February 24, 2026

Dear Editor,

We submit for your consideration the perspective article entitled "**Memory as a Biological Property: How a Single Number from Time-Series Econometrics Reveals Hierarchy in Gene Expression**" for publication in *Cell Systems*.

Summary. We argue that temporal persistence—how much a gene's past determines its future—is a fundamental axis of biological variation, distinct from expression level, network connectivity, or epigenetic state. The eigenvalue modulus of a second-order autoregressive model provides a direct measurement of this property using mathematics that has been refined across physics, engineering, economics, and climate science over two centuries.

Significance. This perspective connects gene expression dynamics to the broader scientific tradition of eigenvalue analysis, showing that the same mathematical object that determines energy levels in quantum mechanics, natural frequencies in structural engineering, and economic persistence timescales also measures biological memory in gene expression. We present evidence that eigenvalue is partially independent of network connectivity ($\rho = -0.29$) and nearly independent of chromatin state ($\rho = 0.08$), confirming it captures a distinct biological dimension.

Broad appeal. This article bridges computational biology, time-series statistics, dynamical systems theory, and circadian biology. It should interest researchers across these fields who may not be aware that their mathematical tools apply directly to gene expression analysis.

This manuscript has not been submitted elsewhere and all work is original.

Sincerely,

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