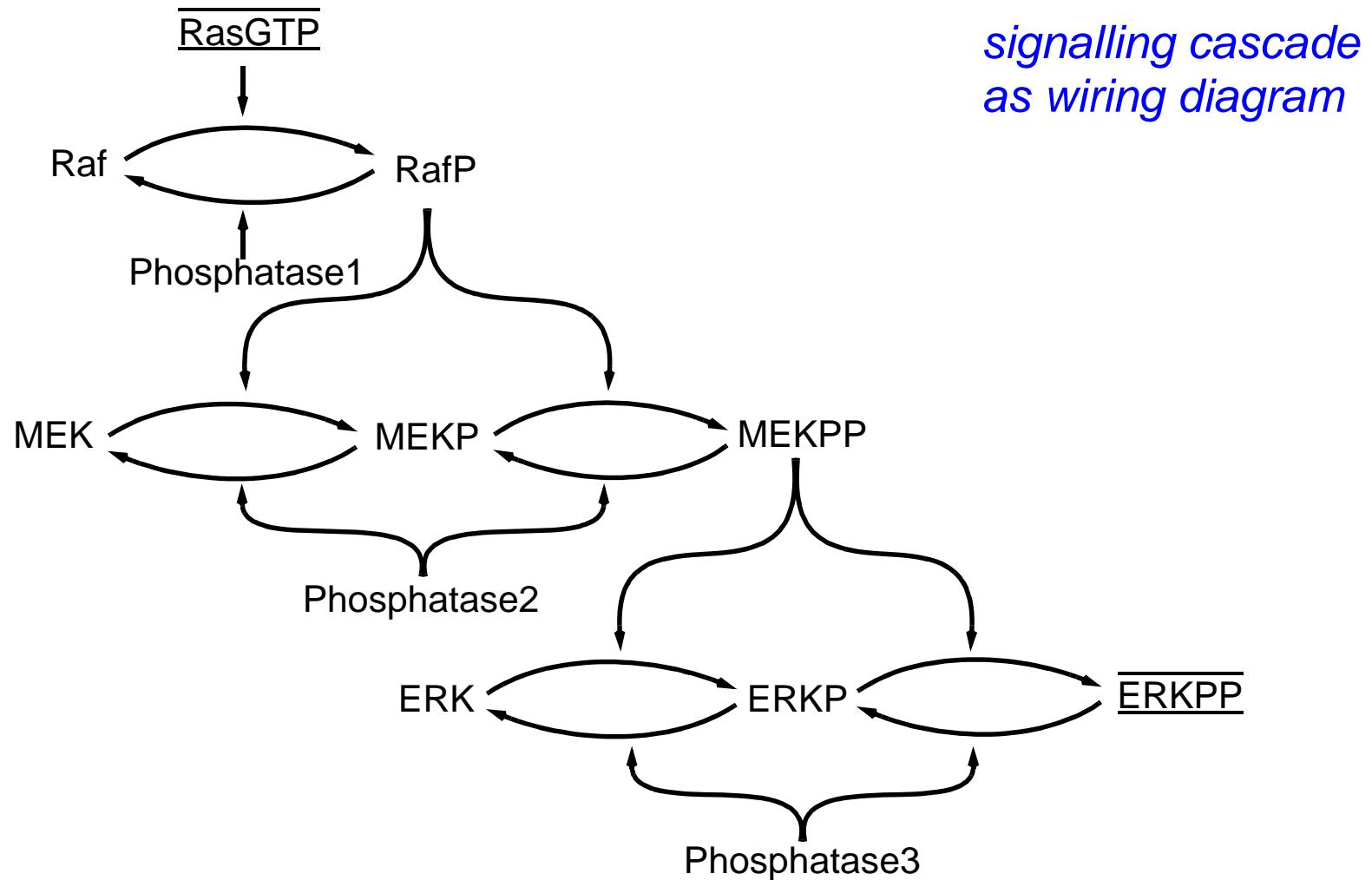


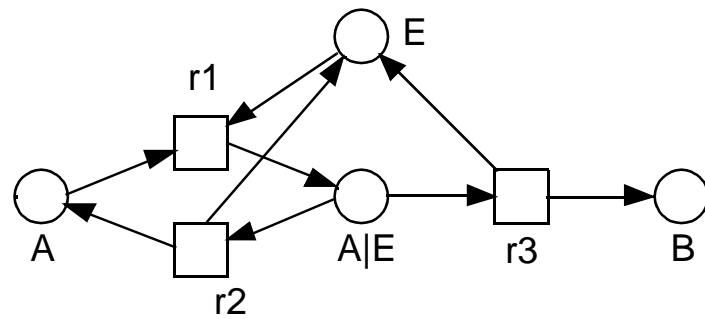
DEVELOPING BIO (PETRI) NETS

APPROACH 1



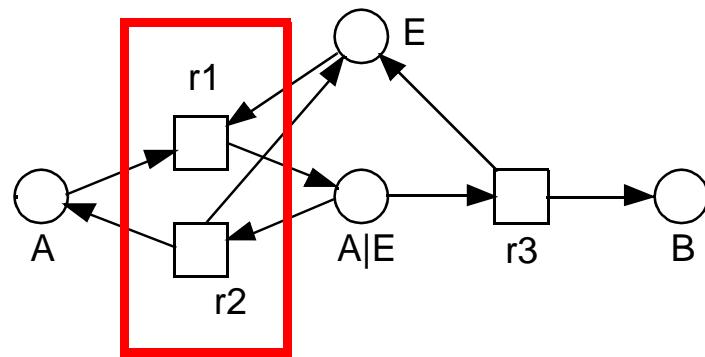


*enzymatic reaction,
mass-action kinetics*



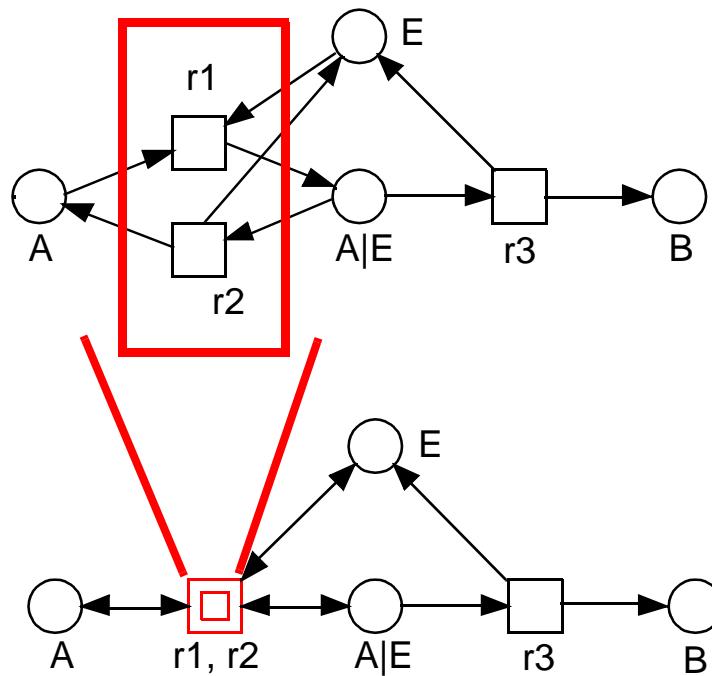


*enzymatic reaction,
mass-action kinetics*

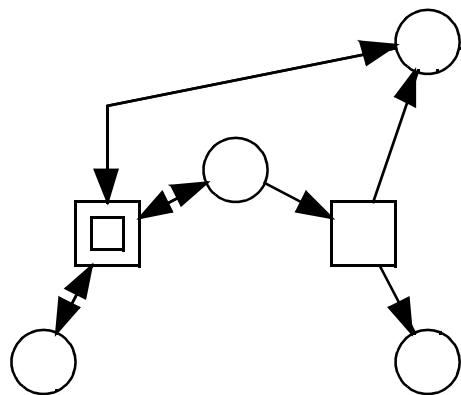


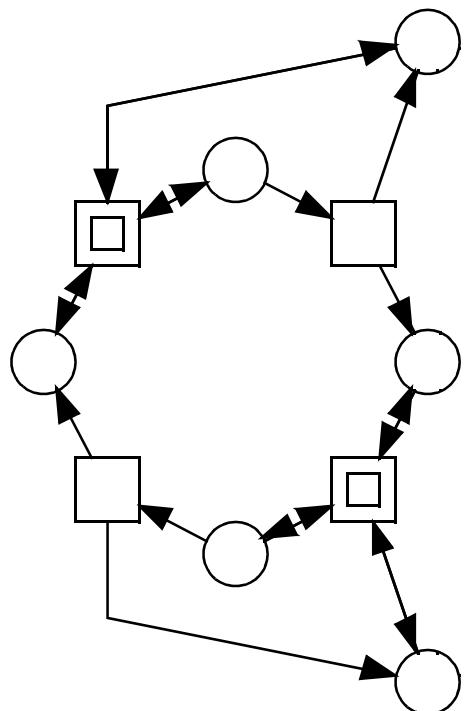


*enzymatic reaction,
mass-action kinetics*



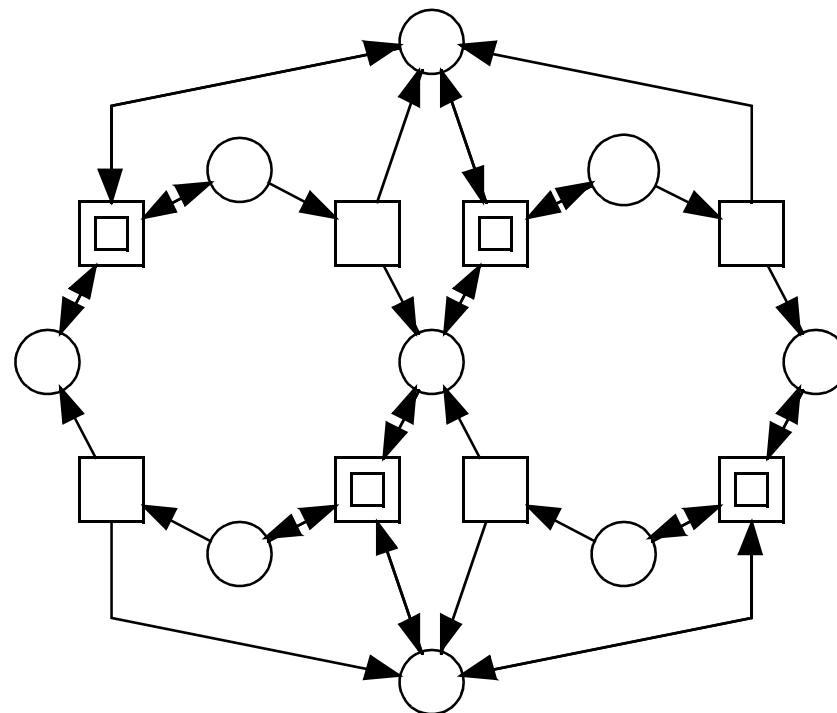
SINGLE
MASS-ACTION STEP





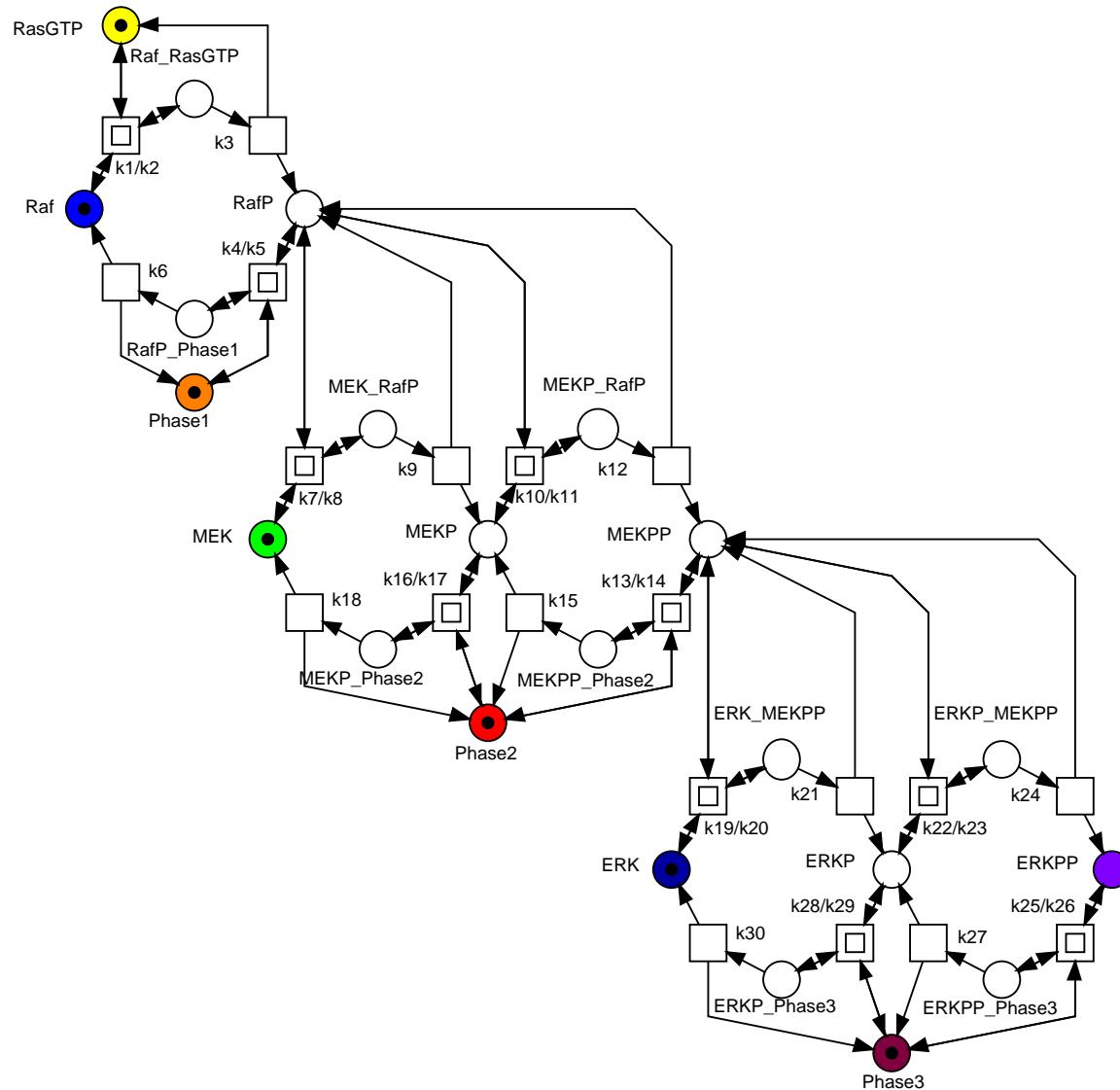
*SINGLE
PHOSPHORYLATION / DEPHOSPHORYLATION*

DOUBLE PHOSPHORYLATION / DEPHOSPHORYLATION



SIGNALLING CASCADE AS PETRI NET

PN & Systems Biology

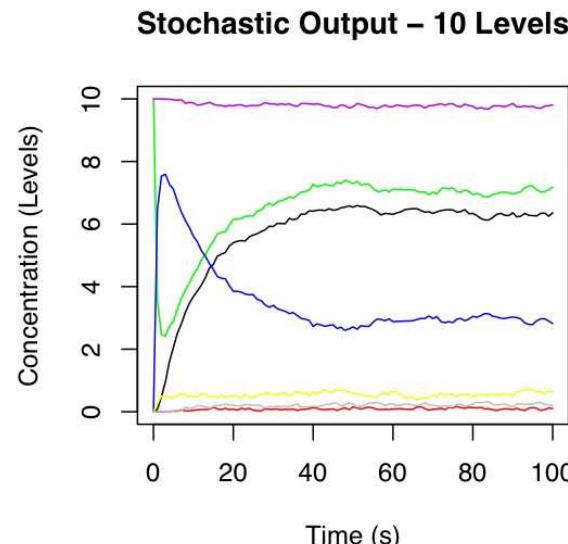
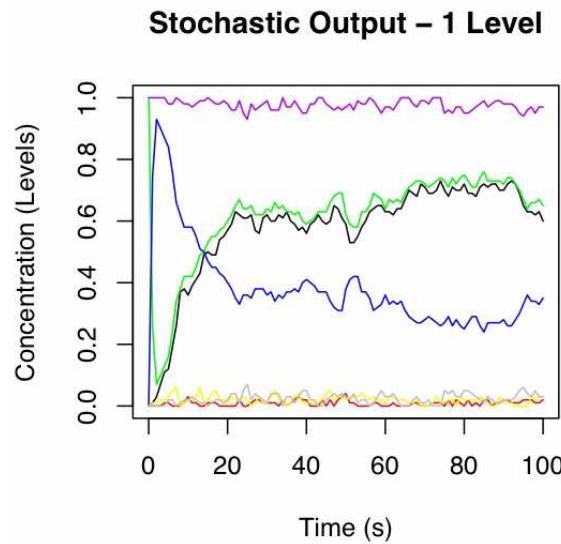


[GILBERT,
HEINER,
LEHRACK 2007]

[HEINER,
GILBERT,
DONALDSON 2008]

SIGNALLING CASCADE, SIMULATIONS

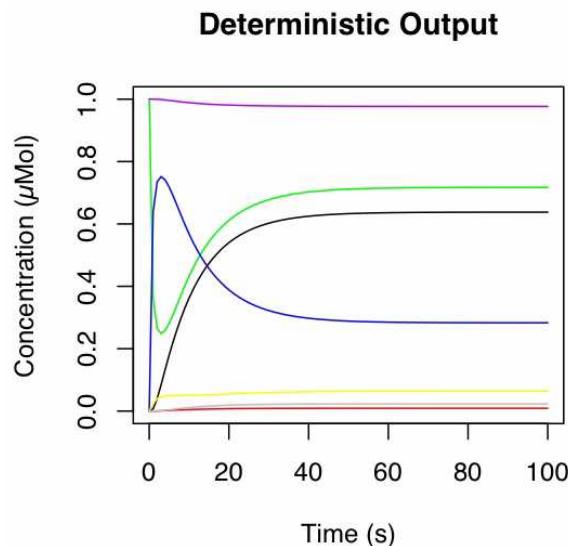
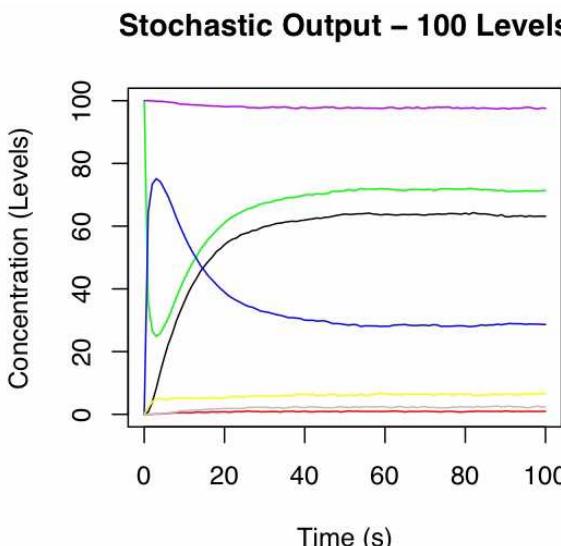
PN & Systems Biology



*signalling cascade
as wiring diagram*

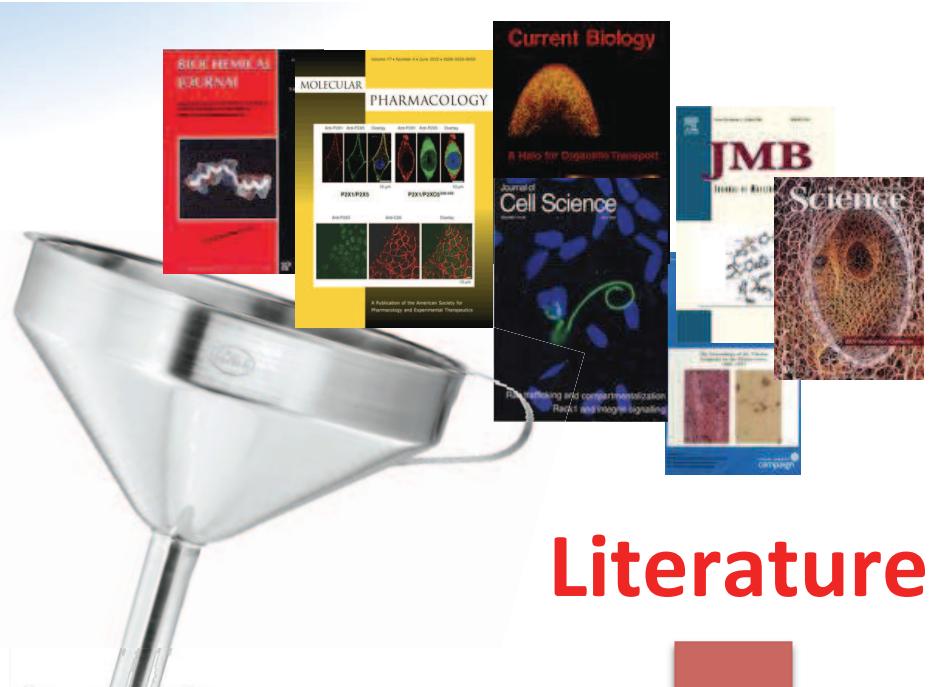
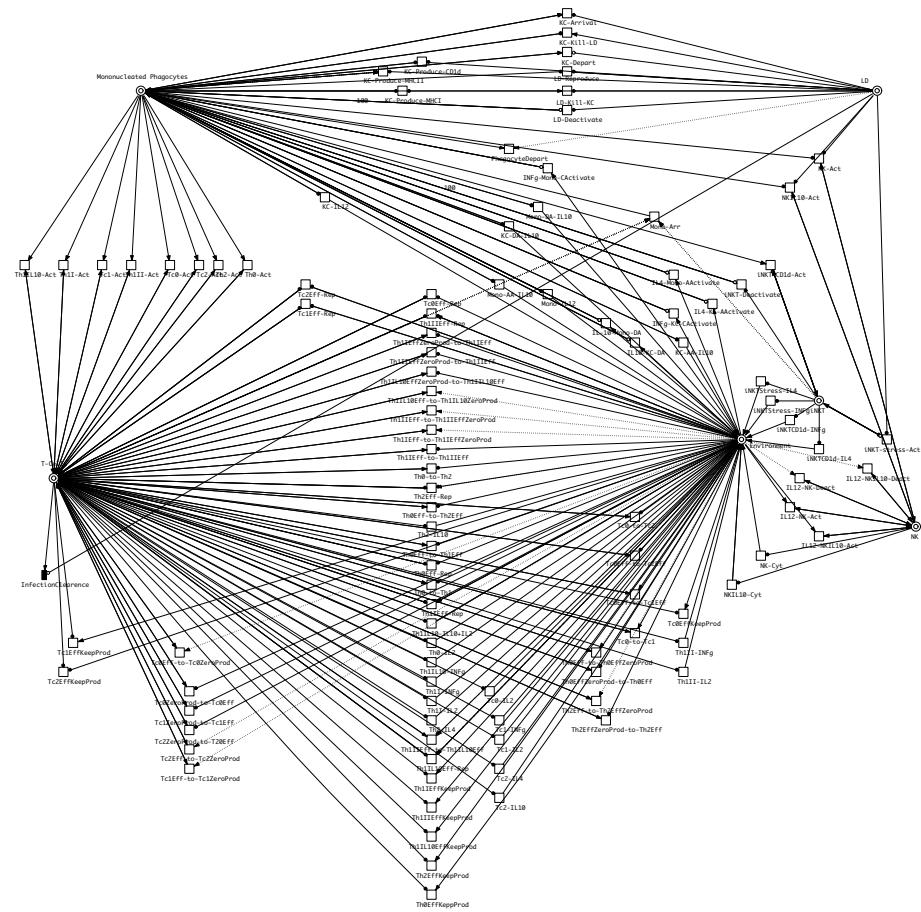
[GILBERT,
HEINER,
LEHRACK 2007]

[HEINER,
GILBERT,
DONALDSON 2008]



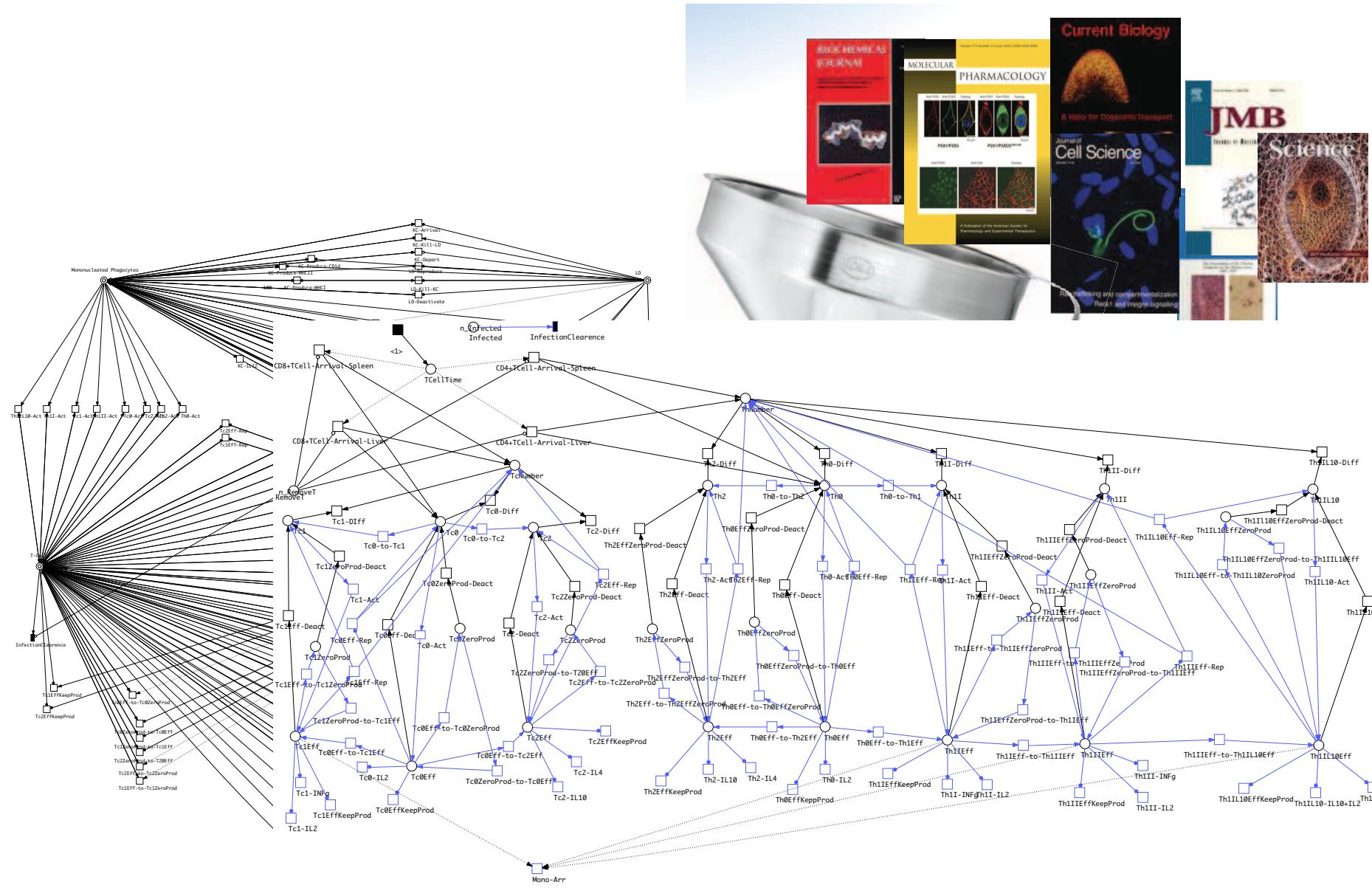
APPROACH 2





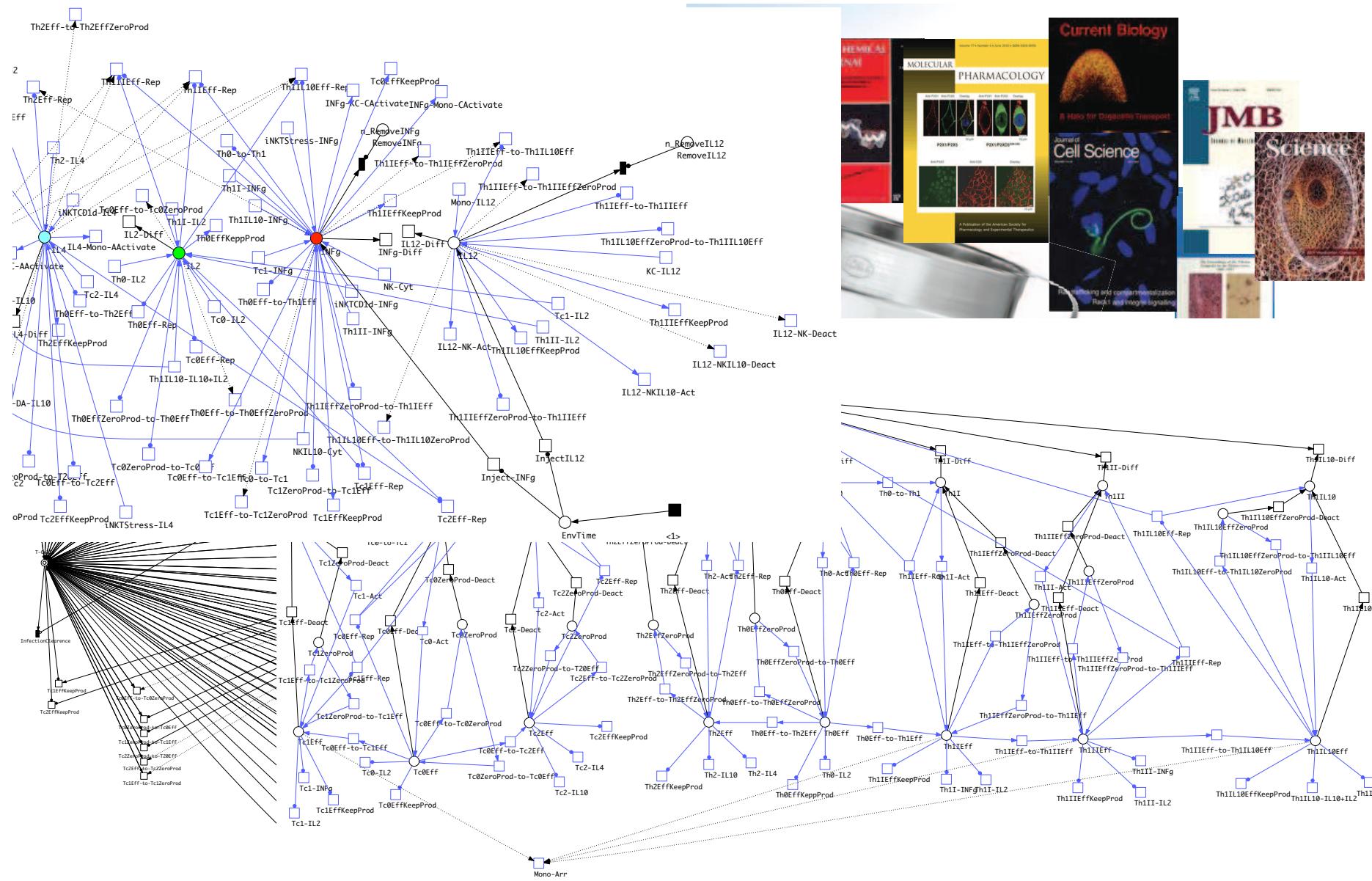
FROM LITERATURE TO MODELS

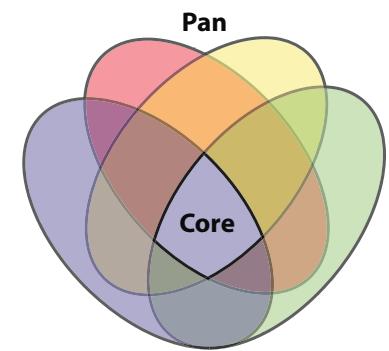
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FROM LITERATURE TO MODELS

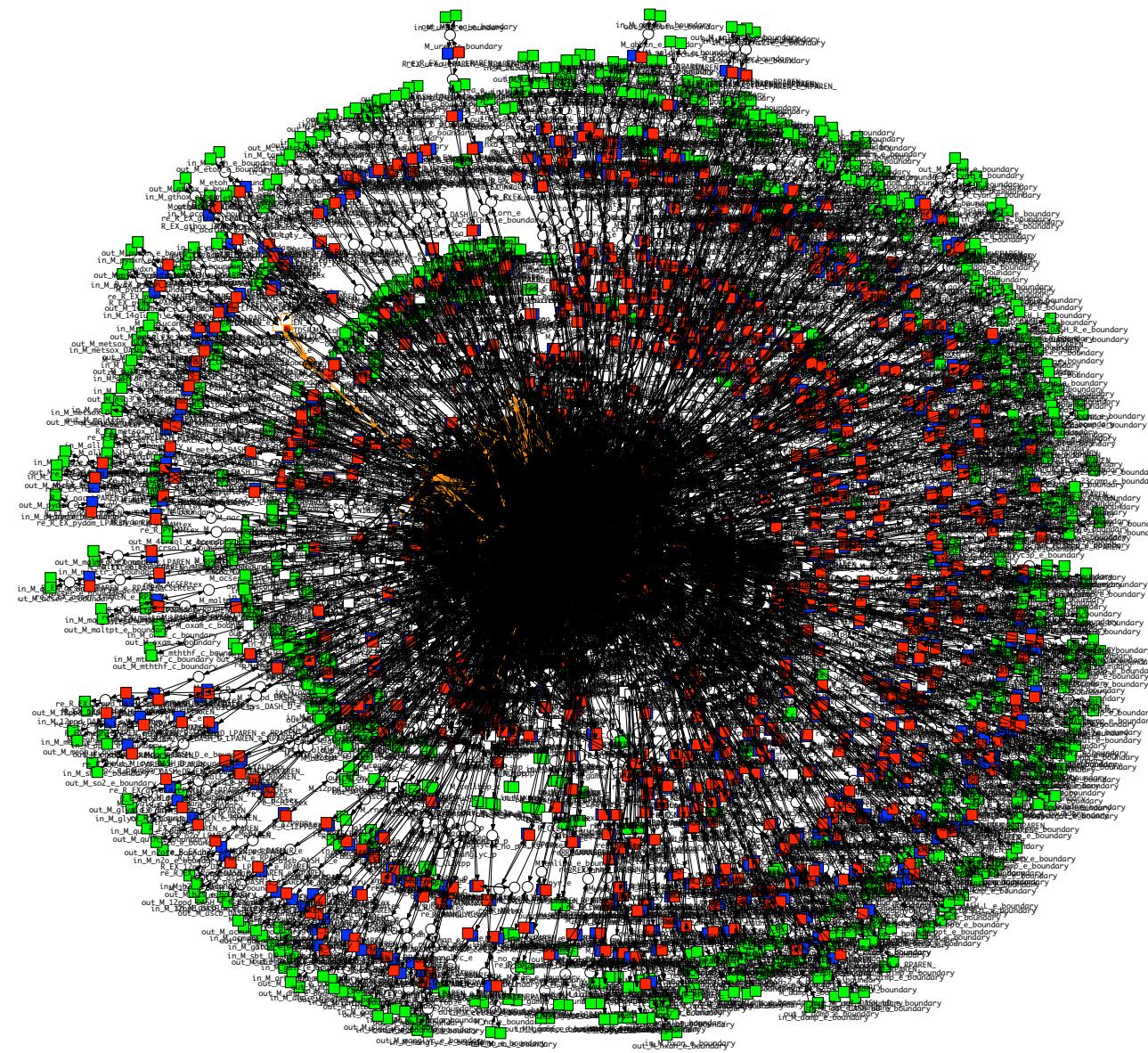
PN & Systems Biology



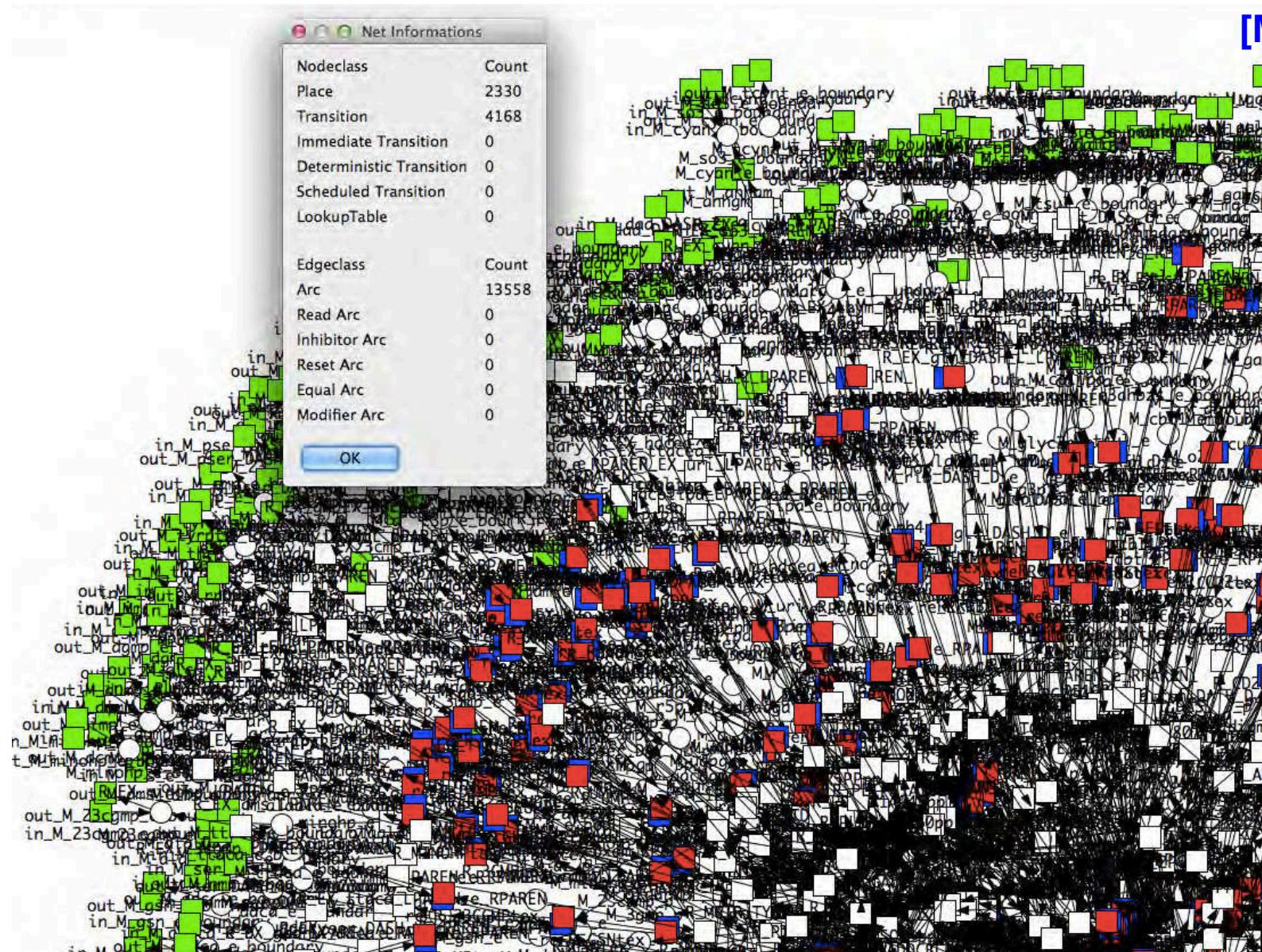


APPROACH 3

[Monk 2013]



[Monk 2013]



HOW TO SURVIVE LARGER MODELS ?

HOW TO SURVIVE LARGER MODELS ?

-> MODULAR MODELLING

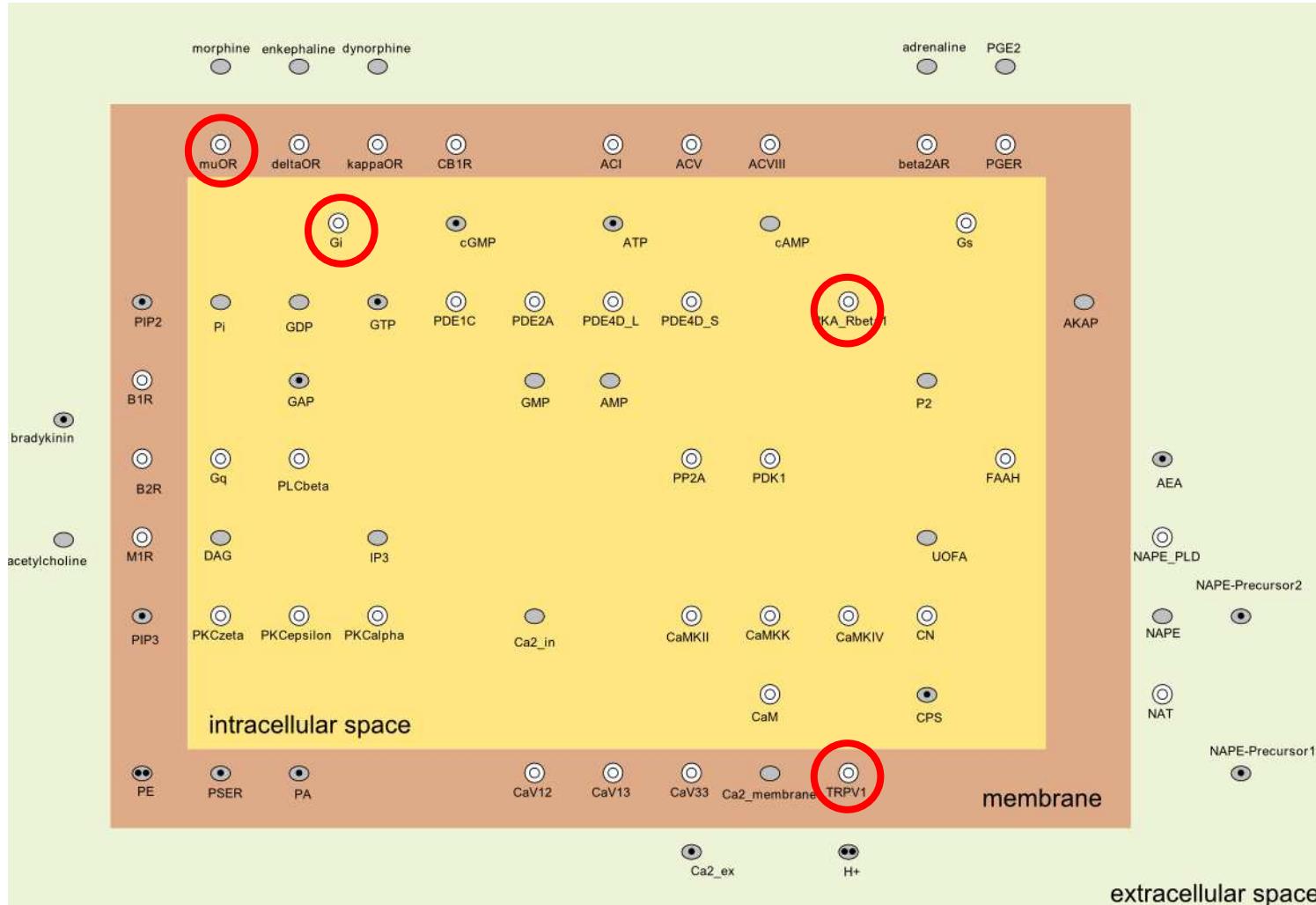
HOW TO SURVIVE LARGER MODELS ?

-> MODULAR MODELLING

-> COLOURED PETRI NETS

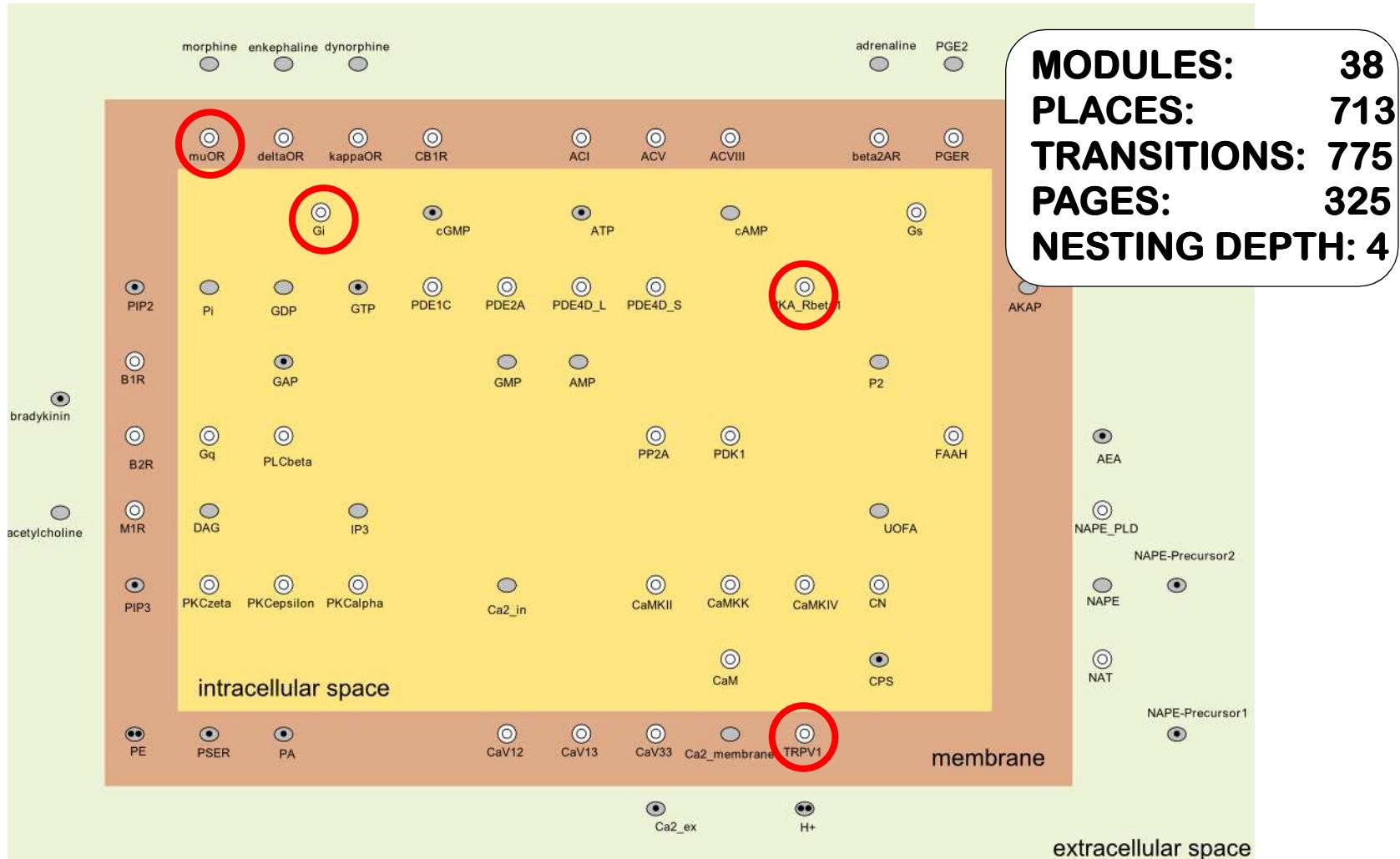
[BLÄTKE, MEYER, MARWAN 2011]

-> A PROTEIN-ORIENTED MODULAR MODELLING CONCEPT



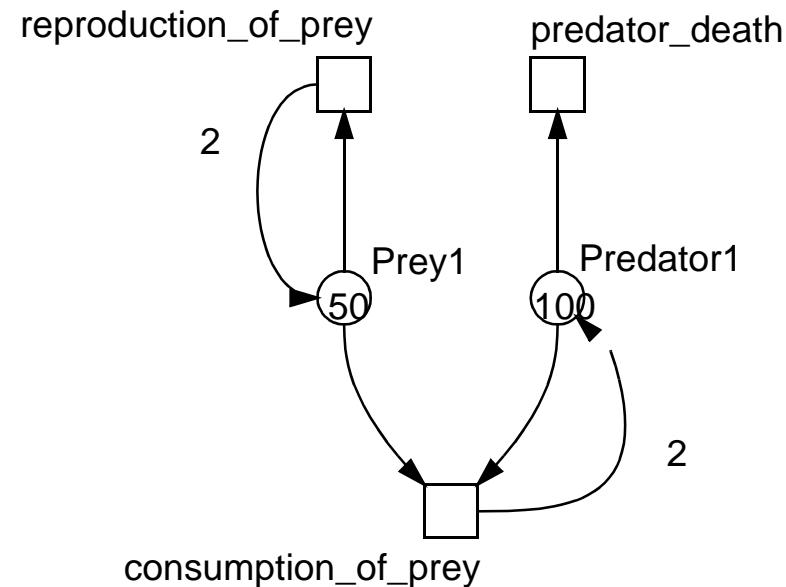
[BLÄTKE, MEYER, MARWAN 2011]

-> A PROTEIN-ORIENTED MODULAR MODELLING CONCEPT



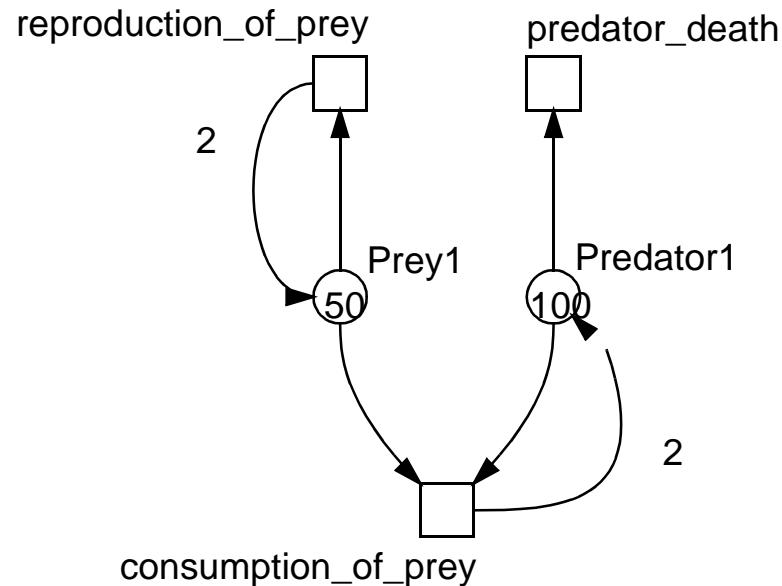
COLOURED PETRI NETS, Ex: PREY - PREDATOR

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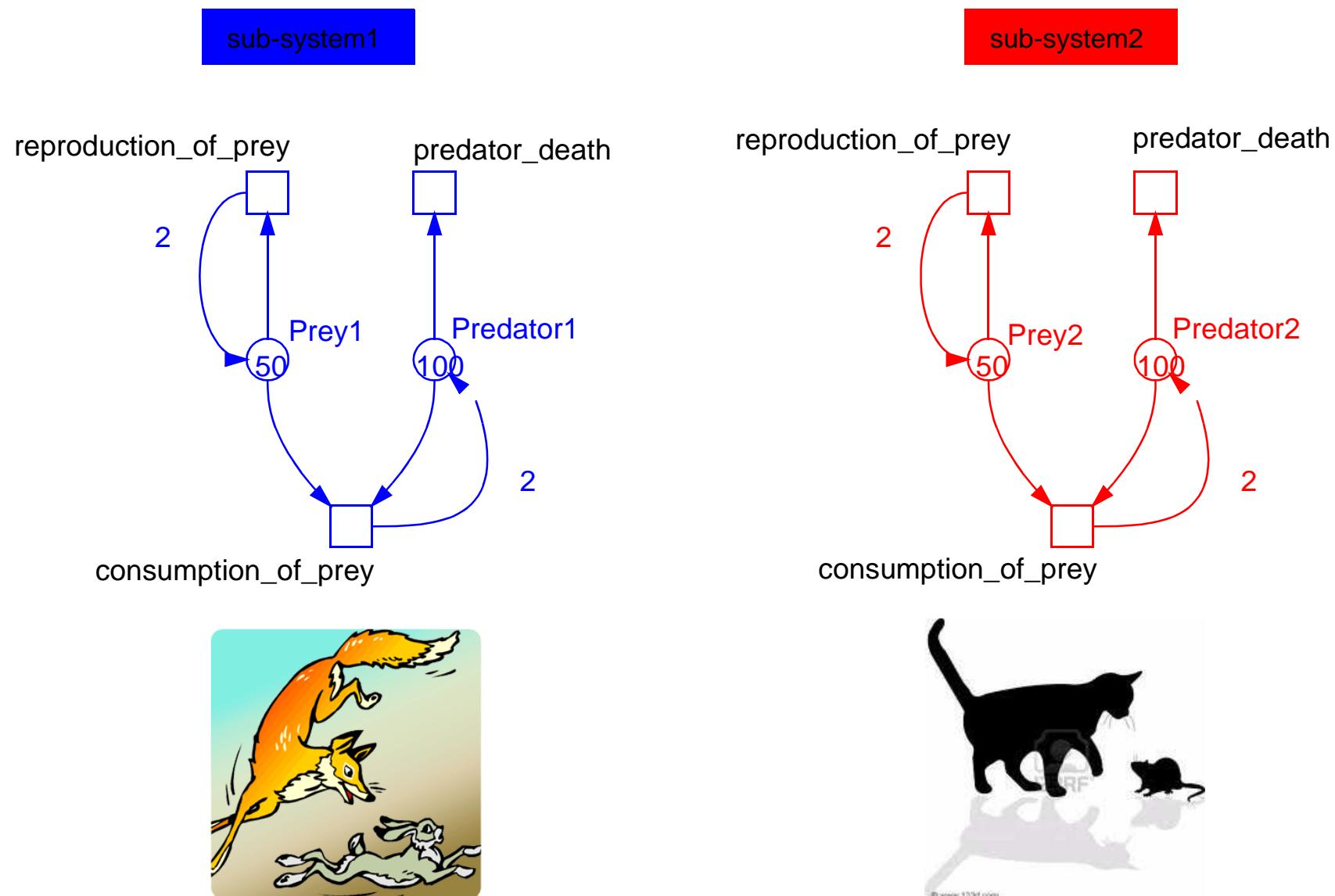
COLOURED PETRI NETS, Ex: PREY - PREDATOR

PN & Systems Biology



COLOURED PETRI NETS, Ex: PREY - PREDATOR

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□ **definitions**

colourset CS = 1-2;

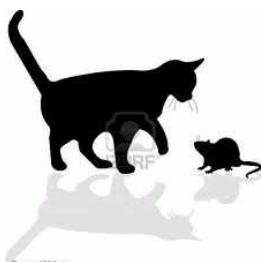
var x : CS;

□ **better:**

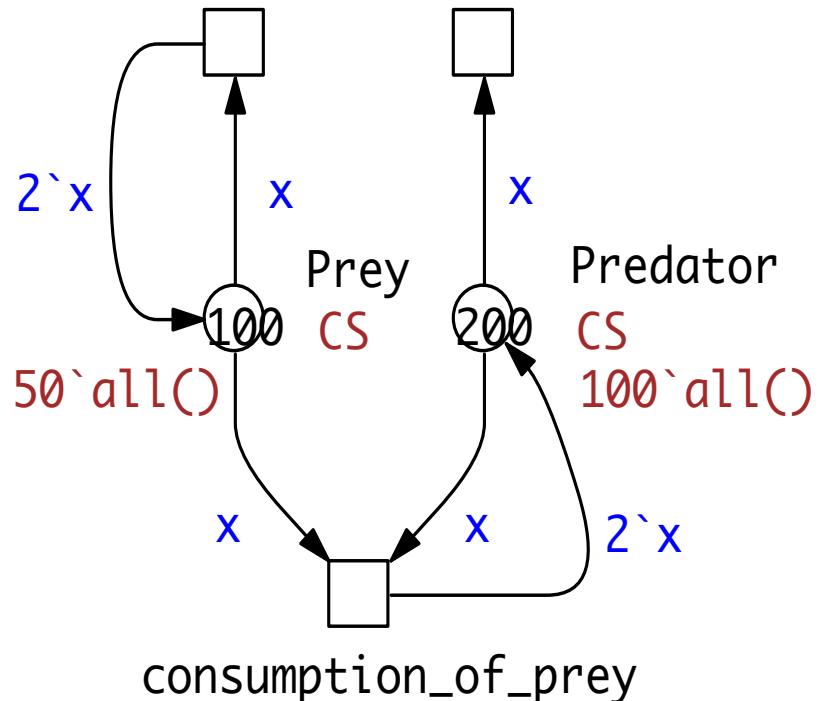
const SIZE = 2;

colourset CS = 1-SIZE;

var x : CS;



reproduction_of_prey predator_death



- **definitions**

```
colourset CS = 1-2;
```

```
var x : CS;
```

- **better:**

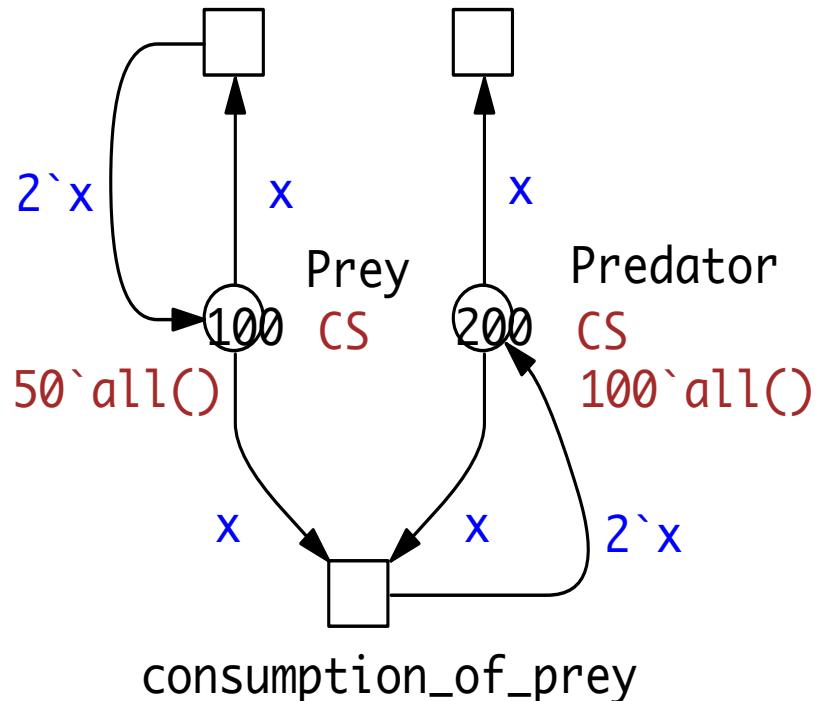
```
const SIZE = 2;
```

```
colourset CS = 1-SIZE;
```

```
var x : CS;
```



reproduction_of_prey predator_death



- **changing SIZE adapts the model to various scenarios**