

# The Viral Fossil

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The Original Viral Stars Part 3

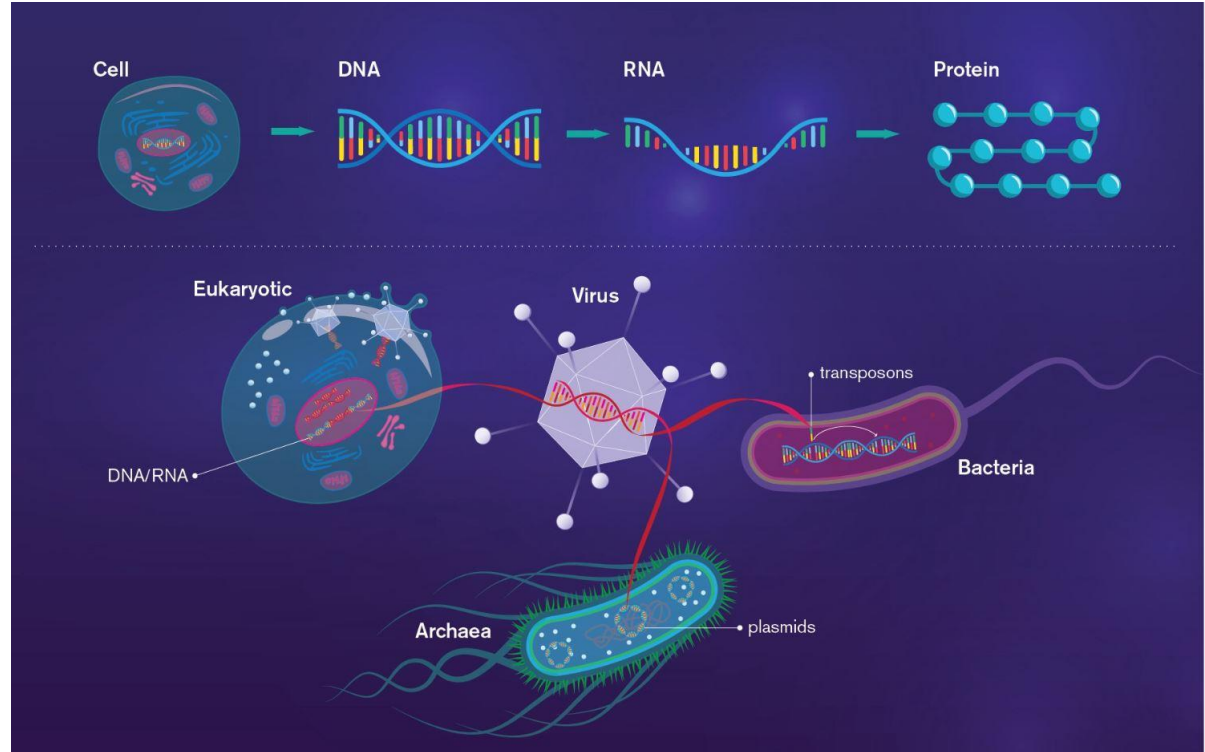


[aceraei.org](http://aceraei.org)

# What Do We Know About Viruses?

Viruses....

- Were assembled from prokaryotic (bacterial) cells billions of years ago
- Do not leave *physical* fossils
- Evolves by natural selection
- Pass on their genes to their offspring
- Have been connected to life since ancient times



***What can we infer about their evolution from these traits?***

# Our Ancient Connection to Viruses

- Viruses started infecting bacteria billion of years ago to survive
- During that time, viral DNA has found its way into every organism on Earth
- Is a central part of sustaining life on Earth, ensuring balance in the microbe world
- Dormant or “fossilized” viral DNA makes up a large percentage of all genetic material on Earth.



# The Genetic Fossil

- A virus doesn't leave a physical mark but instead stamps out a *genetic fossil*.
- Due to viruses' relatively high mutation rates, scientists can only infer so much from their history, but leftover viral DNA appears to trace back to the dawn of microbes 3.5 billion years ago.
- As long as there has been DNA replication, viral DNA has been getting passed on with it.
- Viral DNA will continue to be passed on until the end of time, laying still and dormant.



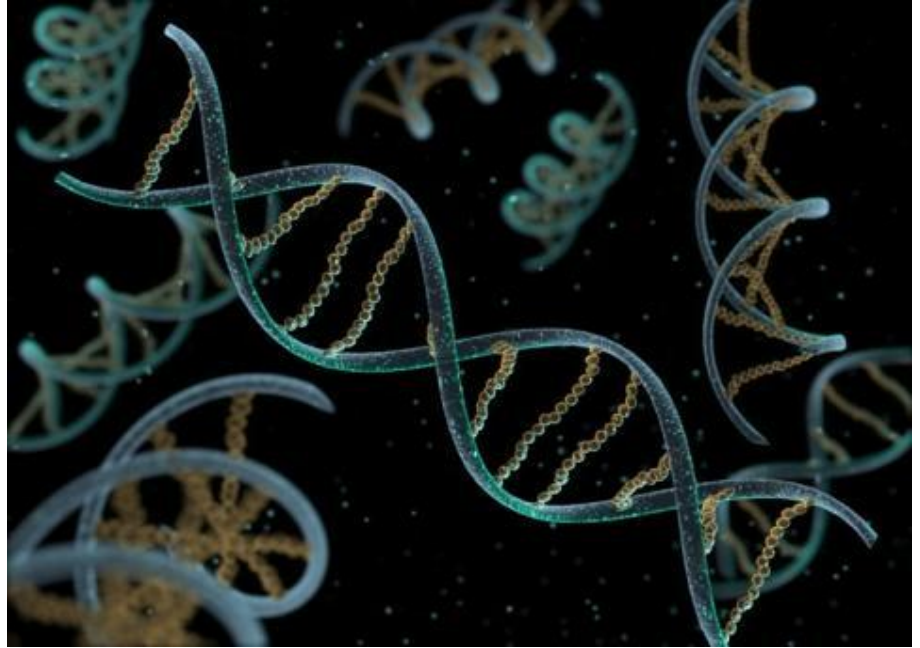
Computer generated image

*How does this change your perspective of viruses?*

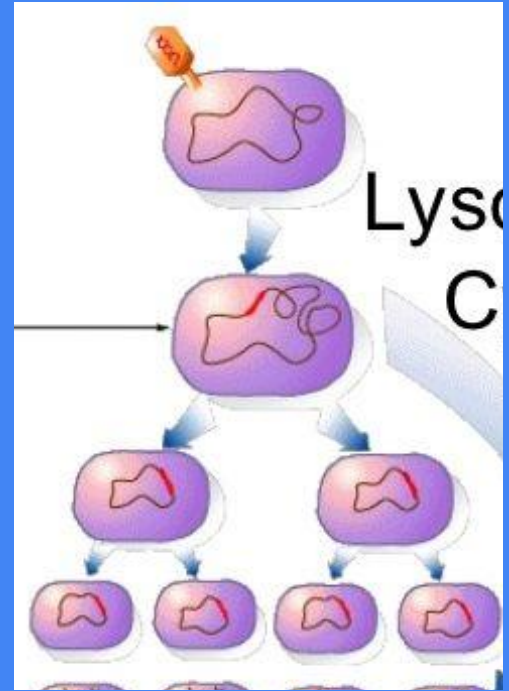
# Leftover Viral DNA is Essential for Life

- In humans, leftover viral DNA provided the genetic for life sustaining practices:
- Viruses provided genetic code to enable placentas to form, allowing live births like the ones in humans, kittens, otters, etc.
- Activates crucial proteins during early embryonic development

*What does that make you think about viruses and their role in our history?*



**Though a vast majority of implanted viral DNA remains dormant and just gets passed on, some of sequences can do something really interesting!**



# Some Leftover Viral DNA Can Jump!

- Jumping genes or **transposable elements** (TEs) are remnants of ancient viral infections
- TEs are able to catalyze their own removal from the genome and jump to another location
- Every organism on Earth has active jumping genes.
- Sometimes viral DNA in adjacent cells will jump in unison!



*\*Activating the Hcrt-UP2 gene can lead to lower body temperatures. Hilarious. I know.*

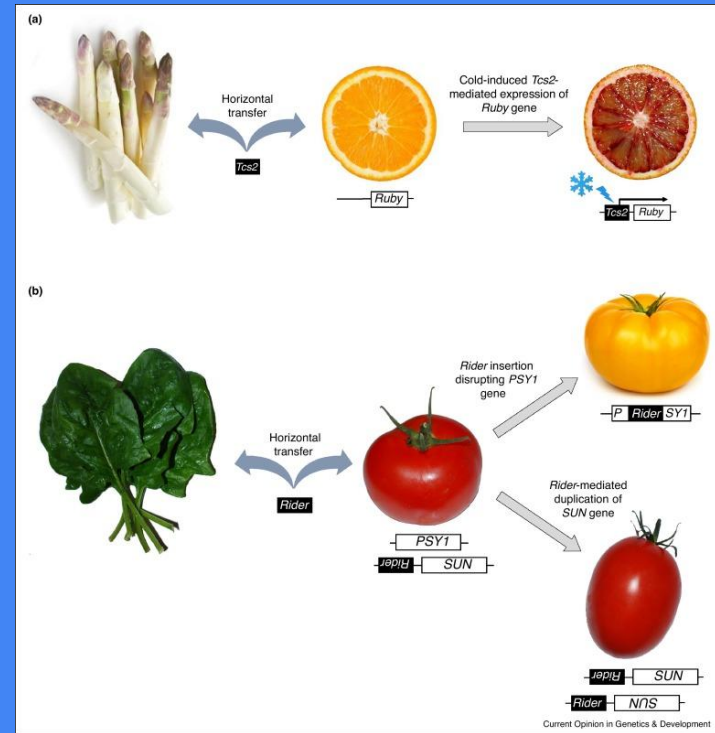
# Are TEs Harmful?

Short Answer: **NO**, except in very rare instances. In fact, they are pretty important.

Transposable elements play an important role in increasing genetic diversity in evolution and in gene expression.

Some TE's can insert into active genes causing certain diseases, but they are rare and embryonic development. TE's don't want to hurt their host as any damage to it will affect the transposon so most "jumps" are silent and undetectable by the host represent a very significant majority of all transposon movement

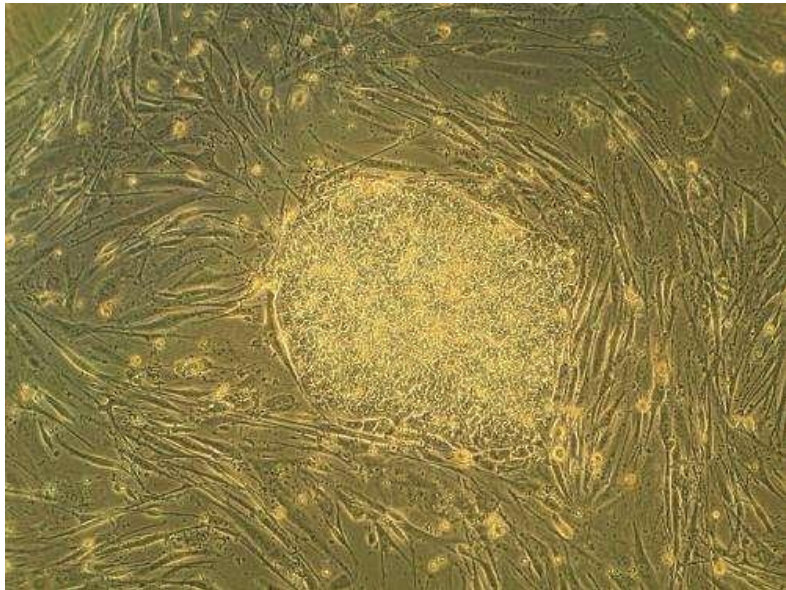
For more information on jumping genes, go [here \(beginner\)](#) or [here \(advanced\)](#)



*Jumping genes can sometimes transfer between hosts. This is widely seen in plants and is responsible for some of the variation in appearance that is seen across the plant kingdom*



# So what does a virus leave behind?



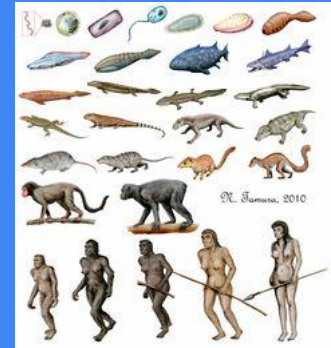
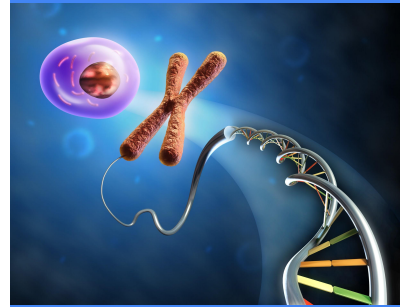
*Image shows the type of human cells viruses help edit to aid early development*

1. Leaves no physical evidence
2. Sometimes leaves a genetic fossil which may aid ancestors
3. The leftover DNA rarely cause medical issues
4. The genes usually lay dormant
5. Occasionally, the genes jump to another location in the same genome that may increase genetic diversity
6. Sometimes, the viral DNA is incorporated into the germ line \_\_\_\_\_ and gets passed on  
...sometimes forever!

# What do humans pass on that lasts forever ?

The images to the right are some examples of materials that humans passed on their ancestors.

*How do each of these get passed on?  
Can you think of anything else?*



# **Resources for COVID19**

# Where Can I Go for Information on COVID19?

The Original Viral Stars lessons were meant as informational guide on biology and their place in the world. Even though viruses are a part of life, COVID19 poses a significant threat to human health and it is essential to curb its spread. For information on the COVID19 Pandemic, we have compiled links.

## News and Information

- [Center for Disease Control](#)
- [World Health Organization](#)
- [National Geographic for Kids](#)
- [Johns Hopkins Coronavirus Hub](#)
- [An Illustrated Scientific Summary \(video\)](#)

## Information Hubs

- [Real Clear Science](#)
- [PBS News Hub](#)
- [Gizmodo News Hub](#)
- [Worldometers](#) - Real time estimated statistics

## International

- [Der Spiegel](#)
- [BBC](#)
- [Al Jazeera](#)

There is a lot of misinformation. If you are visiting a website for the first time, fact check it with a website like <https://mediabiasfactcheck.com/>

# How has your opinion about viruses changed?



During these lessons, you explored the following concepts about viruses

1. Their biology
2. Their classification as non-living
3. Ways that scientists reprogram them
4. Ways they have impacted the course of life

[This link will take you to a reflection](#) that will ask you to summarize what you learned and your closing thoughts about viruses.

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