Simple Cells
Complex Realities

Paul A. Nelson
Simple Cells: Complex Realities

I would like to personally thank you for watching the Origins program. Origins was a special program, near to the heart of my late husband, Russell Bixler.

I trust that the information in this presentation will be helpful in your study of creation science. Thank you for your prayerful and financial support of Origins… you’re making the television production of this program possible.

Norma Bixler
Minimal complexity in biology:

How *simple* can an organism be, and yet exist?

What does an organism need just to survive?
Biotic realm ("living")

Origin of life

Prebiotic realm ("non-living")

"bottom-up approach"
The “bottom-up” approach searches for the sufficient conditions for the living state

\[ A + B + C (\ldots) = \text{life} \]

We can think of this as looking for the recipe for life.
Biotic realm ("living")

Origin of life

Prebiotic realm ("non-living")

"bottom-up approach"
Biotic realm ("living")

Origin of life

Prebiotic realm ("non-living")

"top-down approach"

"bottom-up approach"
The “bottom-up” approach searches for the *necessary conditions* for the living state.

Life without (minus) A, B, C...

...is the organism still viable?

We can think of this as looking for the *parts list* for life.
Biotic realm ("living")

Origin of life

Prebiotic realm ("non-living")

"top-down approach"
Biotic realm ("living")

Origin of life

Prebiotic realm ("non-living")

"bottom-up approach"
The RNA World Hypothesis for the Origin of Life
The RNA World Hypothesis for the Origin of Life
Biotic realm ("living")

Origin of life

Prebiotic realm ("non-living")

"bottom-up approach"
Doubts about the RNA World Hypothesis

Stuart Kauffman, theoretical biologist and origin-of-life researcher at the Santa Fe Institute and the University of Calgary
Doubts about the RNA World Hypothesis

"Of all the problems with the hypothesis that life started as nude replicating RNA molecules, the one I find most insurmountable is the one most rarely talked about:

Stuart Kauffman (1995, p. 42)
Doubts about the RNA World Hypothesis

“Of all the problems with the hypothesis that life started as nude replicating RNA molecules, the one I find most insurmountable is the one all living things seem to have a most rarely talked about minimal complexity below which it is impossible to go.”

Stuart Kauffman (1995, p. 42)
“...a minimal complexity below which it is impossible to go.”

“Sorry, you’re dead.”
Doubts about the RNA World Hypothesis

“All free-living cells have at least the minimum molecular diversity of pleuromona. Your antennae should quiver a bit here.”

Stuart Kauffman (1995, p. 42)
Electron micrograph of *Mycoplasma* 

(from Zinsser 1976, p. 756)
Doubts about the RNA World Hypothesis

“All free-living cells have at least the minimum molecular diversity of pleuromona. Your antennae should quiver a bit here.”

Why is there this minimal complexity?”

Stuart Kauffmann (1995, p. 42)
“Why is there this minimal complexity?”

We can answer Kauffman’s question in two ways:

1. An “in-principle,” or theoretical, analysis of the living state;
2. An empirical, or experimental, analysis of the living state.
First, let’s consider the theoretical answer to Kauffman’s minimal complexity question.
Exploring Planet Zed Beta
(somewhere in the Milky Way)
Minimal complexity
Minimal complexity

cell division (reproduction)
cell wall or membrane
transport
metabolism
information replication
energy conversion
information storage and transfer
Minimal complexity

- cell division (reproduction)
- transport
- metabolism
- information replication
- cell wall or membrane
- energy conversion
- information storage and transfer
Dr. Paul A. Nelson
Ph.D., Philosopher of Biology and Evolutionary Theory

For more Information:
Biola University
13800 Biola Ave.
La Mirada, CA 90639
www.biola.edu

1-562-906-4570
For Guest Information
Simple Cells: Complex Realities
Dr. Paul A. Nelson

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