Comparing Networks in Space
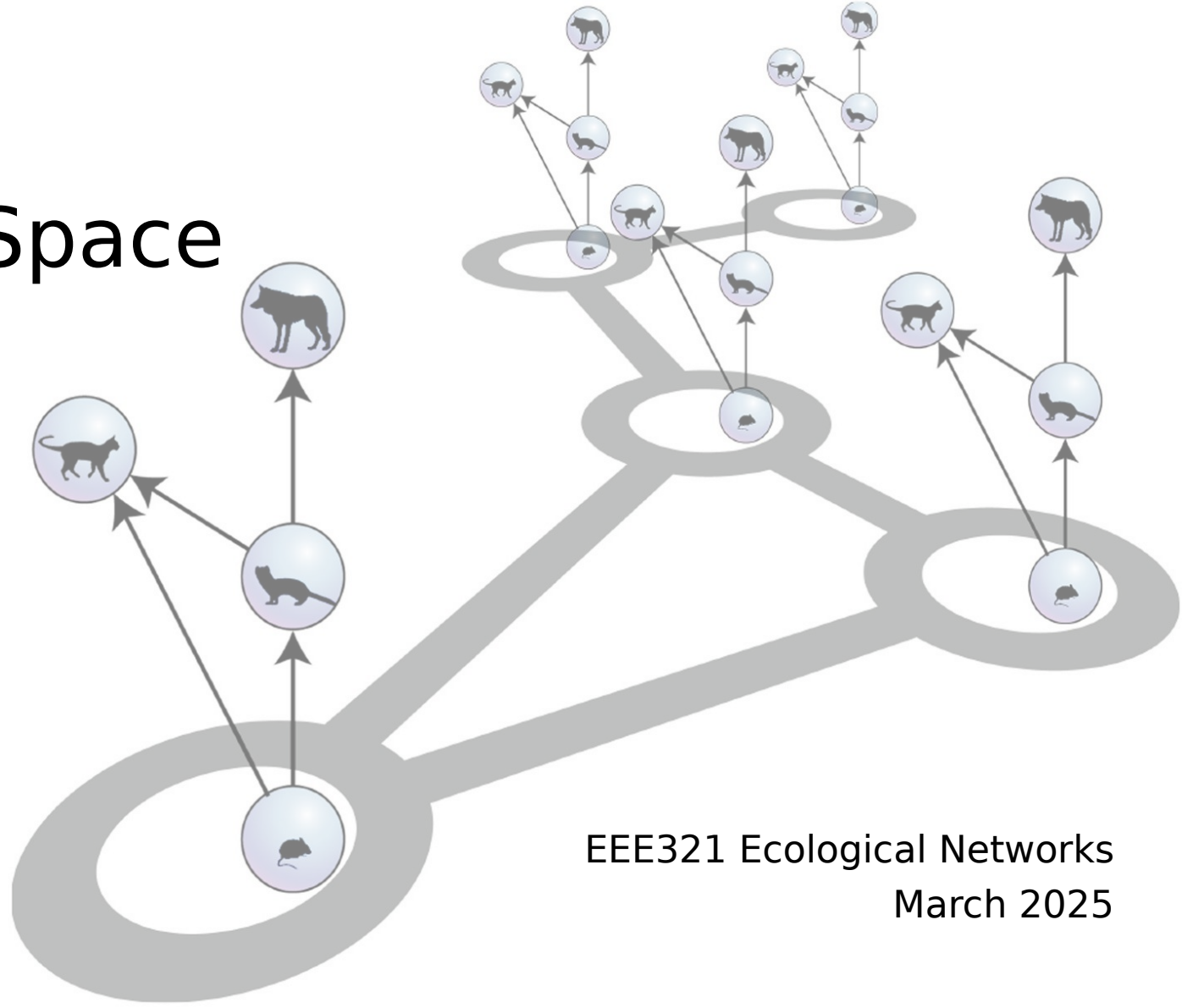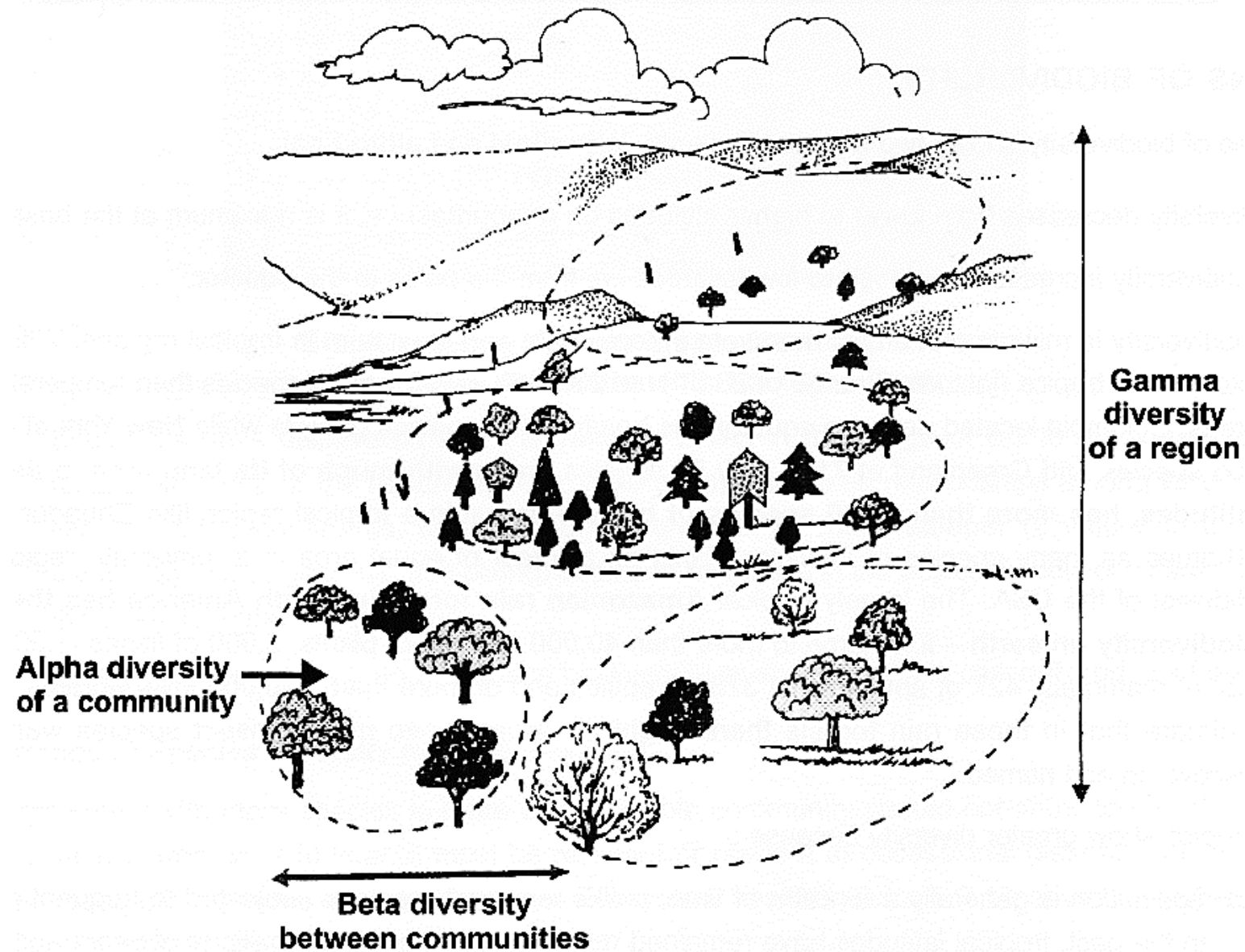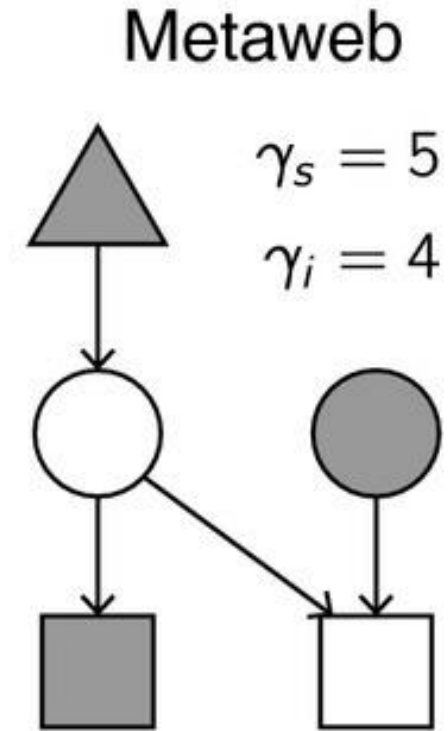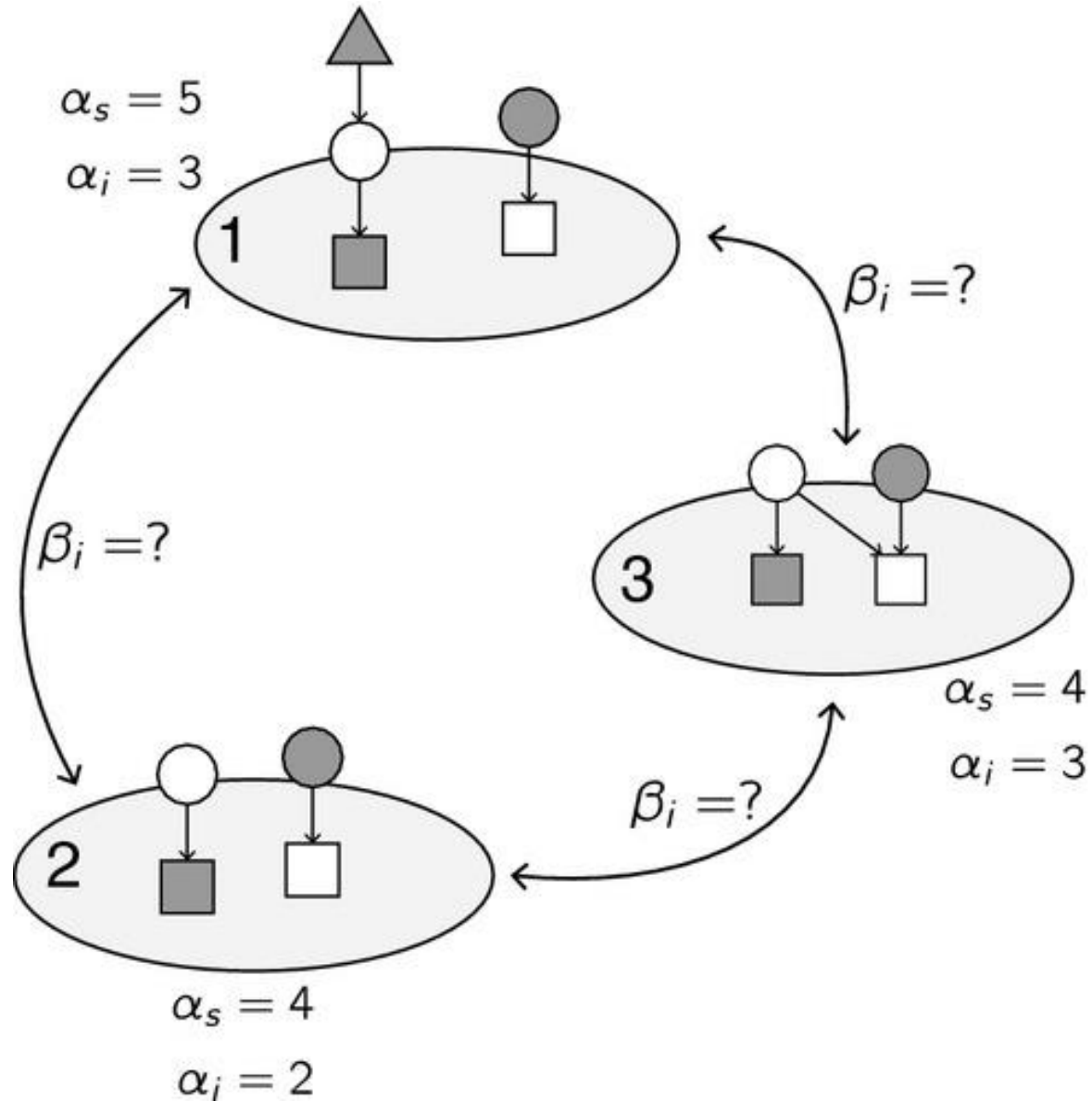
Species diversity

Species and interactions diversity

Interaction β-diversity

dissimilarity of interactions
differences in interactions
between networks

$$\beta_{WN} = \beta_{ST} + \beta_{OS}$$

**dissimilarity of interactions
due to species turnover**
differences in interaction structure
introduced by differences in
species composition

**dissimilarity of interactions
due to rewiring**
differences in interactions between
co-occurring species

Poisot et al. (2012) The dissimilarity of species interaction networks. *Ecology Letters*

Interaction β-diversity

β_{WN} and β_{OS} can be calculated using Whittaker's dissimilarity measure β_W:

$$\beta_W = \frac{a + b + c}{(2a + b + c)/2} - 1$$

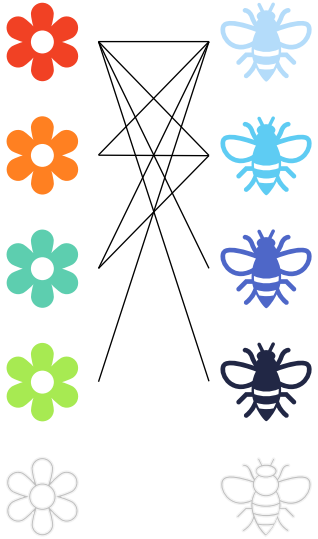a – number of interactions shared between two communities

b – number of interactions unique to community 1

c – number of interactions unique to community 2

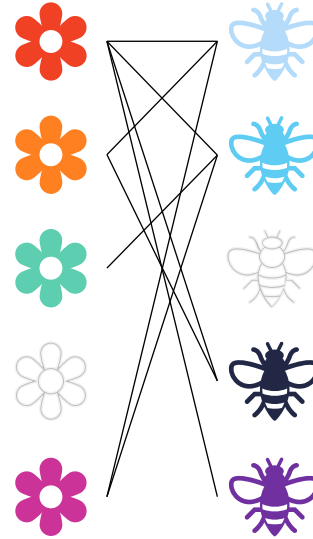β_{ST} is calculated as $\beta_{WN} - \beta_{OS}$

Poisot et al. (2012) The dissimilarity of species interaction networks. *Ecology Letters*

Example – β_{WN}

Network 1

POLLINATORS

	A	B	C	D
A	1	1	1	1
B	1	1	0	0
C	1	1	0	0
D	1	0	0	0

PLANTS
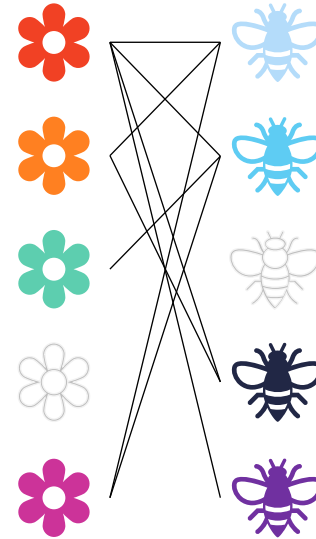
Network 2

POLLINATORS

	A	B	D	E
A	1	1	1	1
B	1	0	1	0
C	0	1	0	0
E	1	1	0	0

PLANTS

Example – β_{WN}

Network 1

POLLINATORS

	A	B	C	D
A	I	I	I	I
B	I	I	0	0
C	I	I	0	0
D	I	0	0	0

PLANTS

Network 2

POLLINATORS

	A	B	D	E
A	I	I	I	I
B	I	0	I	0
C	0	I	0	0
E	I	I	0	0

PLANTS

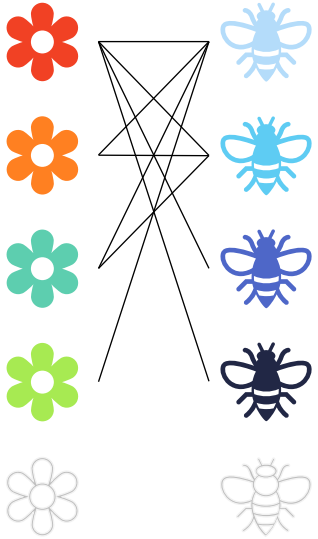$a = 5$ – number of interactions shared between two communities

$b = 4$ – number of interactions unique to community 1

$c = 4$ – number of interactions unique to community 2

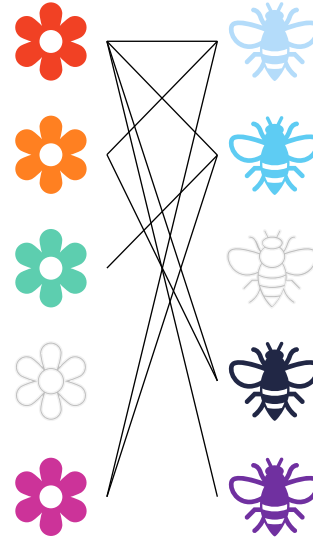$$\beta_{WN} = \frac{5 + 4 + 4}{(2 \times 5 + 4 + 4)/2} - 1 = 0.44$$

Example – β_{OS}

Network 1

POLLINATORS

	A	B	C	D
A	I	I	I	I
B	I	I	0	0
C	I	I	0	0
D	I	0	0	0

PLANTS

Network 2

POLLINATORS

	A	B	D	E
A	I	I	I	I
B	I	0	I	0
C	0	I	0	0
E	I	I	0	0

PLANTS

Example – β_{OS}

Network 1

Network 2

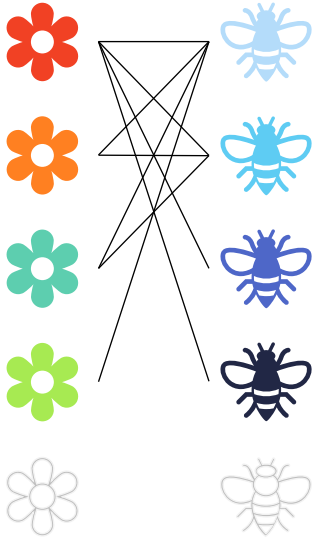$a = 5$ — number of interactions shared between two communities

$b = 2$ — number of interactions unique to community 1

$c = 1$ — number of interactions unique to community 2

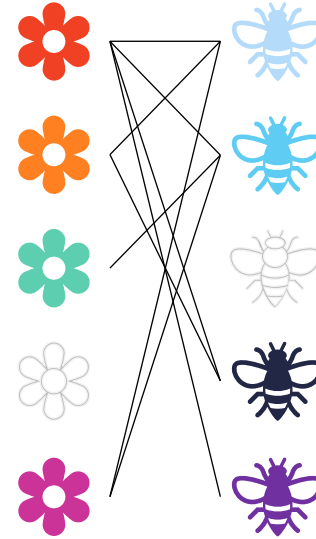$$\beta_{OS} = \frac{5 + 2 + 1}{(2 \times 5 + 2 + 1)/2} - 1 = 0.23$$

Example – β_{ST}

Network 1

POLLINATORS

	A	B	C	D
A	I	I	I	I
B	I	I	0	0
C	I	I	0	0
D	I	0	0	0

PLANTS

Network 2

POLLINATORS

	A	B	D	E
A	I	I	I	I
B	I	0	I	0
C	0	I	0	0
E	I	I	0	0

PLANTS

$$\beta_{WN} = 0.44$$

$$\beta_{OS} = 0.23$$

$$\beta_{ST} = \beta_{WN} - \beta_{OS} = 0.21$$