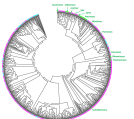


# **A New Concept of Life will lead to a New Theory of Evolution**

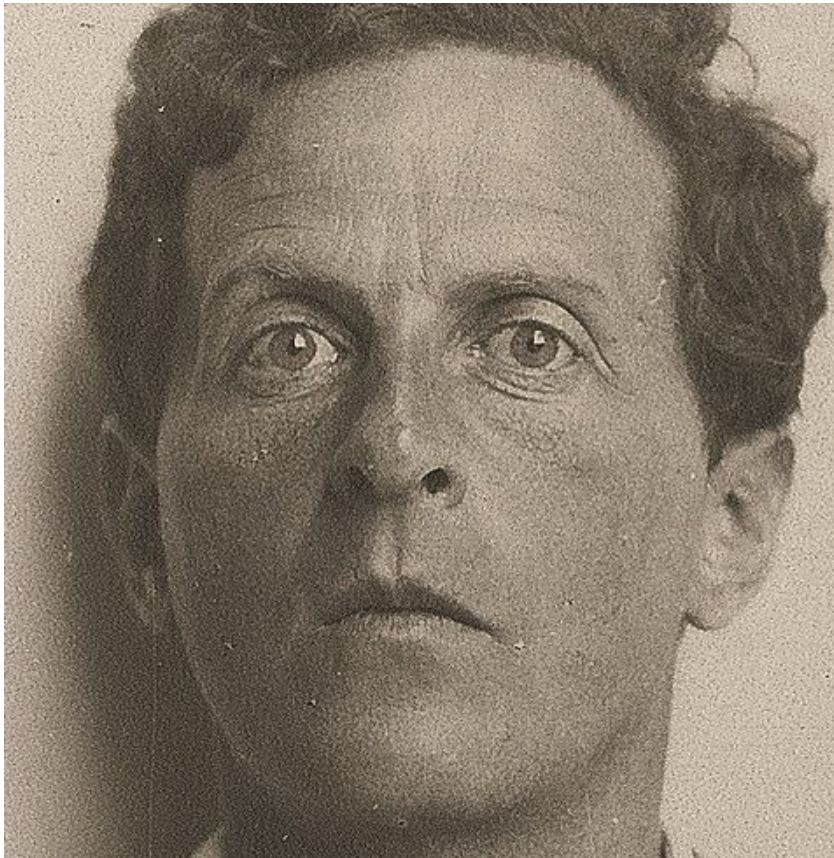
Guenther Witzany  
Telos – Philosophische Praxis  
5111-Buermoos, Austria

# **The Story:**

## **Why this Symposium takes Place**



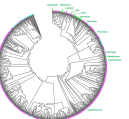
## Where I come from: Philosophy of Language Philosophy of Science



The Meaning of a Word is its use

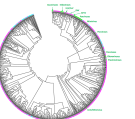


Communication = rule-governed,  
sign-mediated interactions



# Communication *is* interaction

- agent based
- social event
- sign-based
- rule (not laws)-based  
(needs some language or code)





# Languages or Codes in Communication

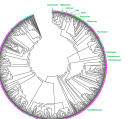
## 3 Levels of Rules

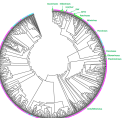
**syntax - combination of signs**

**semantics – meaning of signs**

**pragmatics – context of sign use**

**“The Shooting of The Hunters”**  
**context determines meaning, not syntax**





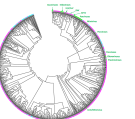
## Empirical Knowledge about Natural Languages and Codes

No natural language speaks itself

No natural code codes itself

Signs, characters don't organize themselves

There must be agents that edit natural code

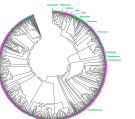


**Consequences:**

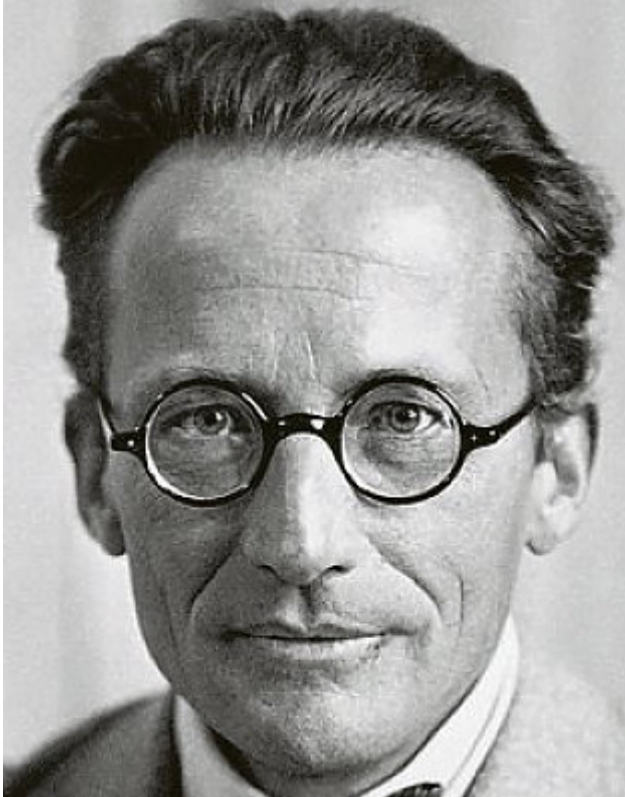
**Mathematical Theories of Language and  
Communication are falsified:  
Information Theory, Systems Theory, Game  
Theory, etc.**

**Natural languages/codes in communication  
processes are biotic, not mechanistic**

**These consequences did not arrive in Biology**



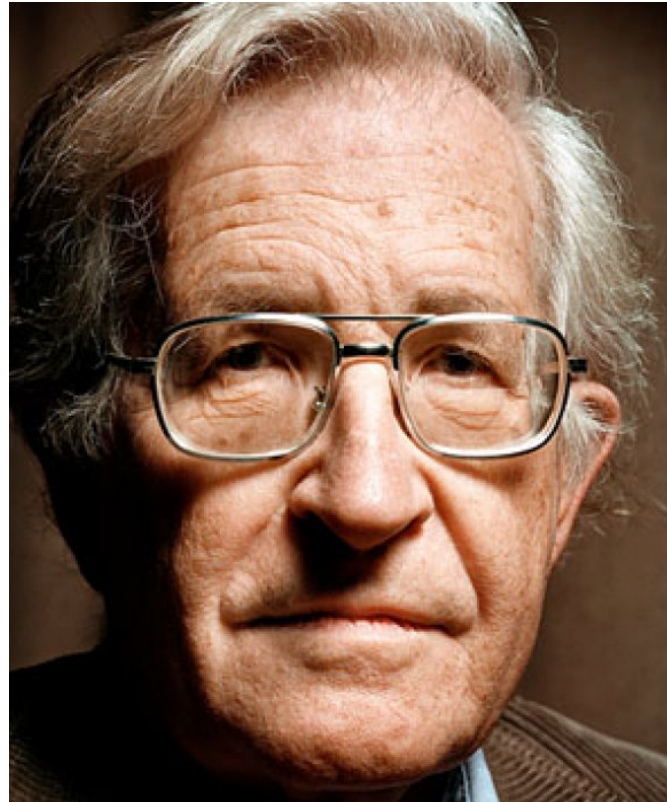




**Erwin Schrödinger**

What is Life?

Physics + Chemistry



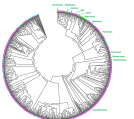
**Noam Chomsky**

Genetic Code has a universal  
syntax which depicts material  
reality



**Manfred Eigen**

Kinetic Theory of  
Reproduction of Nucleic  
Acids

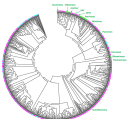


# 1. Biocommunication + Natural Genome Editing

## **Biocommunication :** **signal mediated interactions**

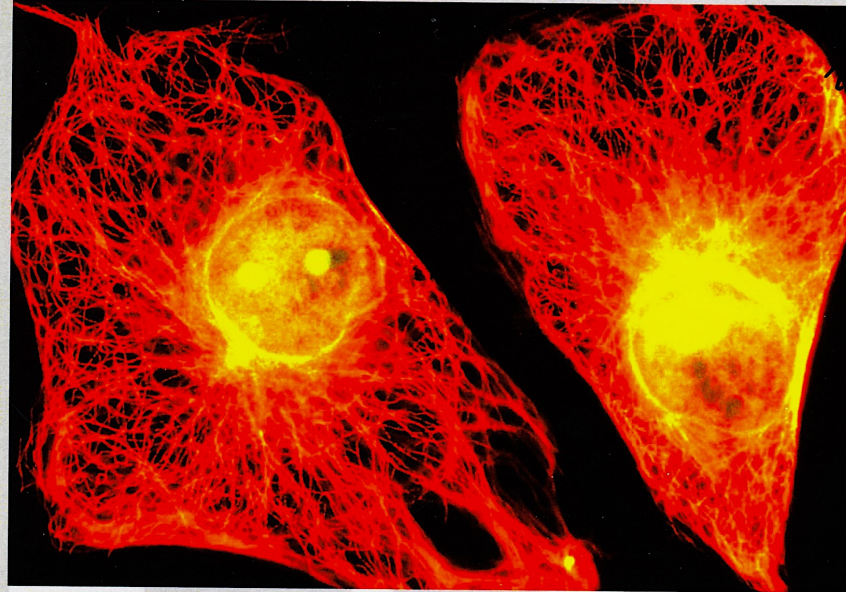
Within and between organisms in all domains  
(viruses, bacteria, protozoa, animals, fungi, plants)

## **Natural Genome Editing :** **viral-driven generation and integration** of nucleic acid sequences



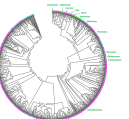


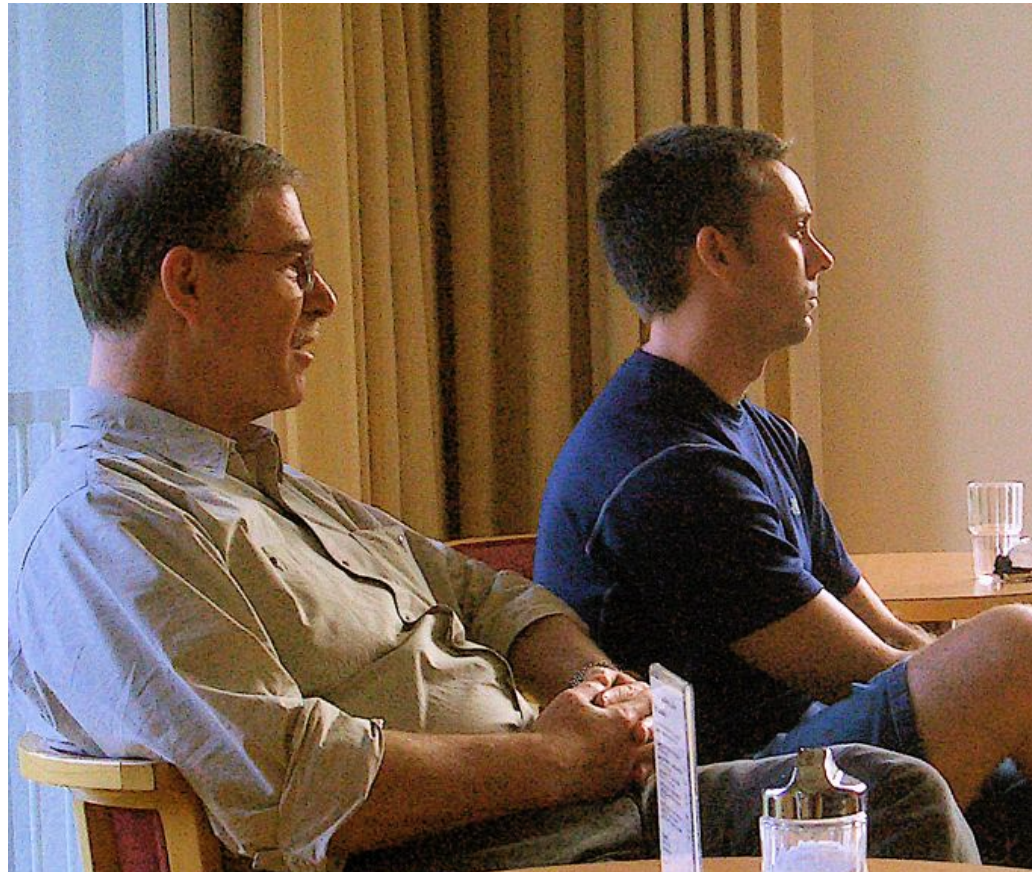
Günther Witzany



# Life: The Communicative Structure

a new philosophy of biology

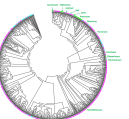




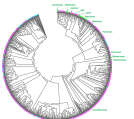
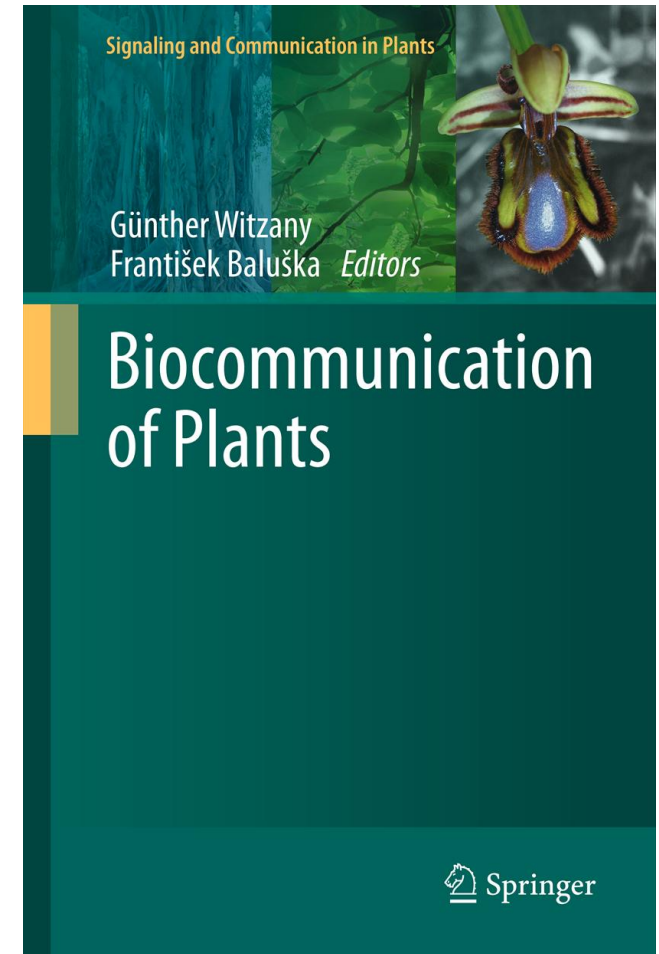
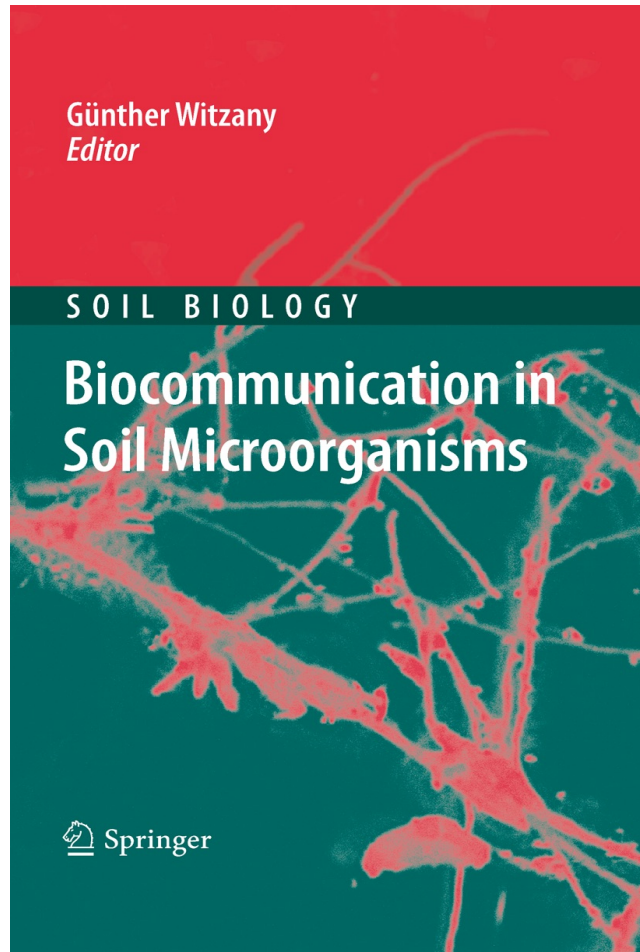
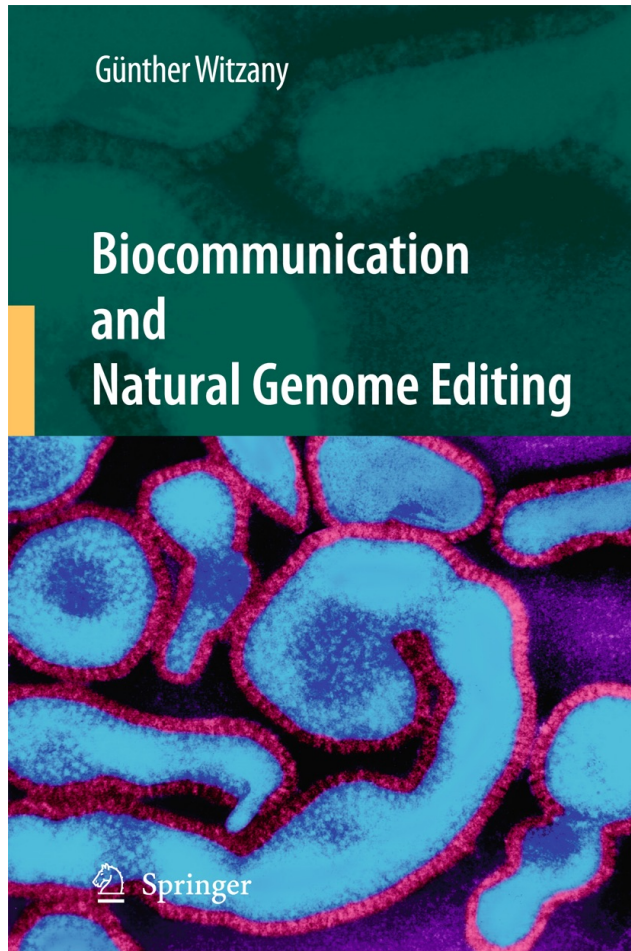
Science. 1995 Apr 21;268(5209):373-4.

## **Adaptive mutation: who's really in the garden?**

Shapiro JA<sup>1</sup>.







Günther Witzany *Editor*

# Biocommunication of Fungi

 Springer

Günther Witzany *Editor*

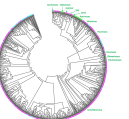
# Biocommunication of Animals

 Springer

Günther Witzany *Editor*

# Viruses: Essential Agents of Life

 Springer



Guenther Witzany · Mariusz Nowacki  
*Editors*

# Biocommunication of Ciliates

 Springer

Guenther Witzany *Editor*

# Biocommunication of Archaea

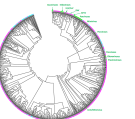
 Springer

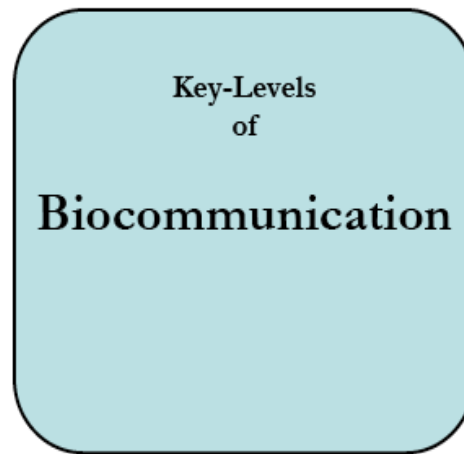
Signaling and Communication in Plants

Frantisek Baluska · Monica Gagliano  
Guenther Witzany *Editors*

# Memory and Learning in Plants

 Springer



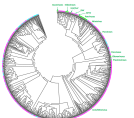


**Sensing, Monitoring  
and Interpretation**  
of  
abiotic  
influences

**Transorganismic  
communication**  
with  
non-related  
organisms

**Interorganismic  
communication**  
with  
same  
or related species

**Intraorganismic  
communication**  
intercellular  
intracellular

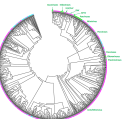




## 2. RNA - Life is a social event

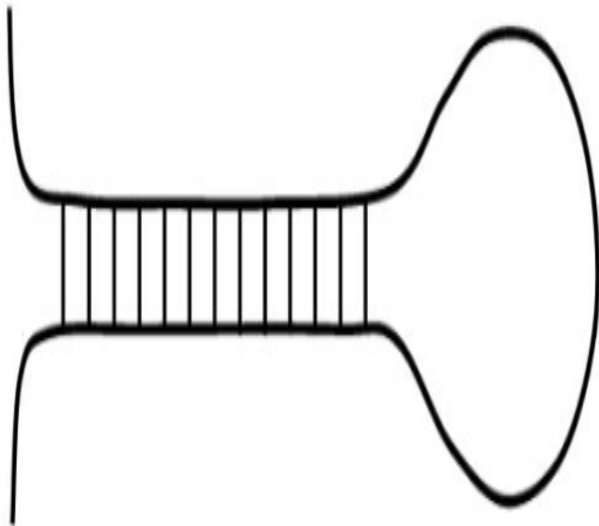
Single RNA stem loops react  
physical/chemical exclusively

Biological selection starts with Interacting  
RNA stem loops



# RNA - Life is a social event

## RNA secondary structure types



stem



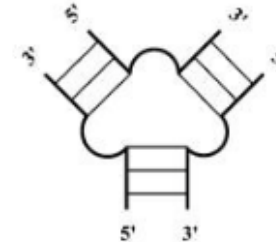
Hairpin loop



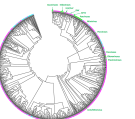
Bulge loop



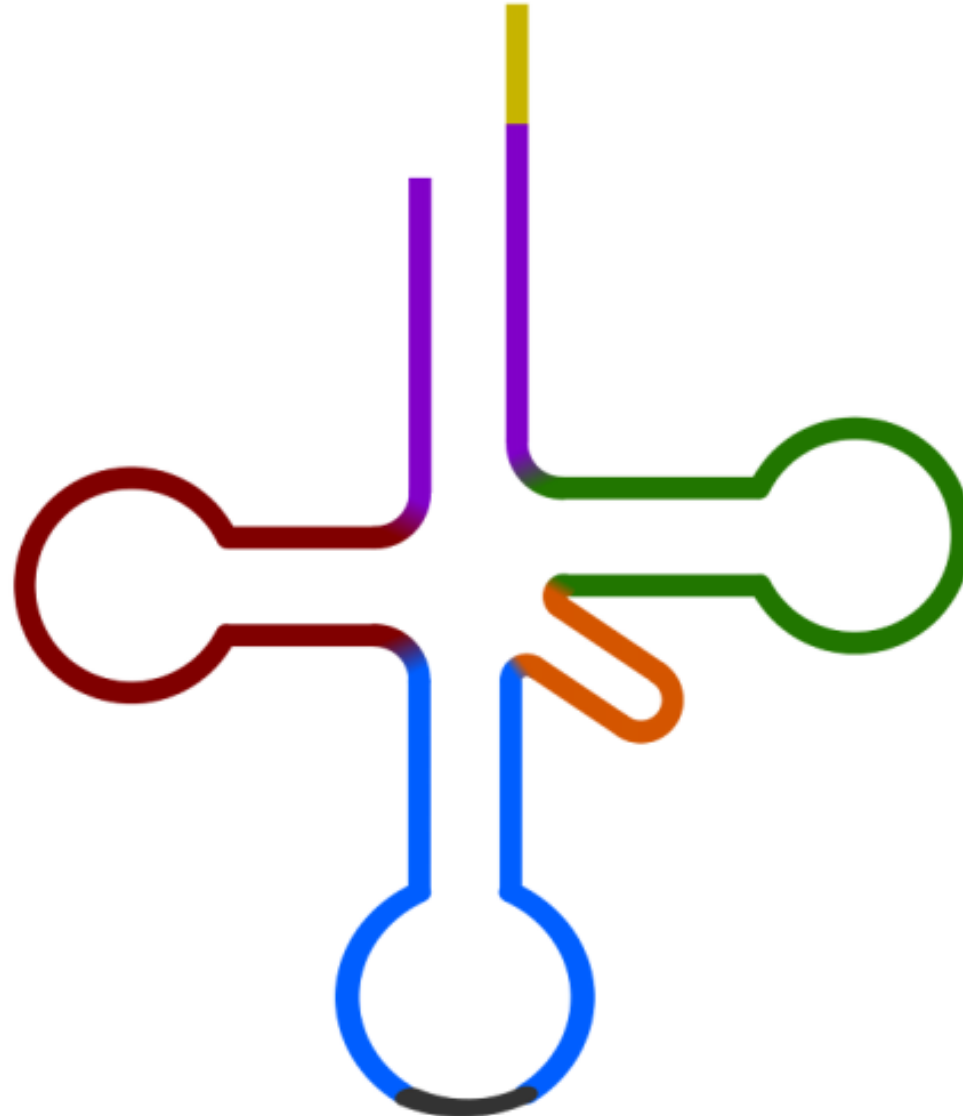
Interior loop



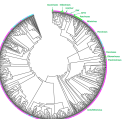
Multi-branched loop



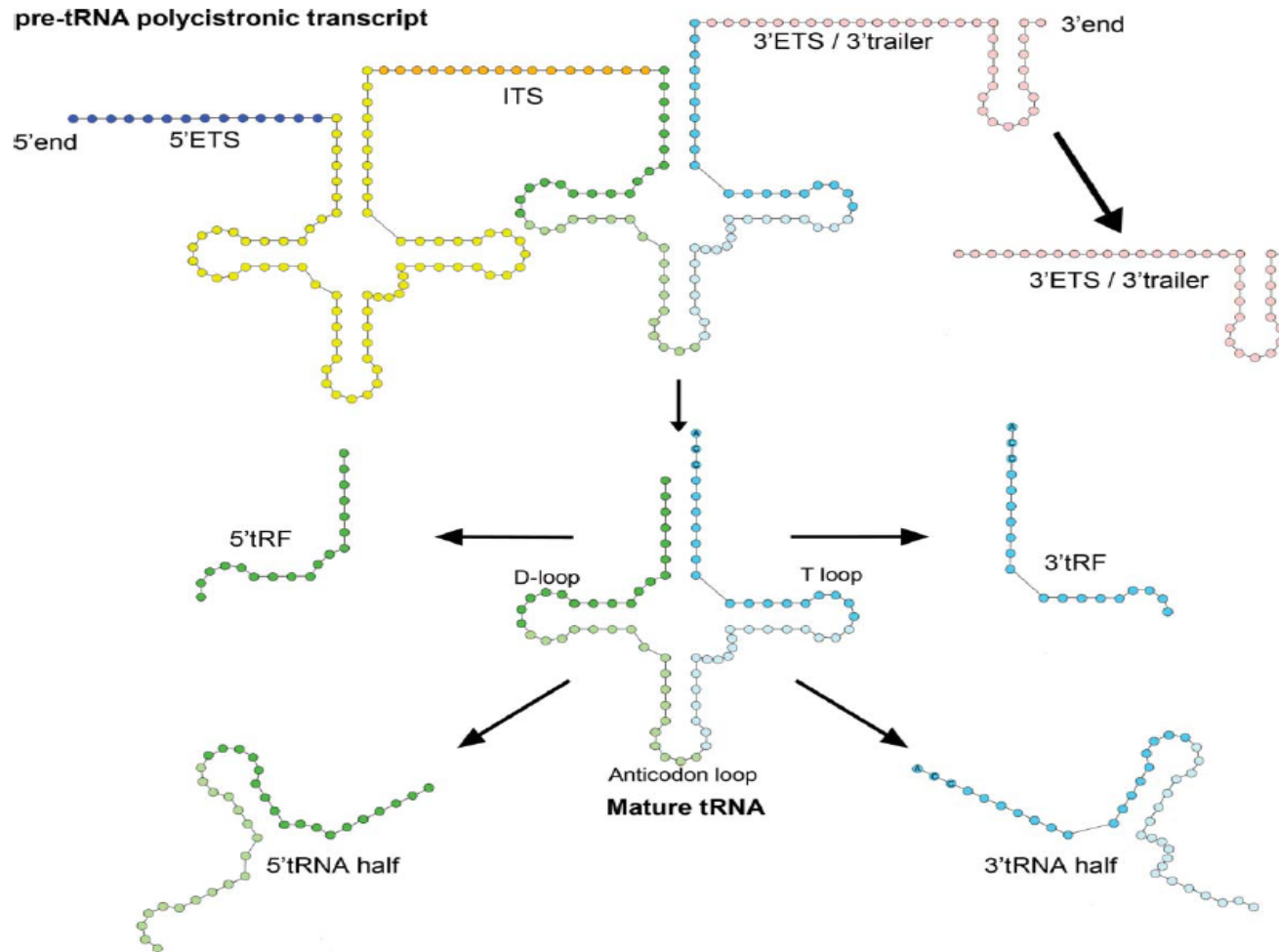
# RNA - Life is a social event



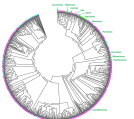
tRNA  
stem loops  
evolved  
independently  
and  
uncorrelated



# RNA - Life is a social event

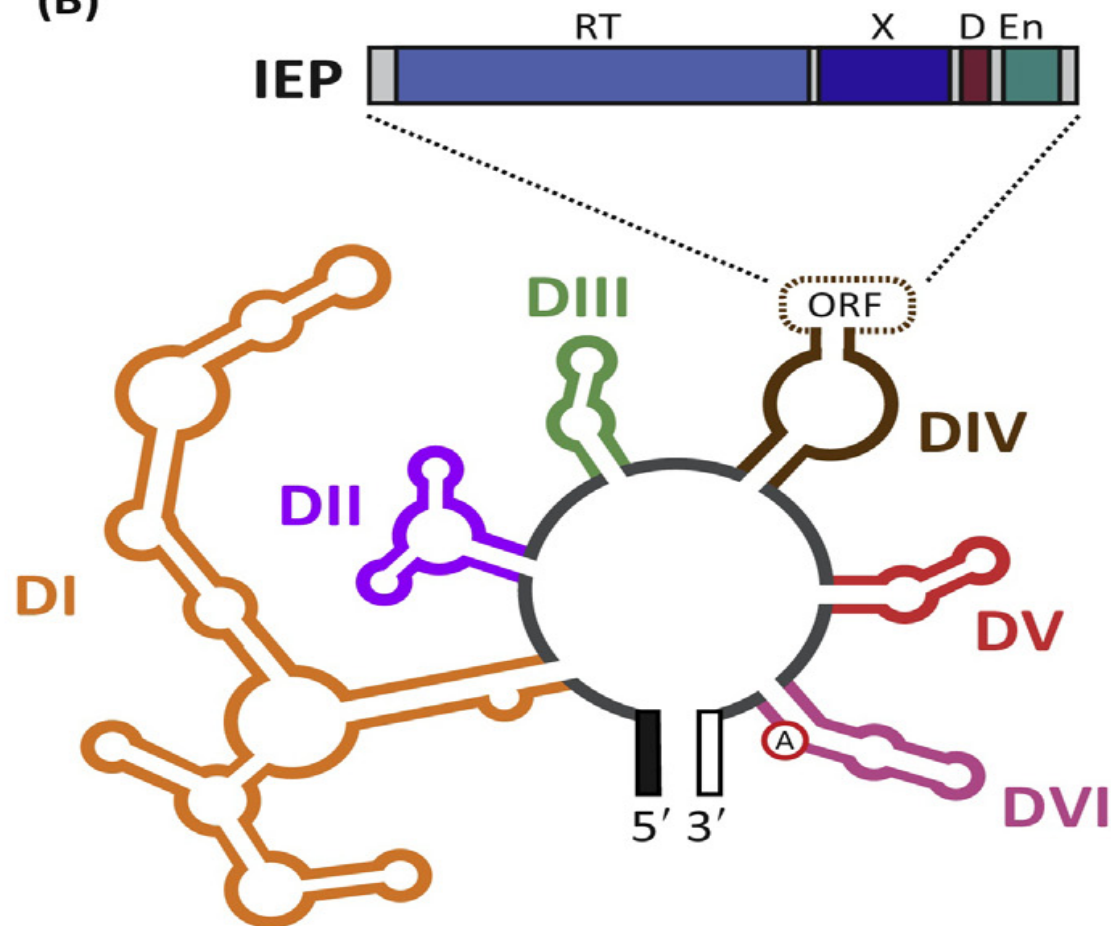


tRNA Fragments may re-combine

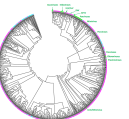


# RNA - Life is a social event

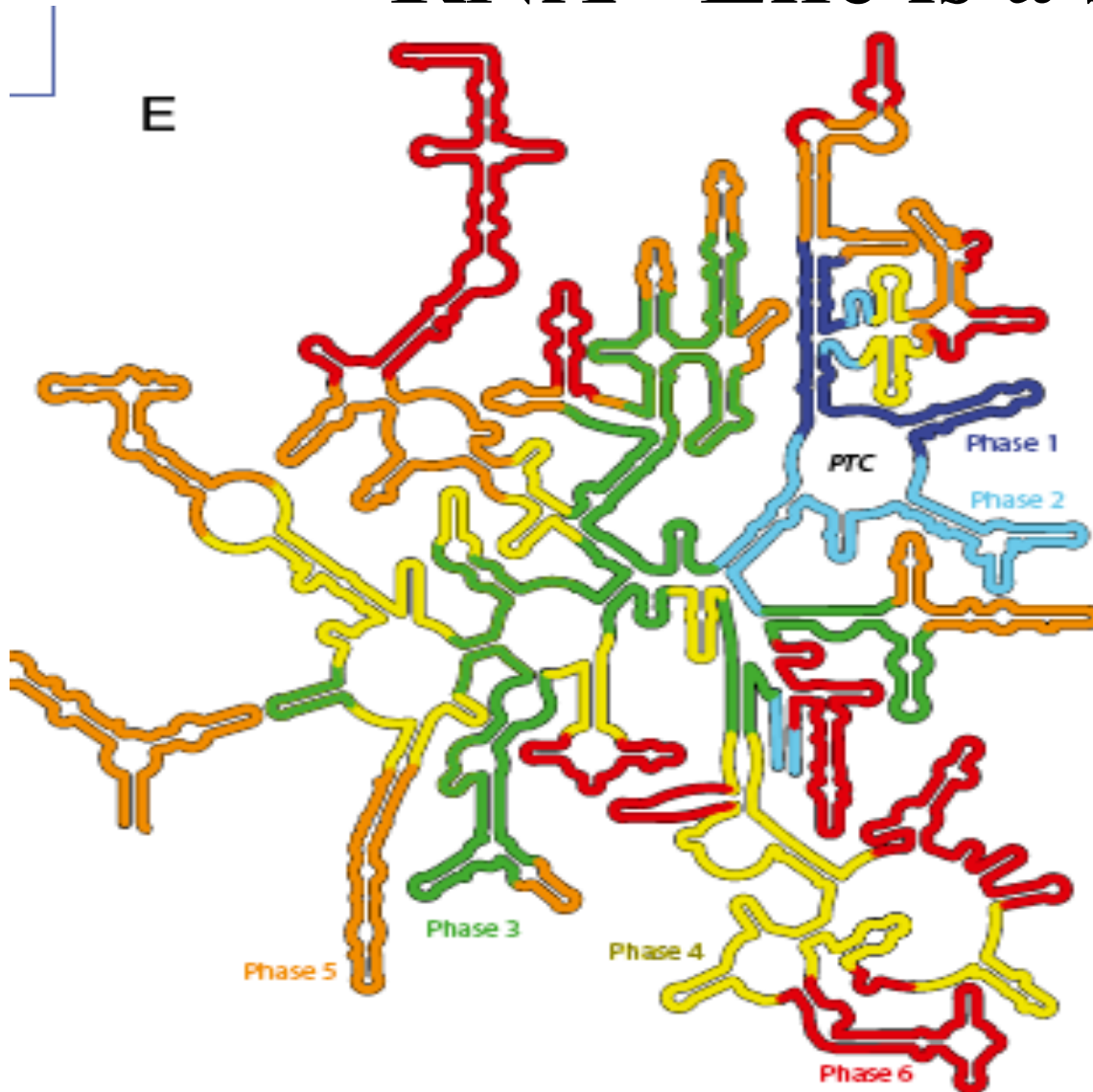
(B)



Group II Intron

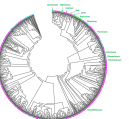


# RNA - Life is a social event



Each colour represents another evolutionary history.

The LSU and the SSU evolved independently and uncorrelated





# RNA - Life is a social event

- **Repetitive sequence syntax is essential in RNA communication**

- **RNA Interaction Motifs**

Self ligation

RNA Editing

Alternative Splicing

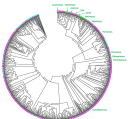
Pseudo knotting

Loop kissing

Frame shifting

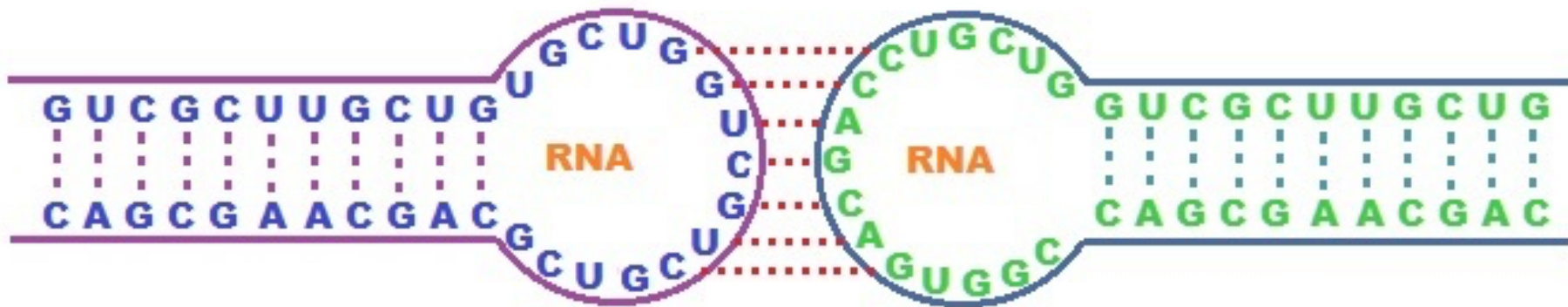
Bypassing translation

- **Masters of the RNA Universe: Reverse Transcriptase**

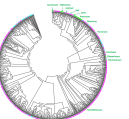


# RNA - Life is a social event

### Kissing-Loop Complex



Whenever a single stranded RNA loop or bulge emerges   unexpectable RNA RNA interactions may emerge

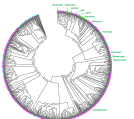


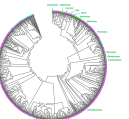
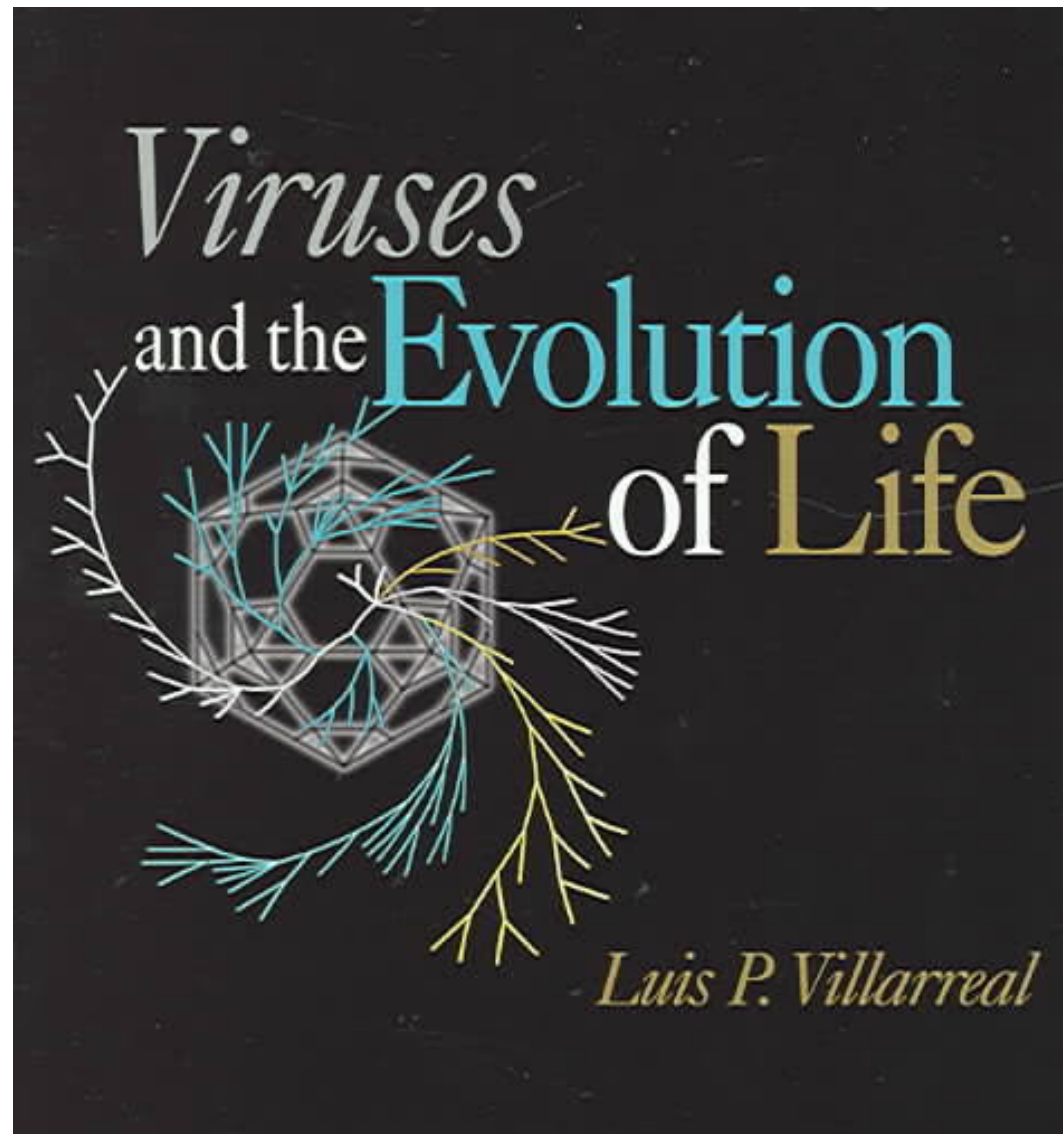
# 3. Virosphere

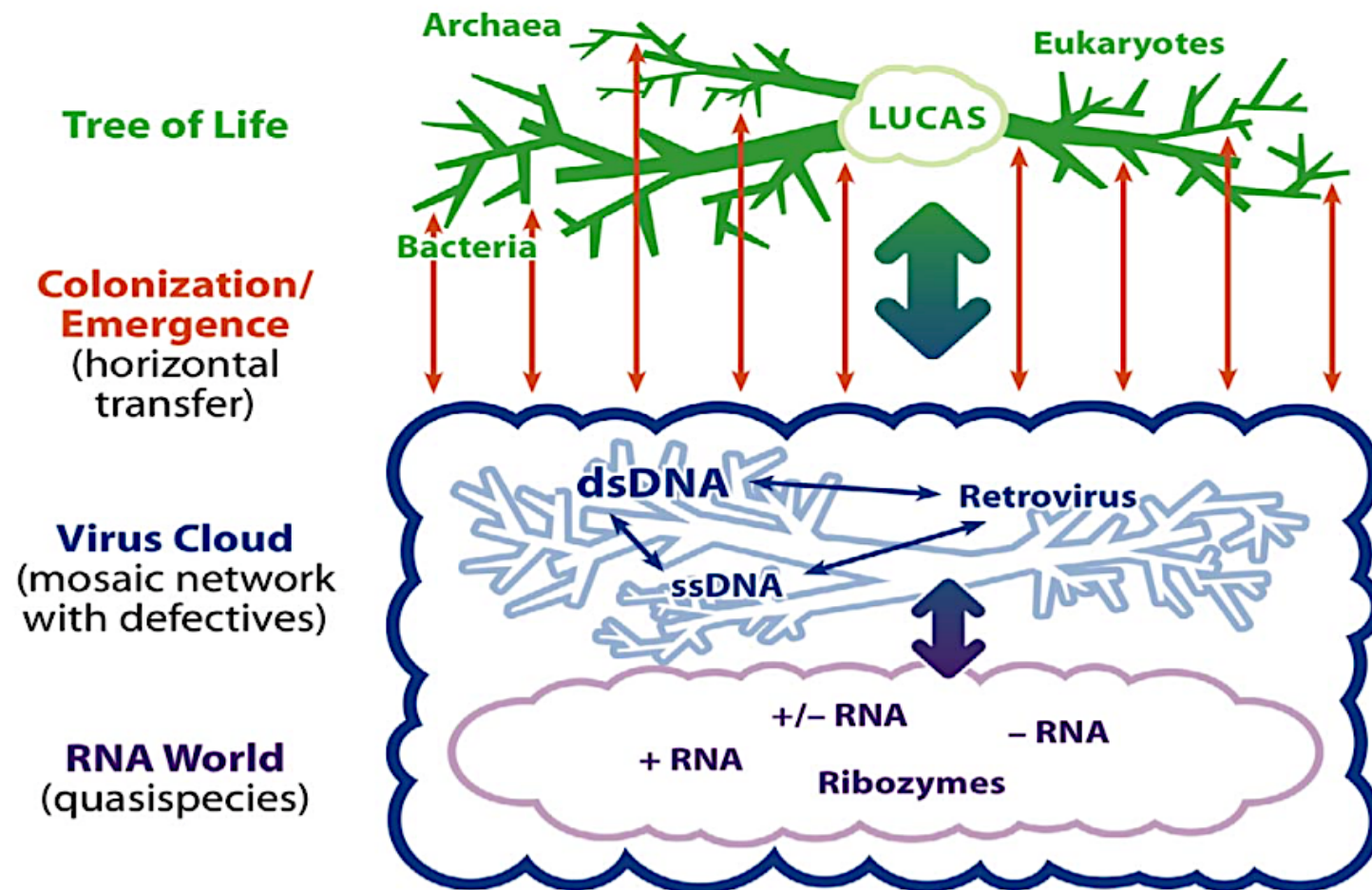
„Without infection no evolution“ (F. Baluska)

**Viruses are biotic identities  
that are competent to edit code**

- can co-operate
- build communities
- generate nucleotide sequences *de novo*
- insert/delete them into host genetic content without damaging host genetic content
- remain as mobile genetic elements or similar ‘defectives’
- build counterbalancing „addiction modules“ (T/A, R/M)
- determine host genetic identities throughout all kingdoms including the virosphere



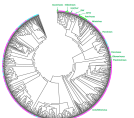




J Theor Biol. 2010 Feb 21;262(4):698-710. doi: 10.1016/j.jtbi.2009.10.014. Epub 2009 Oct 13.

**Viruses are essential agents within the roots and stem of the tree of life.**

Villarreal LP<sup>1</sup>, Witzany G.



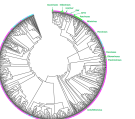
# That's Life:

**Life is constituted by 3 different levels of communication**

- **Cellular communication**
- **RNA communication**
- **Virus communication**

If we subtract only one level, life could not function

**EVOLUTION: Genetic Novelty/Genomic Variations**  
by Viruses and sub-viral RNAs





## Conclusion

Eshel Ben Jacob 2008:

**„Mutations are an empirical fact.  
But they do not play important roles in evolution “**

