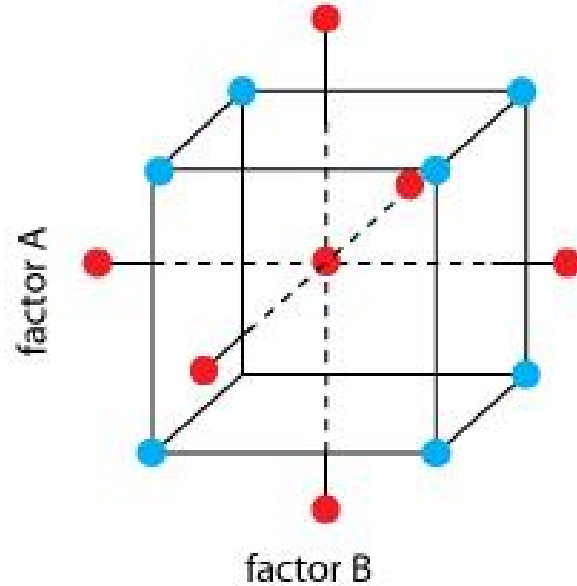# Supporting the Design of Experiments for Synthetic Biology with Clotho 3.0
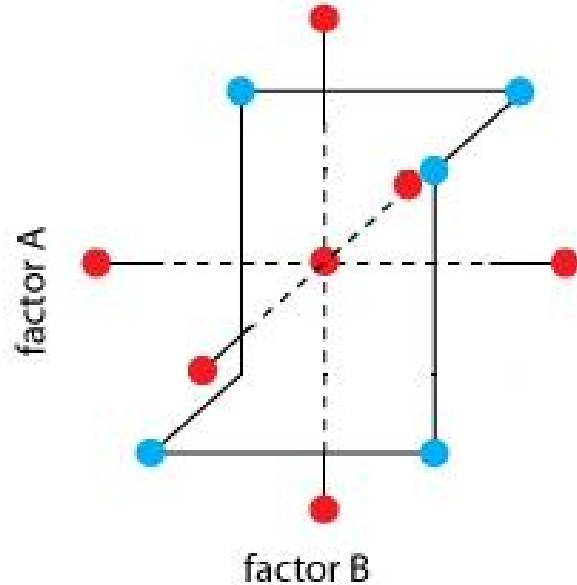

Nicholas Roehner
CIDAR (Densmore Lab)
Boston University
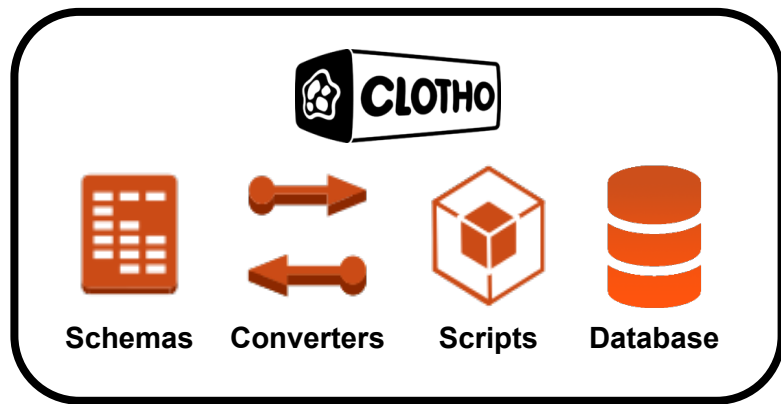
Design of Experiments (DOE)

Design of Experiments (DOE)

Clotho 3.0
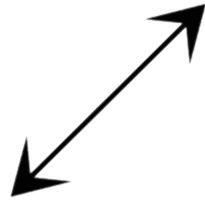
DOE for Synthetic Biology
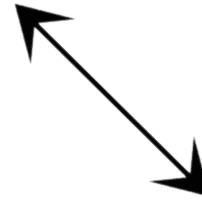

Design of Experiments

Biological Design

Experimental Data

Object-Oriented DOE

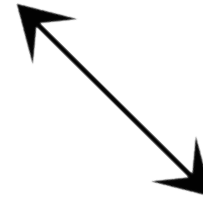factors | levels
A B C | + −

Biological Design

CSV

FCS

Experimental Data

Object-Oriented DOE

A	B	C
+	−	−
+	−	+
+	+	+
+	+	−
−	−	−
−	−	+
−	+	+
−	+	−

Biological Design

CSV

FCS

Experimental Data

Object-Oriented DOE

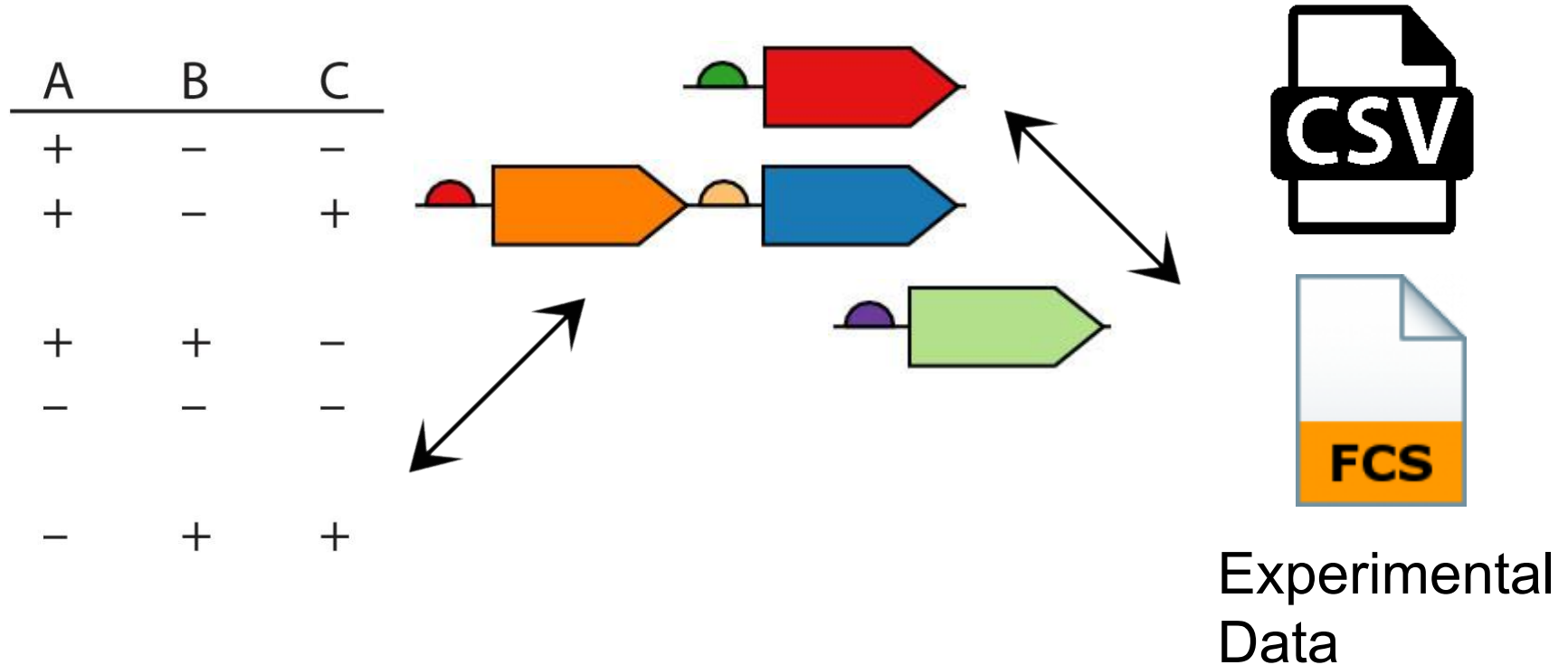| A	B	C
+	−	−
+	−	+
+	+	−
−	−	−
−	+	+

Biological Design

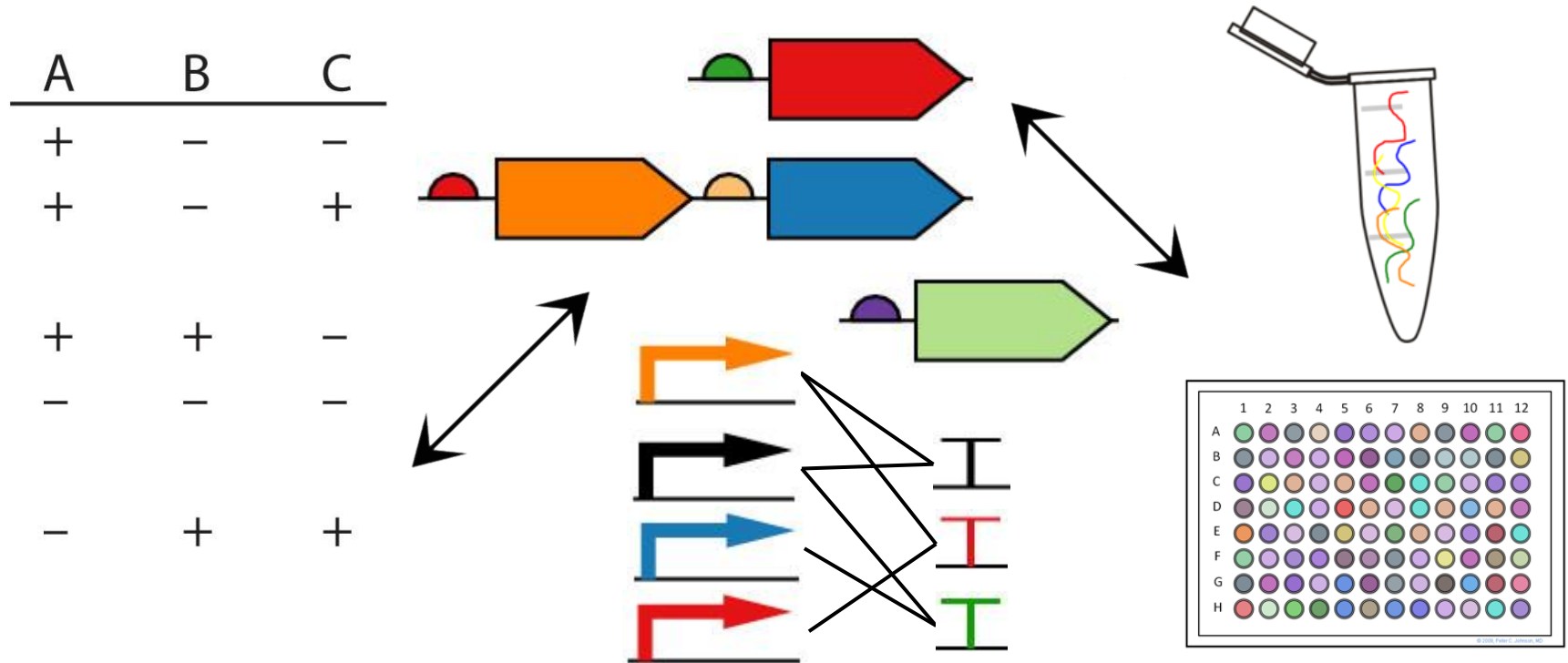Experimental Data

CSV

FCS
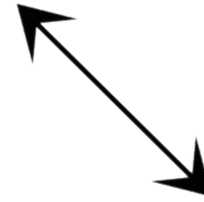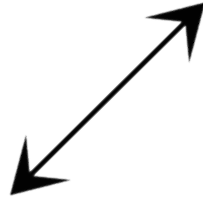
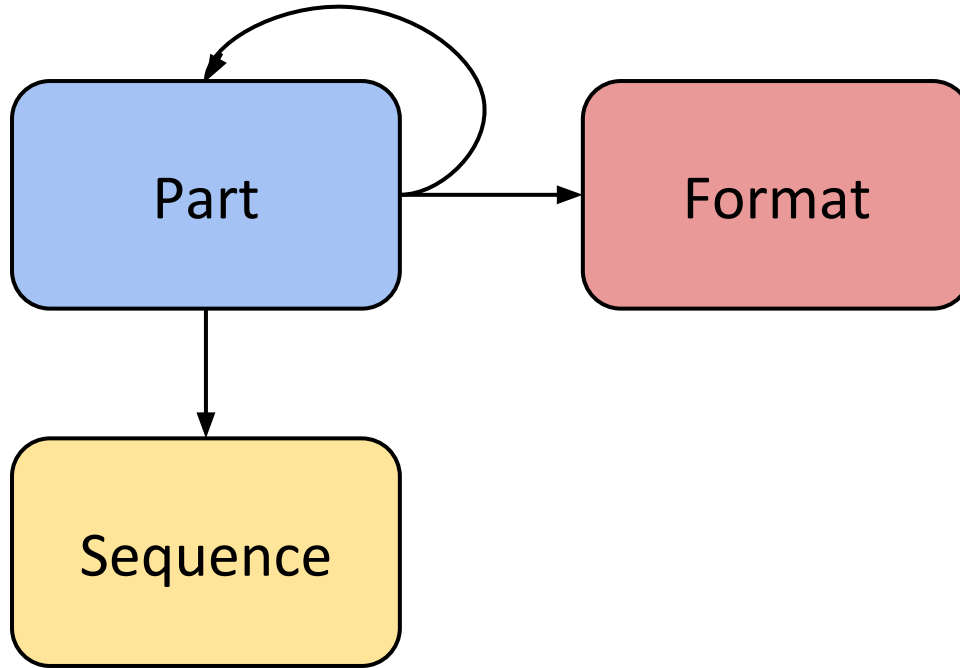# Object-Oriented Biodesign

Object-Oriented Biodesign

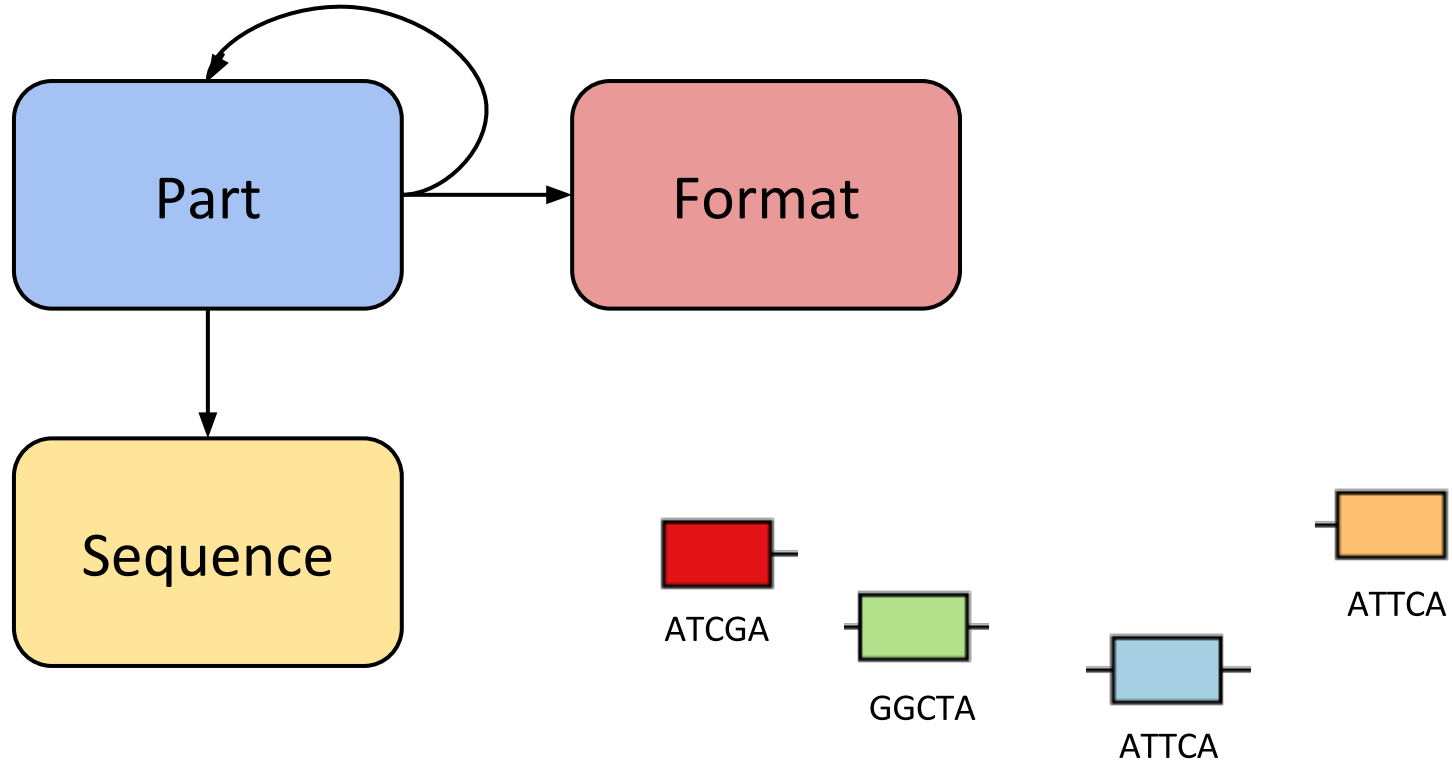Experimental Data
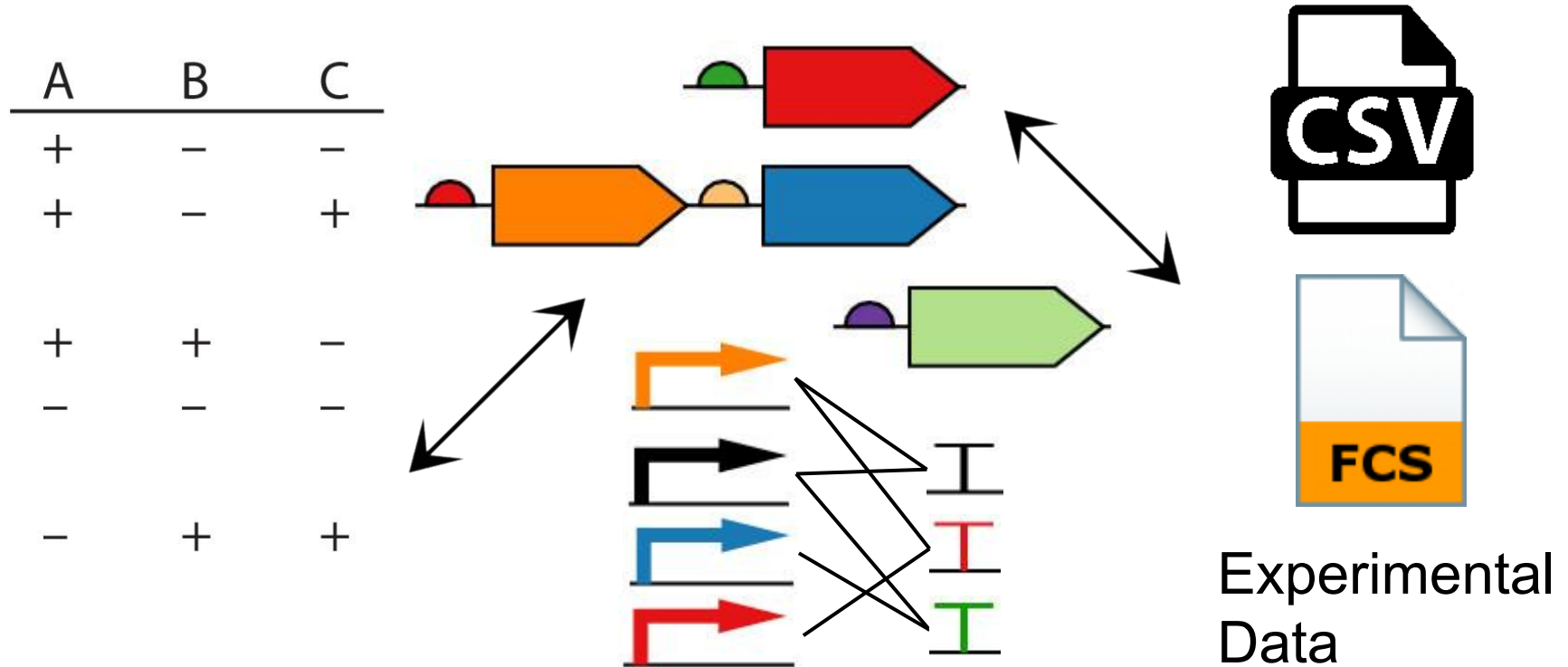
Object-Oriented Experiments

Talk Outline

- Overview of Clotho 3.0 object classes and planned extensions for biodesign and DOE
- Development plan for web app to support DOE for synthetic biology
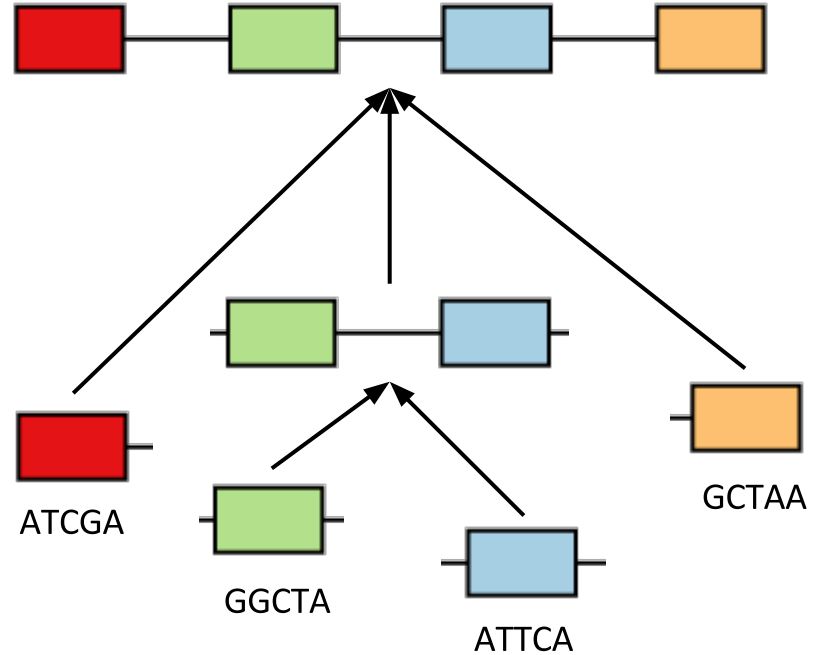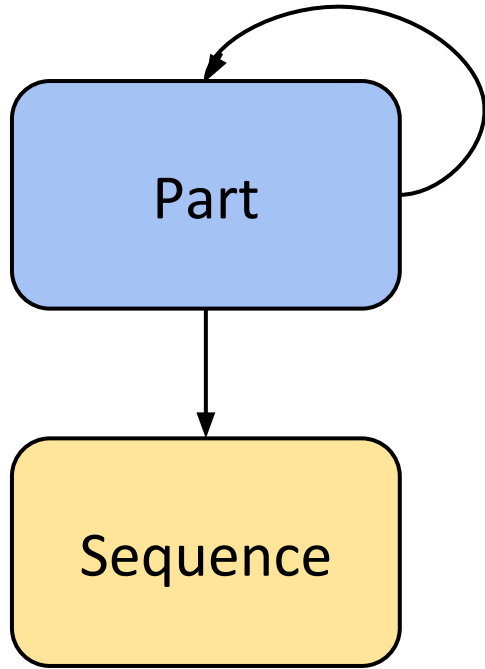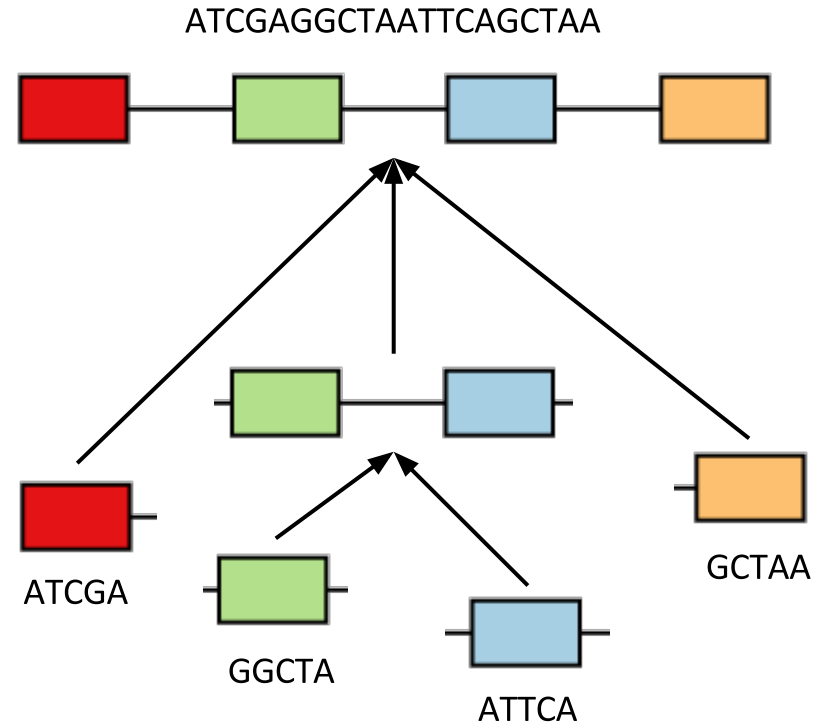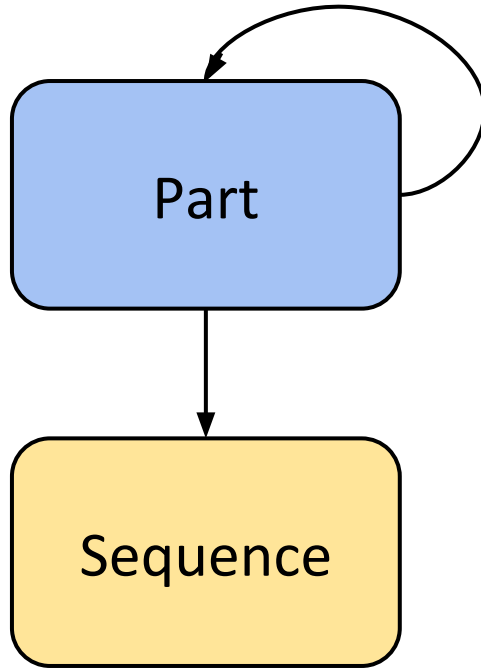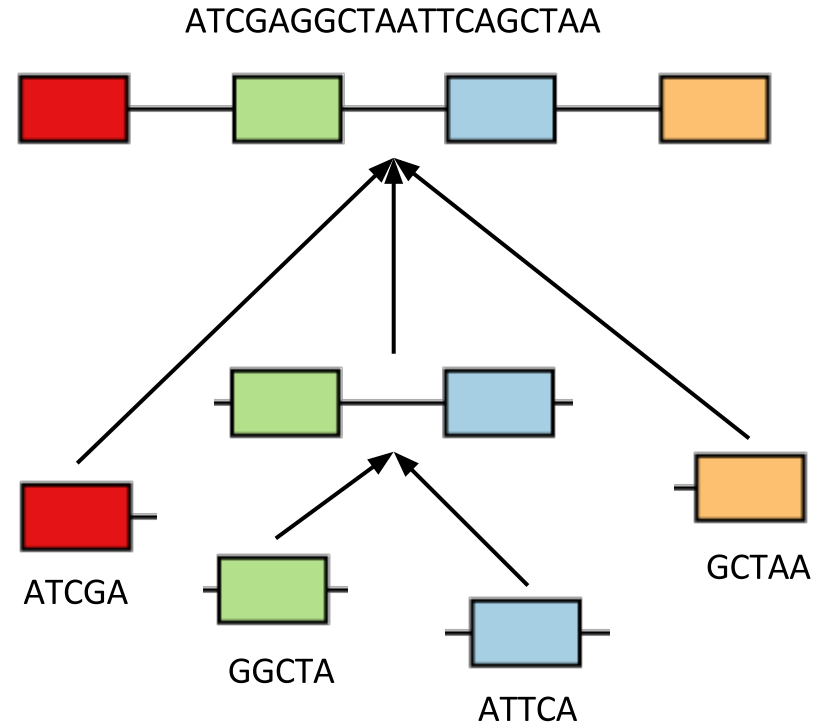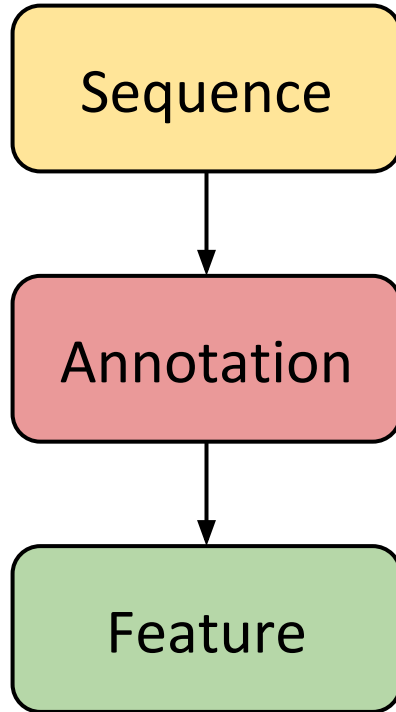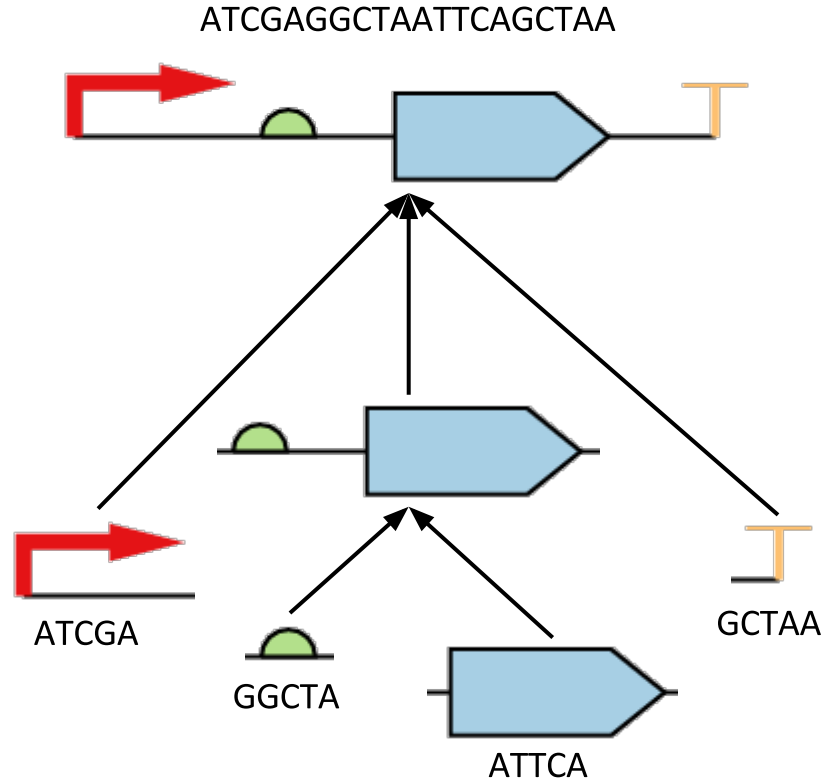
Clotho 3.0 Object Classes

Clotho 3.0 Object Classes

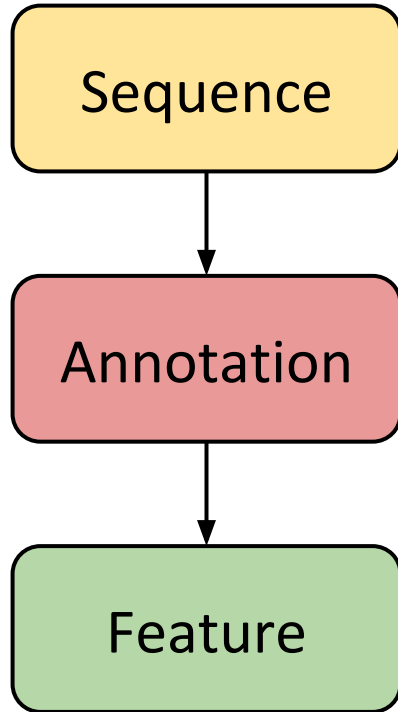# Clotho 3.0 Object Classes

Clotho 3.0 Object Classes

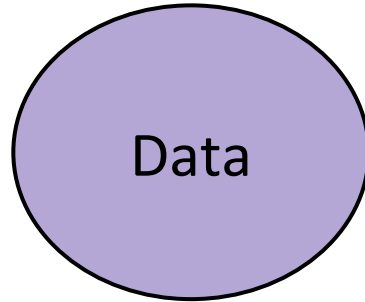# Clotho 3.0 Object Classes

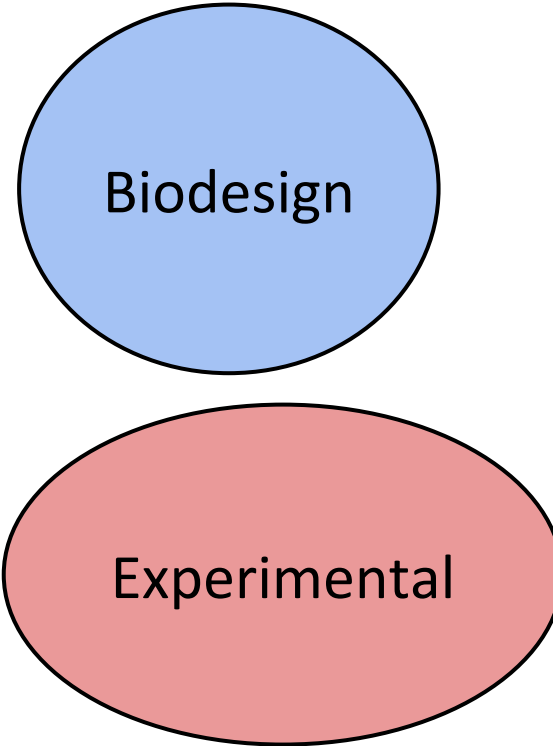# Clotho 3.0 Object Classes

Principles for extending Clotho 3.0

- New object classes should
  - Model new domains of data and relate them to domains previously captured by Clotho
  - Represent data at an appropriate level of detail
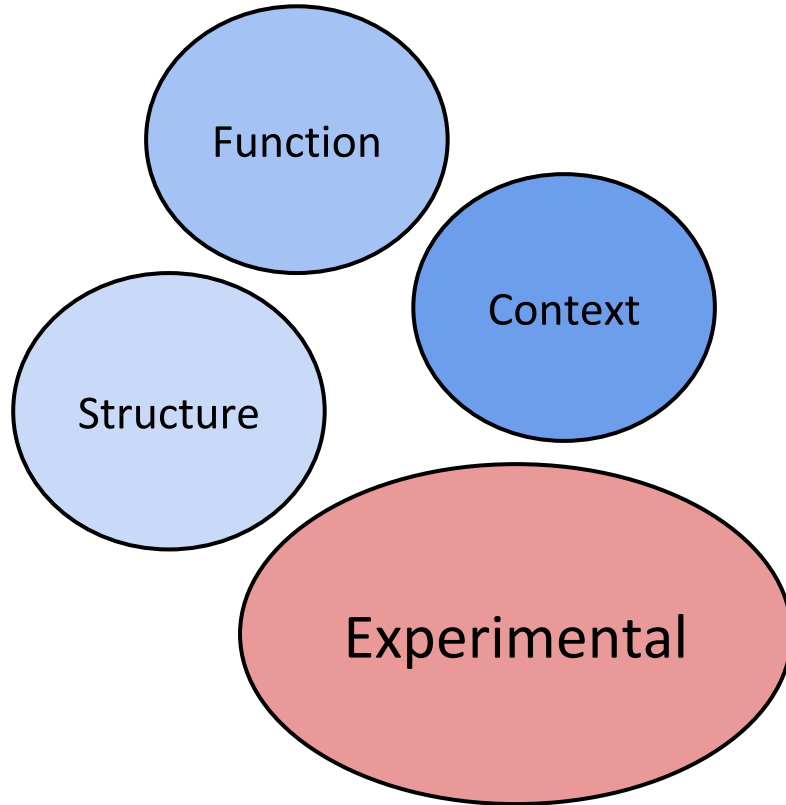 - Provide generally useful functions for computing over stored data
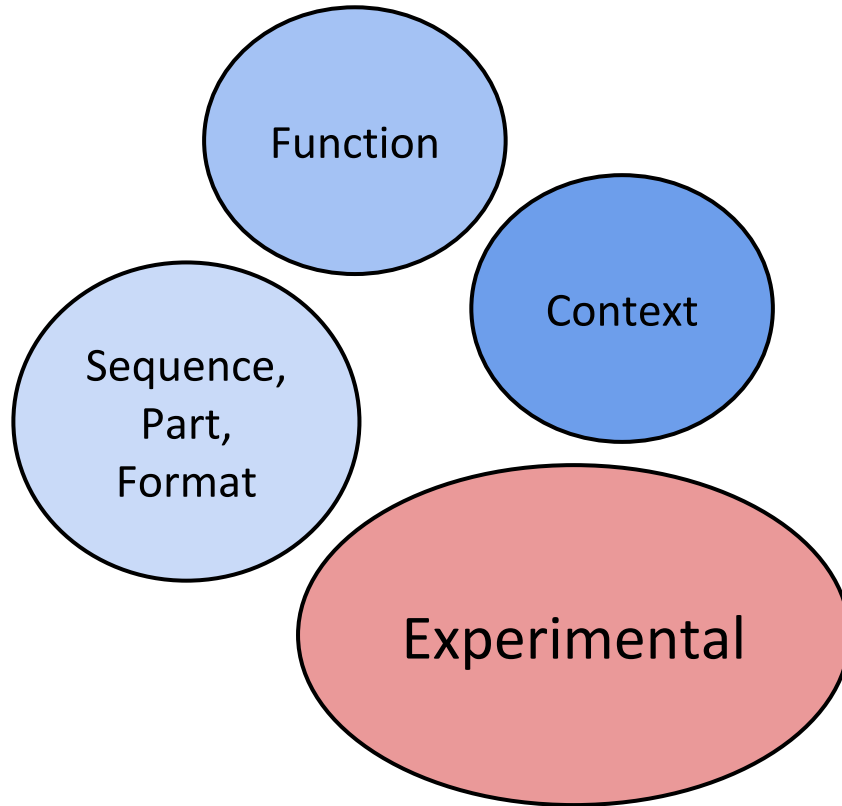
Modeling New Domains of Data

Data

Modeling New Domains of Data

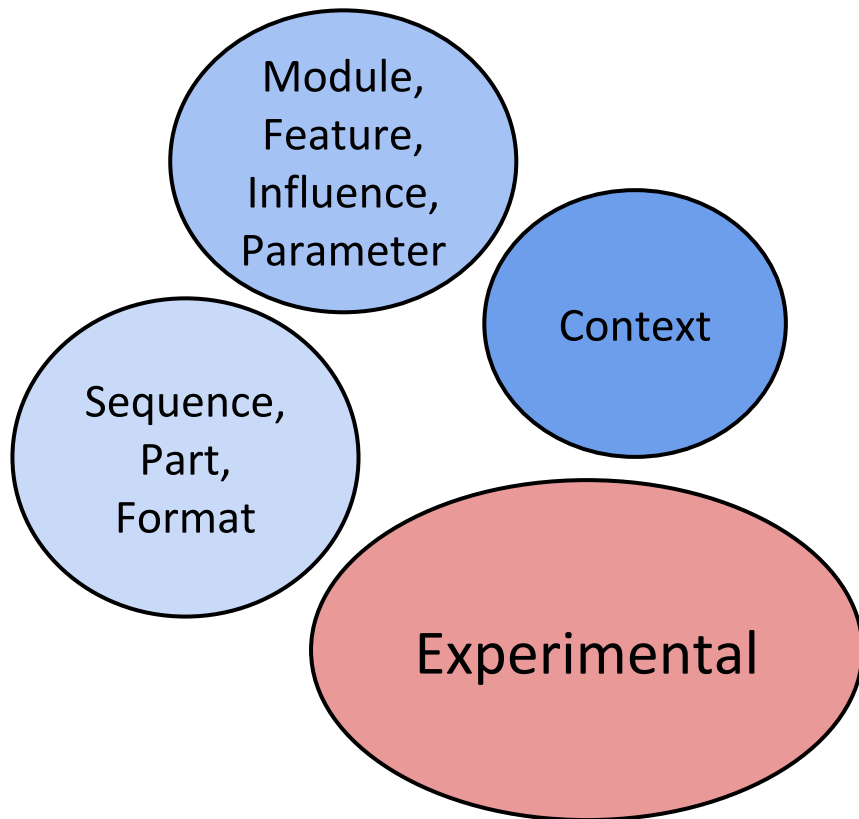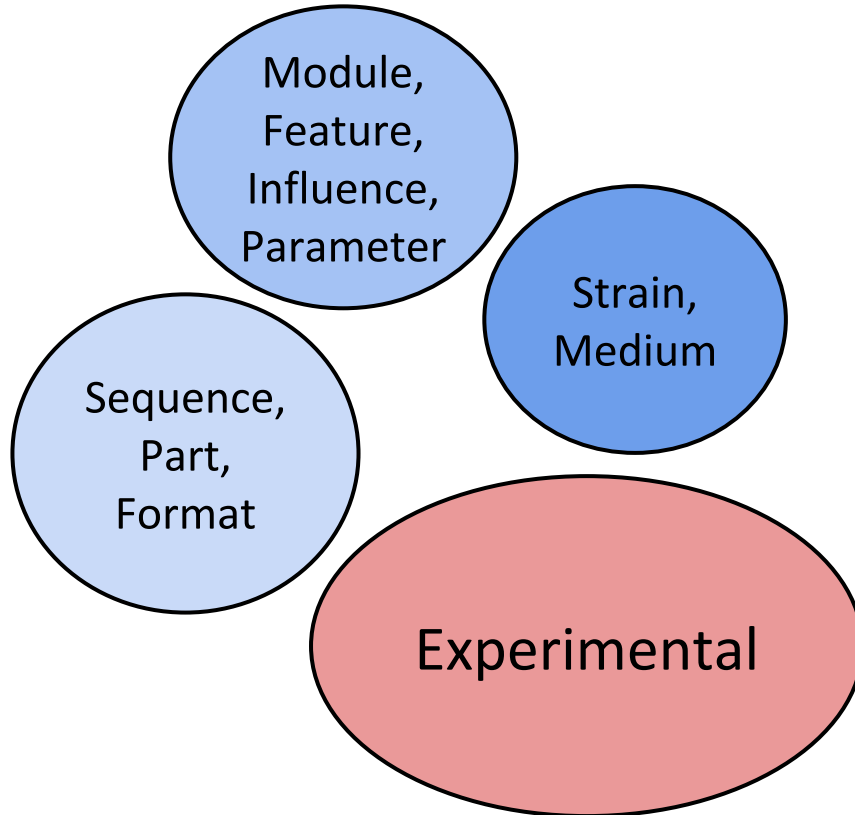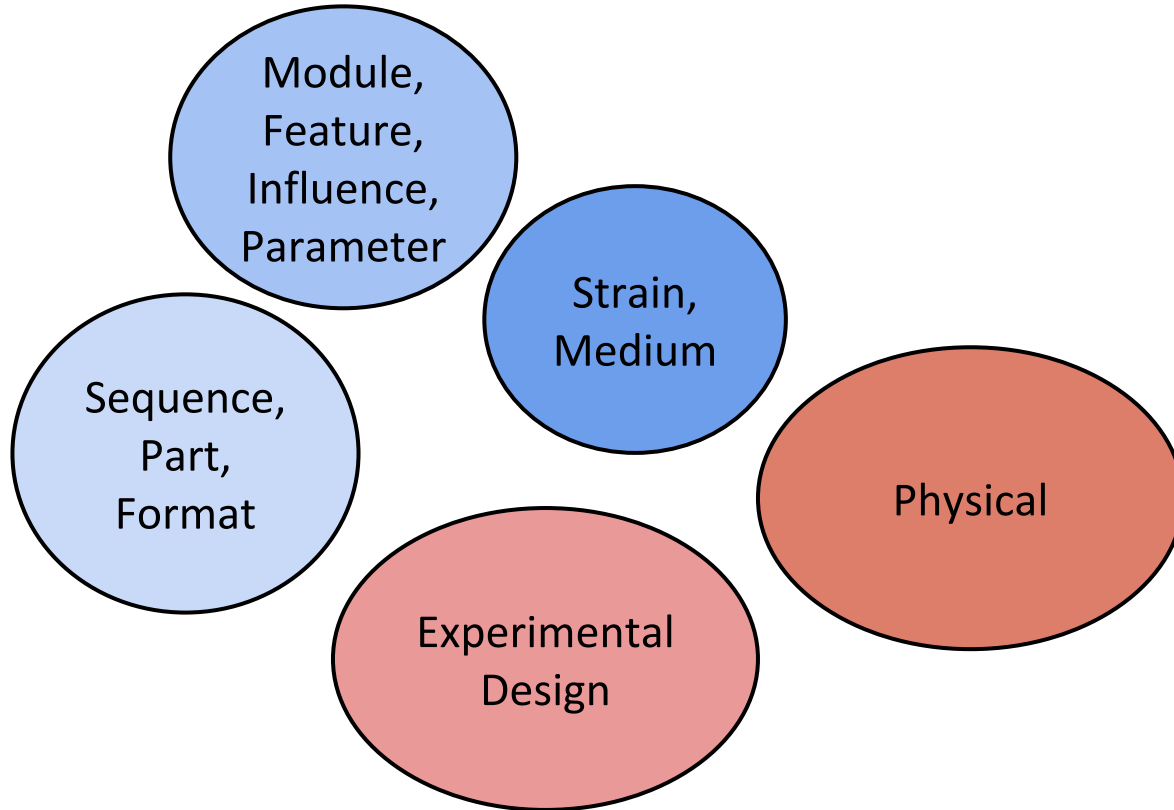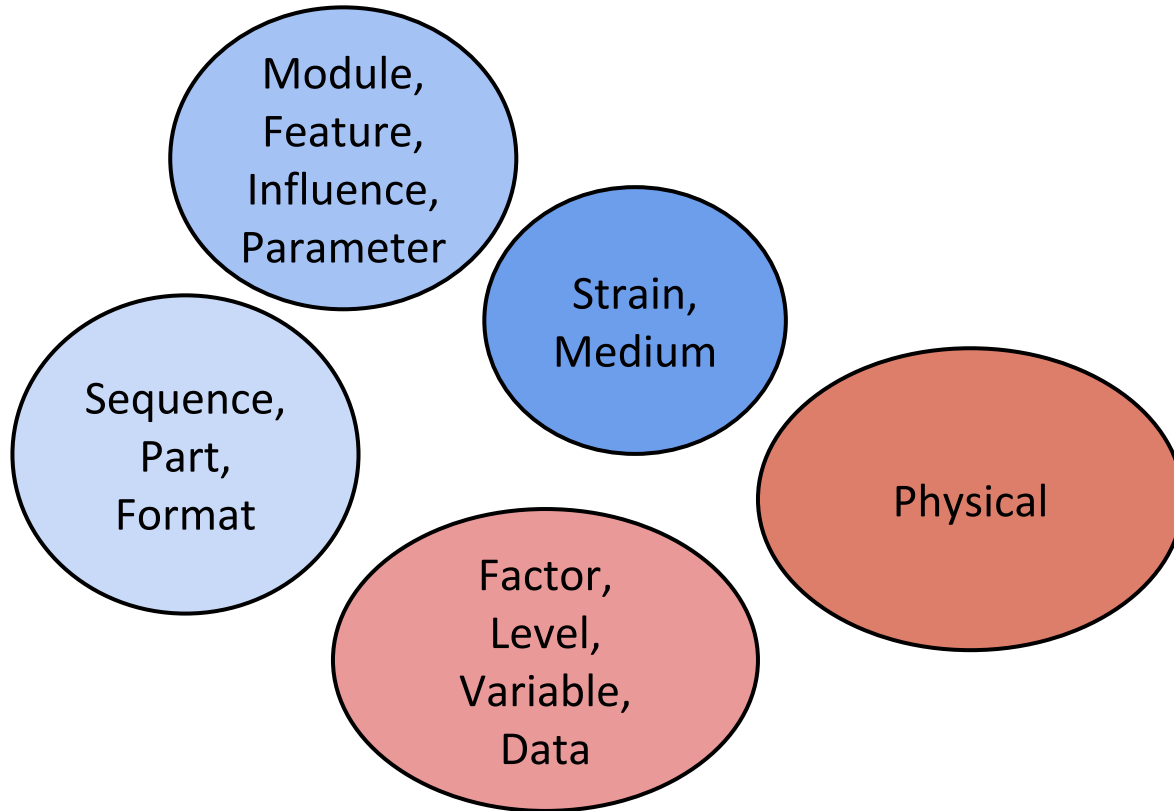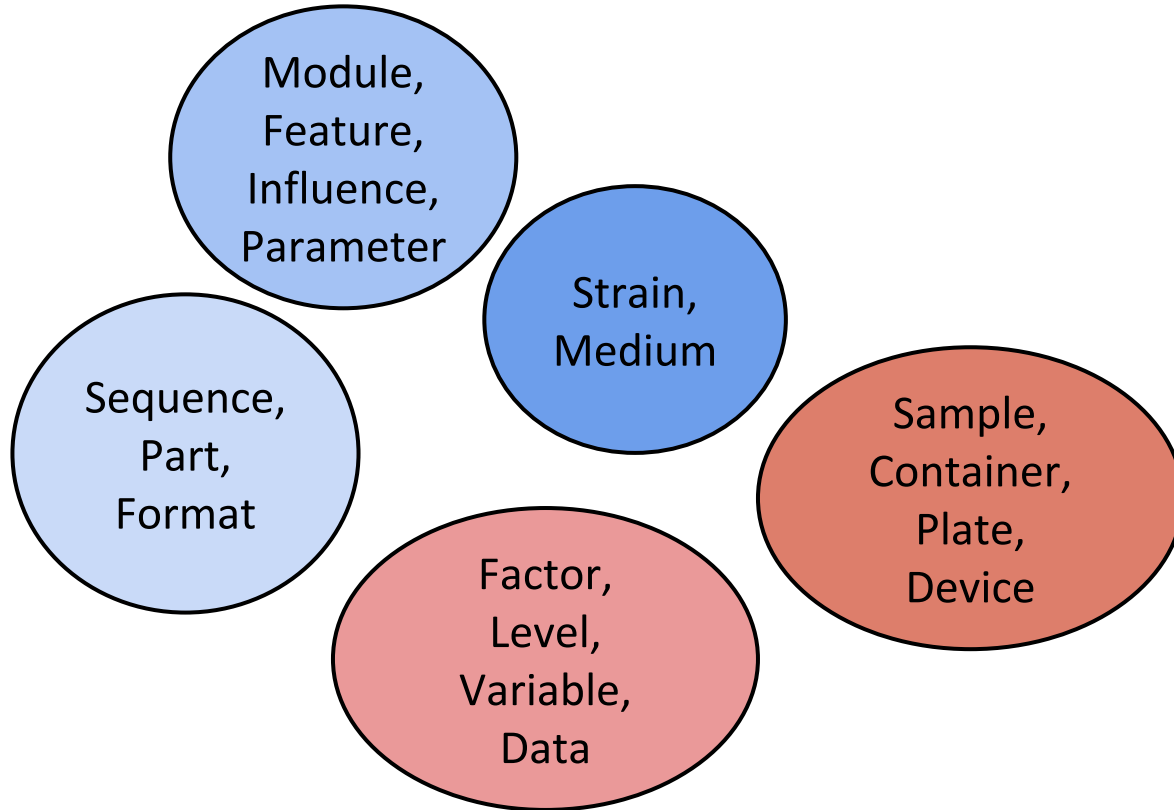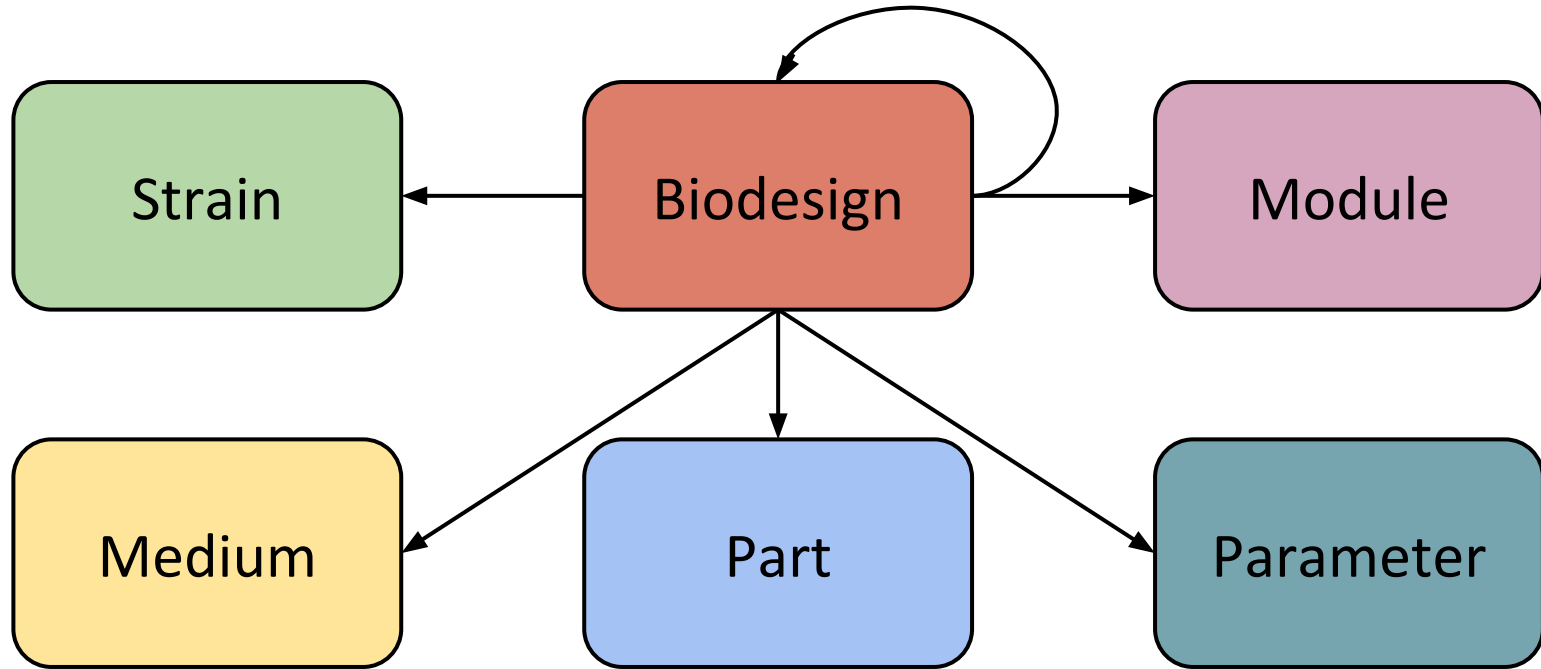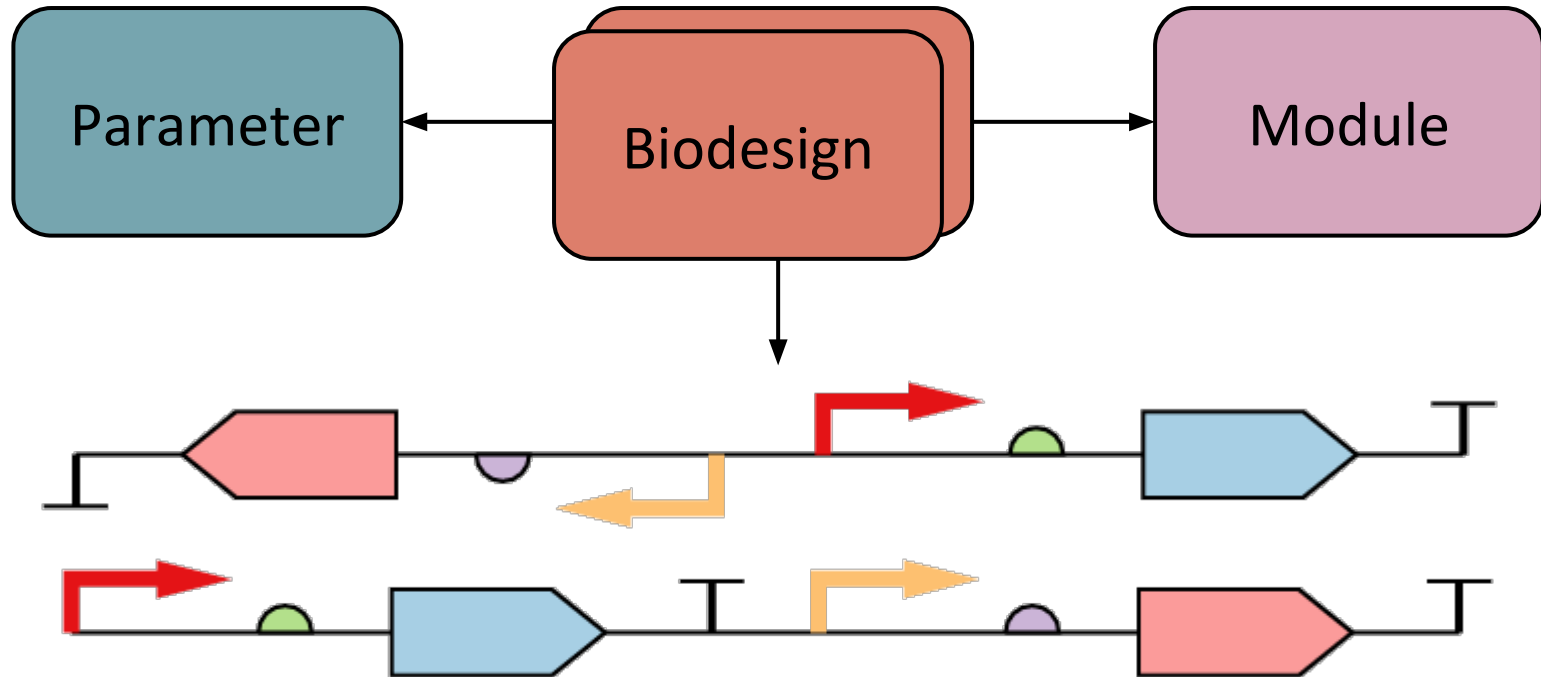# Modeling New Domains of Data
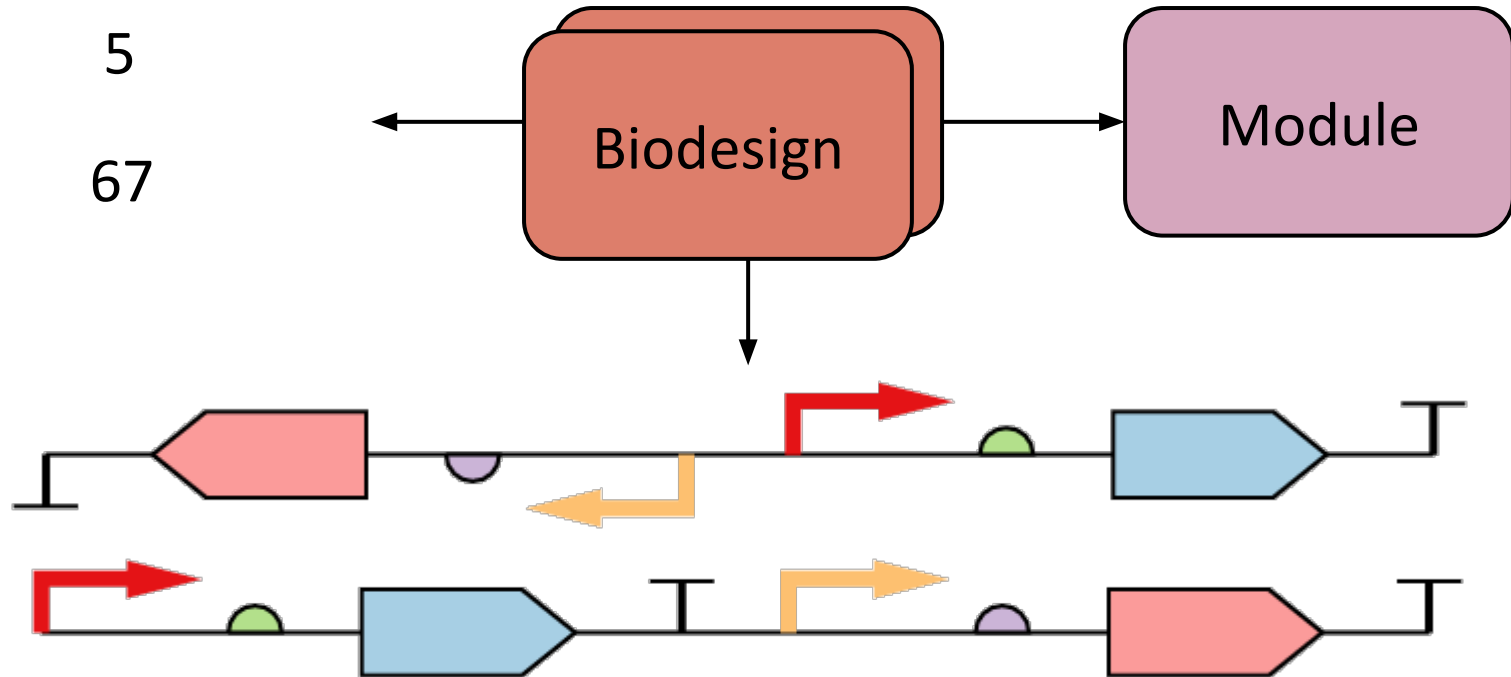
Modeling New Domains of Data

Modeling New Domains of Data

Modeling New Domains of Data

Modeling New Domains of Data

Modeling New Domains of Data
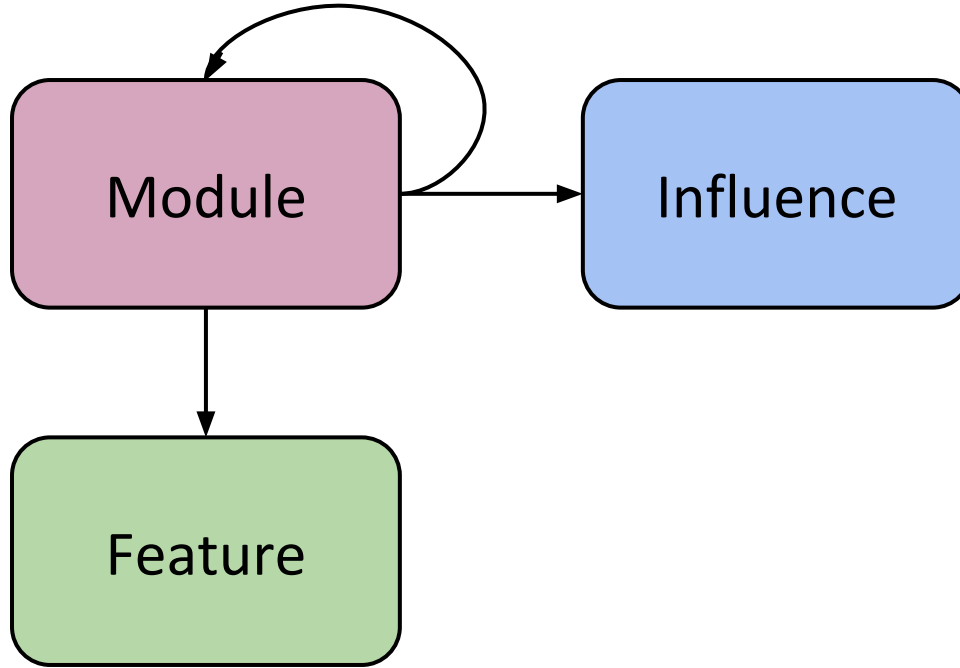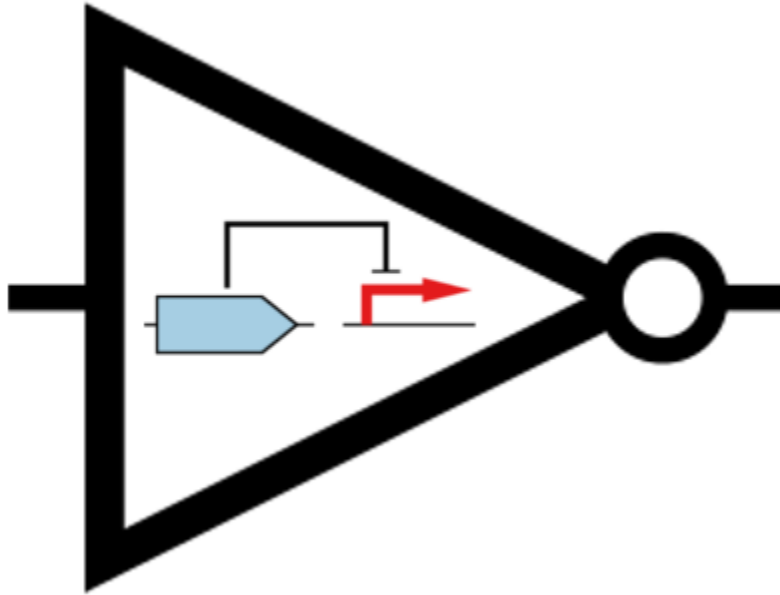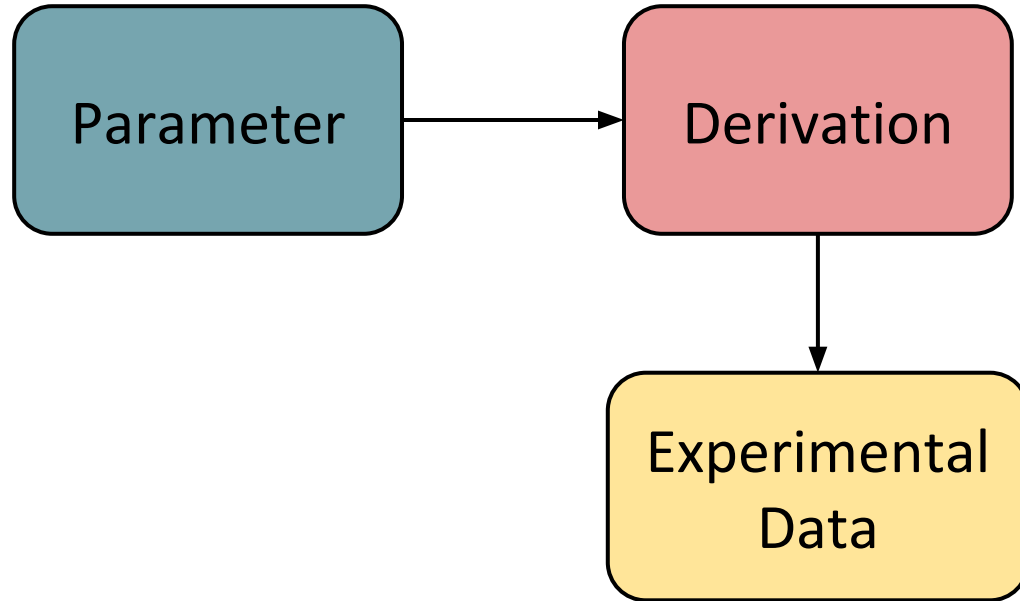
Modeling New Domains of Data

Biodesign

Biodesign

Biodesign

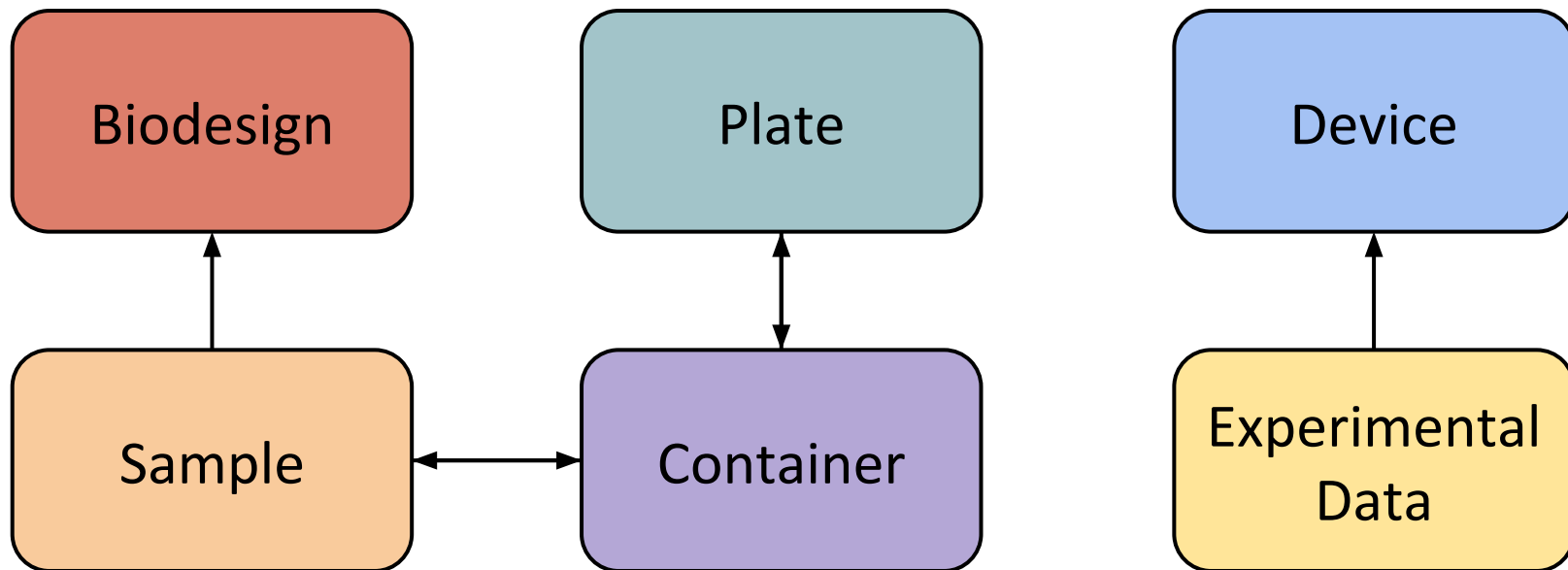# Module

Module

Parameter

Parameter
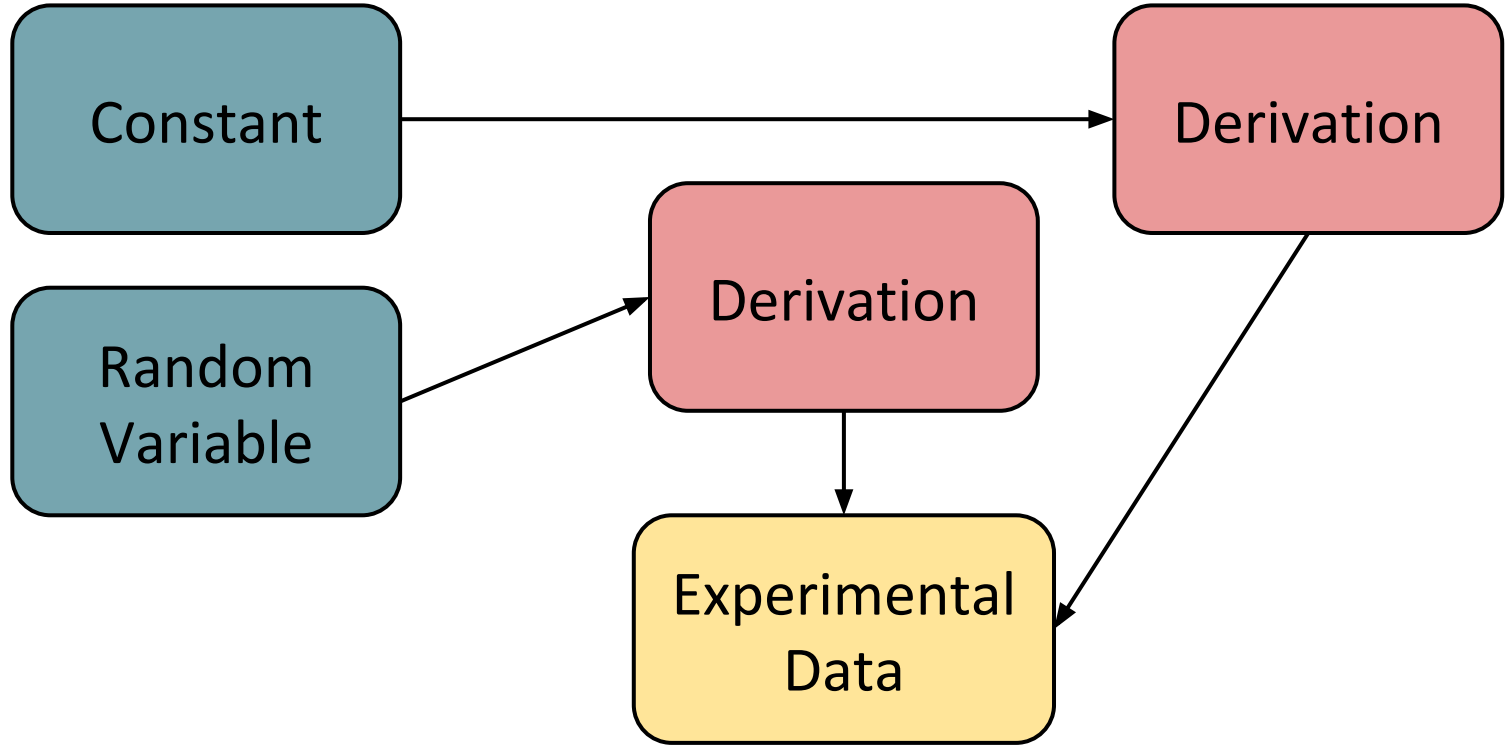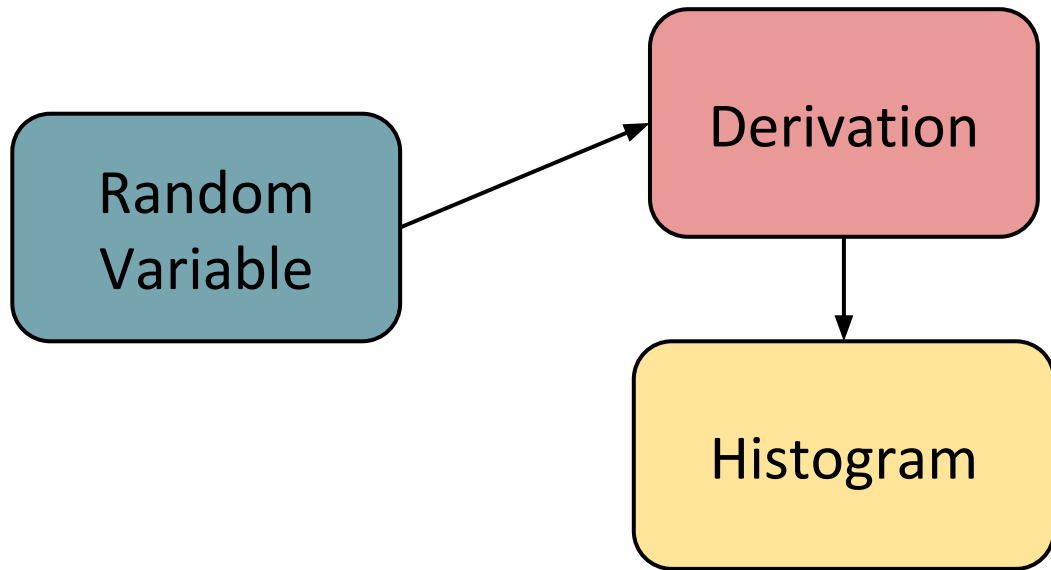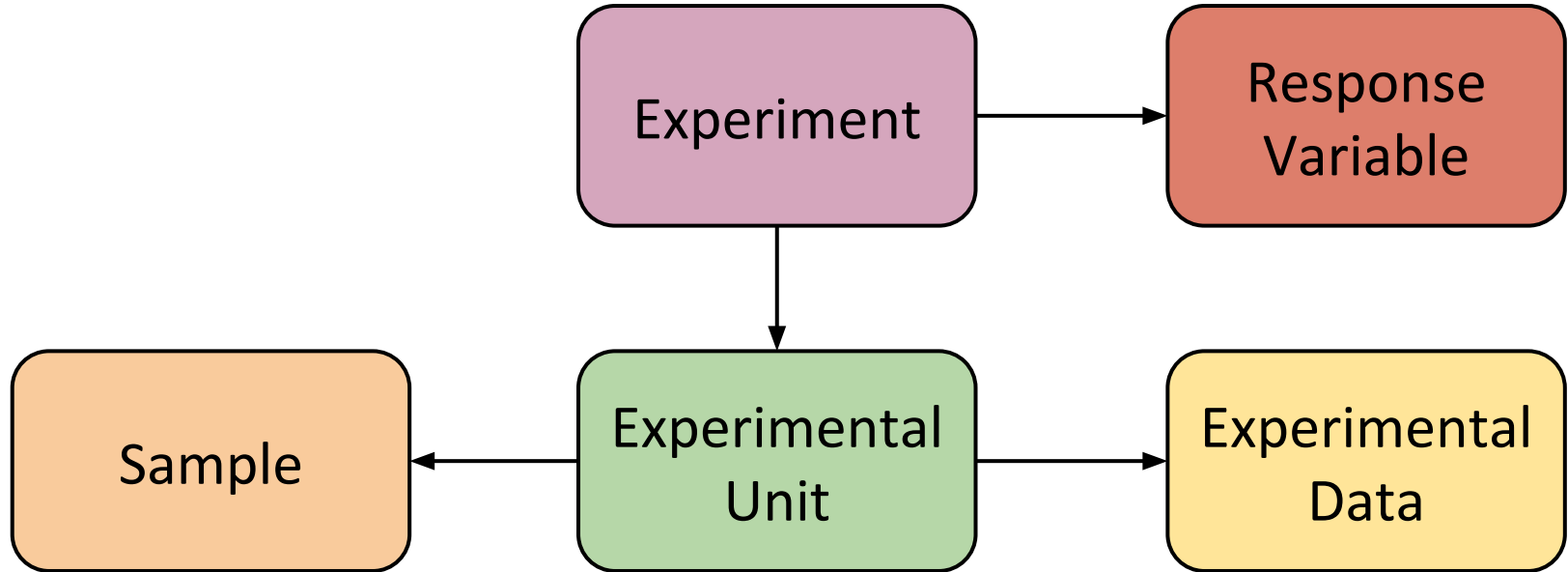
Parameter

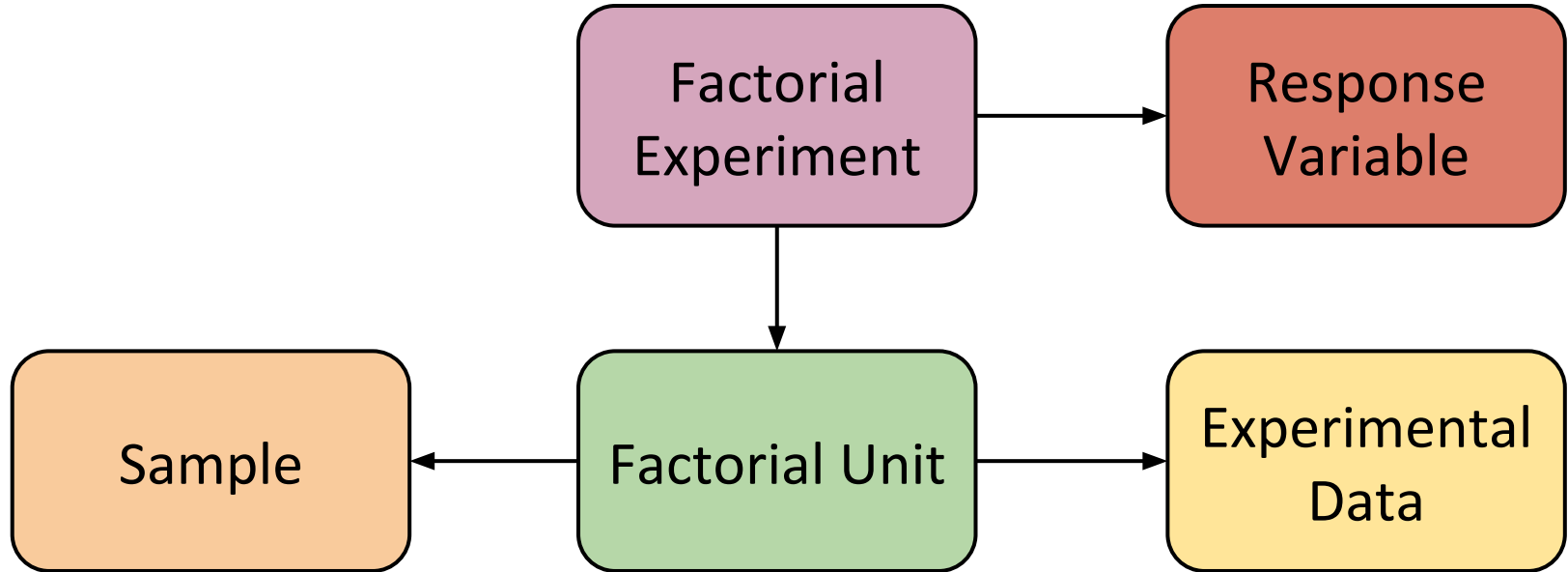# Parameter

Derivation

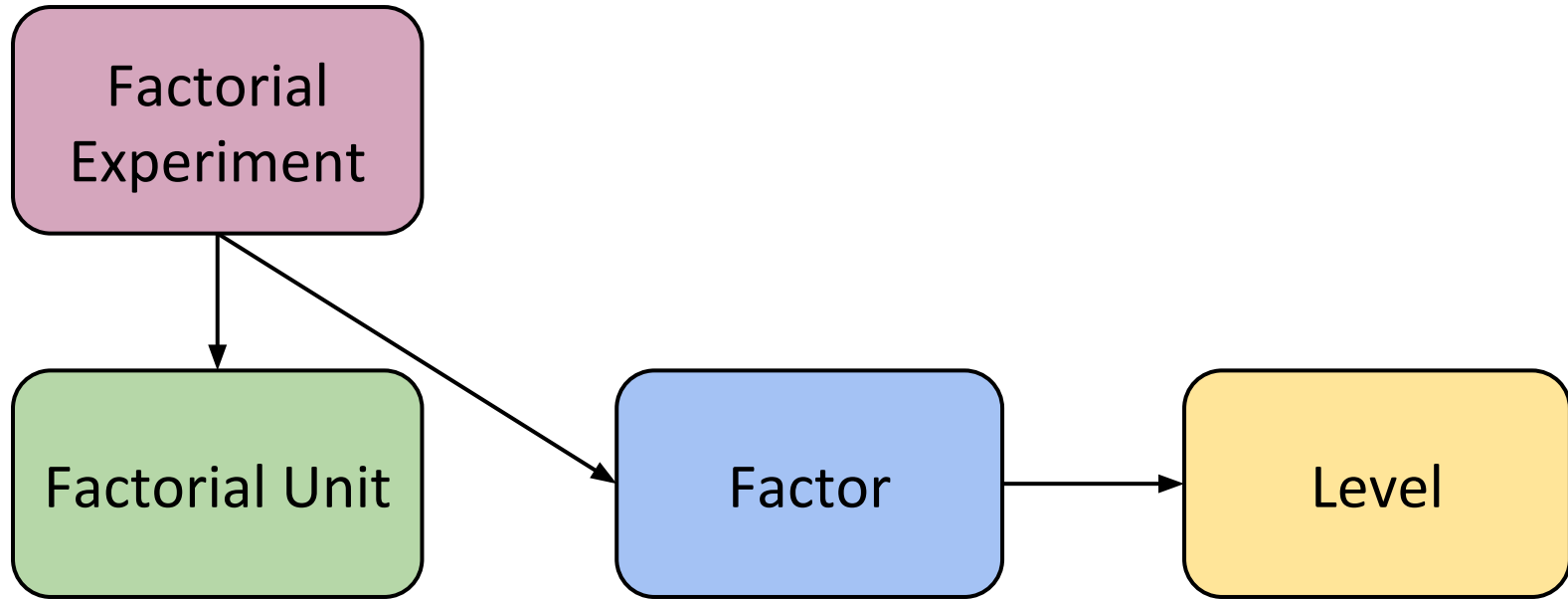921 ± 102
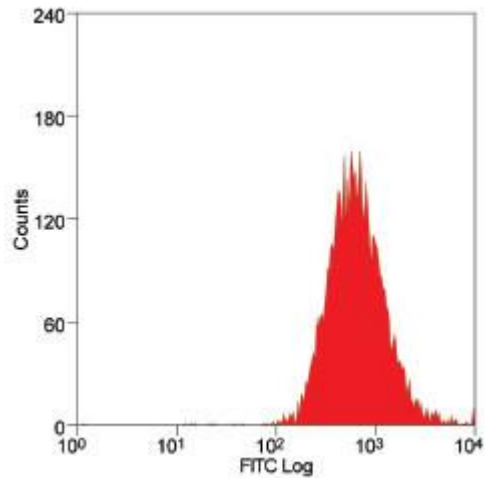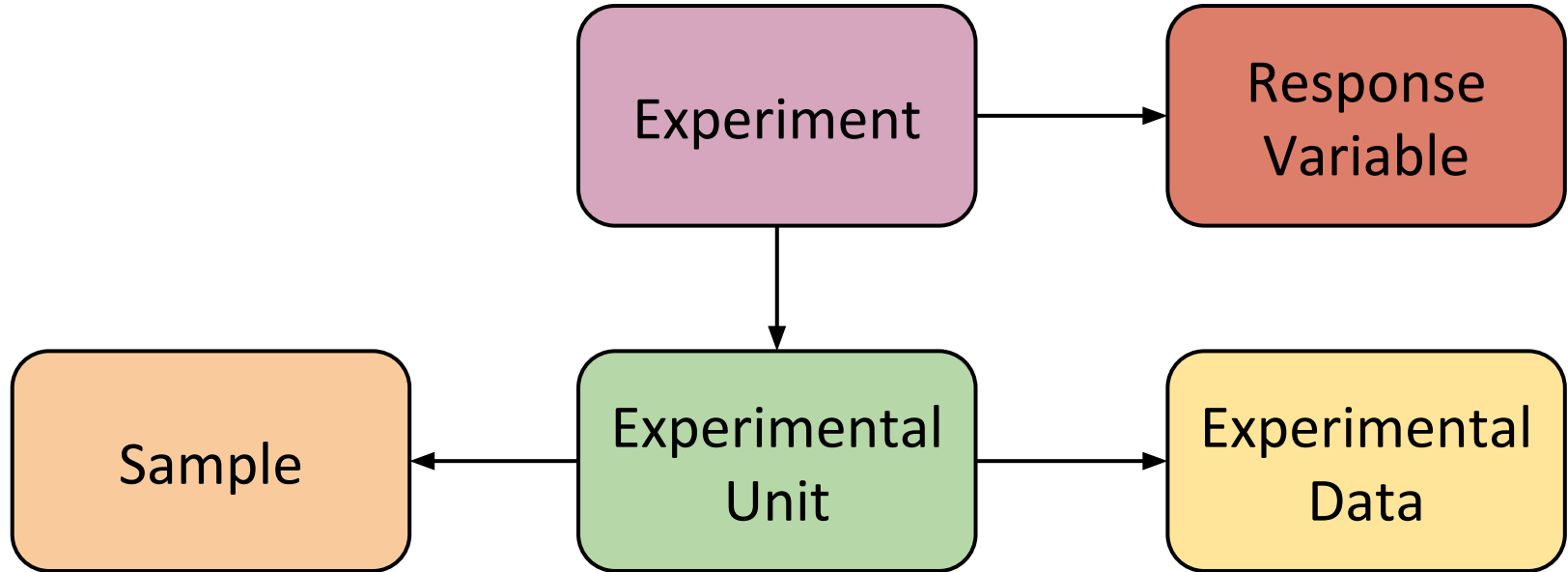
Experiment

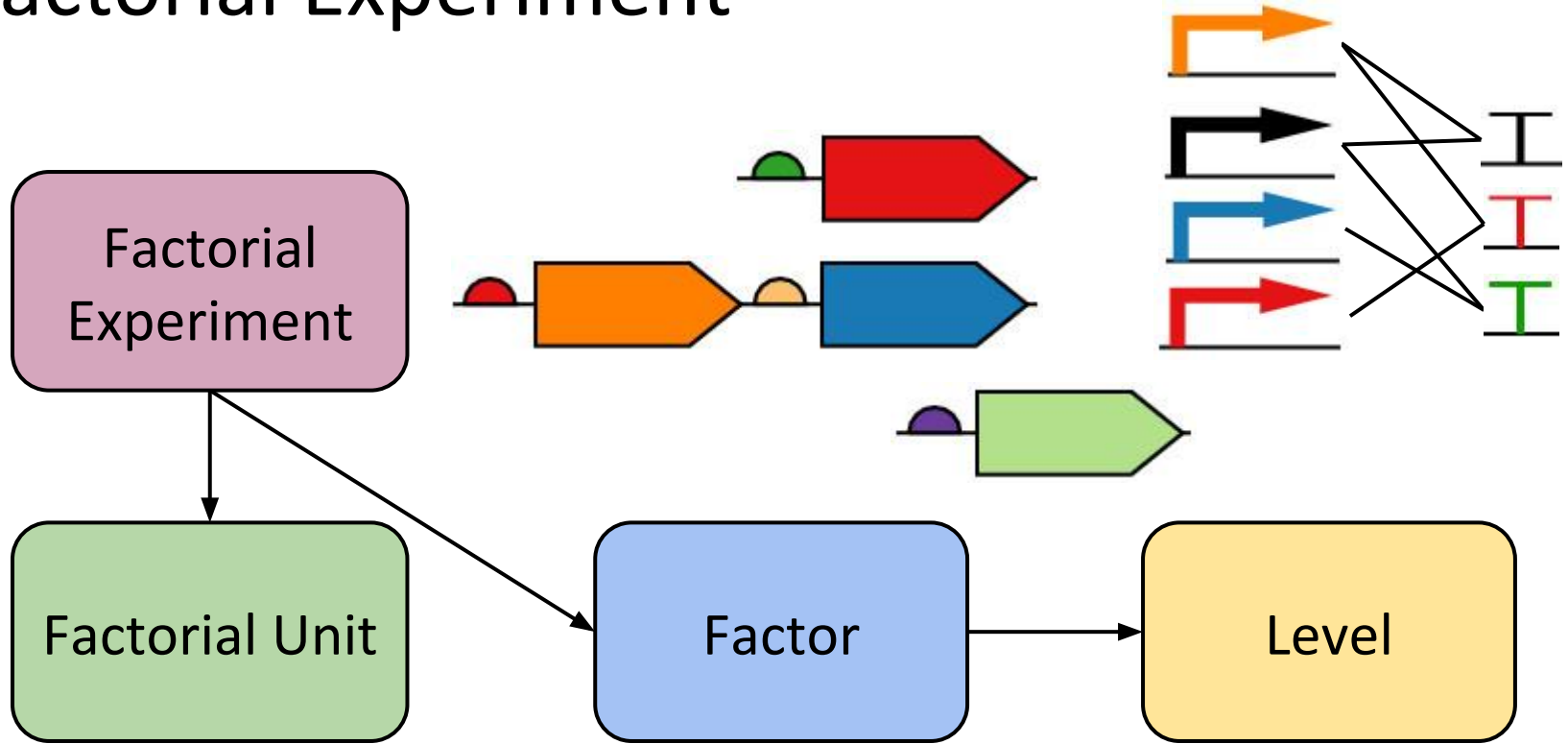# Sample and Device

Experiment

Factorial Experiment

Factorial Experiment

Factorial Experiment

Talk Outline

- Overview of Clotho 3.0 object classes and planned extensions for biodesign and DOE
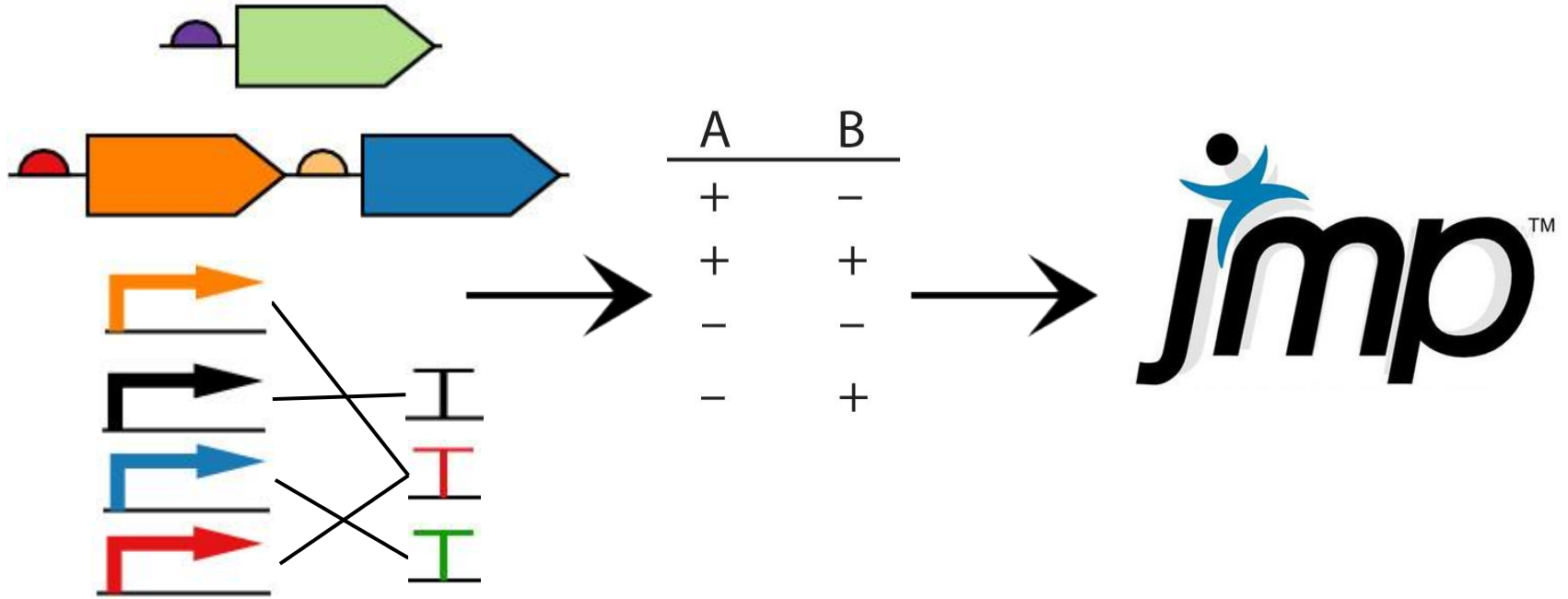- Development plan for web app to support DOE for synthetic biology

Web Application: Code Name Jump Rope

Jump
Rope

→

→

Jump
Rope

Web Application
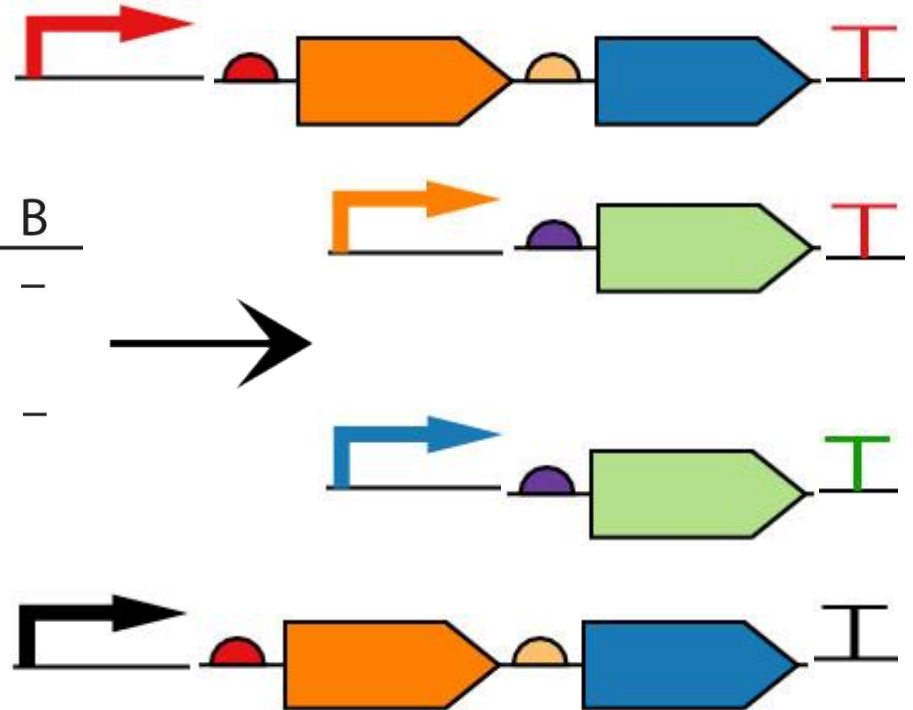
Web Application

Web Application

Web Application

Web Application
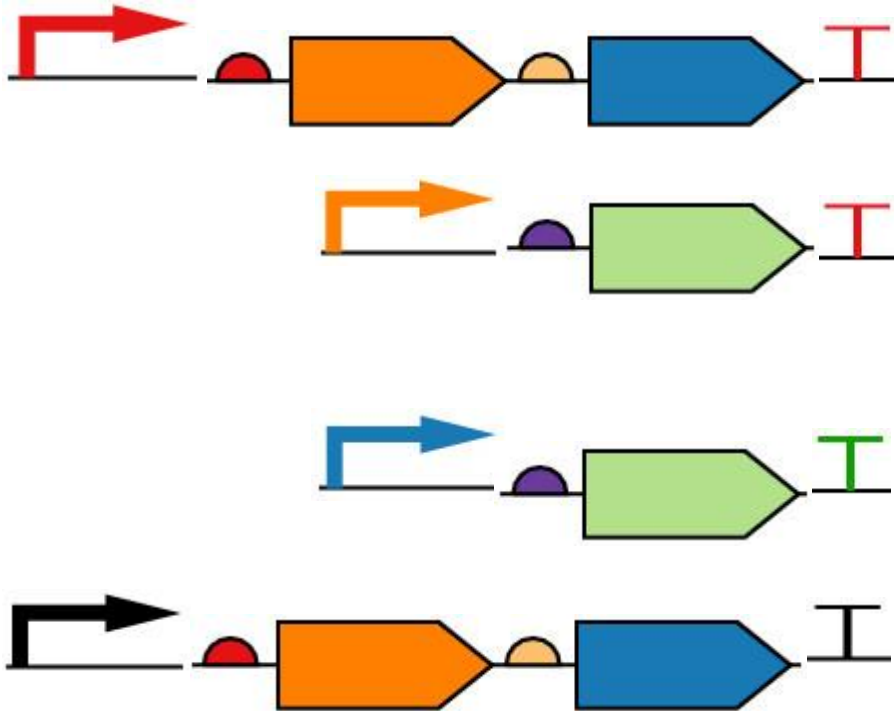
Clotho Team

Douglas Densmore

J. Christopher Anderson
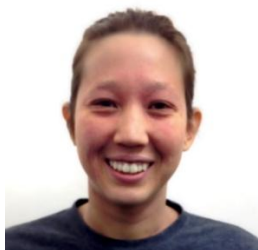
Stephanie Paige

Prashant Vaidyanathan

Bill Cao

Maxwell Bates