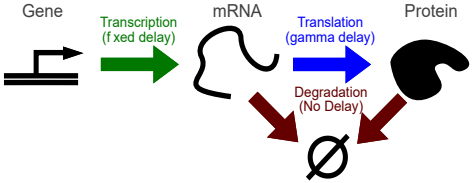
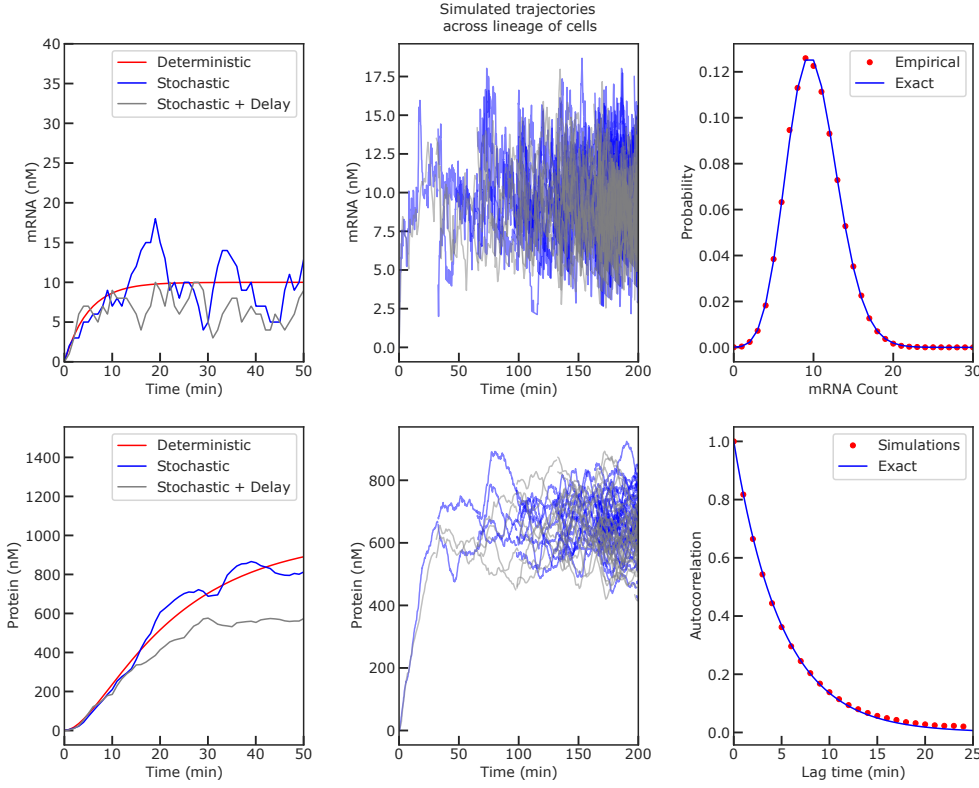
a Gene Expression



b Bioscrape Model

```
from bioscrape.types import Model

M = Model()

M.create_reaction(
    reactants = [],
    products = [],
    propensity_type = "massaction",
    propensity_param_dict = {"k":"beta"},
    delay_reactants = [],
    delay_products = ["mRNA"],
    delay_type = "fixed",
    delay_param_dict = {"delay":"tx_delay"})

M.create_reaction(
    reactants = ["mRNA"],
    products = [],
    propensity_type = "massaction",
    propensity_param_dict = {"k":"beta"})

M.set_parameter("beta", 2)
M.set_parameter("delta", 0.2)
M.set_parameter("tx_delay", 10)

M.set_species({"mRNA": 0})
...Translation and protein degradation not shown...
```

c Simulation Code

```
from bioscrape.simulator import py_simulate_model
time = np.array([0.05*s for s in range(1000)])
result = py_simulate_model(time, Model=M)
```

d Simulations