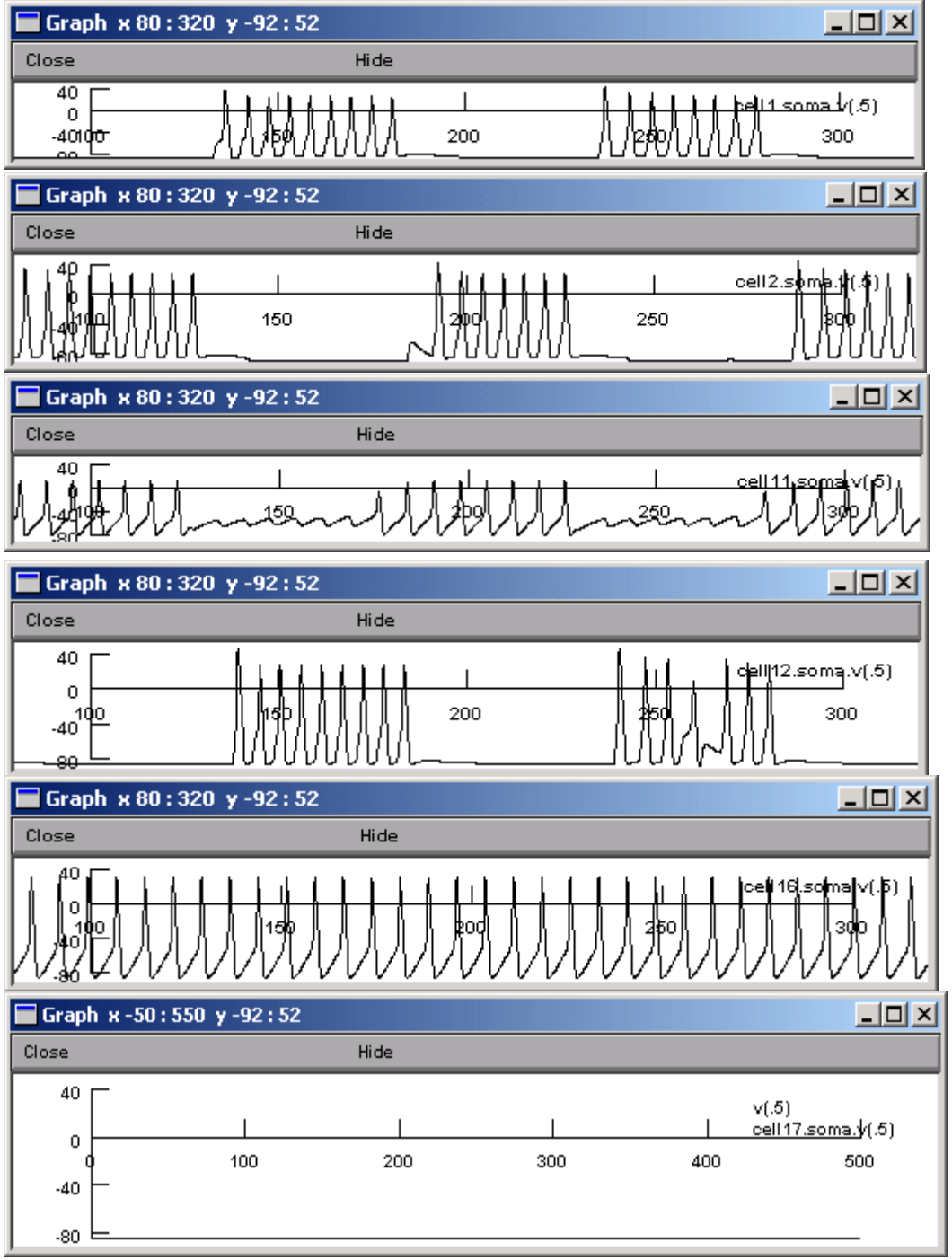
Lab 2 Objectives

(1) Determine what the circuit is: find all the cells that belong in the circuit.

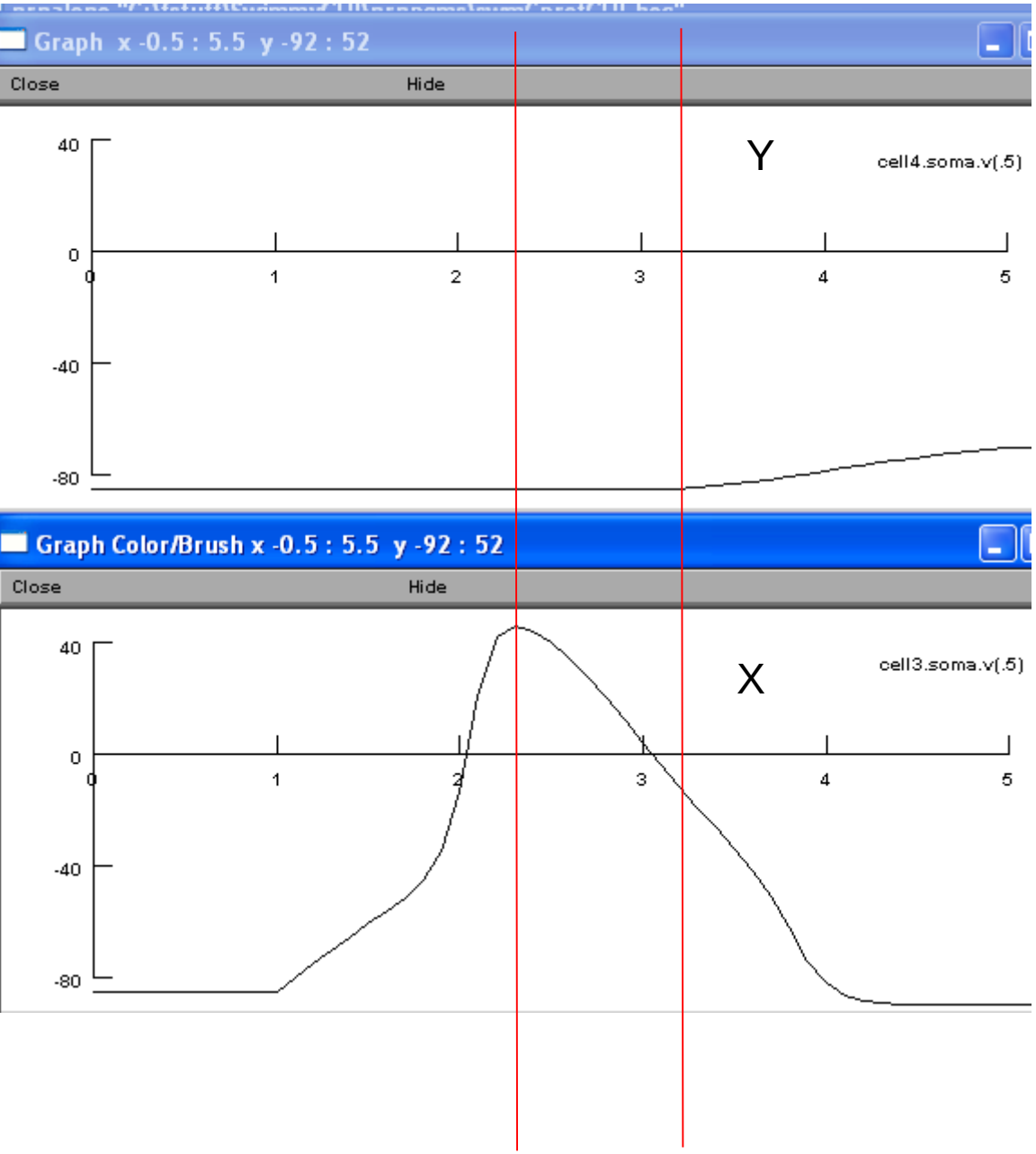
(1) Prove how they are connected.

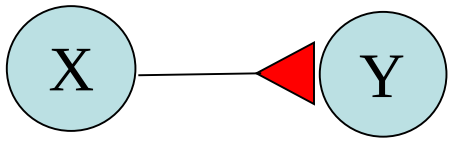
(1) Determine how the circuit functions: find out how the circuit functions by determining the nature of the cells.



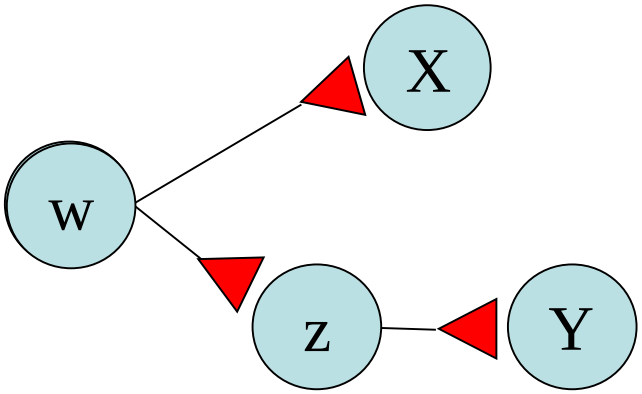
Neurons that show a similar rhythmic pattern as the motor neurons are good candidates.

Spontaneous activity



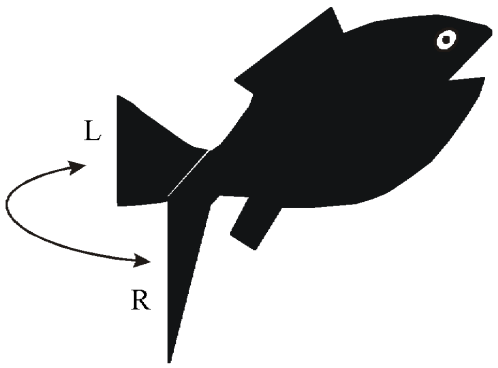


OR



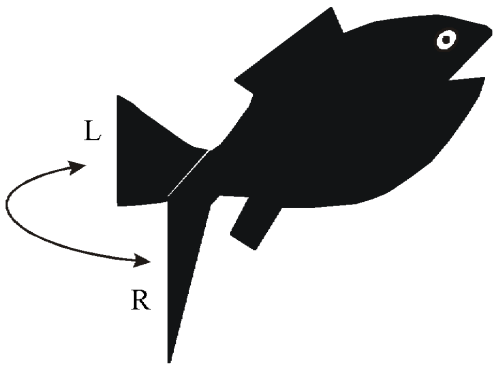
?

Swimmy



So a 1 msec delay may not absolutely ensure a monosynaptic connection. Correlation is not causation.

Swimmy



To establish a monosynaptic connection, you should:

1) Show a 1 msec delay between the peak of an AP and start of a PSP.

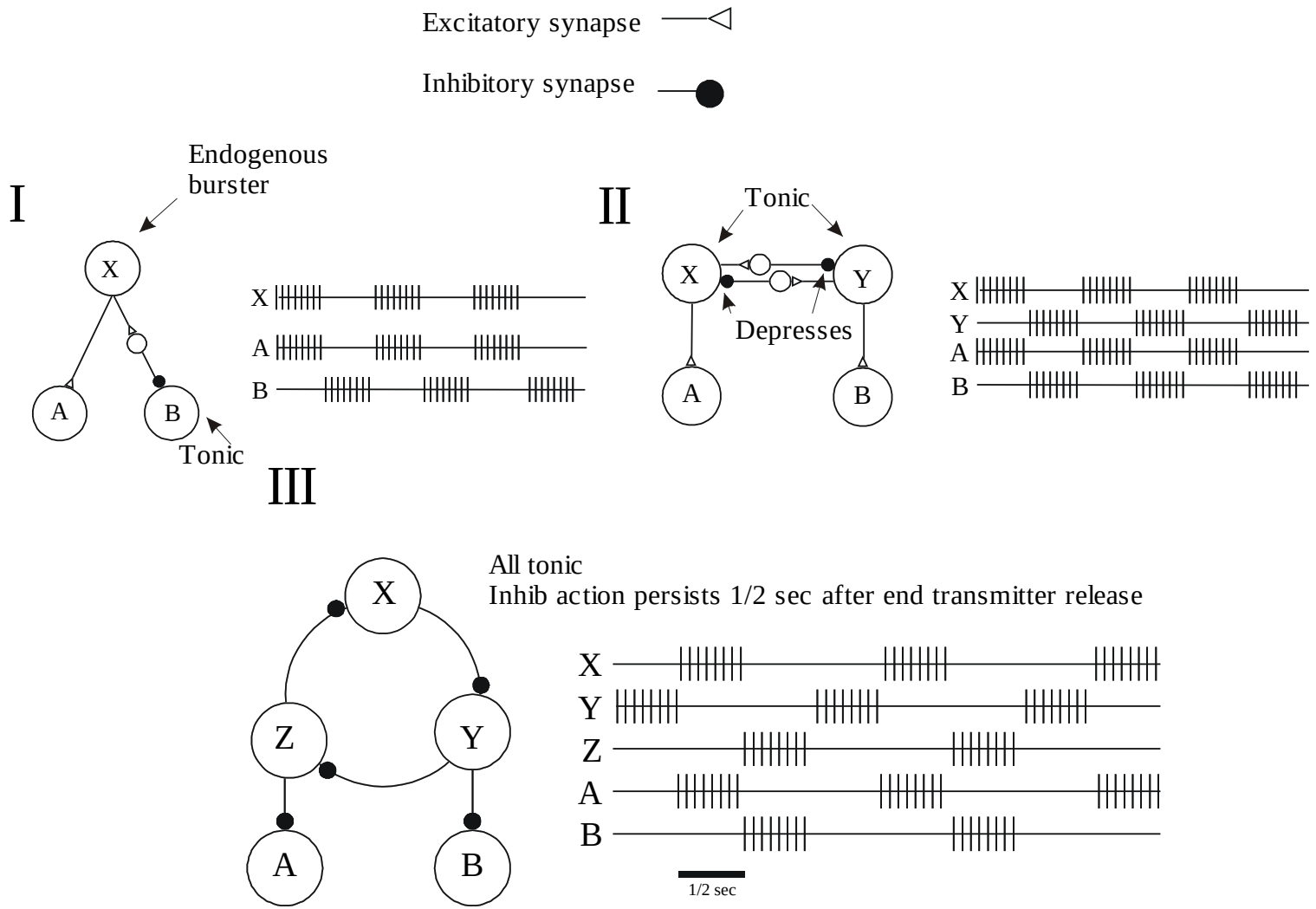
2)Show effects of presynaptic manipulation and postsynaptic results.

Lab 2 Objectives

(1) Determine what the circuit is: find all the cells that belong in the circuit.

(1) Prove how they are connected.

(1) Determine how the circuit functions: find out how the circuit functions by determining the nature of the cells.


Excitatory synapse
Inhibitory synapse
I
Endogenous burster
X
A
B
Tonic
X
A
B
II
Tonic
X
Y
Depresses
A
B
X
Y
A
B
III
X
Z
Y
A
B
All tonic
Inhib action persists 1/2 sec after end transmitter release
X
Y
Z
A
B
1/2 sec

Swimmy Theories

Quiz

*For **Questions 2** - 7 (i.e. all but the last question), we are referring to the circuit in **Figure 2** below and the activity in traces labeled A and B.

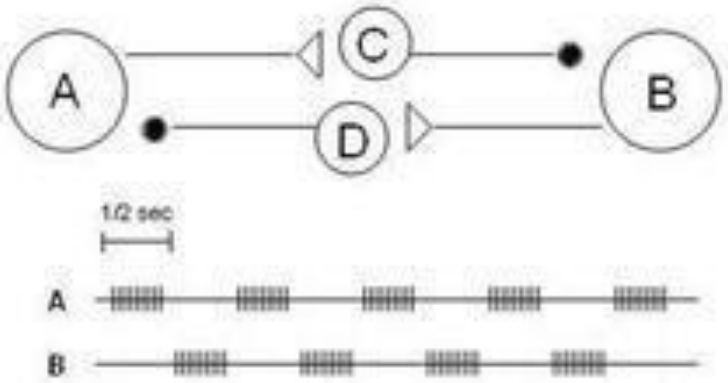
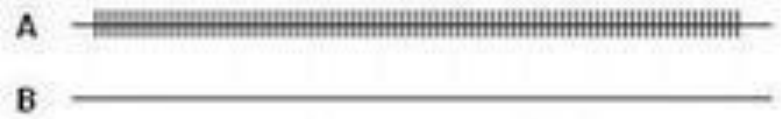


Figure 2

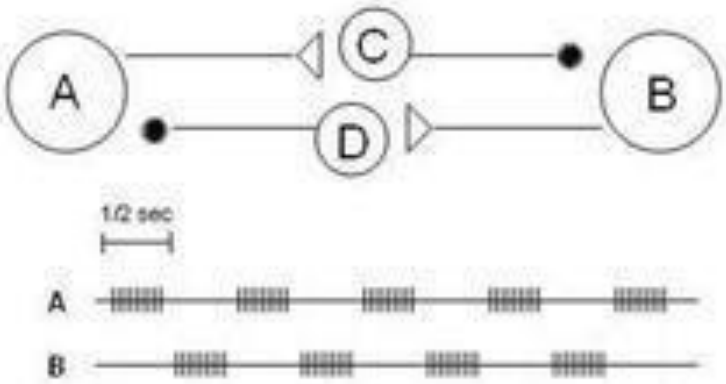
2) Suppose that preventing the firing of cell B by hyperpolarizing it for the entire duration of the trace would cause the overall activity pattern to become like this:



We would conclude that we are dealing with a(n):

a) mutual depressing inhubition oscillator
b) endogenous burster oscillator

*For **Questions 2** - 7 (i.e. all but the last question), we are referring to the circuit in **Figure 2** below and the activity in traces labeled A and B.



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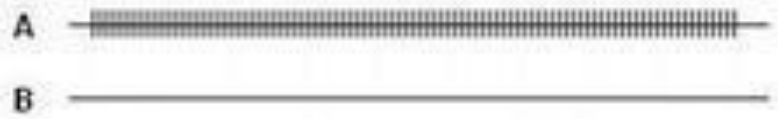

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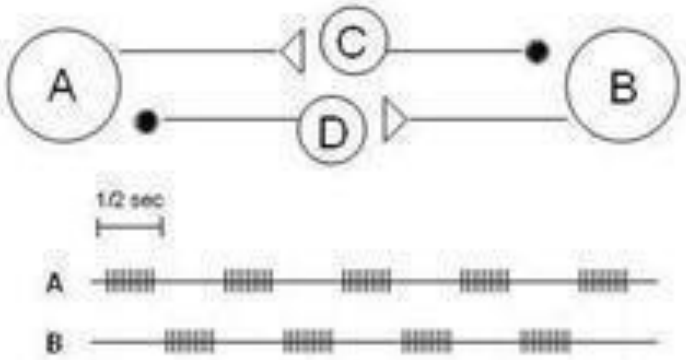
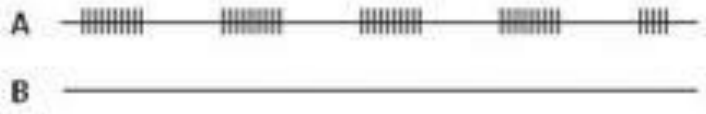


Figure 2

3) Suppose now that the effect of hyperpolarizing cell B was NOT as shown above in **Question 2**, but instead hyperpolarization of either cell A or cell B (and preventing their firing for the entire duration of the trace) resulted in the other cell to emit continuous rhythmic bursts, as shown below for stopping cell B:



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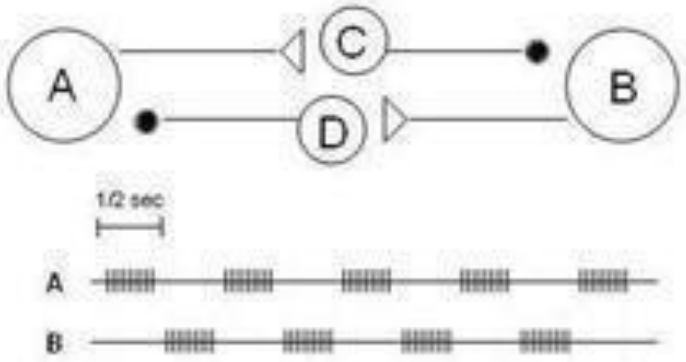

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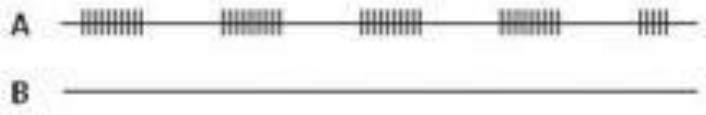

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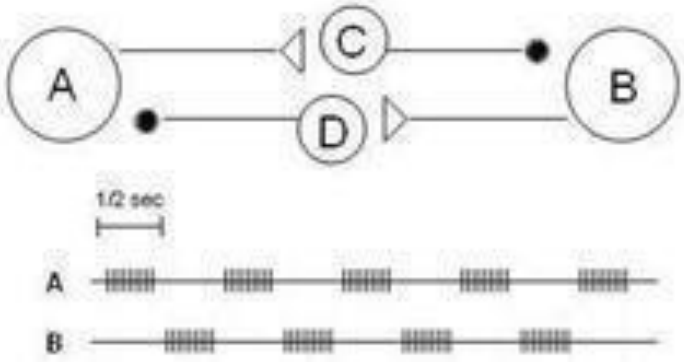
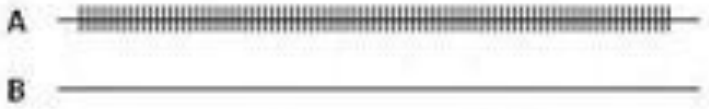


Figure 2

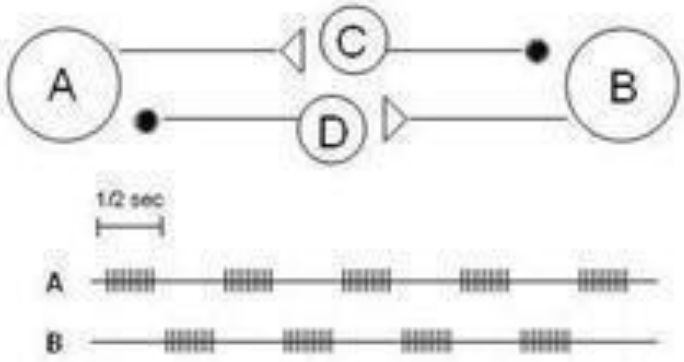
*For **Questions 4 - 6**, assume that we are dealing with a **mutually depressing inhibition** oscillator.

4) Hyperpolarizing cell C (and only cell C) to prevent it from firing for the entire duration of the trace would have this effect:



a) true
b) false

*For **Questions 2 - 7** (i.e. all but the last question), we are referring to the circuit in **Figure 2** below and the activity in traces labeled A and B.



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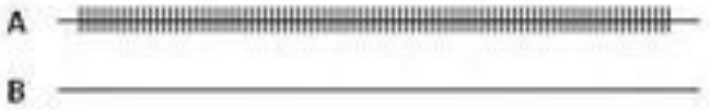

a) true
b) false

B should be firing and should also prevent **A** from firing, though only for a little while.

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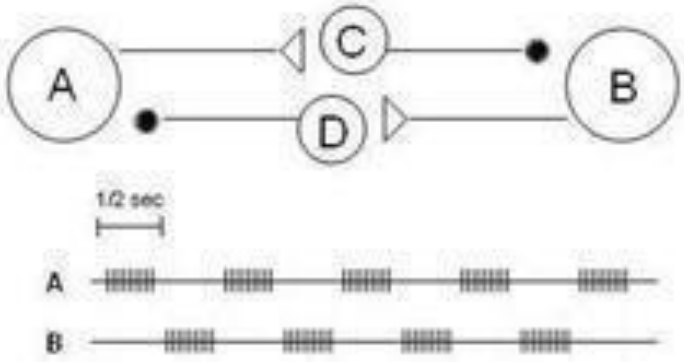

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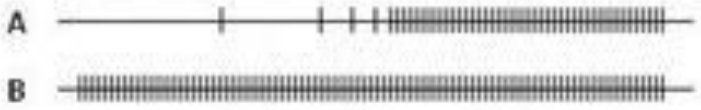
5) Hyperpolarizing cell C (and only cell C) to prevent its from firing for the entire duration of the trace would have this effect:



a) true
b) false

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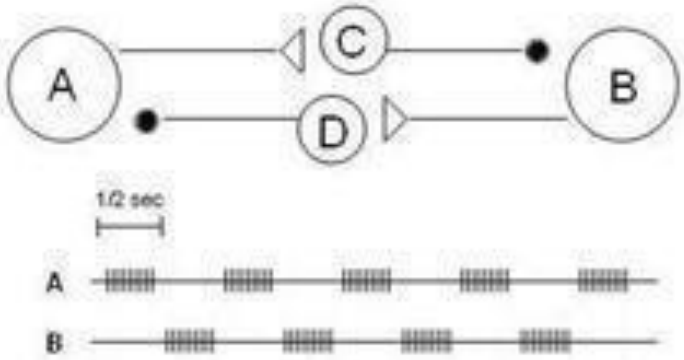

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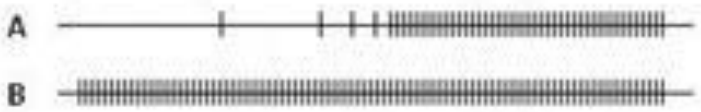

a) true
b) false

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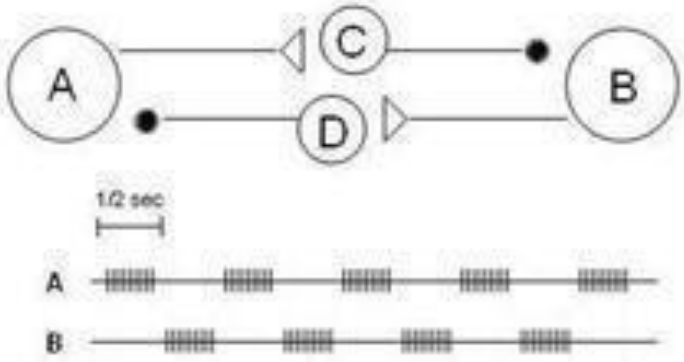
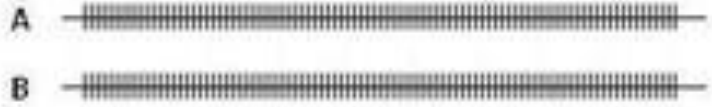


Figure 2

*For **Questions 4 - 6**, assume that we are dealing with a **mutually depressing inhibition** oscillator.

6) Hyperpolarizing both cells C and D (and only cells C and D) to prevent them from firing for the entire duration of their traces, would have this effect:



a) true
b) false

*For **Questions 2 - 7** (i.e. all but the last question), we are referring to the circuit in **Figure 2** below and the activity in traces labeled A and B.

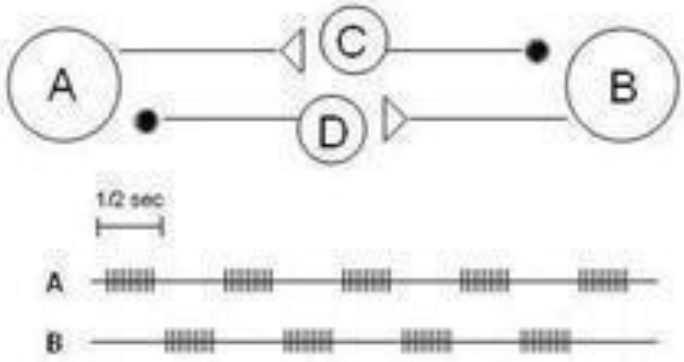
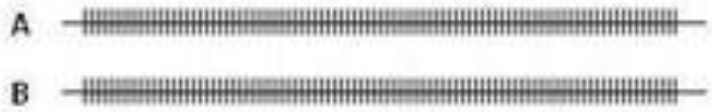


Figure 2

*For **Questions 4 - 6**, assume that we are dealing with a **mutually depressing inhibition** oscillator.

6) Hyperpolarizing both cells C and D (and only cells C and D) to prevent them from firing for the entire duration of their traces, would have this effect:



a) true
b) false

*For **Questions 2 - 7** (i.e. all but the last question), we are referring to the circuit in **Figure 2** below and the activity in traces labeled A and B.

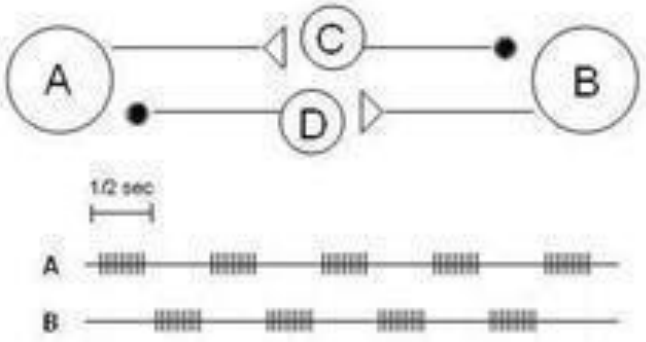
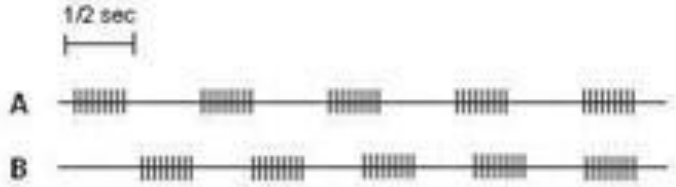


Figure 2

7) Suppose we were dealing with an endogenous burster oscillator. We find that when we stopped a certain cell (or cells) by hyperpolarizing it (or them) for the entire period of observation, we got the following pattern:



Which cell(s) did we probably stop?

a) C
b) D
c) C and D

*For **Questions 2** - 7 (i.e. all but the last question), we are referring to the circuit in **Figure 2** below and the activity in traces labeled A and B.

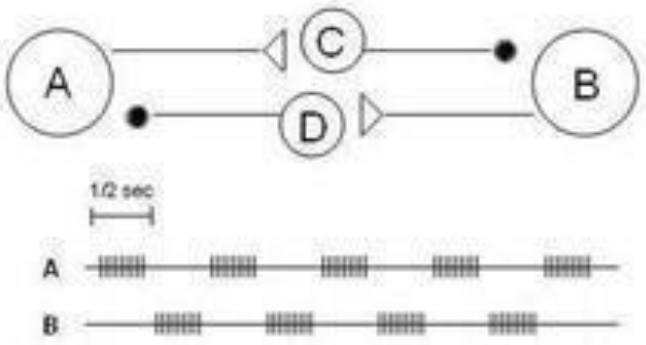
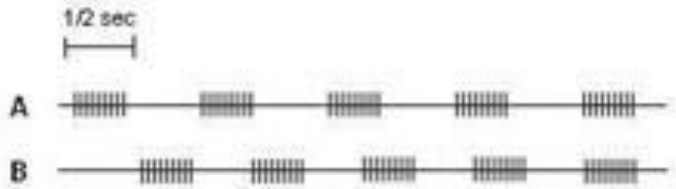


Figure 2

i.e. that **A** and **B** are endogenously bursting cells

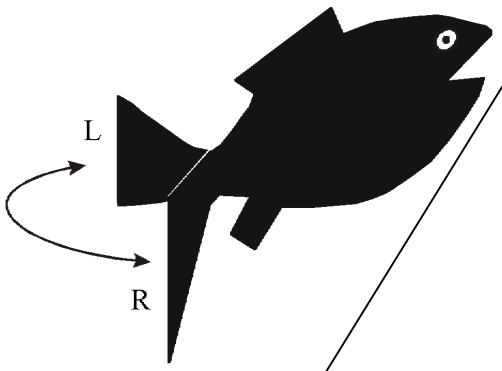
7) Suppose we were dealing with an endogenous burster oscillator. We find that when we stopped a certain cell (or cells) by hyperpolarizing it (or them) for the entire period of observation, we got the following pattern:



Which cell(s) did we probably stop?

a) C
b) D
c) C and D

Swimmy



Neurons in my swimming circuit can come in 3 flavors: tonically active (endogenously tonic), endogenous bursters, and cells that have NO endogenous properties (but are driven by other cells).

Assignment (15.1.2016)

(1) Determine what the circuit is: find all the cells that belong in the circuit.

(1) Prove how they are connected.

(1) Determine how the circuit functions: find out how the circuit functions by determining the nature of the cells.

Assignment (15.1.2016)

(1) Paper containing findings and evidence (graphs, stimulation parametres and observations etc.) + conclusion

(1) Submit via email: stastny.Borek<at>gmail.com