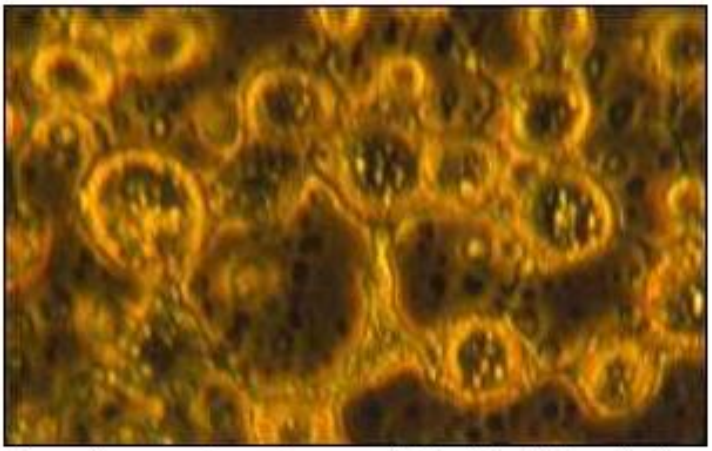
Cells' hint at life's origin



The cells may have been a shelter for life to start

By BBC News Online science editor Dr David Whitehouse

Scientists have managed to create "primitive cells" in an experiment which may indicate that life began in space and was delivered to Earth.

Researchers working with the American space agency Nasa say their "proto-cells" mimic the membranous structures found in all living things. They were produced in a laboratory experiment that duplicated the harsh conditions of cold interstellar space.

> **The delivery of these compounds could well have been critical to the origin of life on Earth.**
>
> **Dr Louis Allamandola**

It is possible such structures could have been important in protecting self-replicating molecules as they evolved into primitive life.

These molecules could then have been delivered to a young Earth by comets, meteorites or interplanetary dust, where they kick-started life on our planet.

Membranous structures

"Scientists believe the molecules needed to make a cell's membrane, and therefore needed for the origin of life, are all over space. This discovery implies that life could be everywhere in the Universe," said lead researcher Dr Louis Allamandola,

Researchers from Nasa's Ames Astrochemistry Laboratory and the Department of Chemistry and Biochemistry at the University of California, Santa Cruz, used simple, common chemicals in their experiment - ices made of water, methanol, ammonia and carbon monoxide.

These were zapped with ultraviolet radiation in a vacuum to simulate space conditions.

This produced solid materials which, when immersed in water, spontaneously created soap bubble-like membranous structures that contained both an "inside" and an "outside" layer. The structures themselves are not alive.

Some of the experimental cells have strange internal structures

Protected chemistry

"The formation of these biologically interesting compounds by irradiating simple interstellar ices shows that some of the organics falling to Earth in meteorites and interplanetary dust might have been born in the coldest regions of interstellar space."

Scientists do not know how life began but at some point membranes became important.

"All life as we know it on Earth uses membrane structures to separate and protect the chemistry involved in the life process from the outside," said Dr Jason Dworkin of the California-based Seti (Search for Extra-Terrestrial Intelligence) Institute.

"Membranes are like a house. Maybe these molecules were just the raw lumber lying around that allowed origin-of-life chemicals to move in and set up housekeeping or construct their own houses."

> **This work is very interesting in that it shows that natural reactions occurring in space are capable of building up more complex structures.**
>
> **Dr Monica Grady**

Life everywhere

This new work suggests that the early chemical steps believed to be important for the origin of life do not require an already-formed planet.

Instead, they seem to take place in deep space long before planet formation occurs.

This implies that the vastness of space is filled with chemical compounds which, if they land in a hospitable environment like our Earth, can readily jump-start life.

Dr Monica Grady, from the Natural History Museum in London, who has analysed Martian meteorites for signs of life, said: "We've known for a long time that the building blocks for life exist in outer space."

The study is published in the Proceedings of the National Academy of Sciences.

Further work

Co-researcher Dr Scott Sandford said the team would continue to investigate the properties of their cells.

"We want to see if they show some of the same behaviours you see in biological membranes," he told the BBC. "It's one thing to have little structures with an inside and an outside, but in living membranes its important to be leaky - but not too leaky.

"You need for waste products to pass out and new resources to come in, but not in an uncontrolled fashion.

"We'd like to understand whether these membranes let things pass through them and whether they're selective about it."

QUESTIONS:

1. What is a protocell?

A protocell is a theoretical, primitive cell composed of a membrane that isolates the cell from the environment and a RNA molecule that replicates and allwos the cell to grow and reproduce.

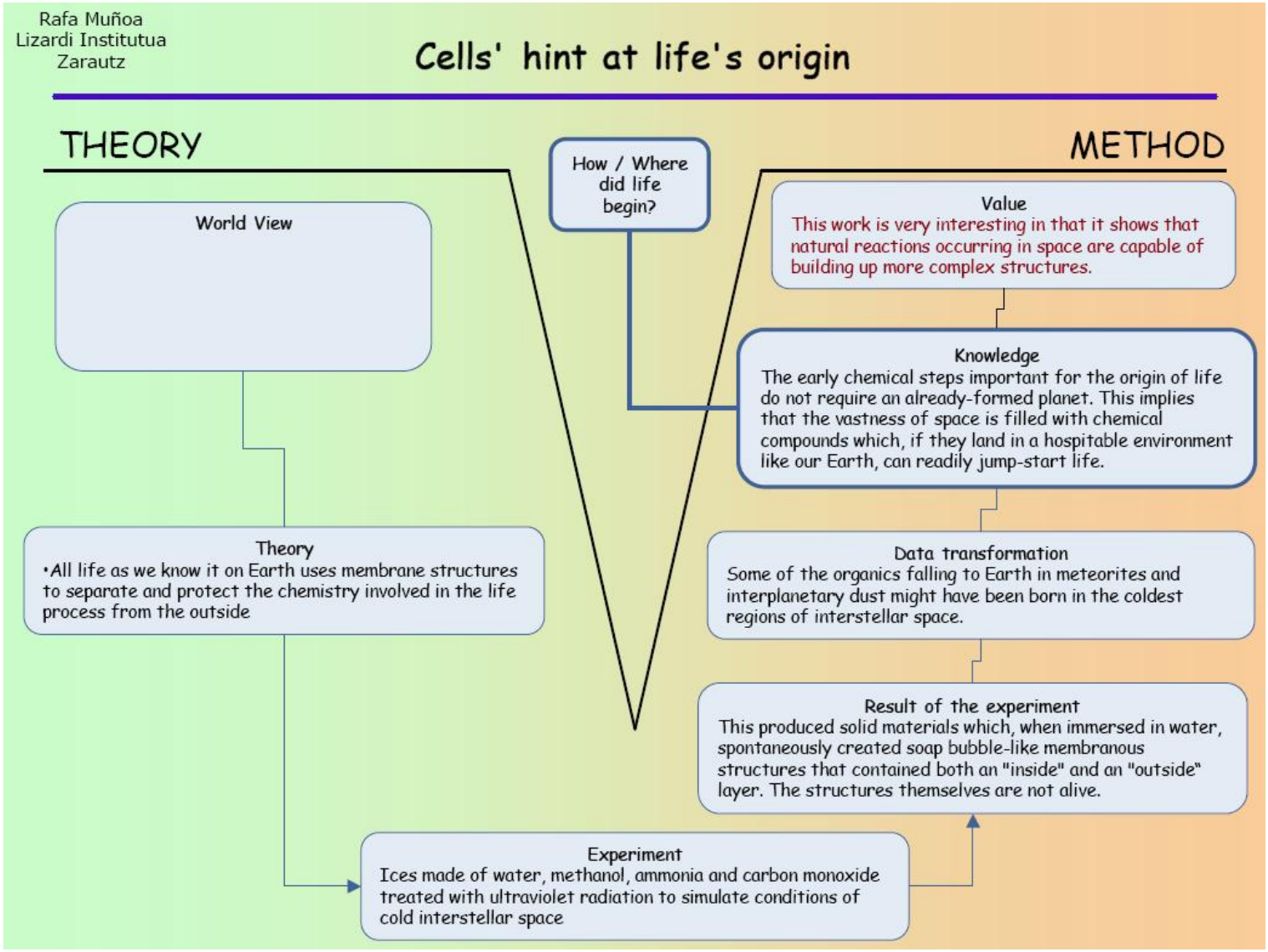
2. Why is the membrane so important for life?

It isolates from the environment and protects the chemical processes involved in life.

3. Does the article suggest that the first living organisms lived in space?

No, it suggests that the first steps in the formation of life (formation of membranes) could have happened in space.

4. Build a Gowin V diagram


Rafa Muñoa
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Cells' hint at life's origin
THEORY
METHOD
How / Where did life begin?
World View
Value
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Knowledge
The early chemical steps important for the origin of life do not require an already-formed planet. This implies that the vastness of space is filled with chemical compounds which, if they land in a hospitable environment like our Earth, can readily jump-start life.
Theory
•All life as we know it on Earth uses membrane structures to separate and protect the chemistry involved in the life process from the outside
Data transformation
Some of the organics falling to Earth in meteorites and interplanetary dust might have been born in the coldest regions of interstellar space.
Result of the experiment
This produced solid materials which, when immersed in water, spontaneously created soap bubble-like membranous structures that contained both an "inside" and an "outside" layer. The structures themselves are not alive.
Experiment
Ices made of water, methanol, ammonia and carbon monoxide treated with ultraviolet radiation to simulate conditions of cold interstellar space