The Reaction Diffusion System

**Produced for the CRC for Premium Quality Wool undergraduate program by;
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Equations Can Define Biochemical Reactions

- ## Usual form of equations

$$\frac{\partial U}{\partial t} = f(U,V)$$

- ## Equations that define a RD system

$$\frac{\partial U}{\partial t} = \text{net diffusion of U} + f(U,V)$$

$$\frac{\partial V}{\partial t} = \text{net diffusion of V} + g(U,V)$$

- ## Steady state of RD system

$$0 = 0 + f(U_0, V_0)$$

$$0 = 0 + g(U_0, V_0)$$

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The Reaction Terms of an RD System

- **The simplest RD systems involve 2 chemical components that interact with each other.**

  - U is an activator
    - U activates its own production
    - U activates the production of V
  - V is an inhibitor
    - V inhibits its own production
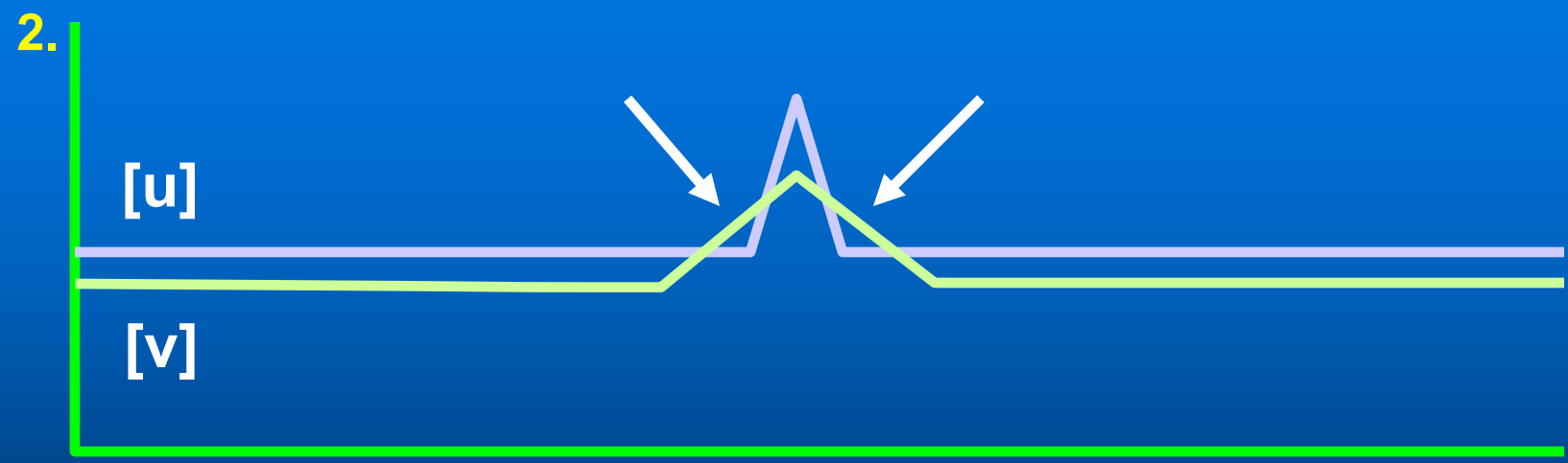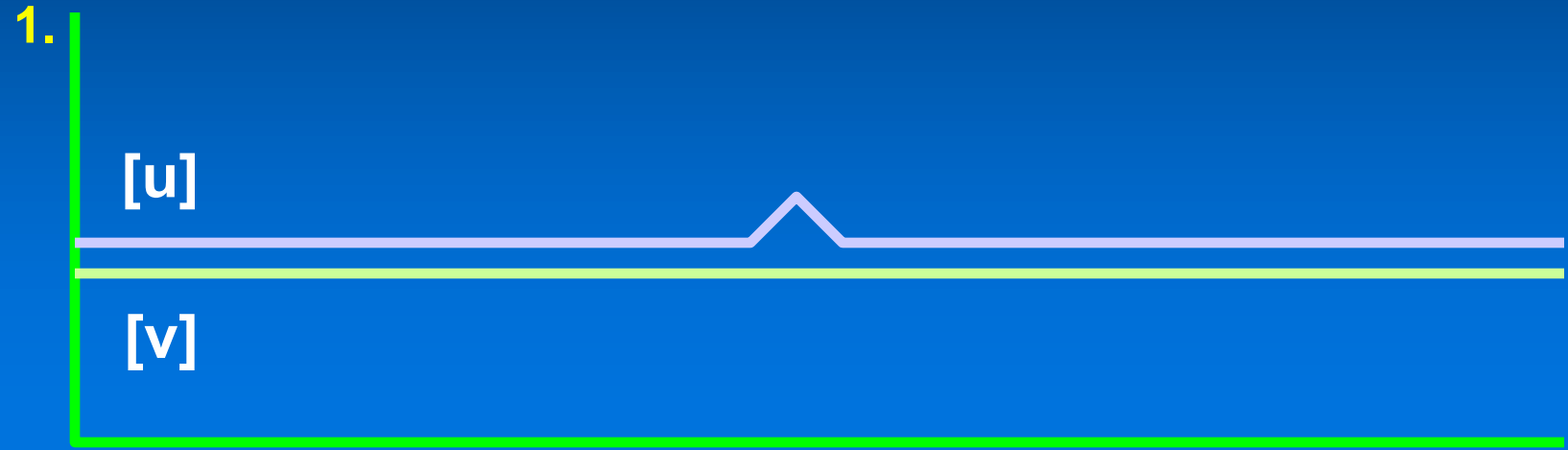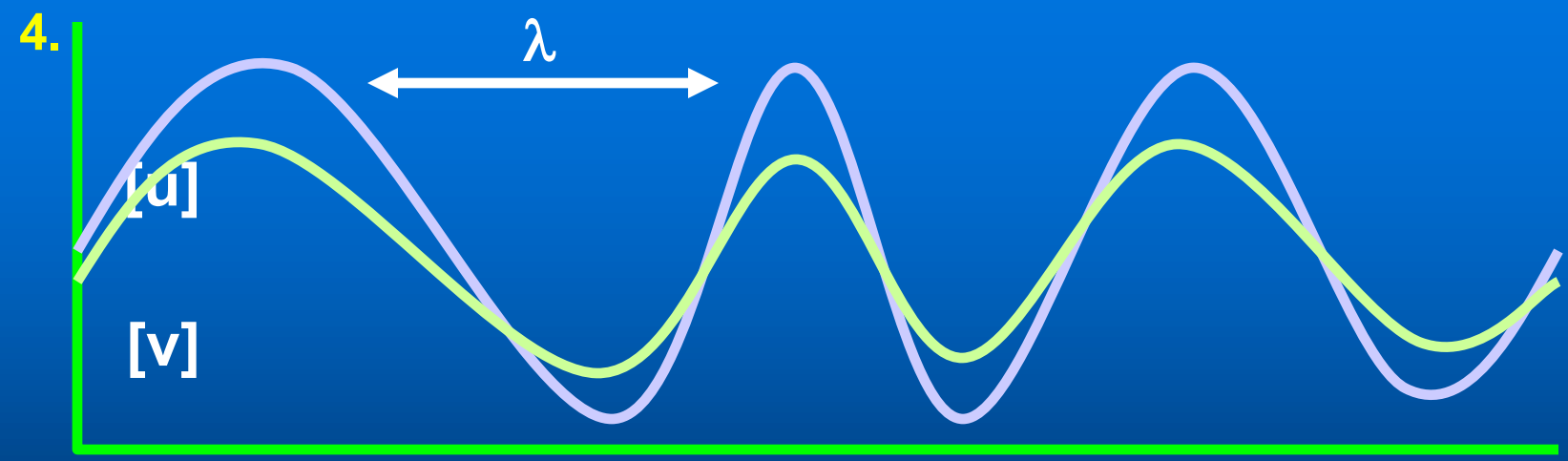   - V inhibits the production of U
  - V diffuses faster than U

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Response of RD System to Chemical Noise

1.

[u]

[v]

2.

[u]

[v]

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Response of RD System to Chemical Noise (cont.)

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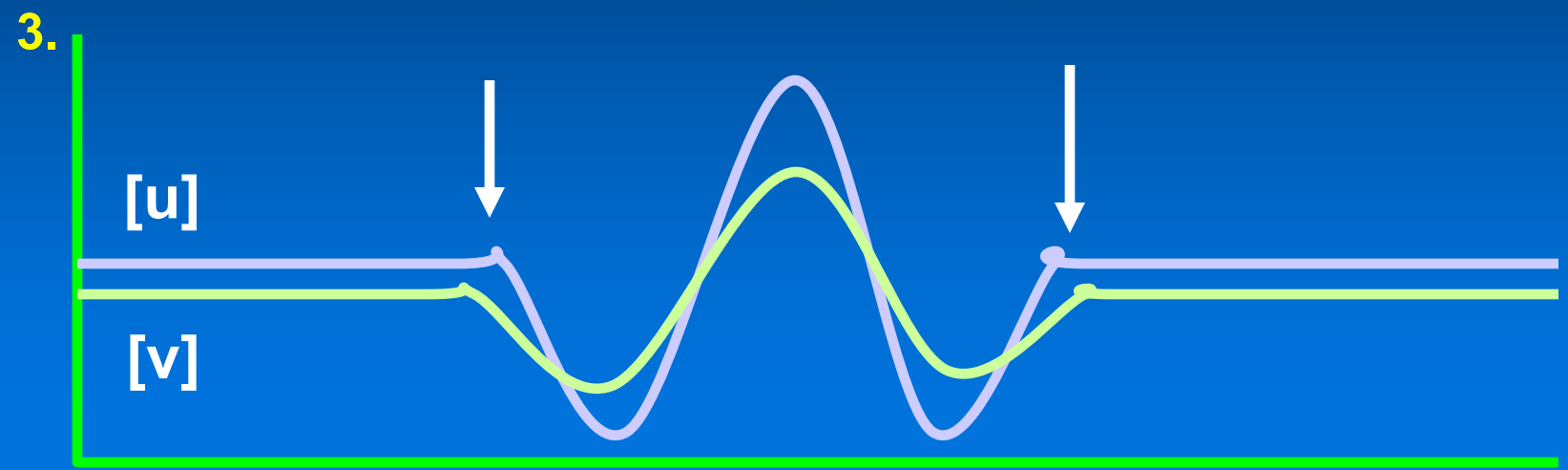
Characteristics of Wavelike Patterns

- **The wavelength spontaneously generated is a function of the reaction and diffusion rates of U and V**

- **The amplitude is determined by the parameters defining the reaction and diffusion terms in the RD system equations**

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