. The sessions on cell metabolism and optimization of metabolic fluxes were particularly intriguing, offering a detailed look at how cells maximize their metabolic efficiency.

One of the highlights was the lecture on scaling laws in cell evolution, which provided a unique perspective on how cells have evolved to optimize their functions across different scales. This was complemented by a session on cells facing uncertainty, which examined how cells adapt to fluctuating environments, applying principles from economic theories of risk and uncertainty. The school also included a "Night Science"

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lecture, which discussed the creative process in scientific research. This session was both inspiring and thought-provoking, encouraging us to think outside the conventional boundaries of scientific inquiry.

We also had the opportunity to network with the other participants and learn more about their research. I explained my project to other people in my group and got interesting questions from them since they work on something completely different. It was also great to hear about the mathematical modelling techniques other people were using to build models.

Overall, the summer school was a great experience. It not only enhanced my understanding of cellular functions through the lens of economic principles but also fostered a collaborative and interdisciplinary learning environment. The opportunity to interact with peers and instructors from diverse scientific backgrounds was invaluable. I left the program with a renewed enthusiasm for my research and a broader perspective on how economic models can elucidate complex biological systems. The summer school on Economic Principles in Cell Biology has provided me with a new perspective to look at living beings as economical systems attaining to maximize their returns. I highly recommend it to anyone interested in the intersection of biology and economics.