

# Mathematical modeling of juxtacrine signaling systems during the development of vertebrates

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# Development of vertebrates

- ✓ **What is development??**
- ✓ **Processes occurring during development**
- ✓ **Cell to cell communication**
- ✓ **Yuxtacrine signaling: How it works??**



**Fertilized  
egg**

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**Fertilized  
egg**

**Adult  
organism**

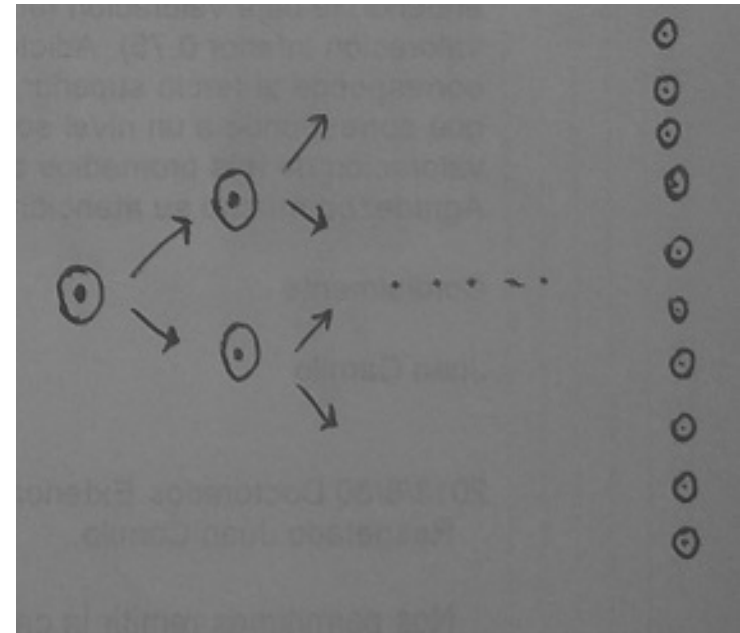
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Cell division

# Development of vertebrates

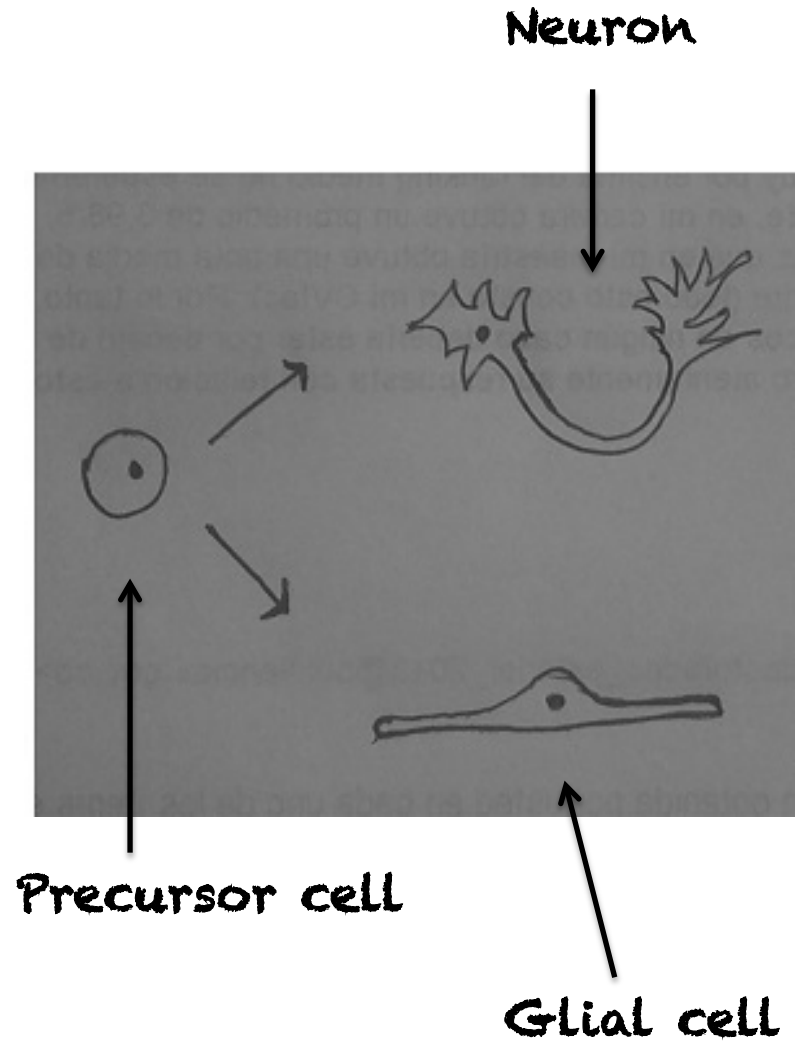
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Precursor cell

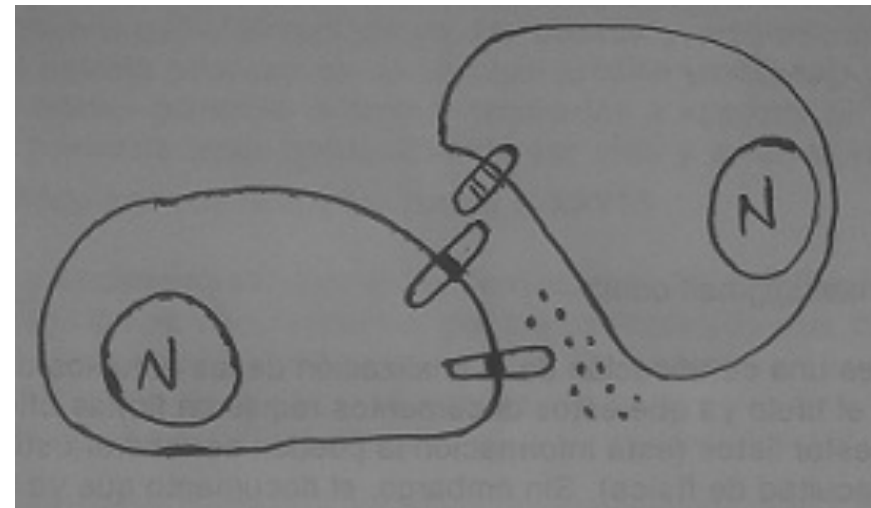
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# Cell signaling

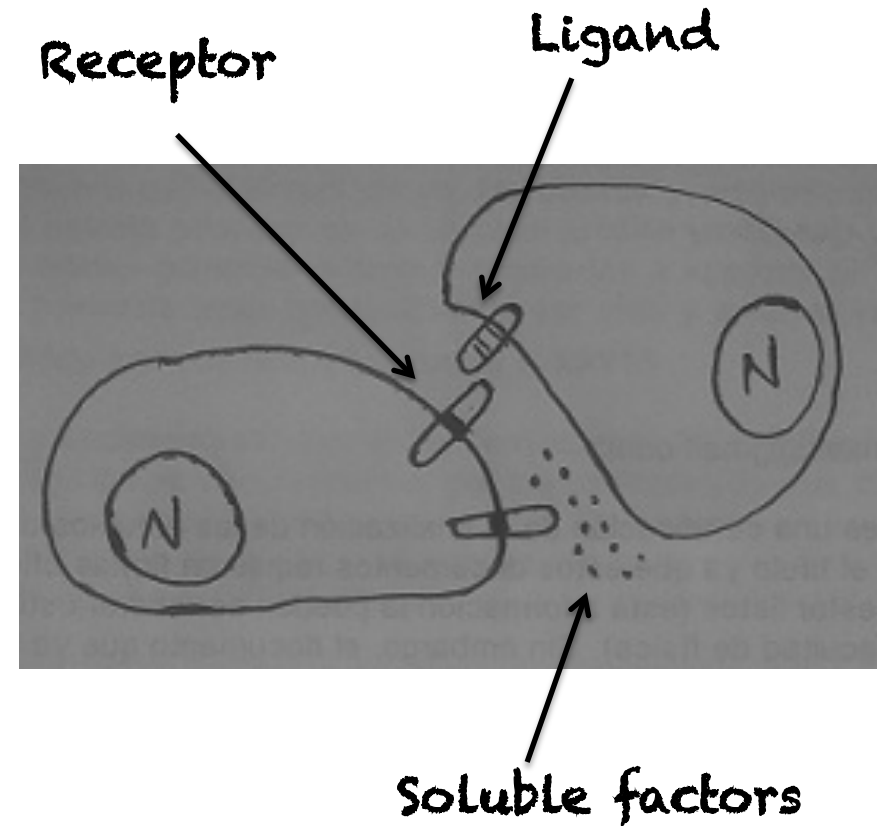
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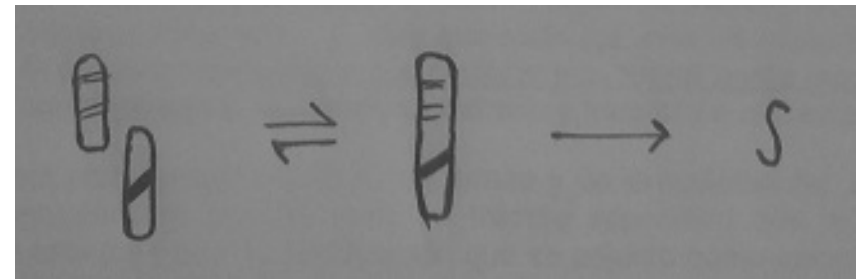
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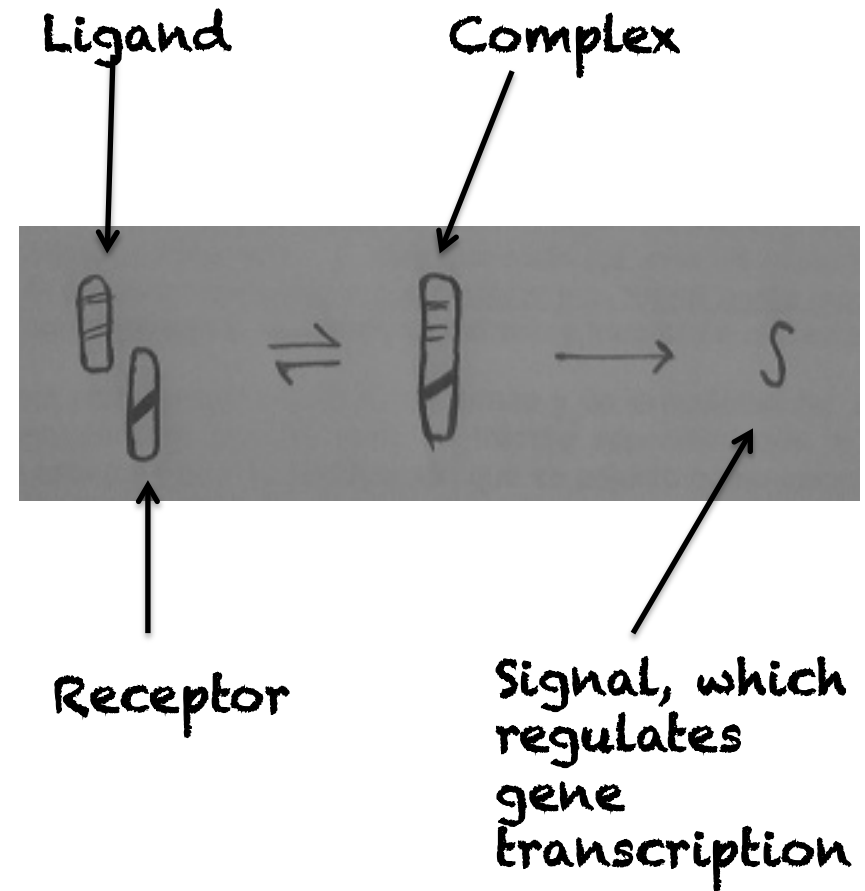
# Cell signaling

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# Cell signaling

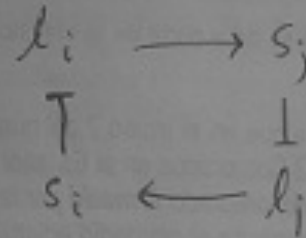
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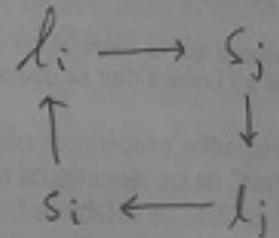
# Regulatory circuits

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Lateral inhibition



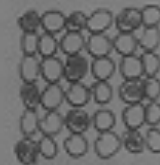
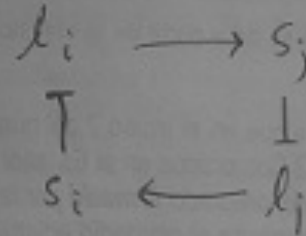
Lateral induction



# Regulatory circuits

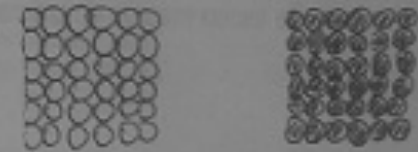
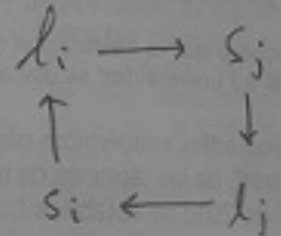
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Lateral inhibition



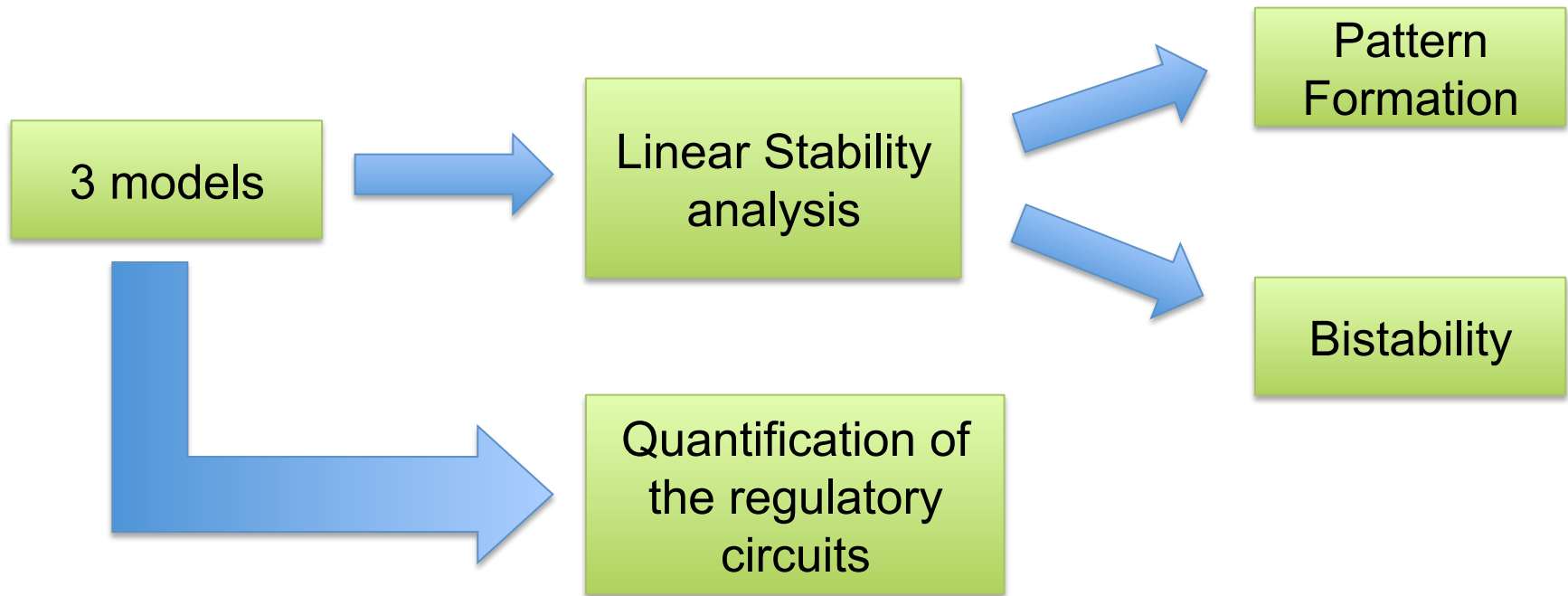
Pattern Formation

Lateral induction

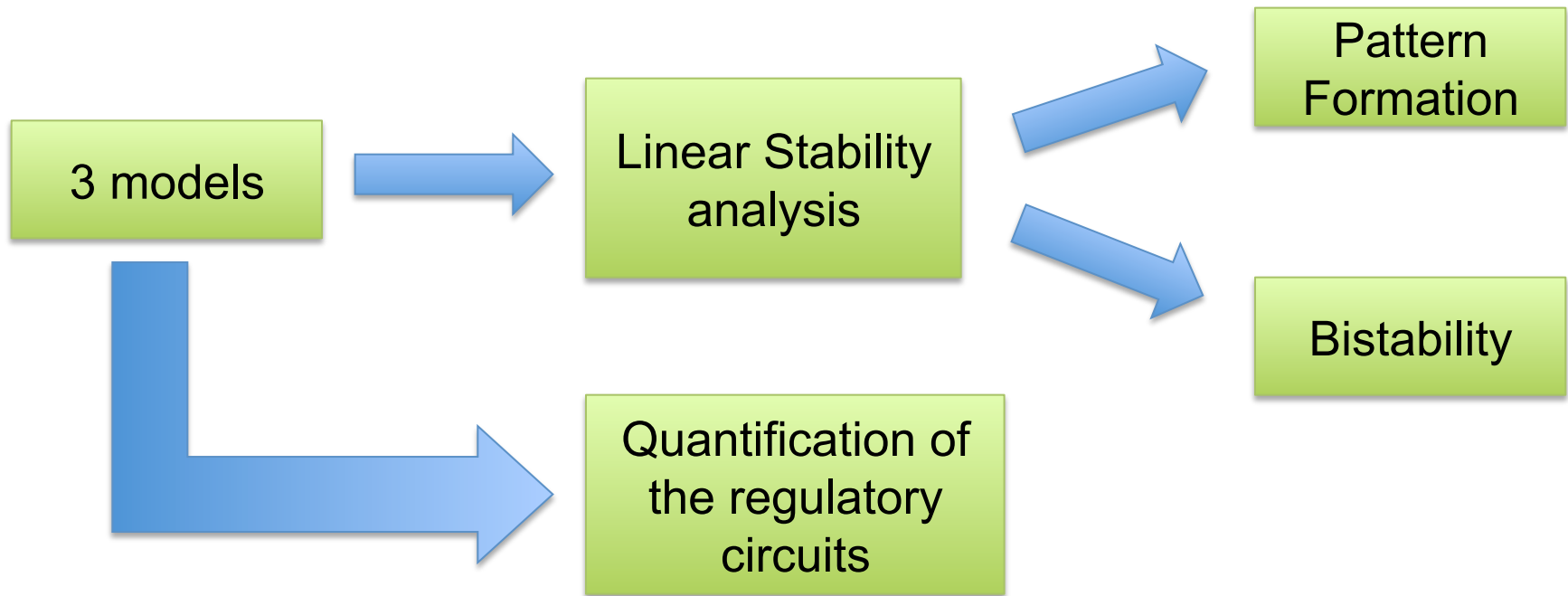


Bistability

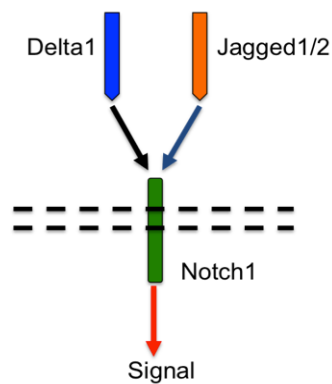
# Our approach



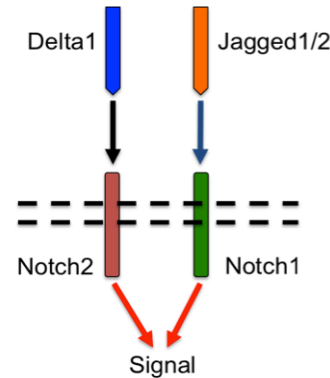
# Our approach



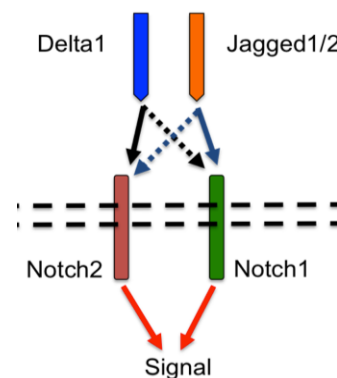
Competitive model



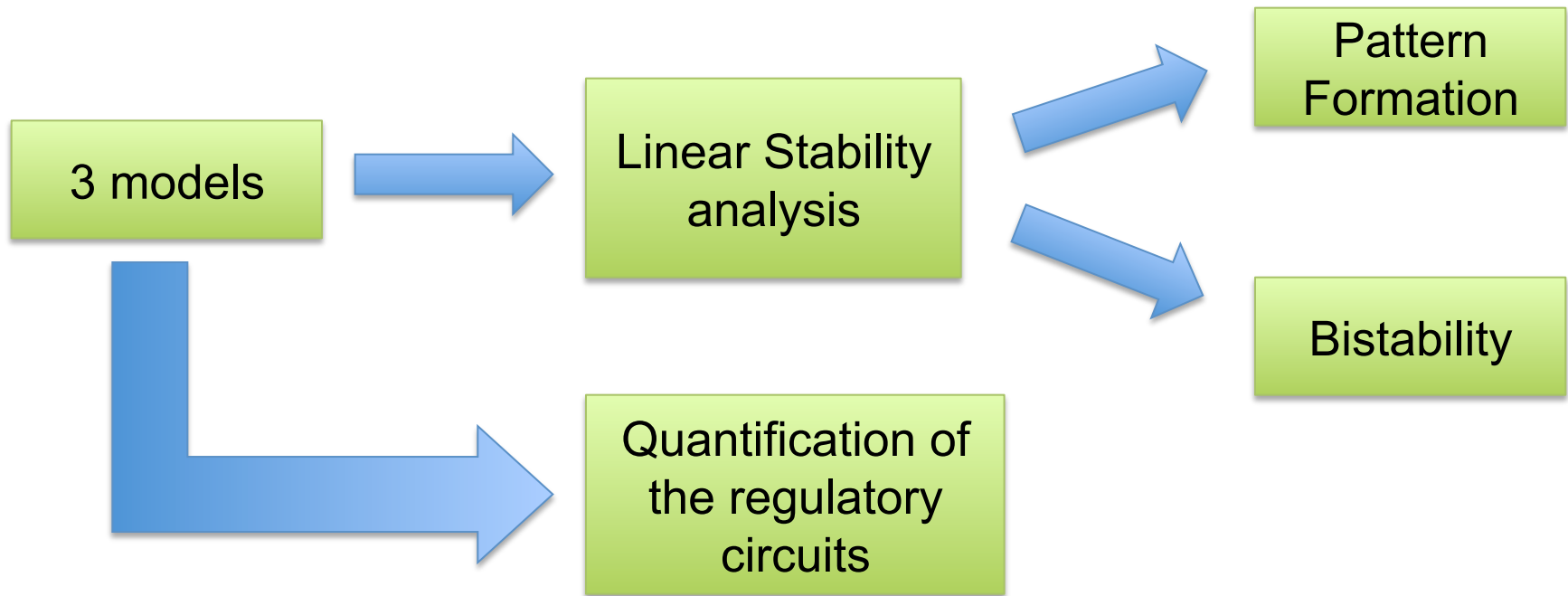
Additive model



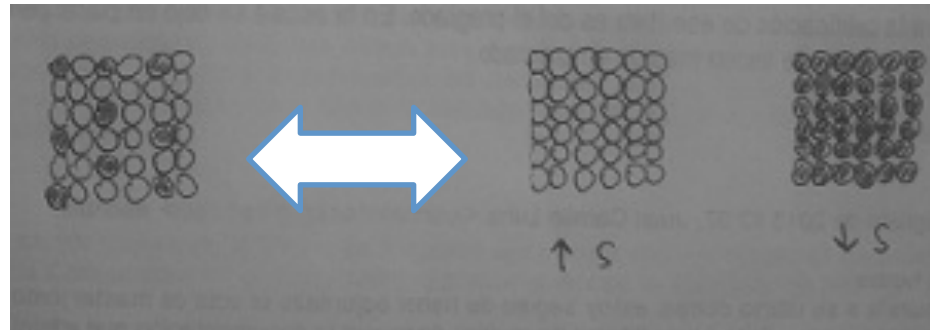
Mixed model



# Our approach



Pattern Formation  $\longleftrightarrow$  Bistability





**THANK YOU FOR YOUR ATTENTION!!**