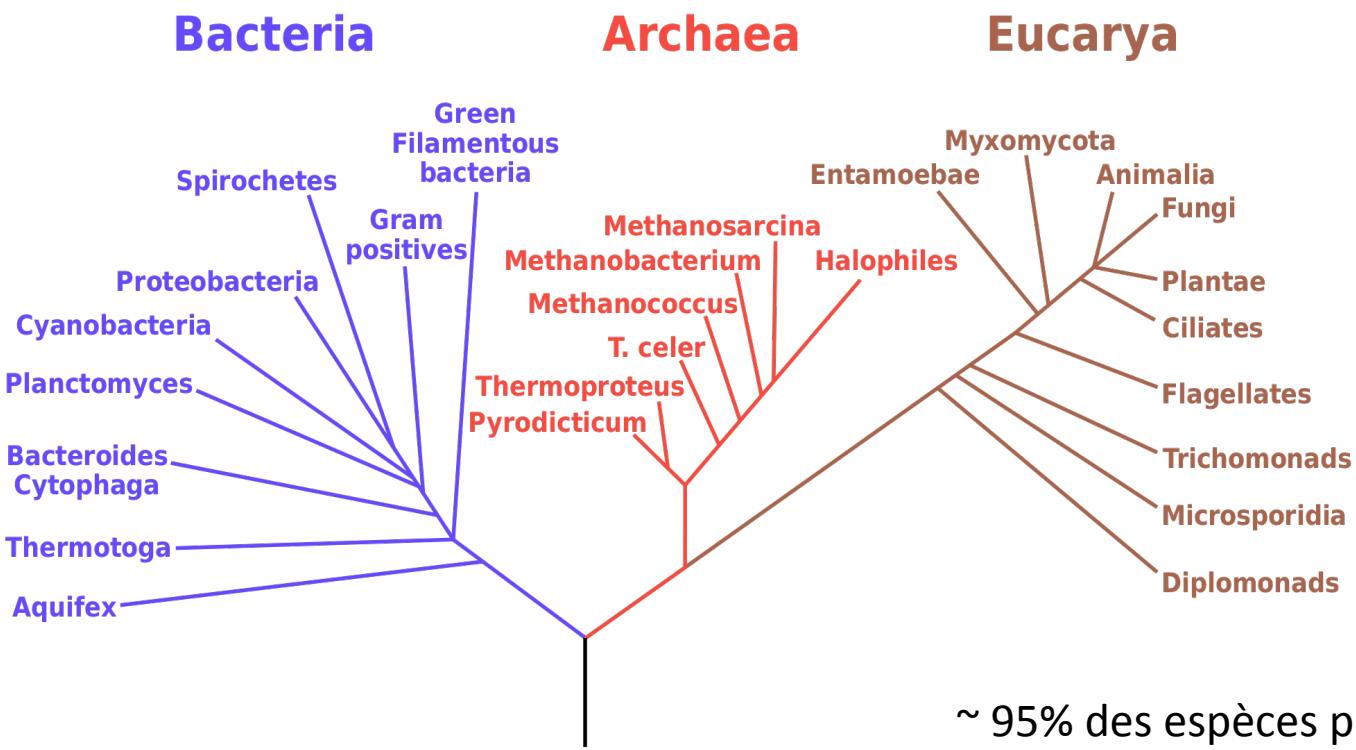
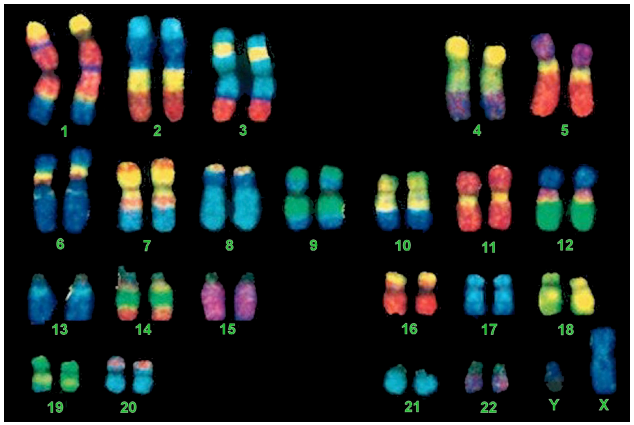
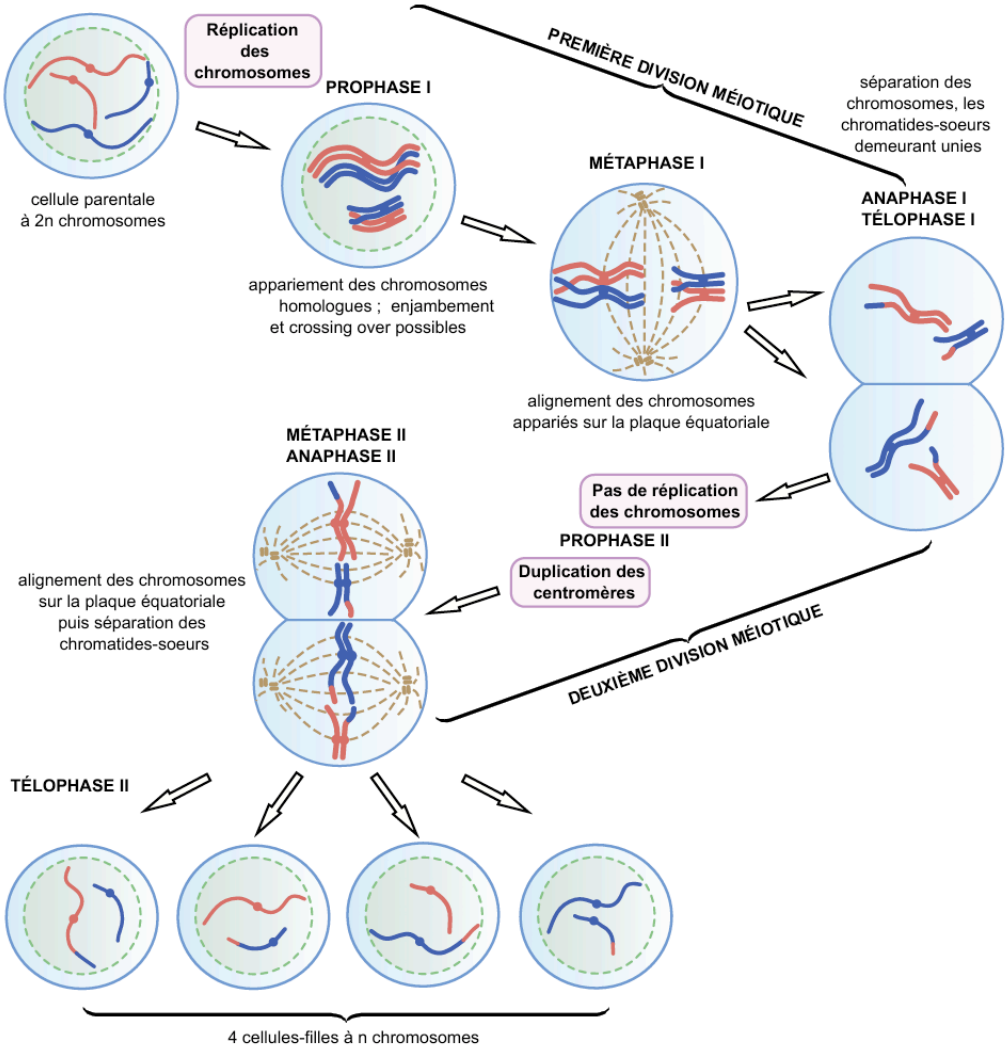
L’arbre du vivant



~ 95% des espèces pluricellulaires sont sexuées

Comment on fait les bébés?
1- la meiose





Les différentes étapes de la méiose.

Comment on fait les bébés?
2- les sexes

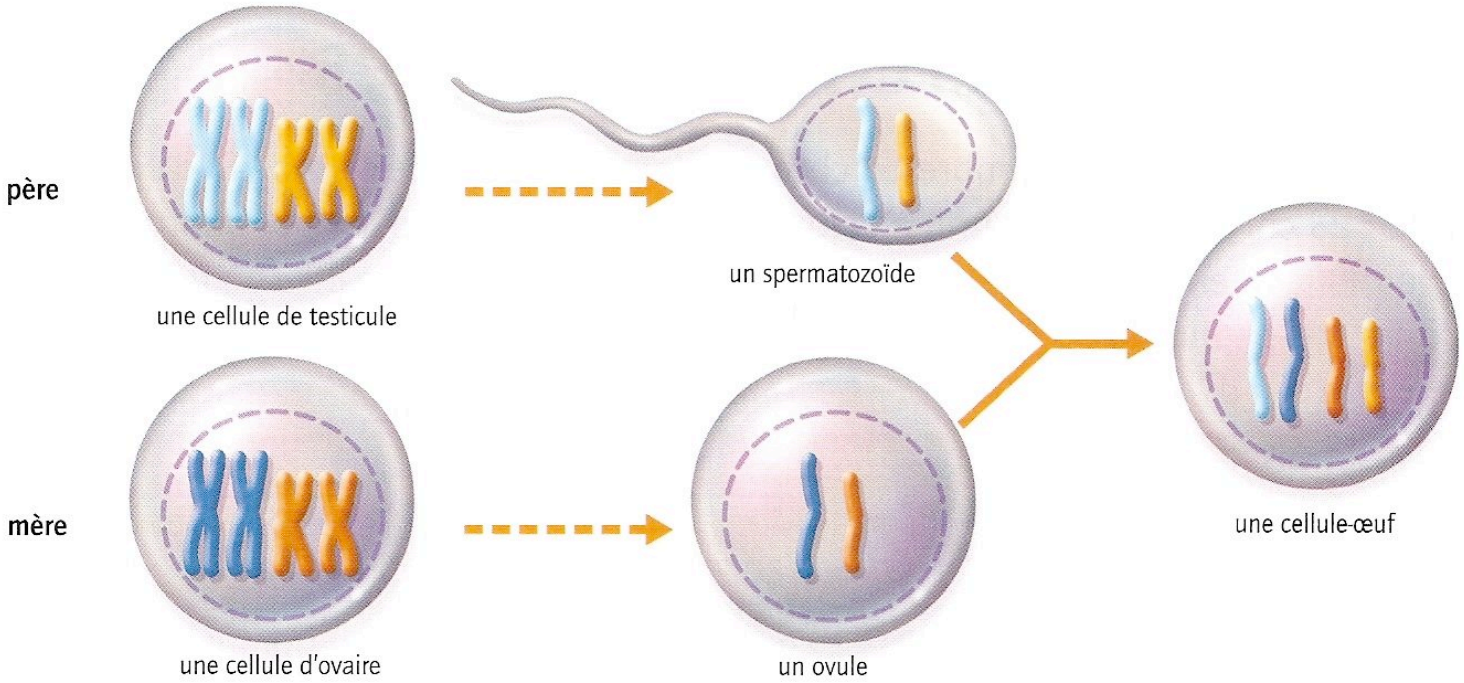
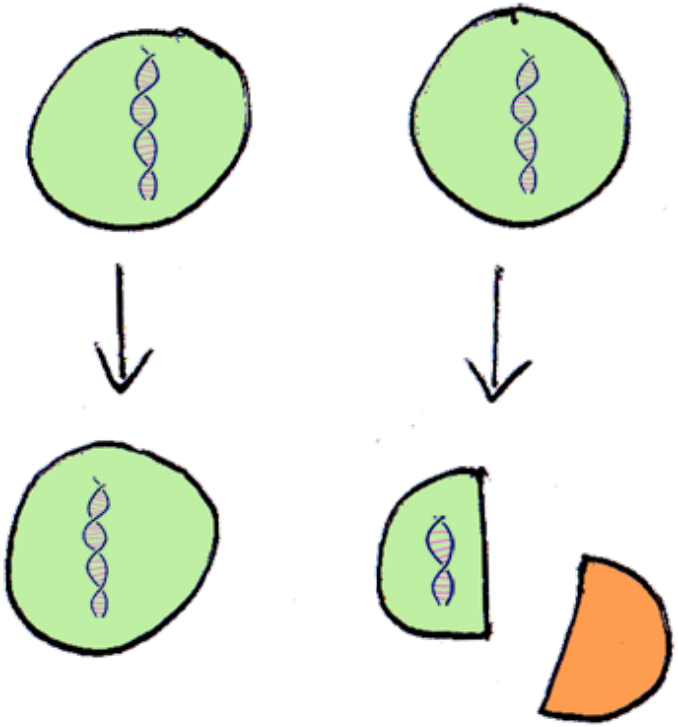
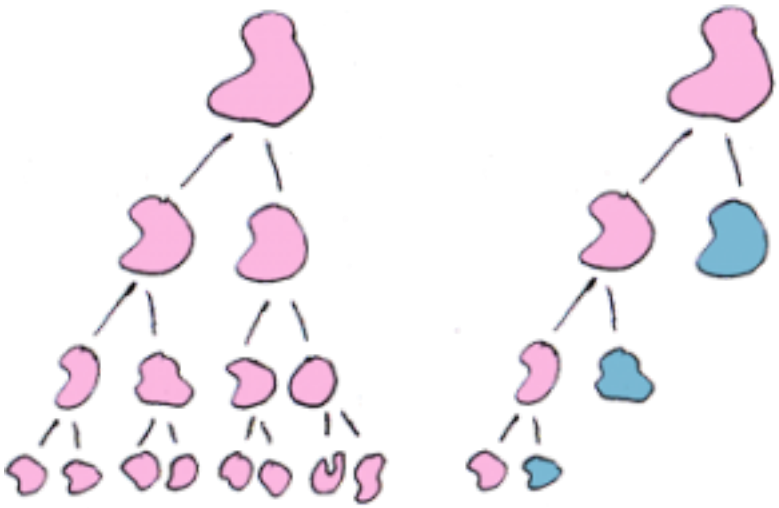


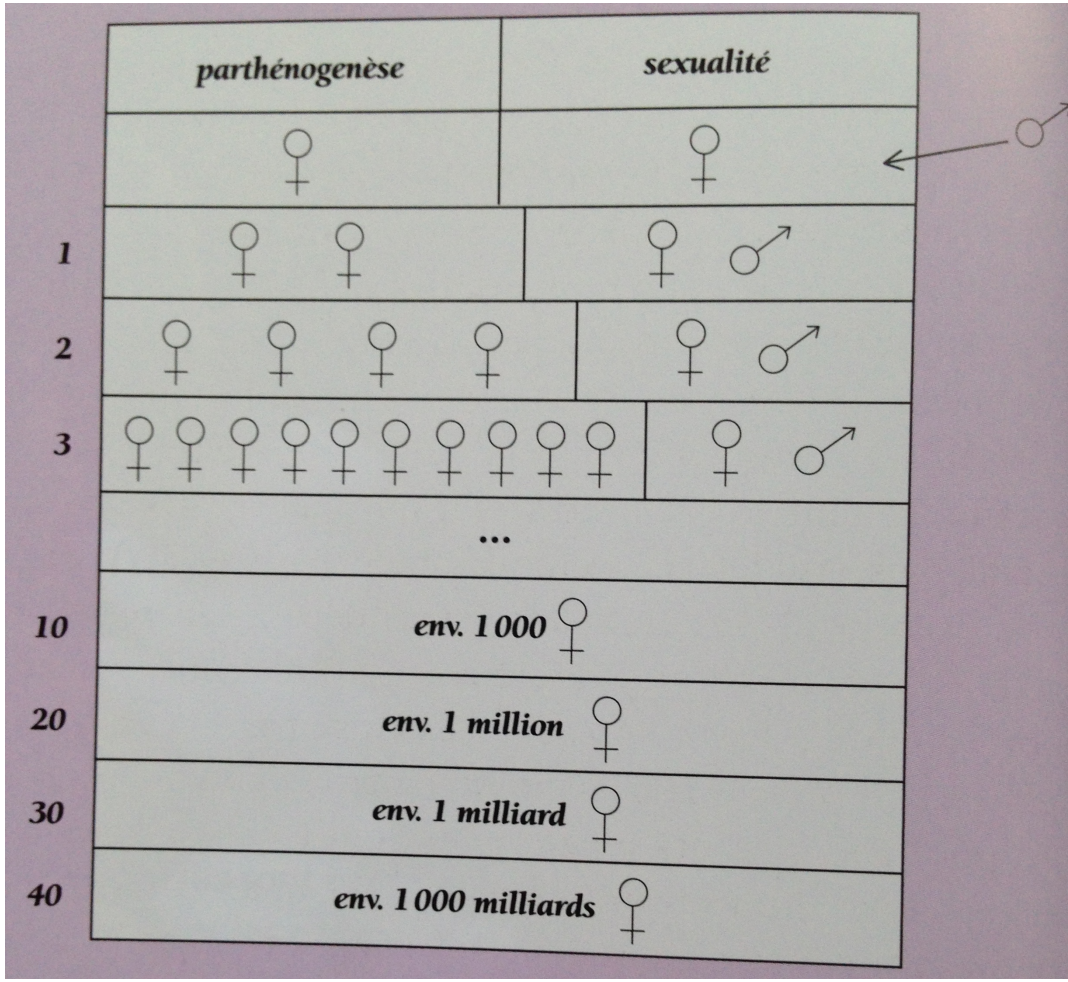
Schéma du devenir des chromosomes lors de la fécondation. Pour faciliter la lecture, seules deux des 23 paires de chromosomes de l'espèce humaine sont représentées.

Le coût de la meiose



Le coût des mâles





Et la recherche d'un partenaire…

- … nécessite du temps et des ressources!
- Compétition entre mâles (développement de caractères sexuels secondaires -> sélection sexuelle)
- Développement de caractères coûteux pour attirer les pollinisateurs chez les plantes (pétales, nectar…)

De nombreuses espèces de pluricellulaires sont capables de reproduction asexuée

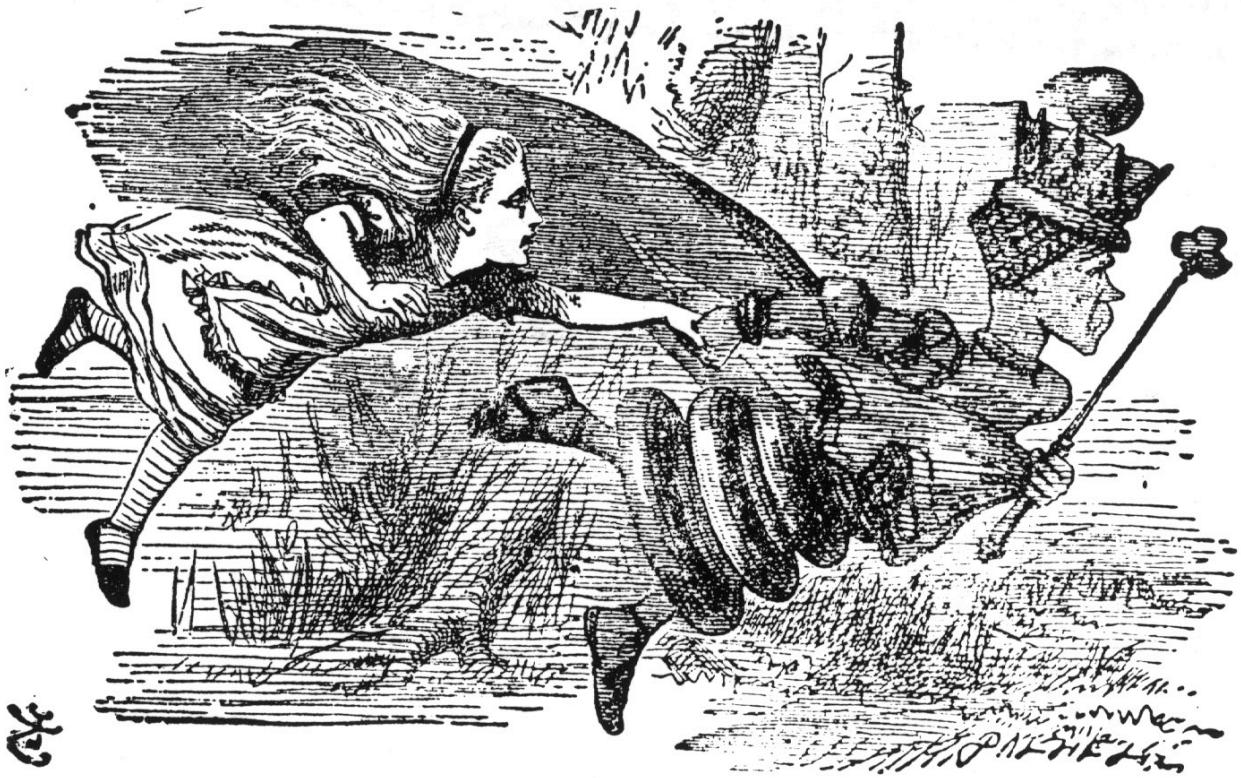
- Stolons, tiges rampantes, tubercules chez les plantes (-> bouturage)
- Champignons: rhizomes, spores asexuées
- Animaux:
  - pucerons

- Certaines espèces sont connues pour n'avoir qu'une reproduction clonale:
  - Certains champignons, fougères, insectes poissons, reptiles…
  - Rotifères bdelloïdes

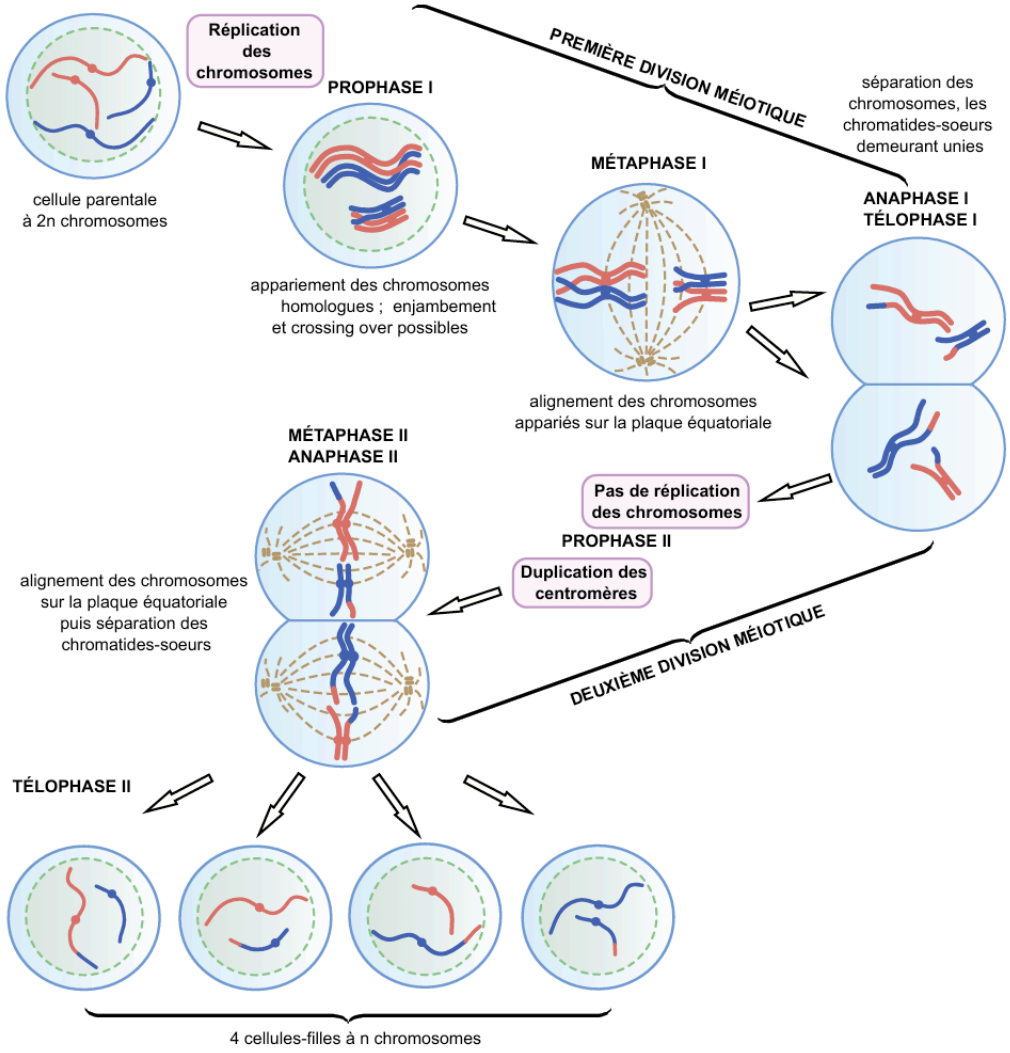
Quel est le succés évolutif des espèces asexuées?

- La totalité des espèces asexuées pluricellulaires dérivent d'ancêtres sexuées
- Elles sont en général d'apparition très récentes
- (elles conservent des reliquats de sexualité. Ex: lezard fouette-queue)
- Paradoxe : il existe un énorme avantage a être asexué (à court terme), mais il semble que le succès à long terme soit très faible

La reine rouge: courir pour rester à la même place

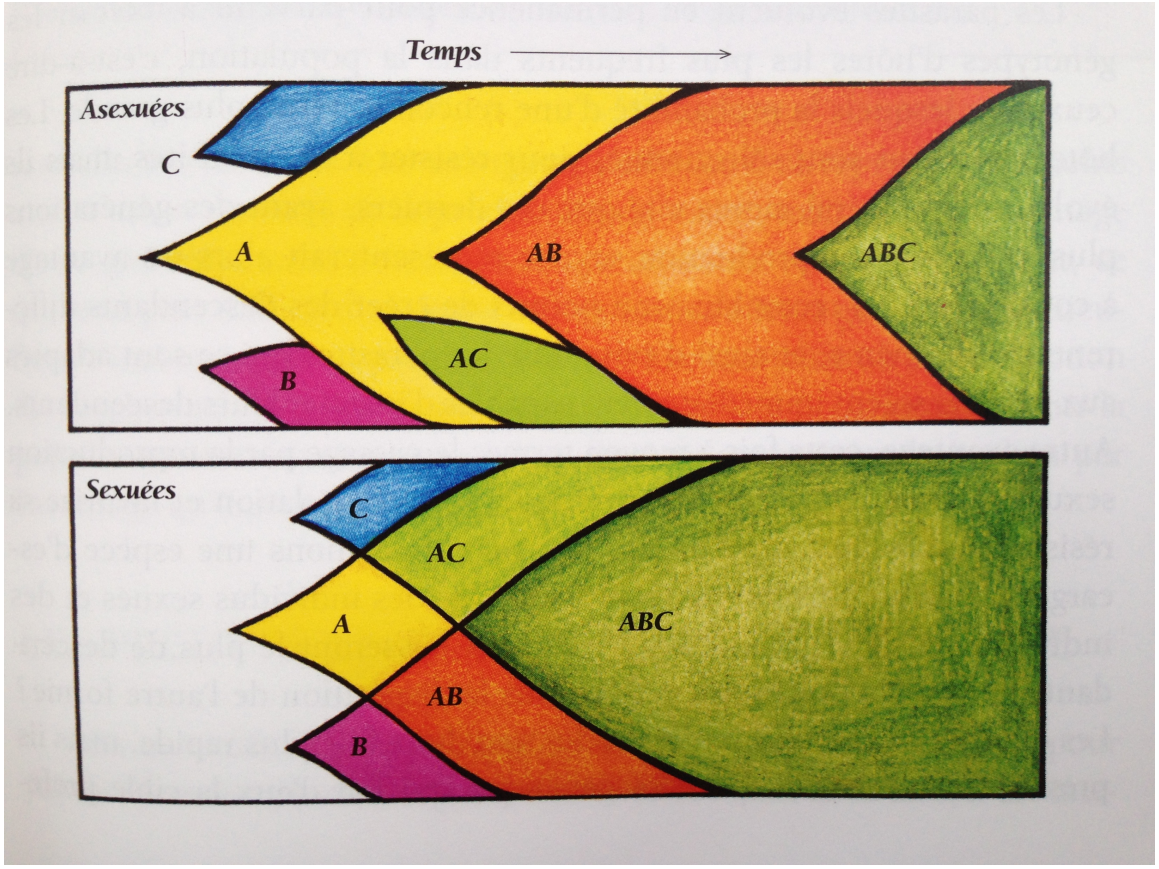


- « Mais, Reine Rouge, c'est étrange, nous courons vite et le paysage autour de nous ne change pas ? »
- « Nous courons pour rester à la même place. »



Les différentes étapes de la méiose.

Recombinaison et association d'alleles avantageux

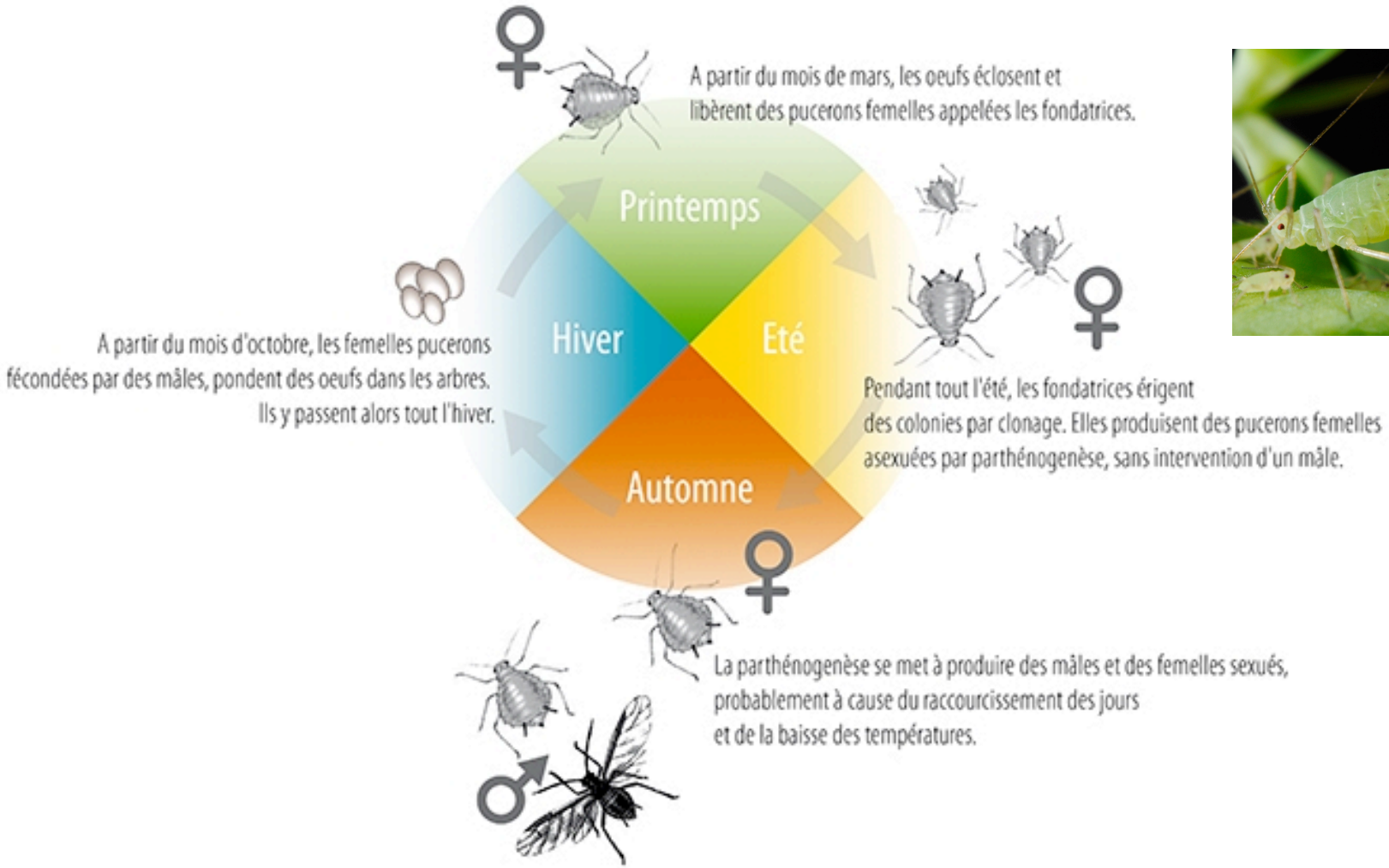


Exemple de la resistance aux parasites

Mais différentes échelles de temps

- Les femelles parthénogénétiques envahissent une population en quelques dizaines de génération
- La résistance à un nouveau pathogène peut mettre beaucoup plus longtemps à évoluer
- Avantage à court terme du sexe? (qui soit valable pour toutes les espèces)

Cycle de vie du puceron



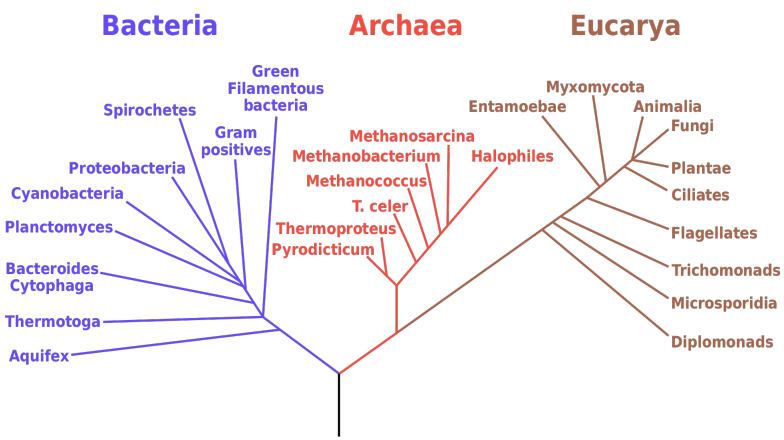
Hivers et maintien du sexe

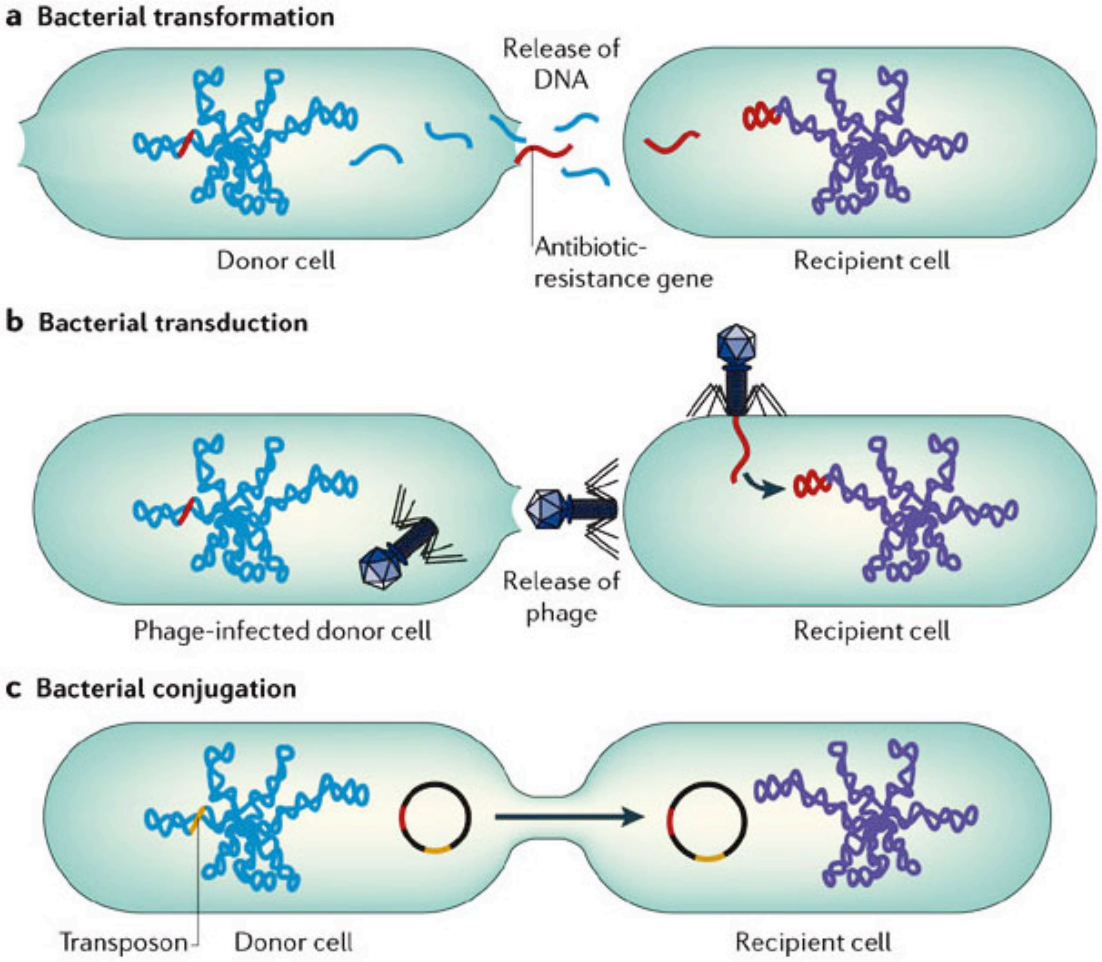
- Seuls les oeufs peuvent résister aux hivers froids
- Les individus (et donc la reproduction par parthénogénèse) peuvent cependant résister aux hivers doux
- Après une succession d'hivers doux, on observe une augmentation des formes uniquement parthénogénétiques
- Un hiver rigoureux élimine ces formes et on revient au cycle sexué

Mille raisons de faire du sexe

- On pense aujourd'hui que chaque espèces sexuée à une raison *proximale* de faire du sexe (un pression de sélection à court terme)
- Celle qui n'en ont pas finissent pas disparaître (sélection au niveau des espèces!)
- Ou bien elles font du sexe autrement: rotifères bdelloïdes

Transfert horizontal de gènes





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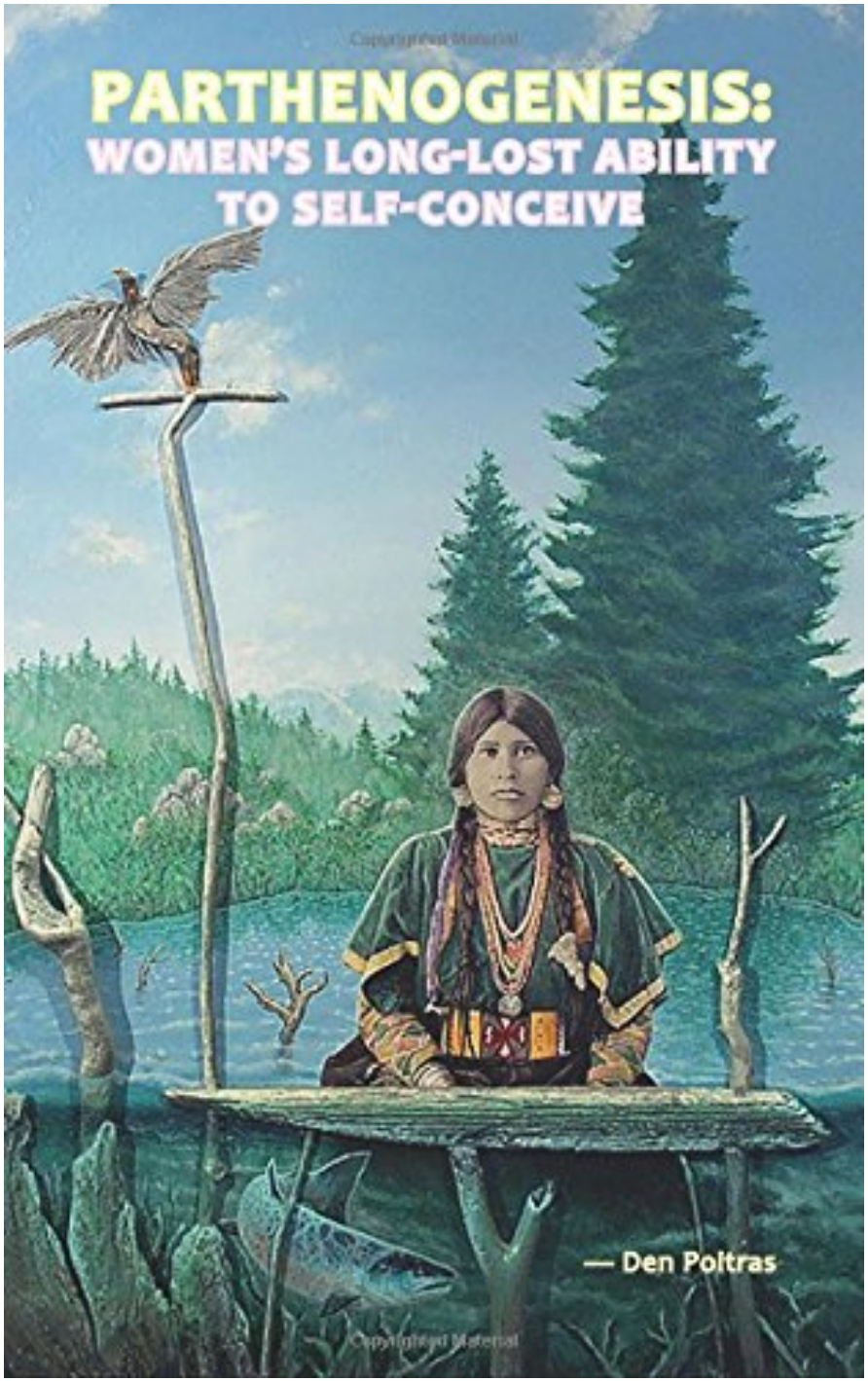
PARTHENOGENESIS:
WOMEN'S LONG-LOST ABILITY
TO SELF-CONCEIVE
— Den Poitras

J.B.S Haldane et H Spurway

Pictured here with her mother:

'MY BABY BORN WITHOUT A MAN'

THE least surprised woman in Britain this morning is thirty-year-old Mrs. Emmanuelle Jonats.

Her quiet confidence, during the six dramatic months of the great Virgin Birth investigation never ceased to amaze doctors.

SHE NEVER wavered in her story. SHE NEVER faltered when faced with new and sophisticated medical tests.

WHAT THE DOCTORS SAY . . . IS ON PAGE 11

Audrey Whiting

REPORTS THE HUMAN DRAMA OF THE RESEARCH

THE WORD

PROBLEM

SHE WROTE

FOUR LEFT

SIX MONTHS

RELIEF

THE TESTS

The blood-groups of the remaining eight pairs were then examined with the following results :

Mrs. Alpha	A1	Rhesus phenotype $\bar{c}de\bar{c}de$
Daughter	A1	,, ,, $\bar{c}de\bar{c}de$
Mrs. Beta	A1	,, ,, CCDee
Daughter	O	,, ,, CCDee
Mrs. Gamma	O	,, ,, CCDee
Daughter	O	,, ,, CCDee
Mrs. Delta	A	,, ,, $C\bar{c}$Dee
Daughter	A	,, ,, $\bar{c}dc\bar{c}de$
Mrs. Epsilon	A2	Rhesus positive to anti-D
Daughter	A2B	,, ,, to anti-D
Mrs. Zeta	O	Rhesus phenotype $\bar{c}\bar{c}$DE
Daughter	O	,, ,, $C\bar{c}$Dee
Mrs. Eta	O	,, ,, CCDee
Daughter	O	,, ,, $C\bar{c}$DE
Mrs. Theta	O	Rhesus positive to anti-D
Daughter	A1	,, ,, to anti-D

Further blood-group studies were carried out on four of these pairs ; and the results are shown in the accompanying table :

—	M	N	S	P	Lu	Le^a	Le^b	K	Fy^a
Mrs. Alpha ..	+	+	−	+ +	−	−	−	−	−
Daughter ..	+	+	−	+ + +	−	−	−	−	−
Mrs. Beta ..	+	−	+	+ + +	−	−	−	−	+
Daughter ..	+	−	+	+	−	−	+	−	+
Mrs. Gamma ..	+	+	−	−	−	+	−	+	−
Daughter ..	+	+	−	+	+	+	−	+	−
Mrs. Delta ..	+	−	+	+ + +	−	−	−	−	+
Daughter ..	+	−	+	+ + +	−	−	−	−	−

Although the Betas could not be excluded on the blood-group results (since the A1 antigen is known to tend to suppress Le^b) they were nevertheless eliminated on the least the graft from the child to mother would take, Folley [4] would apparently not be satisfied that such a result would be conclusive.

In such a case as this, rigorous proof is impossible, but it remains that all the evidence obtained from serological and special tests is consistent with what would be expected in a case of parthenogenesis. The absence of the pre-knowledge factor, although not capable of precise statistical evaluation, adds greatly to the probability of such a claim being well founded. Thus, this mother's claim must not only be considered seriously, but it must also be admitted that we have been unable to disprove it.

It is desirable that all who undertake investigations of this sort should publish the results, for in the long run the evidence can only be fully assessed if negative and inconclusive as well as positive results are available for criticism.

My thanks are due to Prof. J. B. S. Haldane, F.R.S., for permission to quote his statistical evaluation of the serological data ; to Mr. David Wynn-Williams for undertaking the skin-grafting investigation ; to Dr. Sidney Shaw, of Charing Cross Hospital, for carrying out the pathological investigation ; to all these for permission to quote their results and opinions ; and to Dr. A. E. Mourant, director of the Blood Group Reference Laboratory of the Medical Research Council, for samples of the rare blood-group sera. I should also like to thank Dr. Bernard Camber, of Charing Cross Hospital clinical research department, for his invaluable help and constant advice during this investigation.

An investigation of this kind was made possible only by the publicity given by a mass-circulation journal.

London, W.8. S. BALFOUR-LYNN.

SUNDAY PICTORIAL
THE NEWSPAPER FOR THE YOUNG IN HEART

British doctors give their startling verdict

after 6 months' research on:

VIRGIN BIRTH

'We have been unable to prove that any man took a part in the creation of this child. All our results are consistent with a Virgin Birth'

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Article

Nature Genetics **11**, 164 - 169 (1995)
doi:10.1038/ng1095-164

A human parthenogenetic chimaera

Lisa Strain[1], Jon P. Warner[1], Thomas Johnston[1] & David T. Bonthron[1]

In mice, parthenogenetic embryos die at the early postimplantation stage as a result of developmental requirements for paternally imprinted genes, particularly for formation of extraembryonic tissues. Chimaeric parthenogenetic↔normal mice are viable, however, due to non–random differences in distribution of their two cell types. Species differences in imprinting patterns in embryo and extra–embryonic tissues mean that there are uncertainties in extrapolating these experimental studies to humans. Here, however, we demonstrate that parthenogenetic chimaerism can indeed result in viable human offspring, and suggest possible mechanisms of origin for this presumably rare event.

Hwang Woo-suk