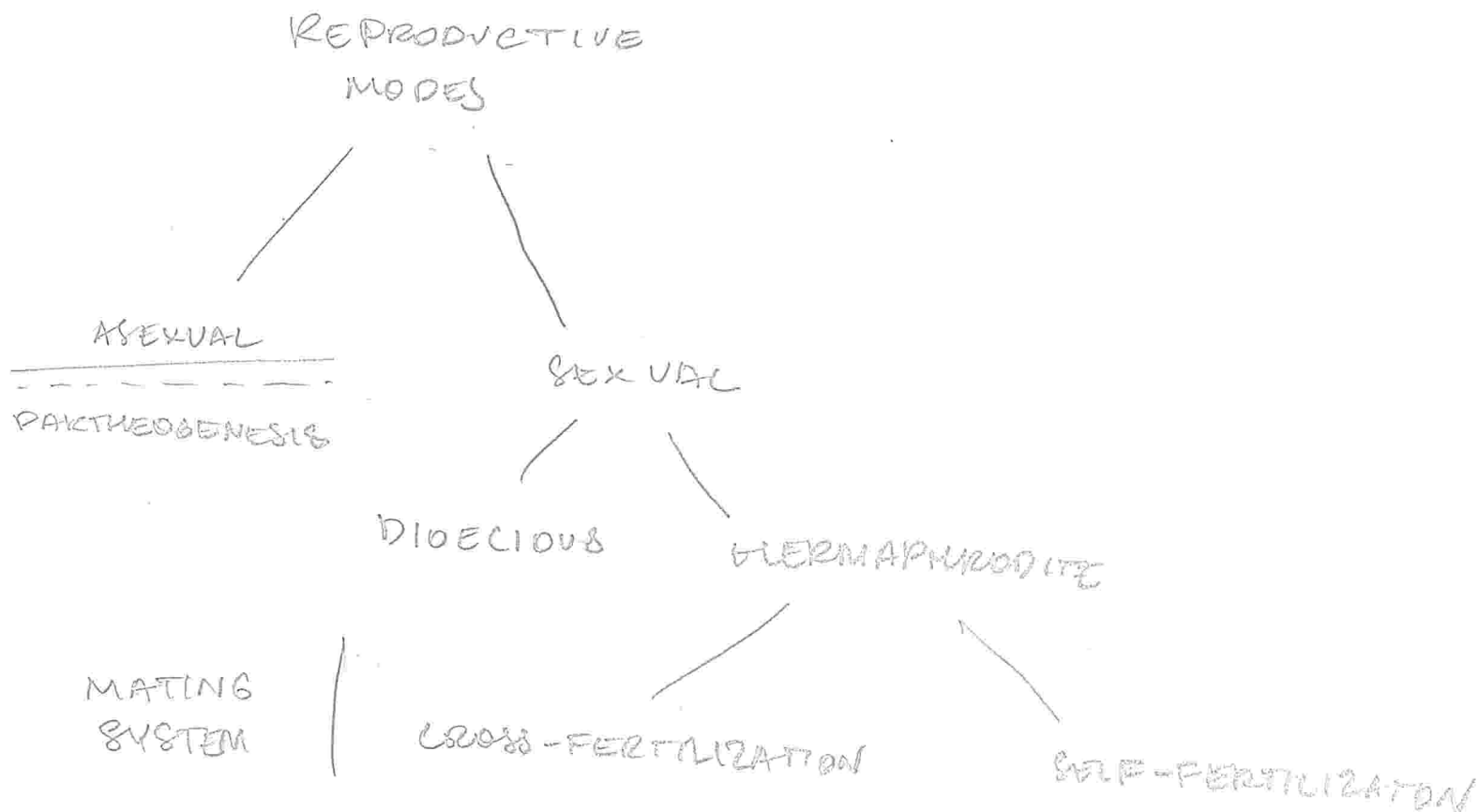


- WHY DID SEX EVOLVE?
- HOW CAN THE DIVERSITY OF REPRODUCTIVE SYSTEMS CAN BE EXPLAINED?



DAPHNIA



MANY PERENNIAL PLANTS REPRODUCE THROUGH BOTH SEXUAL AND CLONAL REPRODUCTION

→ SENSING MECHANISMS
PROXIMATE CUES FOR CHANGE IN
THE MODE OF REPRODUCTION.

→ DIFFERENT FROM ULTIMATE MECHANISMS

COSTS OF SEX:

- TIME AND ENERGY TO FIND AND ATTRACT MATES
- INCREASED ENERGETIC COSTS
- RISK OF PREPARATION & INFECTION
- COST OF PRODUCING MALES
- 50% LESS GENETIC TRANSMISSION
- BREAK UP OF ADAPTIVE GENES COMBINATIONS

BUT THERE IS THE PARADOX OF SEX —
WHAT ARE THE BENEFITS?

EVOLUTION OF SEX:

SARKAR OTO | ANEIL AGRAWAL | GRAHAM BELL

THE TWO-FOLD COST OF MEIOSIS:

TRANSMISSION BIAS — FAVOUR FOR ASEXUALITY

A SEXUAL FEMALE CONTRIBUTES ONLY 50% OF HER GENES.

HYPOTHESES FOR THE ADVANTAGES OF SEX

- SEX BRINGS TOGETHER FAVOURABLE MUTATIONS — LONG TERM BENEFIT
- BENEFITS OF GENETIC VARIATION IN VARIABLE ENVIRONMENTS:

“LOTTERY MODEL”

— SPATIALLY HETEROGENEOUS ENVIRONMENTS

“TANGLED BANK HYPOTHESIS”

— TEMPORALLY HETEROGENEOUS ENVIRONMENTS

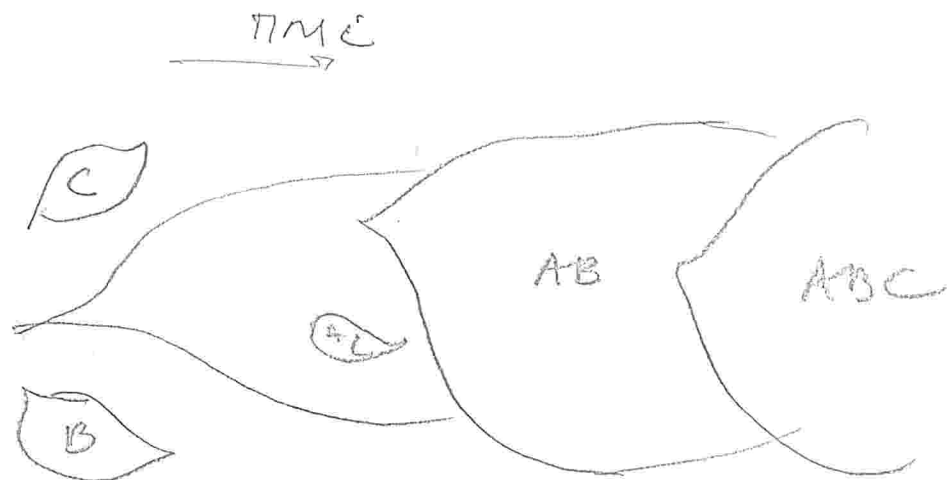
“RED QUEEN HYPOTHESIS”

EXAMPLE
HOW CAN TREES SURVIVE THE PEST PRESSURE?

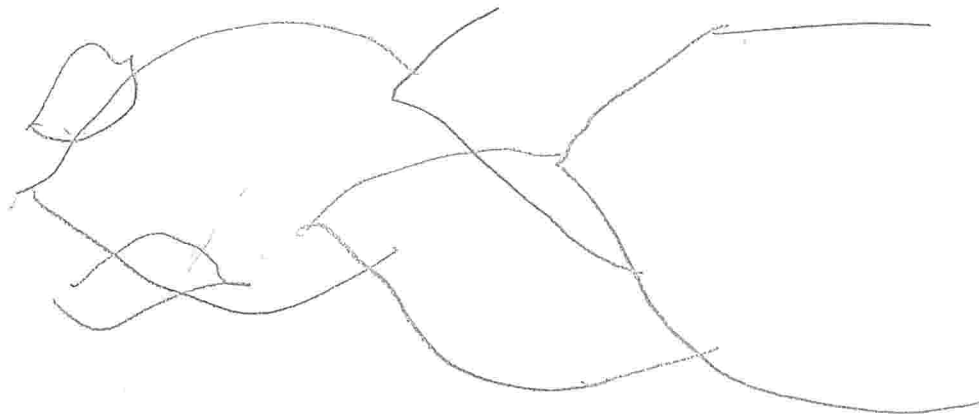
NUMEROUS THEORETICAL MODELS
BUT A PAUCITY OF EXPERIMENTAL EVIDENCE

FAVOURABLE COMBINATIONS OF MUTATIONS
 BROUGHT TOGETHER MORE RAPIDLY BY SEX.

ASEXUAL



SEXUAL



THEORY PREDICTS SPATIAL HETEROGENEITY
 IN SELECTION CAN FACILITATE THE
 EVOLUTION OF SEX BUT UNTIL - RECENTLY - NO DATA

ROTIFERS



OVER 12 WEEKS, SEX
 DECLINED RAPIDLY IN
 HOMOGENEOUS ENVIRONMENTS

EVOLUTIONARY HISTORY OF SEXUALITY

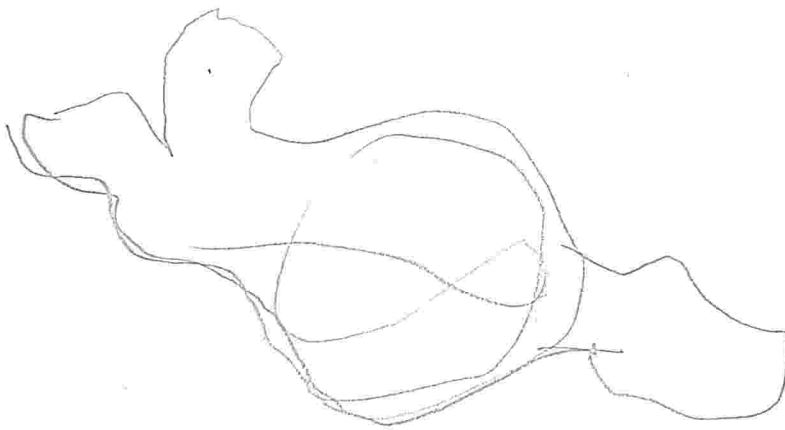
- ASEXUALITY IS SPORADICALLY DISTRIBUTED ACROSS THE ANIMAL KINGDOM; MORE COMMON IN INVERTEBRATES BUT RARE IN VERTEBRATES.
- ASEQUAL SPECIES ARE USUALLY AT THE TIPS OF PHYLOGENETICS

A-100

MYSTERY OF BOE LLOID ROTIFIERS -

NO SEX FOR MILLIONS OF YEARS

→ DIVERSIFICATION HAS LED TO >300 SPECIES



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RELATED MAN 124-0100M

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RELATED ~~man~~ RANDOM

INTERVIEWING

- GENOTYPE FREQUENCIES CHANGED

- ALL FREQUENCIES MEASURED

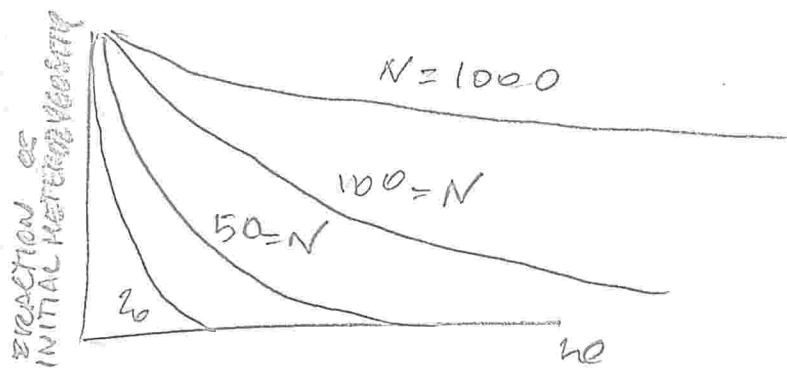
- ③ METEROLOGY REDUCES 50% PER GENERATION

→ INBREEDING DEPRESSION

population 1 | ASEXUAL

SEXUAL + INBREEDING

HETEROZYGOSITY DECREASES AT DIFFERENT RATES DEPENDING ON MATING PATTERNS



INBREEDING DEPRESSION

• REDUCTION OF FITNESS:

— VIABILITY

— FERTILITY

• STRONG DEPRESSION WILL FAVOUR OUTCROSSED MATING SYSTEMS

• DARWIN'S FASCINATION WITH INBREEDING & OUTBREEDING IN PLANTS

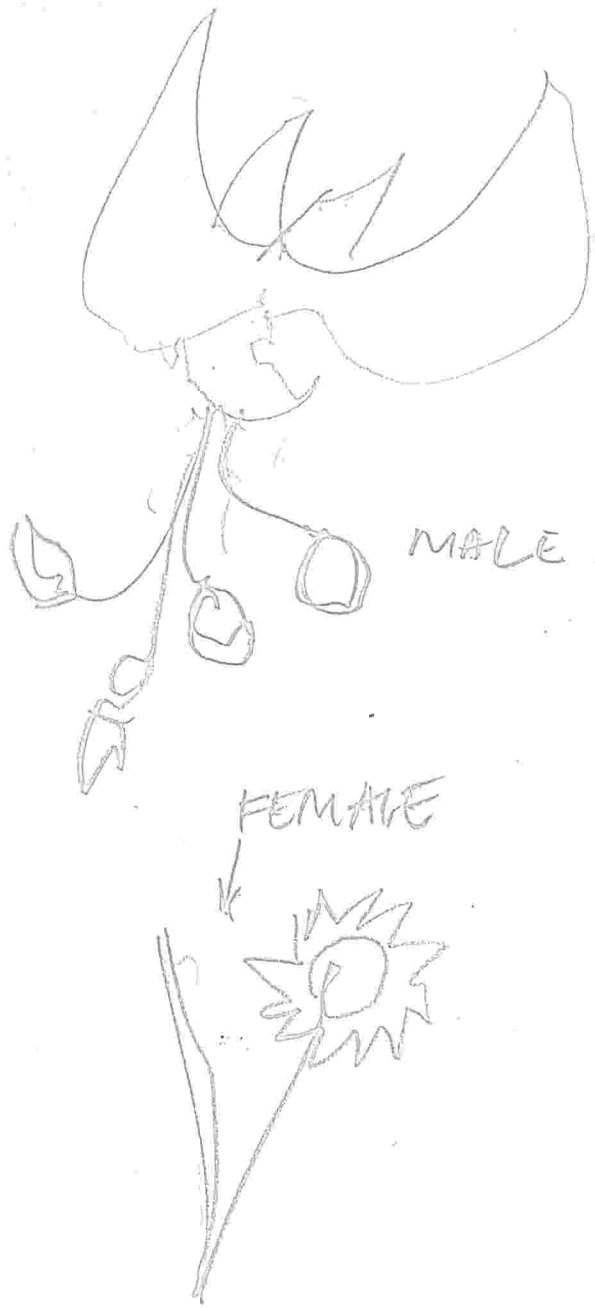
→ PERSONAL INTEREST

→ BRED MORNING GLORY IN THE CONTINUOUS EXPERIMENT DURING 10 YEARS

→ LOOKED AT 53 SPECIES AND CONDUCTED SELFS AND CROSSINGS

BUT HOW DO PLANTS STOP INBREEDING?

MOST PLANTS ARE HERMAPRODITE



MECHANISM OF
SELF-INCOMPATIBILITY



DIOECY ONLY OCCURS IN 7% OF FLOWERING PLANTS

SEXUAL SELECTION ACCOUNTS FOR
SEXUAL DIMORPHISM

SELFING IS FAVOURED IN ISLAND
COLONISATIONS WHERE NO OR
SMALL NUMBER OF POLLINATORS RESIDE.

BRADY'S LAW