

# Looking for a Bledator

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MATOMIC



UNIVERSITÄT  
LEIPZIG

GRAZIE PER L'ATTENZIONE!



Como Lake, “Lario”



Bled Lake, “Bled lake”



# Lariosaurus

## FACTS



## MYTHS



[Nessie]

# Bledator (Bledsaurus)

FACTS

???

MYTHS

???????

# Bledator (Bledsaurus)

FACTS

???

MYTHS

??????



GOAL: Designing principles for...

# CHEMICAL OSCILLATOR

“Designing principles”= simple stoichiometric patterns

## MOTIVATION:

Chemical oscillator are extremely rare in literature

”A new chemical oscillator is a direct publication in Nature”

(cit. Anonymous)



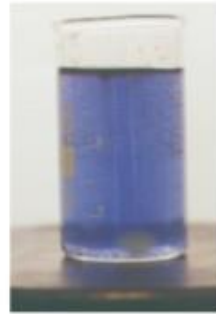
# Literature review



$t = 0$



$t = 5s$



$t = 10s$



$t = 15s$



$t = 20s$



$t = 25s$



$t = 30s$



$t = 35s$



$t = 40s$



$t = 45s$

Belousov–Zhabotinsky reaction (1958-1964)  
Soviet Union

Briggs–Rauscher reaction (1972)  
USA

# VARIOUS THEORETICAL MODELS:

1) BrusselATOR (1968)

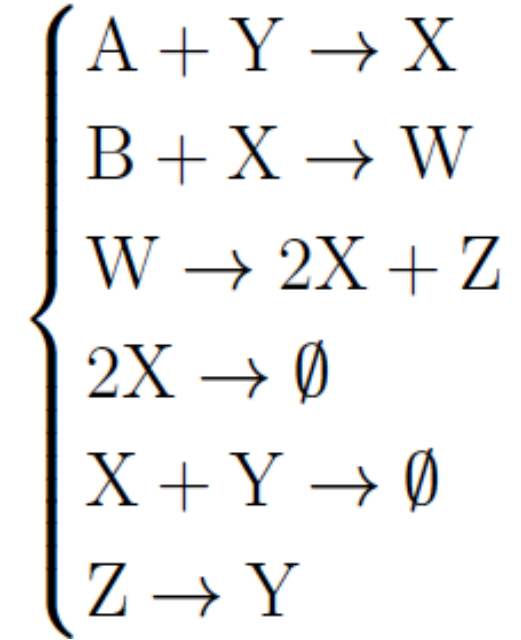
2) OregonATOR (1974)

3) GroningenATOR (2023)

# Oregonator (1974)

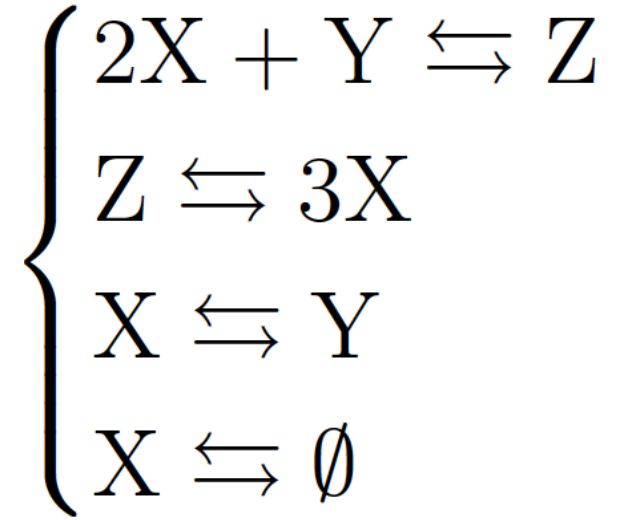


Crater's lake



$$S = \begin{pmatrix} -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 \\ 0 & 1 & -1 & 0 & 0 & 0 \\ 1 & -1 & 2 & -2 & -1 & 0 \\ -1 & 0 & 0 & 0 & -1 & 1 \\ 0 & 0 & 1 & 0 & 0 & -1 \end{pmatrix}$$

# Brusselator (1968)



$$S = \begin{pmatrix} -2 & 3 & -1 & -1 \\ -1 & 0 & 1 & 0 \\ 1 & -1 & 0 & 0 \end{pmatrix}$$

# Groningenator (2023)



$$\begin{cases} X + W \rightleftharpoons Y \\ Y \rightleftharpoons 2X \\ X + A \rightleftharpoons \emptyset \\ X \rightleftharpoons \emptyset \\ T + W \rightleftharpoons X \\ X + B \rightleftharpoons \emptyset \end{cases}$$

$$S = \begin{pmatrix} -1 & 0 & 0 & 0 & -1 & 0 \\ -1 & -1 & 2 & -1 & 1 & -1 \\ 1 & 0 & -1 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$

# Bledator (2025)?



THEORY  $\Rightarrow$  PRACTICE

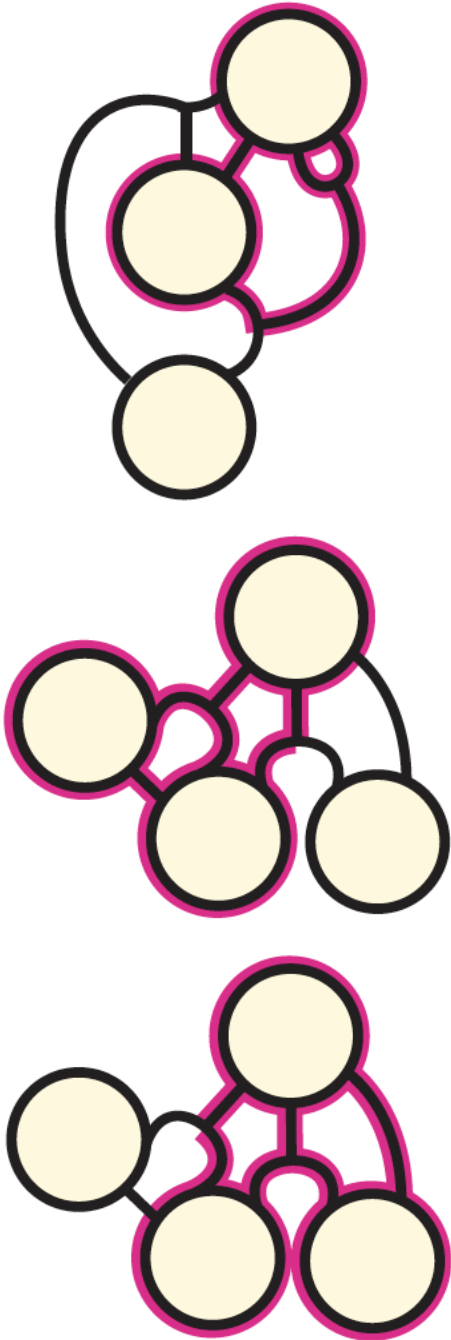
GENERAL  $\Rightarrow$  PARTICULAR

# Bledator (2025)?



Oscillatory  
Cores

Positive feedback Autocatalytic	Negative feedback Nonautocatalytic
$\begin{pmatrix} -1 & 2 & 1 \\ 1 & -1 & 1 \\ 0 & -1 & -1 \end{pmatrix}$	$\begin{pmatrix} -1 & -2 \\ 1 & -1 \end{pmatrix}$ $n = 7$
$\begin{pmatrix} -1 & 0 & 1 & 1 \\ 1 & -1 & 0 & 0 \\ 1 & 1 & -1 & 0 \\ 0 & 0 & -1 & -1 \end{pmatrix}$	$\begin{pmatrix} -1 & 0 & -1 \\ 1 & -1 & 0 \\ 1 & 1 & -1 \end{pmatrix}$ $n = 7$
$\begin{pmatrix} -1 & 1 & 1 & 2 \\ 1 & -1 & 0 & 0 \\ 1 & 0 & -1 & 0 \\ 0 & 0 & -1 & -1 \end{pmatrix}$	$\begin{pmatrix} -1 & -1 & -1 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{pmatrix}$ $n = 7$
$\begin{pmatrix} -1 & 1 & 1 & 1 \\ 1 & -1 & 0 & 1 \\ 1 & 1 & -1 & 0 \\ 0 & -1 & -1 & -1 \end{pmatrix}$	$\begin{pmatrix} -1 & -1 & -1 \\ 1 & -1 & 0 \\ 1 & 1 & -1 \end{pmatrix}$ $n = 4$
$\begin{pmatrix} -1 & 1 & 1 & 1 \\ 1 & -1 & 1 & 1 \\ 1 & 1 & -1 & 0 \\ 0 & -1 & -1 & -1 \end{pmatrix}$	$\begin{pmatrix} -1 & -1 & -1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{pmatrix}$ $n = 2$



# Bledator (2025)?



!!!!

BRUSSELATOR  
OREGONATOR  
GRONINGENATOR

ALL HAVE SAME  
MATHEMATICAL PATTERN

!!!!

# Bledator (2025)?



Further bioinf tasks:

develop algorithms  
to identify oscillatory patterns in  
reaction networks

Computer Algebra  
(Python SymPy)  
for smaller networks

More for large networks  
(MATOMIC)



**To conclude...**

# What google has to say about a Bledator...

Option 1:



Option 2:



# What Chatgpt has to say about a Bledator...



Based on the sound of "Bledator," it gives me vibes of a fierce, futuristic creature—maybe something like a mix between a robotic predator and an alien warrior. Picture a hulking humanoid figure with sharp metallic armor, glowing red eyes, clawed hands, and weaponry integrated into its body. The setting could be a dark, misty battlefield.

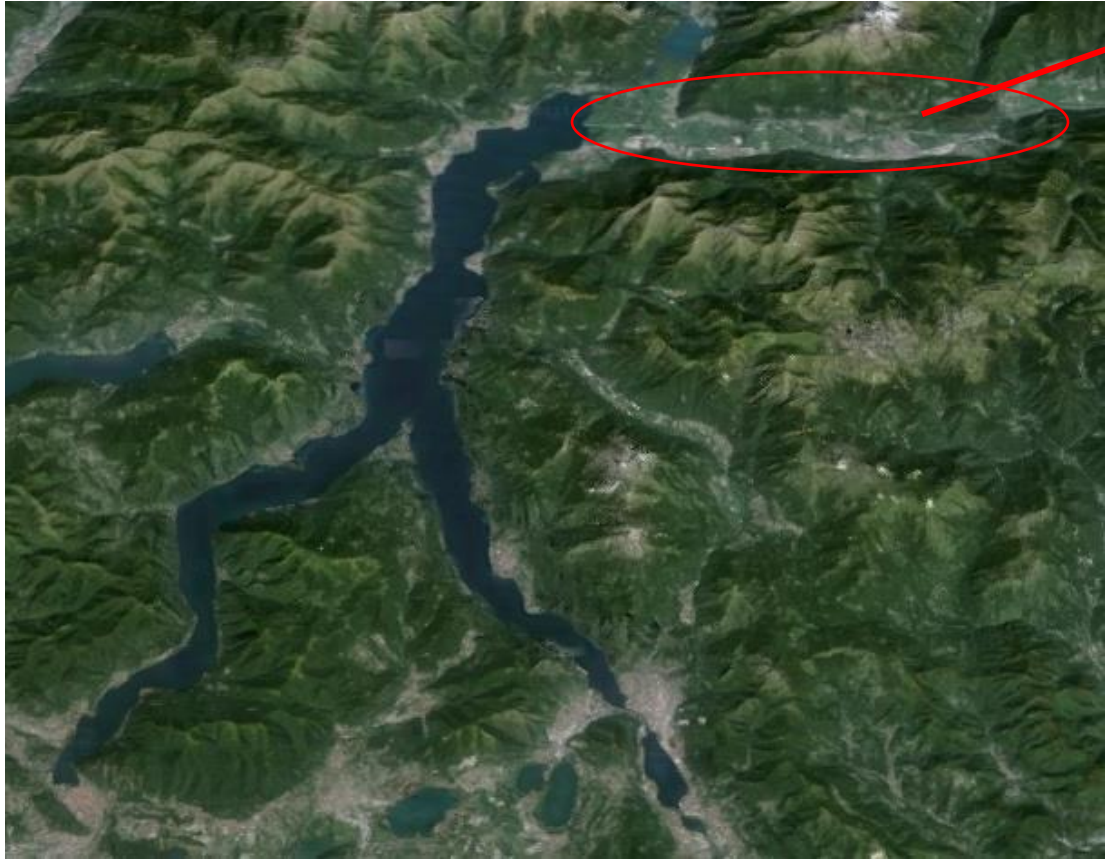
# What Chatgpt has to say about a Bledator...



# GRAZIE PER L'ATTENZIONE!

**VALTELLINA**

**PIZZOCCHERI**



18.00 today Villa Plemelj