

REVIEW ARTICLE

Contribution of Dr. Eric Kandel in Field of Pediatrics

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ABSTRACT

Eric R. Kandel is a pioneering neuroscientist whose work revolutionized the understanding of the biological basis of memory. This review highlights his seminal discoveries using the marine snail *Aplysia californica*, which demonstrated that learning and memory are stored as changes in synaptic strength.¹⁻³ His research established that short-term memory involves functional synaptic modifications, whereas long-term memory requires gene activation, protein synthesis, and the formation of new synaptic connections.⁴⁻⁶ Central to this process is the transcription factor CREB, which acts as a molecular switch for memory consolidation.⁷ By linking molecular mechanisms to behavior, Kandel bridged psychology and biology, providing a unified framework for cognitive neuroscience. Awarded the Nobel Prize in Physiology or Medicine in 2000, Kandel's work continues to influence research into neurodegenerative and psychiatric disorders.⁸⁻¹⁰

KEYWORDS

• Eric Kandel • Memory • Synaptic Plasticity • *Aplysia* • CREB • Learning
• Neuroscience • Nobel Prize

INTRODUCTION

Eric Richard Kandel is a transformative figure in modern neuroscience whose research provided the first clear biological explanation of memory formation.^{1,2} By demonstrating

that experiences modify synaptic connections, he established a direct link between behavior and molecular events in the brain³. His work laid the foundation for modern cognitive neuroscience and neuropsychiatry.

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Background:

Eric Kandel was born on November 7, 1929, in Vienna, Austria.⁸ After fleeing Nazi persecution, his family emigrated to the United States. He studied history and literature at Harvard University before earning his medical degree from New York University. His postdoctoral training at the NIH and in Paris shaped his commitment to understanding memory through a biological lens.⁸⁻⁹

Scientific Contributions

1. Choice of *Aplysia californica*

Kandel selected *Aplysia* for its simple nervous system and identifiable neurons, allowing direct correlation between behavior and neuronal activity.⁴ This reductionist approach was critical to deciphering memory mechanisms.

2. Synaptic Basis of Memory

His experiments showed that short-term memory results from enhanced neurotransmitter release due to synaptic modification, while long-term memory requires structural synaptic changes mediated by new protein synthesis.^{1,3,5}

3. Molecular Mechanisms and CREB

Kandel identified CREB as a key transcription factor that regulates gene expression necessary for long-term memory consolidation.⁶⁻⁷ This discovery provided a molecular explanation for memory persistence.

Challenges and Breakthroughs

Kandel faced skepticism regarding the relevance of a simple organism to human cognition. His persistence and rigorous experimental evidence demonstrated that fundamental memory mechanisms are conserved across species.^{2,4}

Discussion and Legacy

Kandel's work reshaped neuroscience by integrating molecular biology with

psychology.¹⁰ His discoveries have influenced research on Alzheimer's disease, PTSD, and other memory-related disorders.^{9,10}

CONCLUSION

Eric Kandel fundamentally transformed the understanding of memory by revealing its molecular and synaptic foundations.¹⁻¹⁰ His work remains a cornerstone of neuroscience and a model for interdisciplinary scientific inquiry.

Conflict of Interest: None

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