

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:

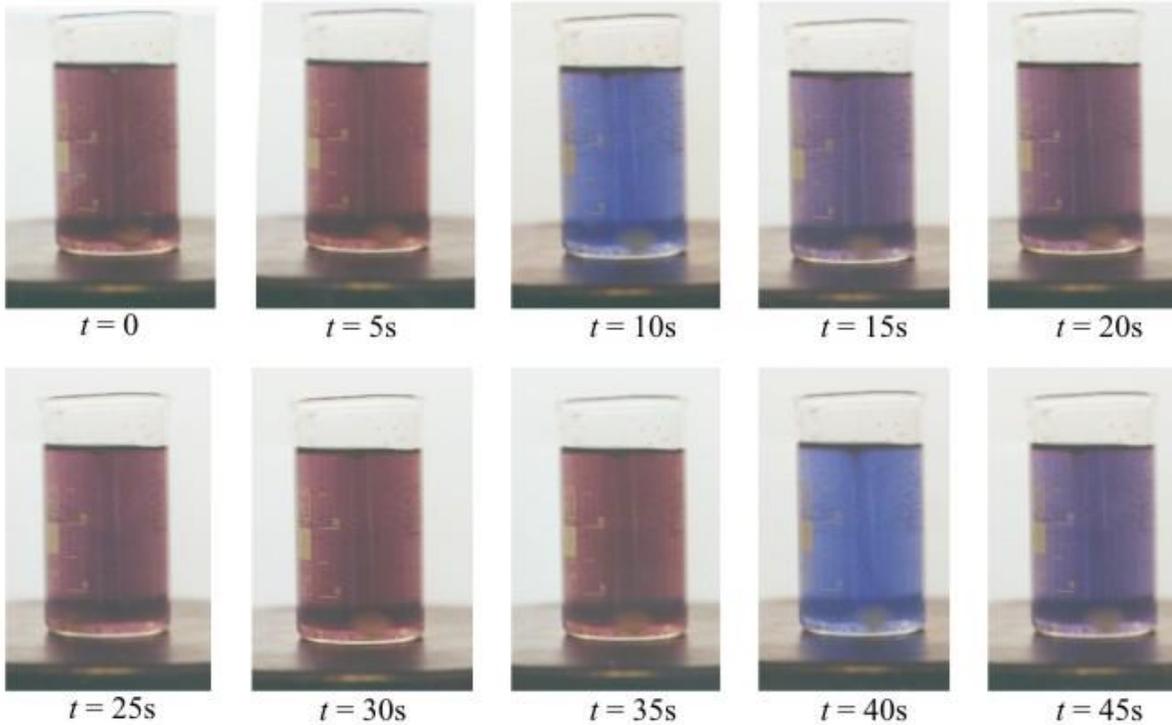
Chemical oscillators are extremely rare in literature

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

(cit. Anonymous)



Literature review



Belousov–Zhabotinsky reaction (1958-1964)
Soviet Union

Briggs–Rauscher reaction (1972)
USA

VARIOUS THEORETICAL MODELS:

1) BrusselATOR (1968)

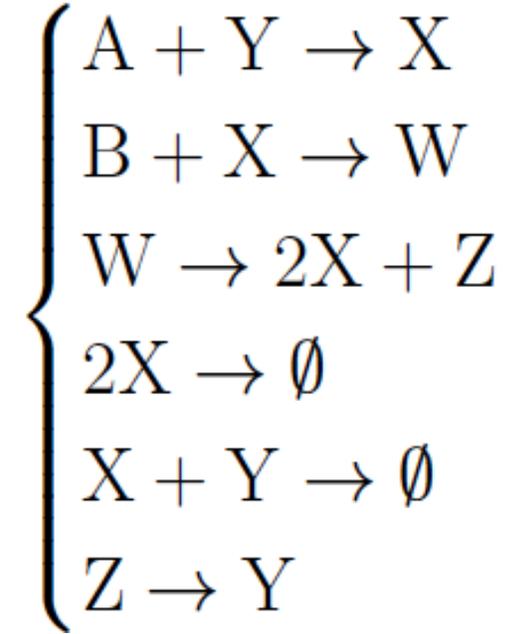
2) OregonATOR (1974)

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)



$$\left\{ \begin{array}{l} 2X + Y \rightleftharpoons Z \\ Z \rightleftharpoons 3X \\ X \rightleftharpoons Y \\ X \rightleftharpoons \emptyset \end{array} \right.$$

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

Groningenator (2023)



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

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

Bledator (2025)?



THEORY \Rightarrow PRACTICE

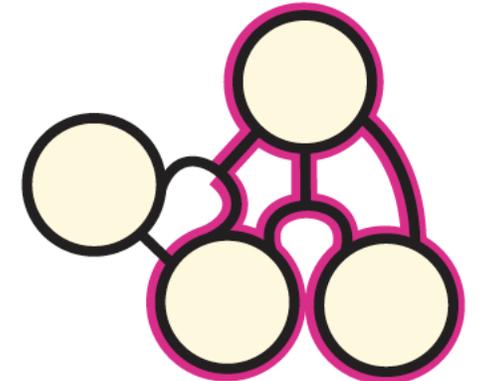
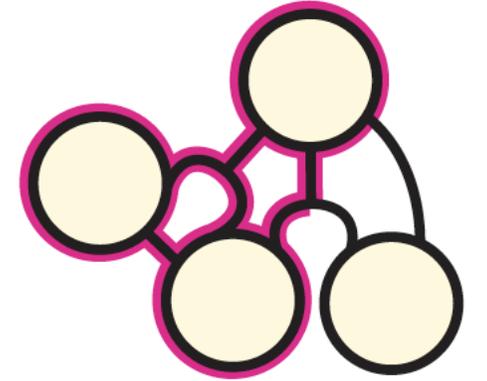
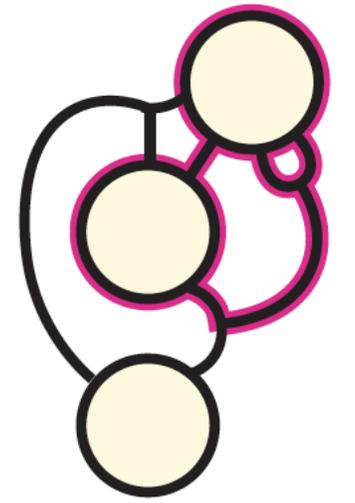
GENERAL \Rightarrow PARTICULAR

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