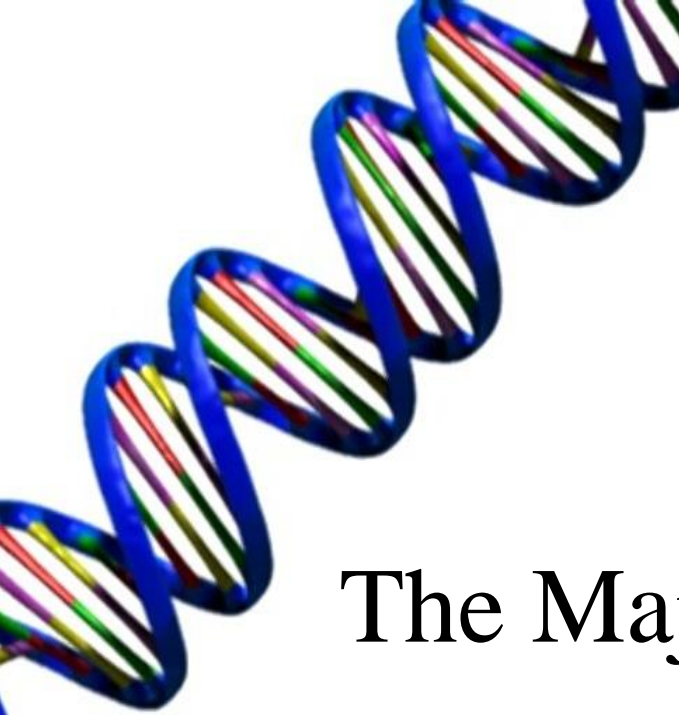


Relatedness and the evolution of multicellularity

Roberta Fisher
Oxford University

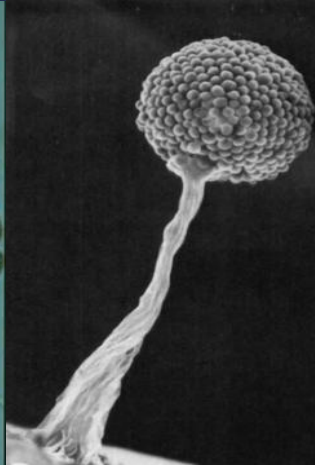
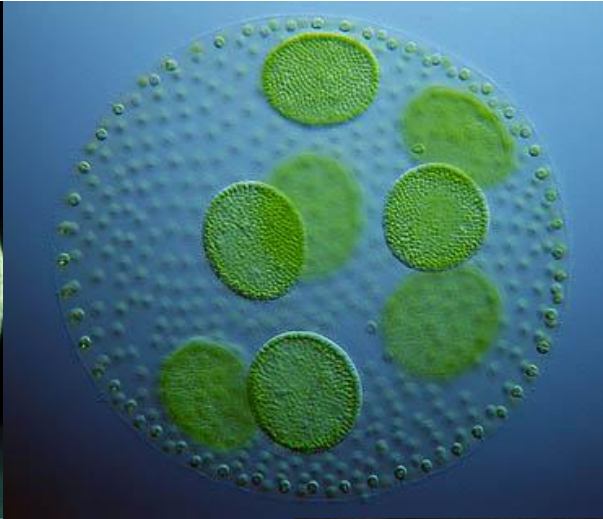




The Major Transitions of Evolution

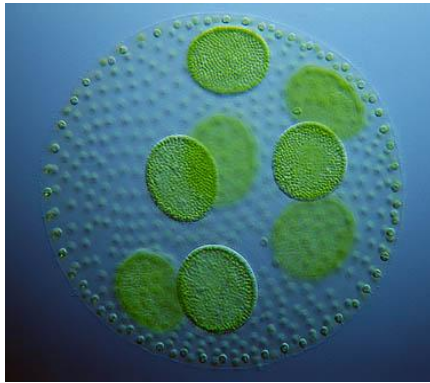


Multicellularity



Complexity

Simple



Low # cell types

Small size

Low degree of dimorphism

Complex

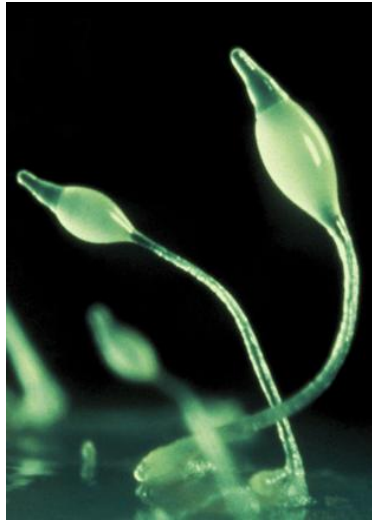


High # cell types

Large size

High degree of dimorphism

The importance of relatedness



$r = < 1$



Simple



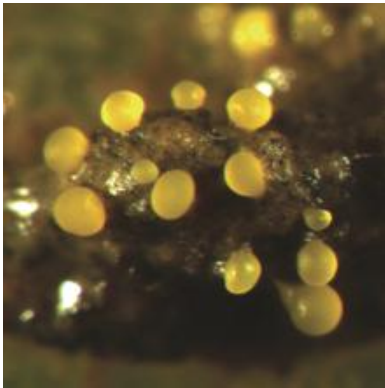
$r = 1$



Complex

Obligate or facultative?

(Has the species undergone a major transition?)



Myxococcus xanthus

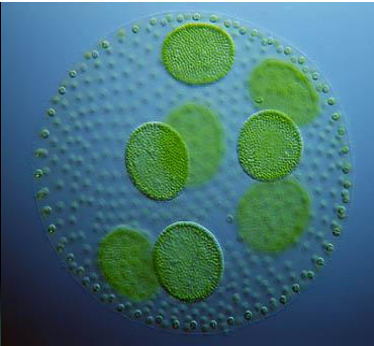


Mus musculus

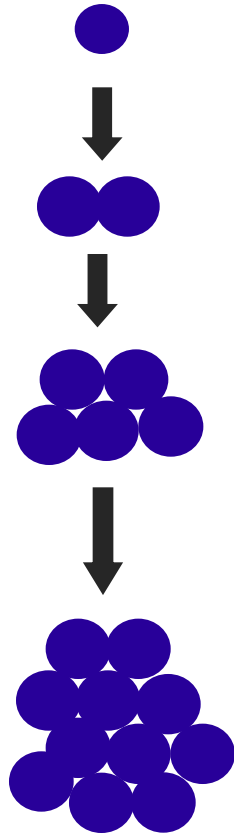
How does **relatedness** between cells influence:

1. Complexity?

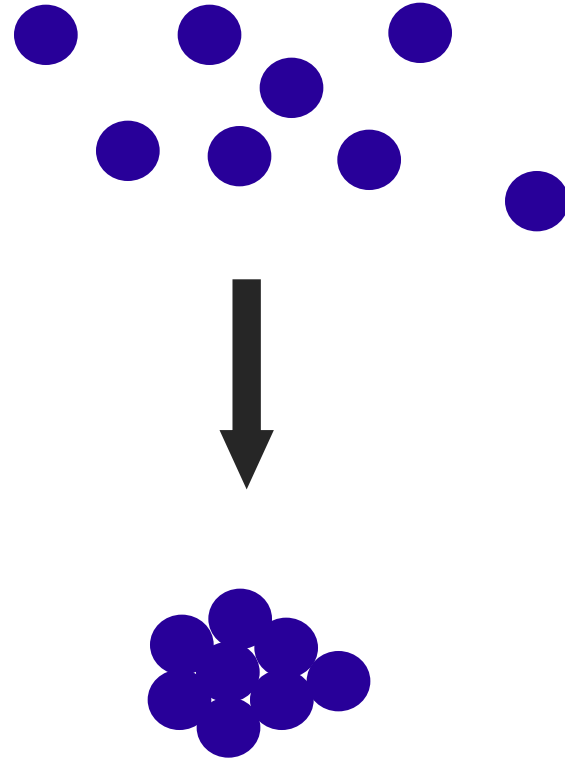
2. Obligate/facultative?



Group formation & relatedness



Clonal

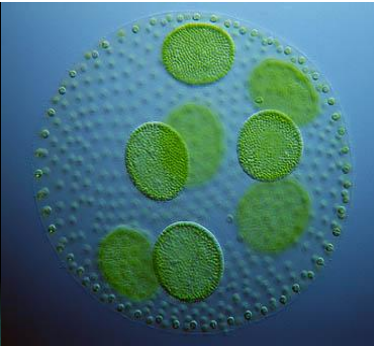


Non-clonal

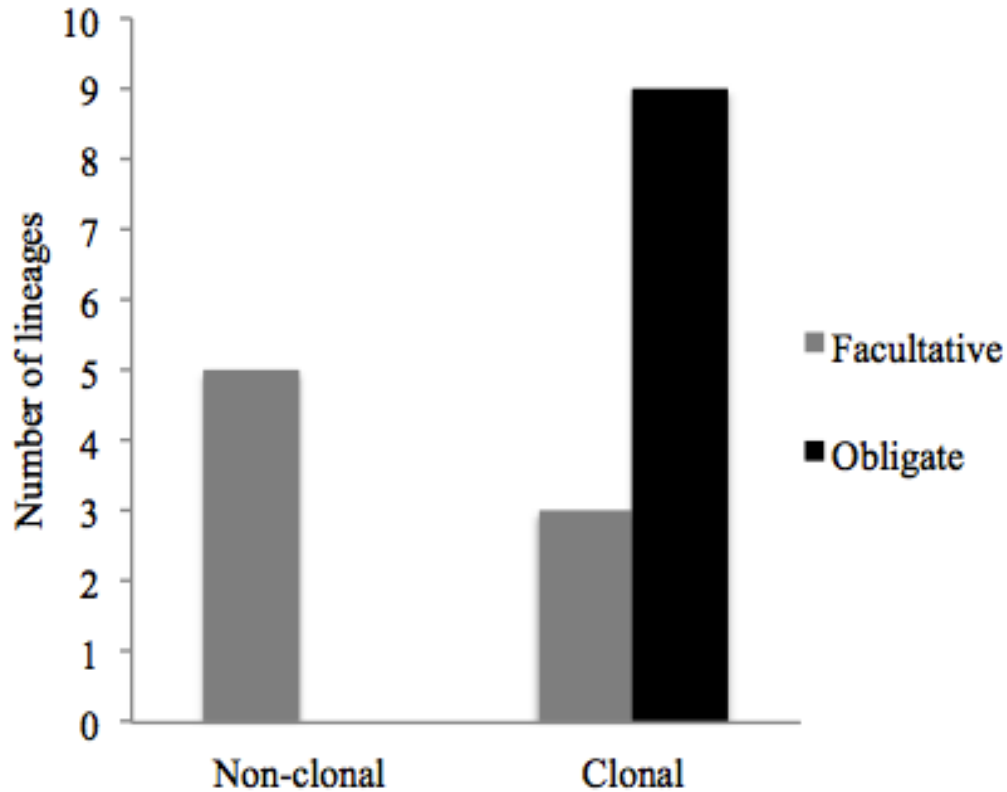
How does **relatedness** between cells influence:

1. Complexity?

2. Obligate/facultative?

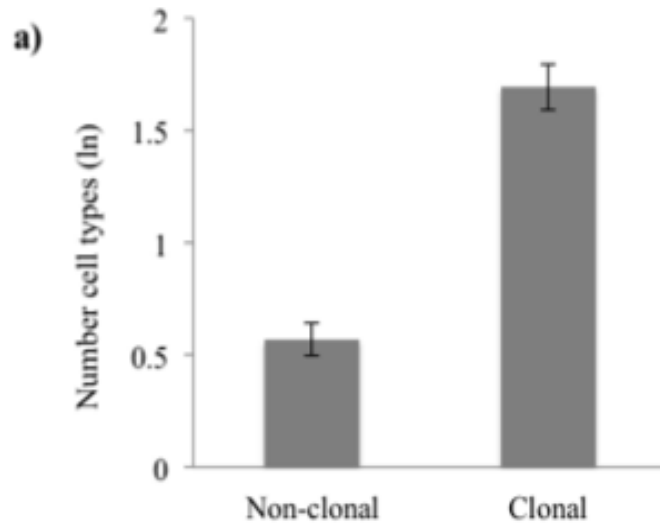


1. Does relatedness influence the transition to obligate multicellularity?

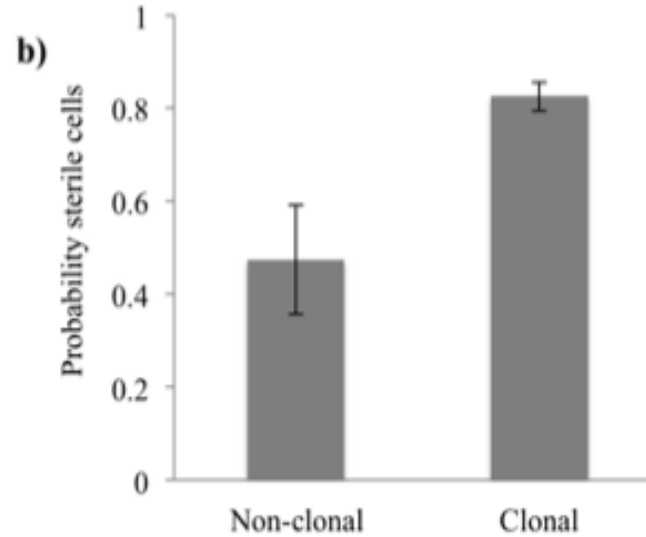


pMCMC = 0.0002

2. Does relatedness influence the level complexity?

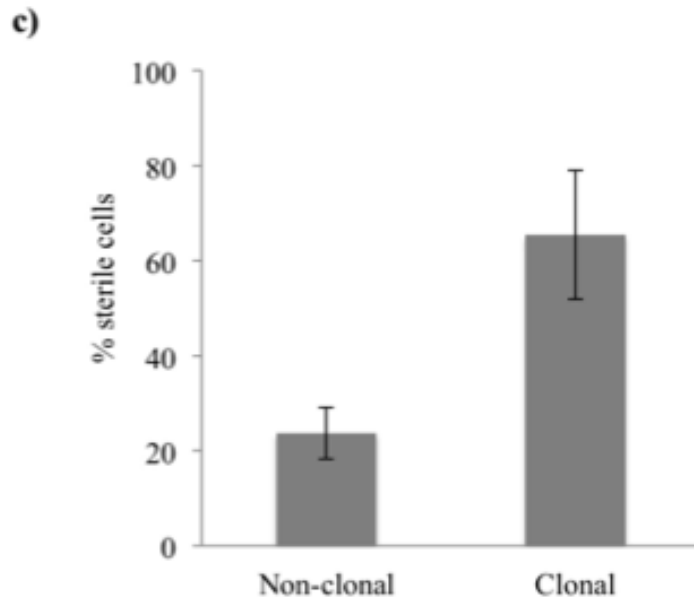


pMCMC = 0.0008

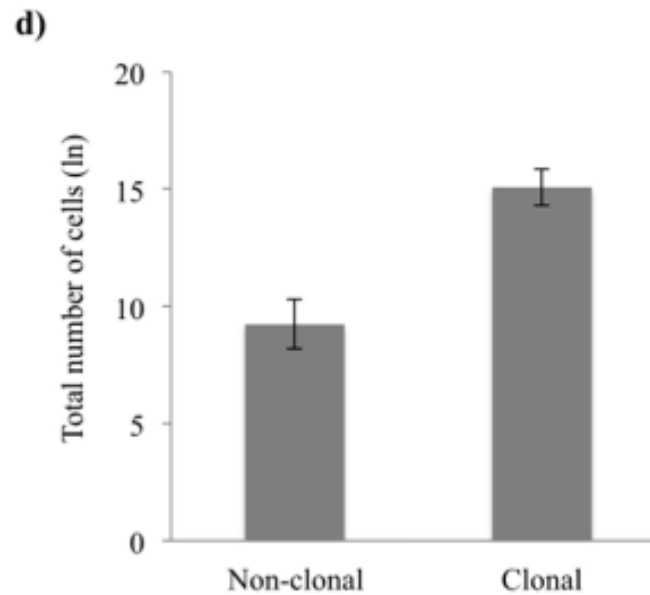


pMCMC = 0.02

2. Does relatedness influence the level complexity?

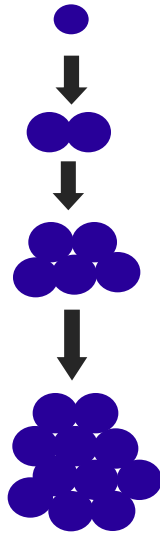


pMCMC = 0.41

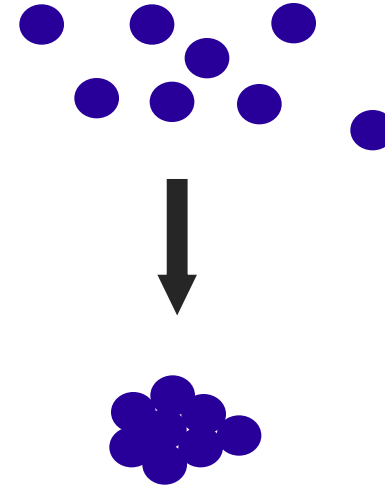


pMCMC = 0.27

23/01/13



Clonal
 $r = 1$



Non-clonal
 $r = < 1$

Facultative
multicellularity

**MAJOR
TRANSITION**
to Obligate
multicellularity

Parallels with eusociality.....

Clonal / Subsocial

$$r_{\text{help}} = r_{\text{off}}$$



Obligate
multicellularity/eusocial
ity



Non-clonal / Semisocial

$$r_{\text{help}} < r_{\text{off}}$$



Facultative
multicellularity/eusocial
ity



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**NATURAL
ENVIRONMENT
RESEARCH COUNCIL**

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