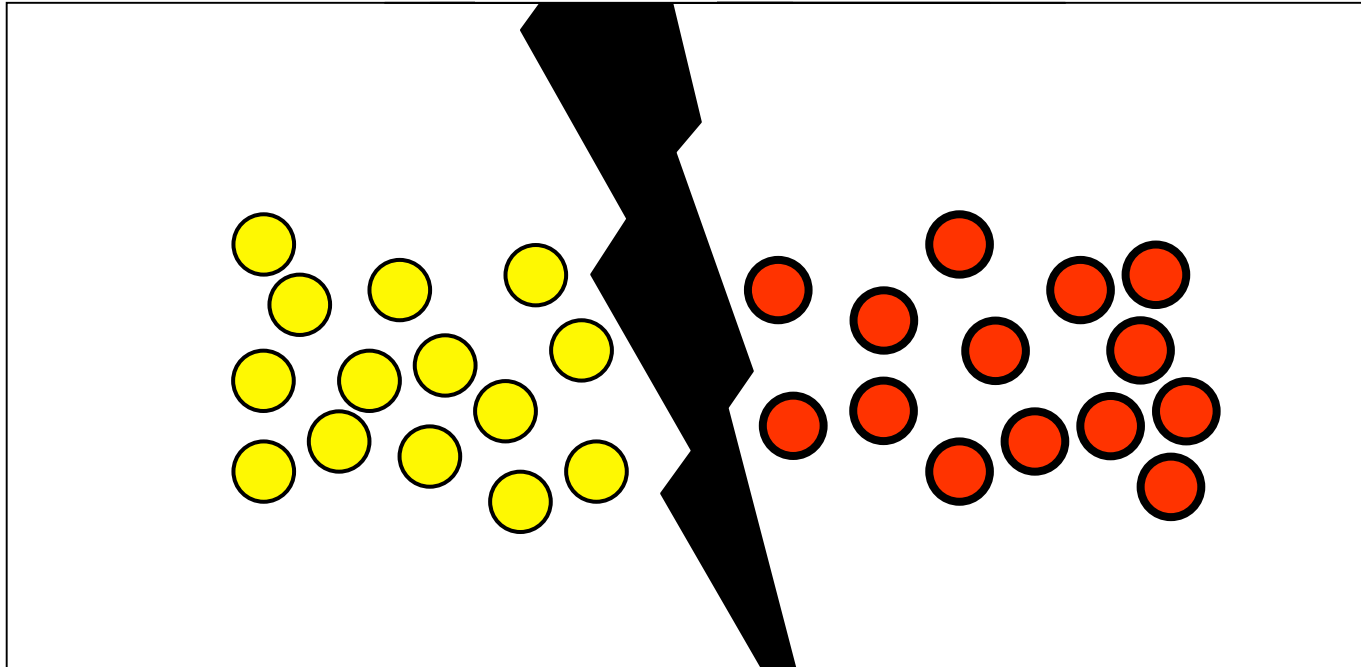


*A cellular automata model
of
sympatric speciation*

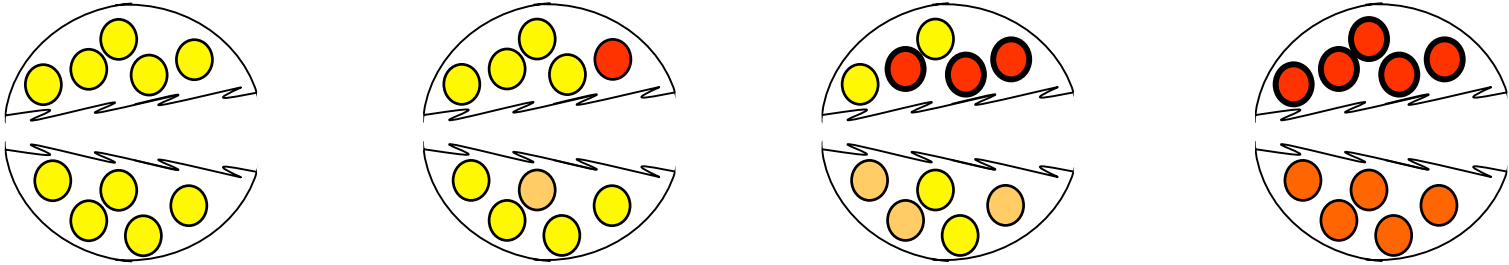
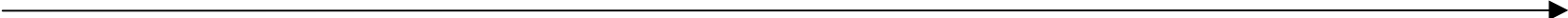
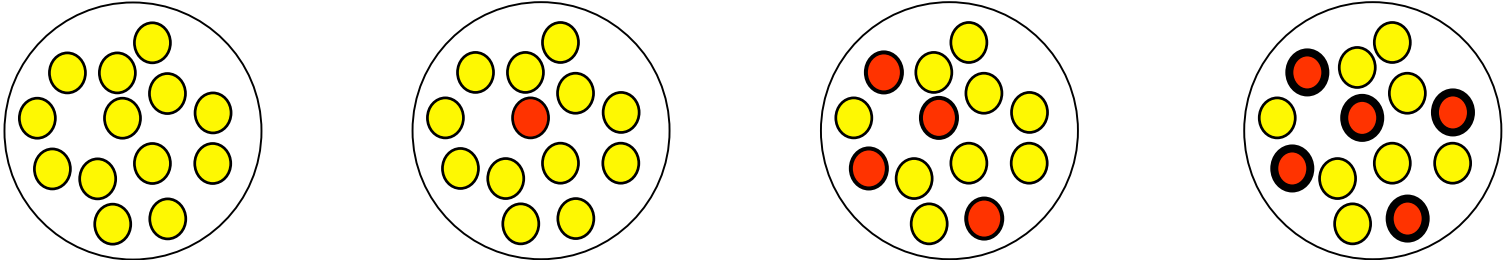
Samira El Yacoubi and Sébastien Gourbière

Laboratoire de **M**athématiques **E**t **P**hysique pour les **S**ystèmes (**MEPS**)
Université de Perpignan Via Domitia

Biological Species Concept



Sympatric Speciation



Allopatric speciation

THE INGREDIENTS

Individuals

Ecological Adaptation

EA₁

EA₂

Mating Preference	S ₁	AB ●	aB ●
	S ₂	Ab ●	ab ●

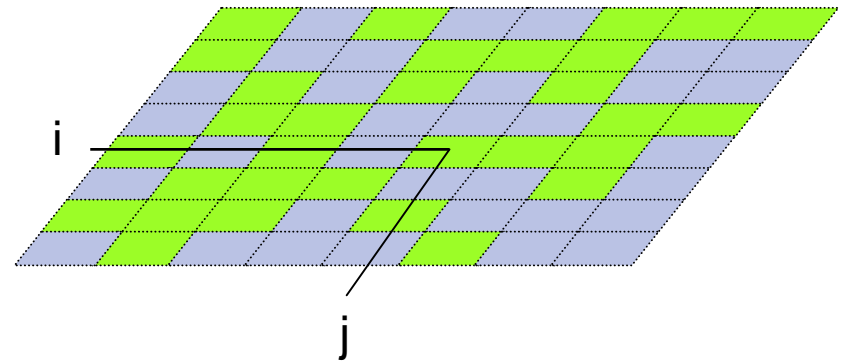
A – adaptation to E₁

a – adaptation to E₂

B – mating preference 1

b – mating preference 2

Landscape

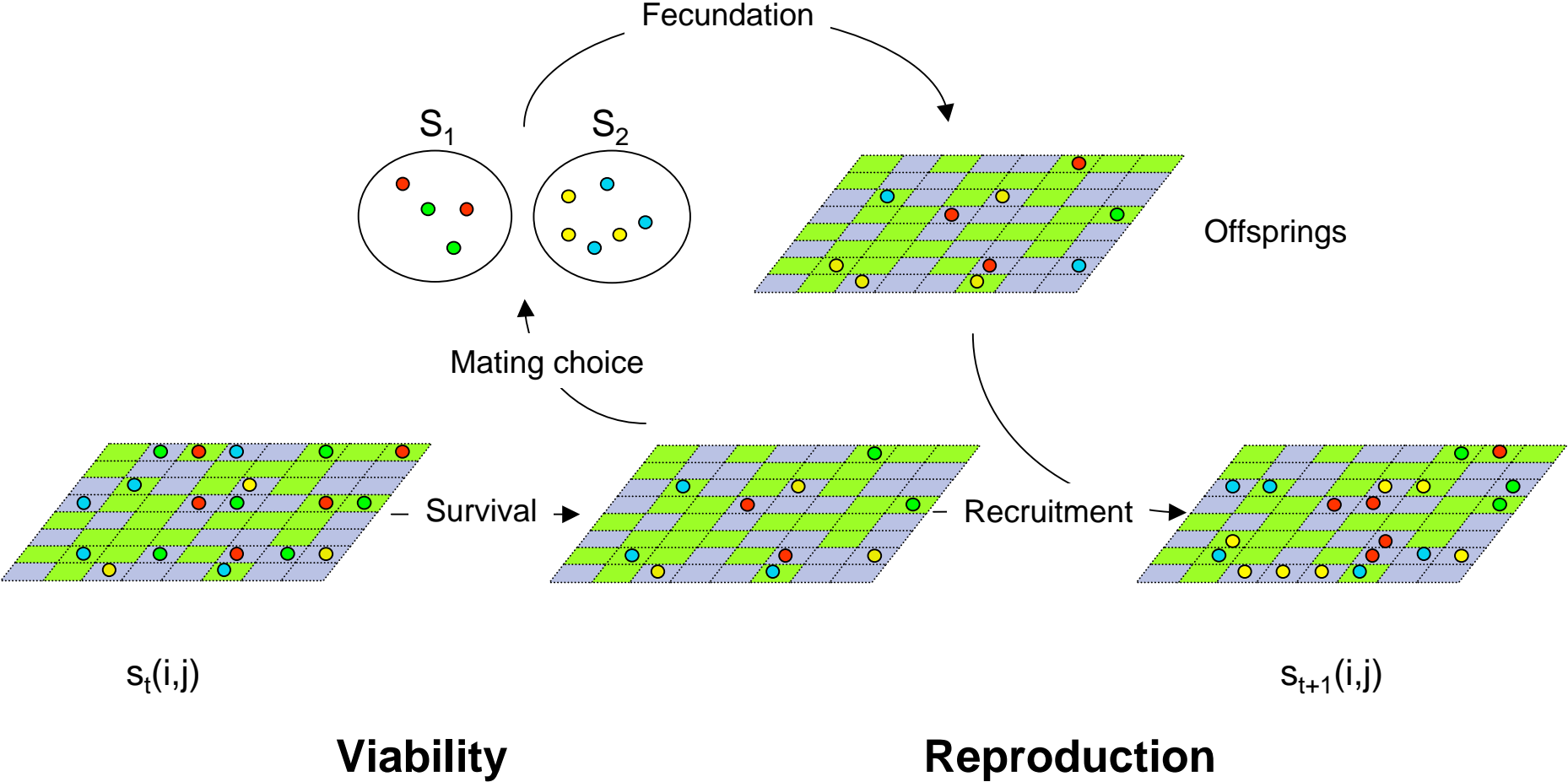


$C(i,j)$: type of environment $\in \{E_1, E_2\}$

$s_t(i,j)$: occupation $\in \{A,a\} \times \{B,b\} \cup \{*\}$

THE LIFE-CYCLE

	EA ₁	EA ₂
S ₁	●	●
S ₂	●	●



More about *THE RULES*

The viability selection

		Ecological Adaptation	
		EA ₁	EA ₂
Environment	E ₁	s	1-s
	E ₂	1-s	s

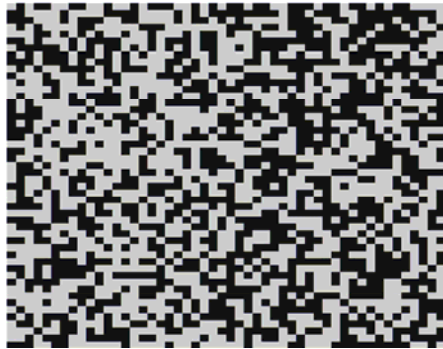
s – Adaptation (>0.5)

The mating scheme

		Mating Preference	
		P ₁	P ₂
Mating Pool	S ₁	p	1-p
	S ₂	1-p	p

p – Preference (>0.5)

Two types of Landscape



Random Landscape

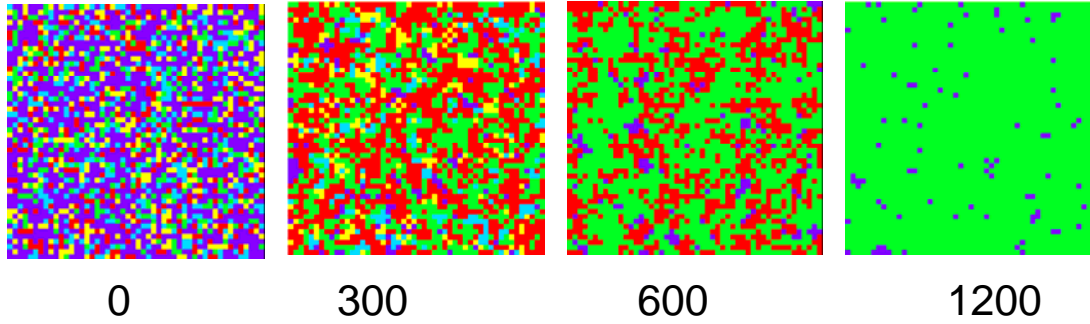


Structured Landscape

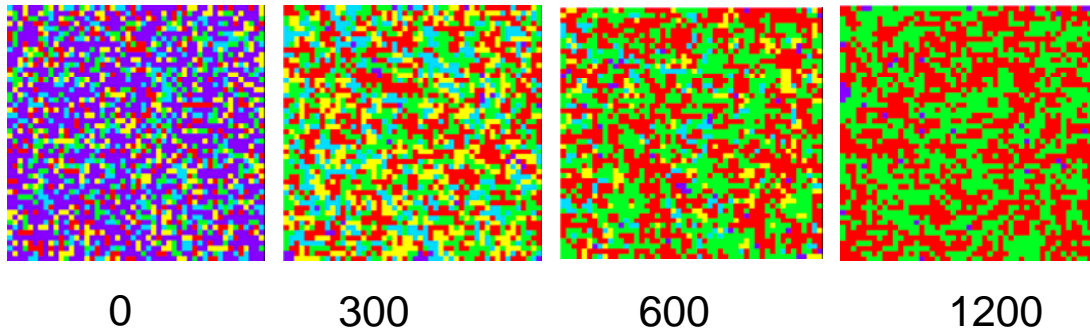
Possible Outcomes in a Random Landscape

	EA ₁	EA ₂
S ₁	●	●
S ₂	●	●

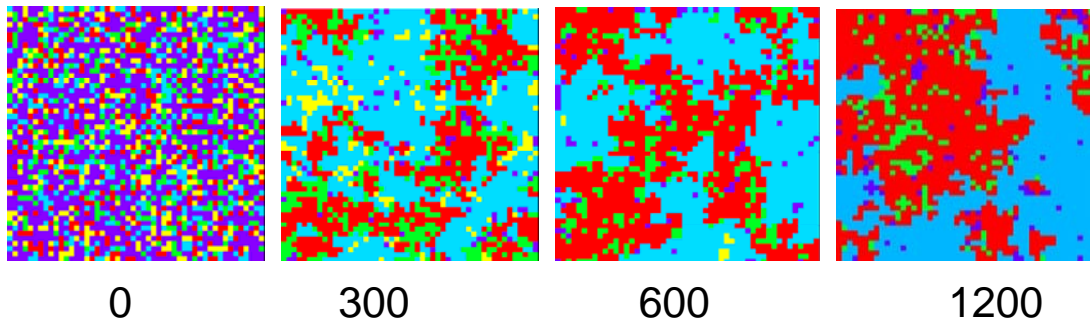
Fixation



Polymorphism



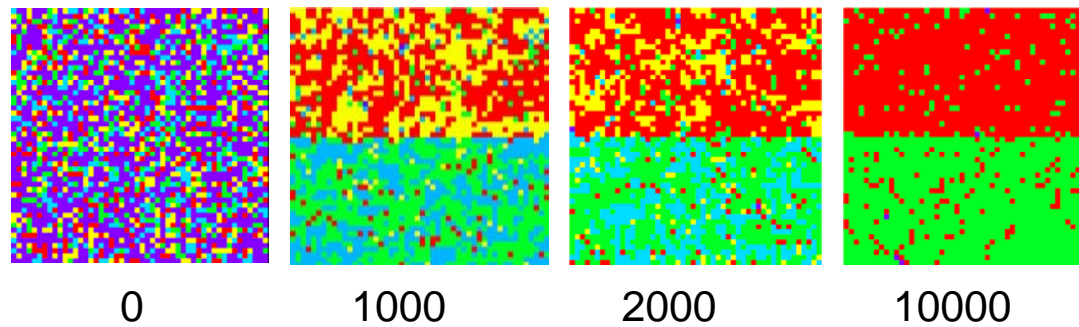
Speciation



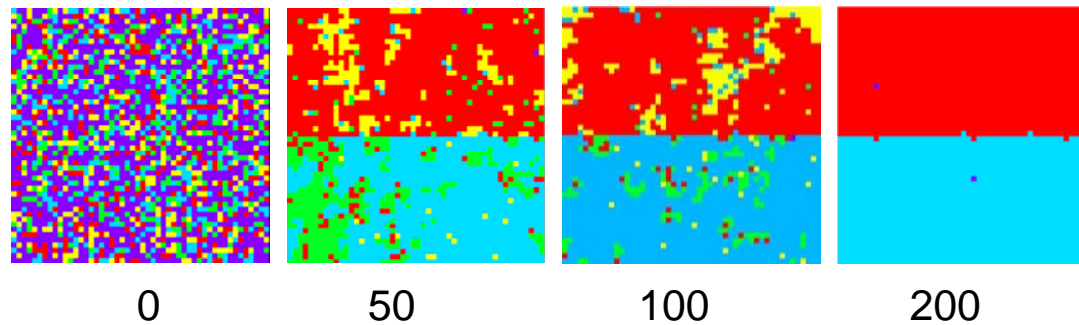
Possible Outcomes in a Structured Landscape

	EA ₁	EA ₂
S ₁	●	●
S ₂	●	●

Polymorphism



Speciation



Speciation probability in Random and Highly Structured Landscapes

