Why does the age structure of the human population change?

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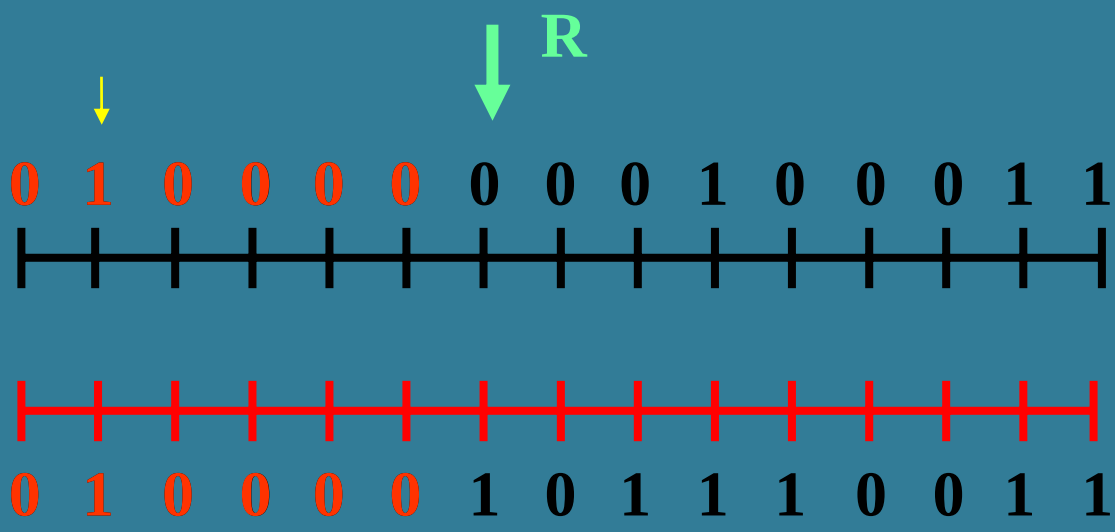
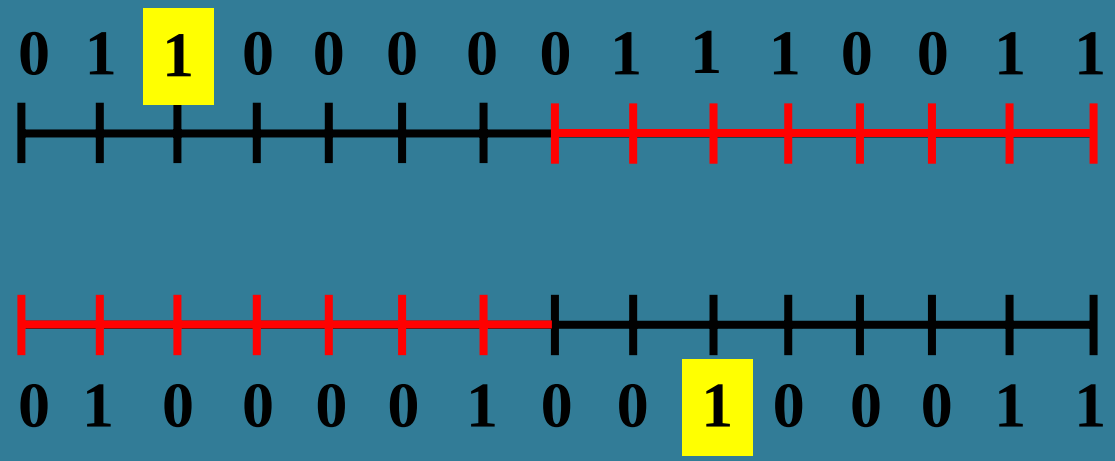
Ageing/Population Evolution

- Telomeres attrition
- Oxygen radicals
- Antagonistic pleiotropy
- Toxic metabolites accumulation
- Mutations accumulation theory
  - *Medawar's hypothesis*
  - *Penna model*

Diploid sexual Penna model

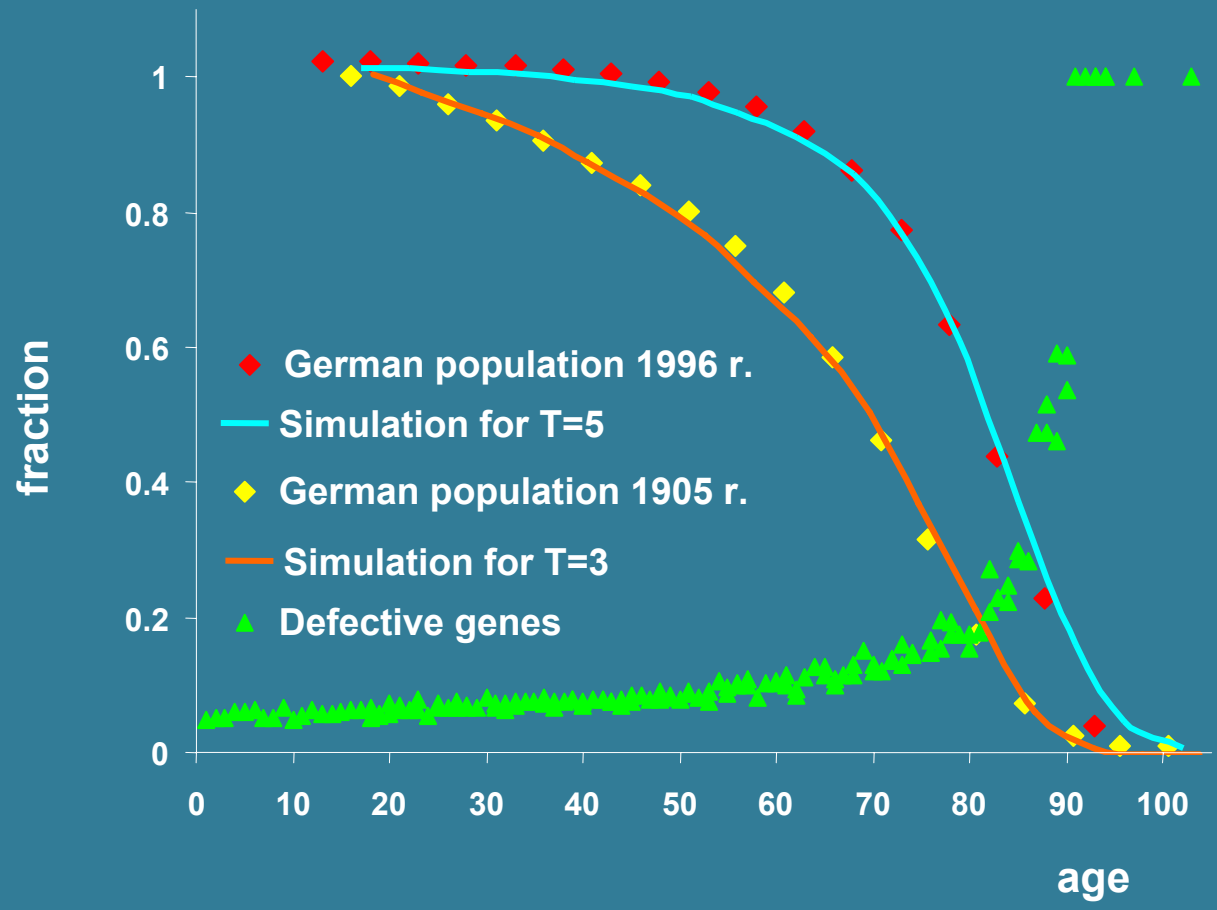


Gamete production

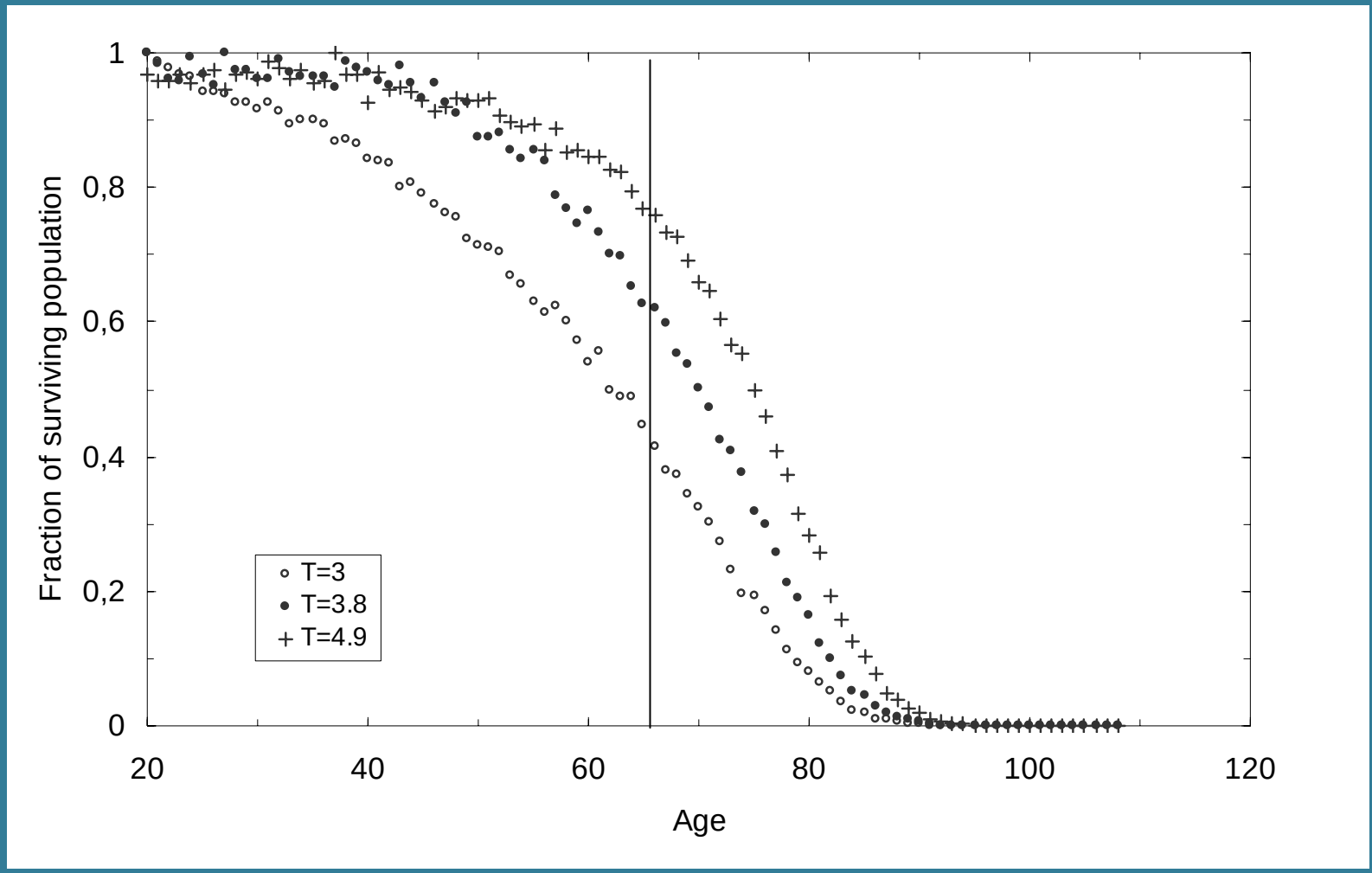


- M - the number of new mutations introduced into the haploid genome during the gamete production (usually M=1 per haploid genome per generation).
- B - the number of offspring produced by each female at reproduction age at each time step or the probality giving the offspring (B=1)
- R - minimum reproduction age
- T - the upper limit of expressed defects, at which an individual dies (T=3)
- C - probability of cross-over between parental haplotypes during gamete production
- V -Verhulst factor: $V=1-N_t/N_{max}$

Fraction of defective genes and the demographic structure of real and computer simulated populations



The role of increasing threshold *T*



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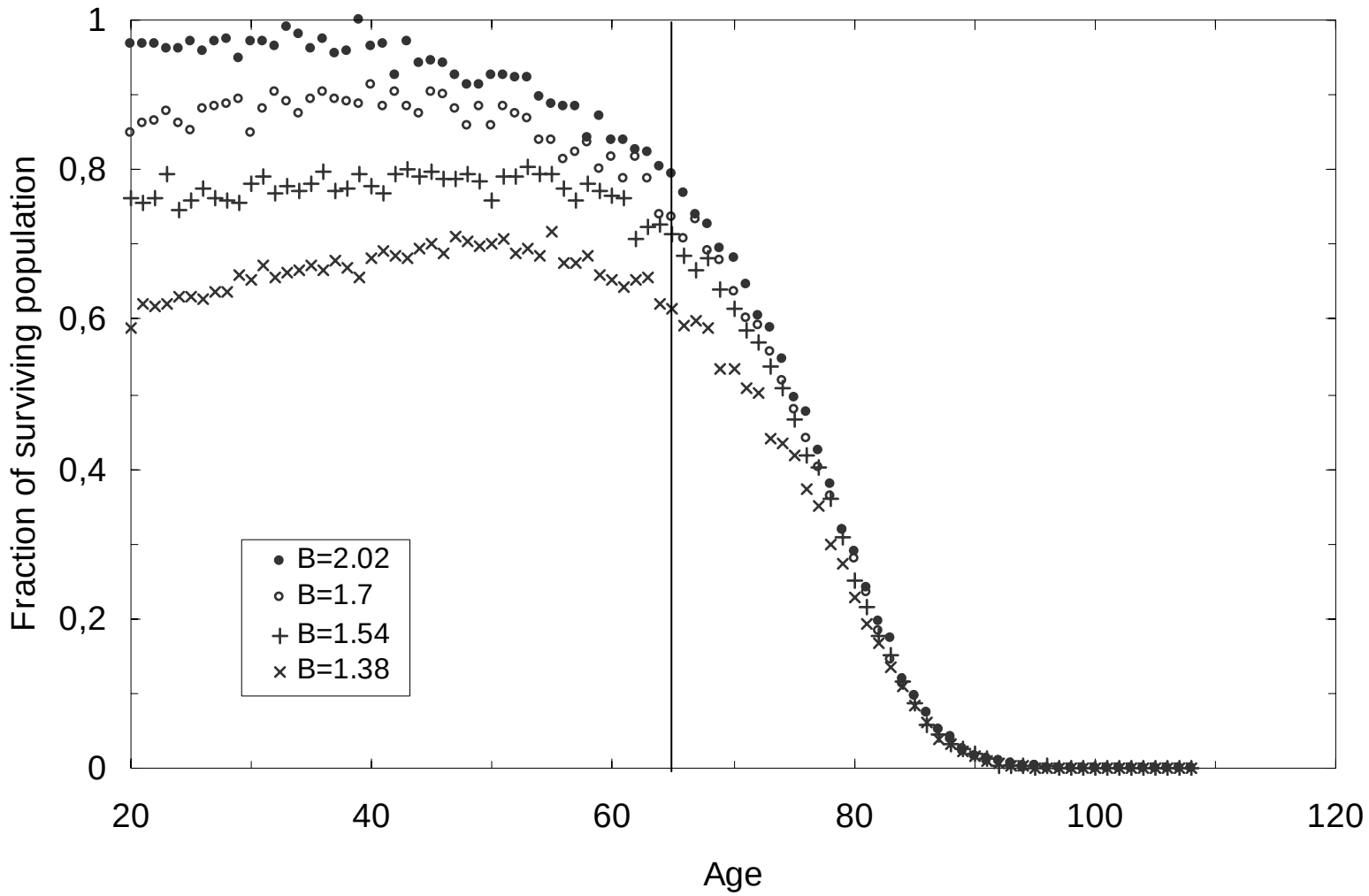
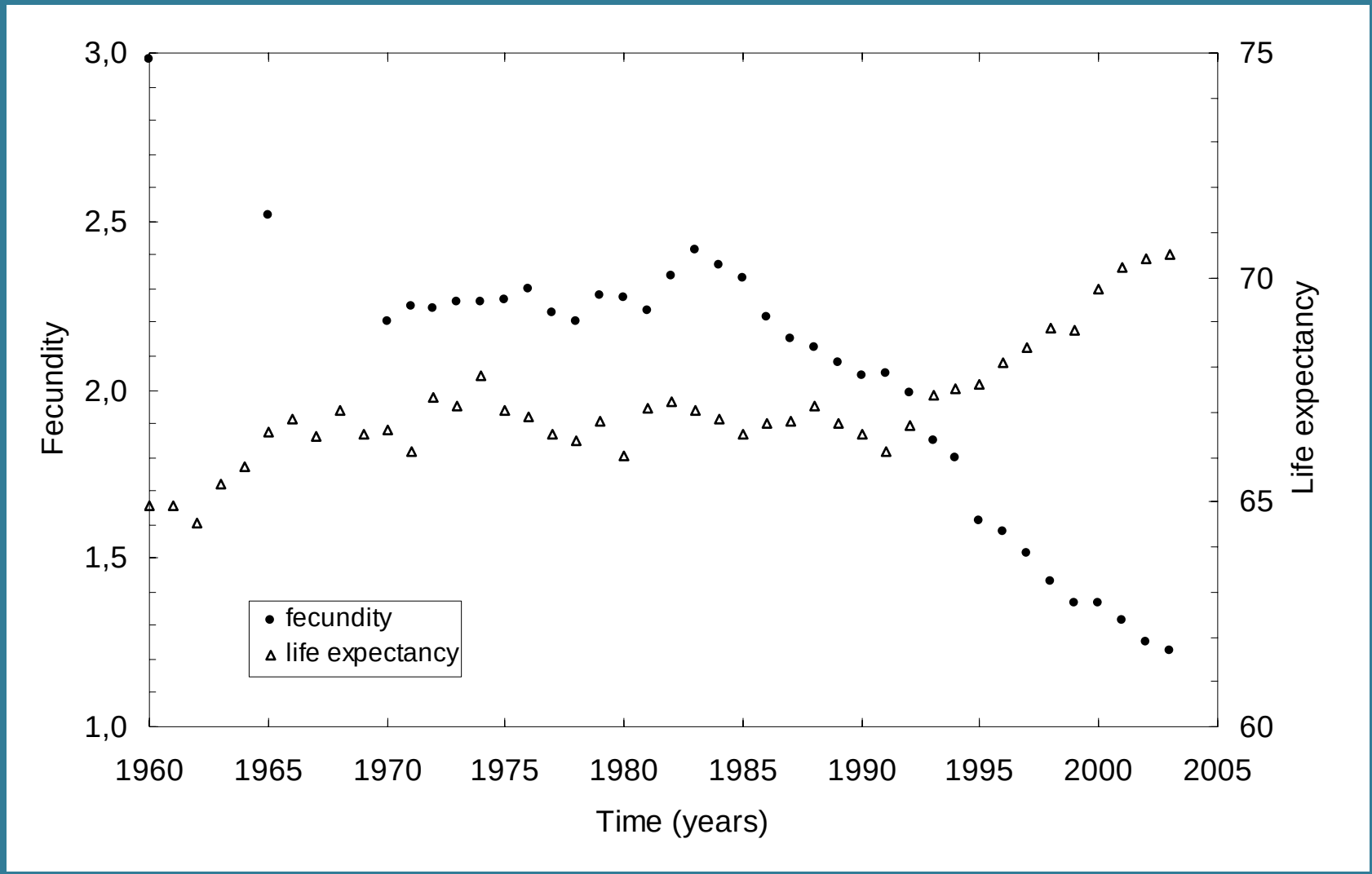
Fecundity – total number of offsprings produced by one female

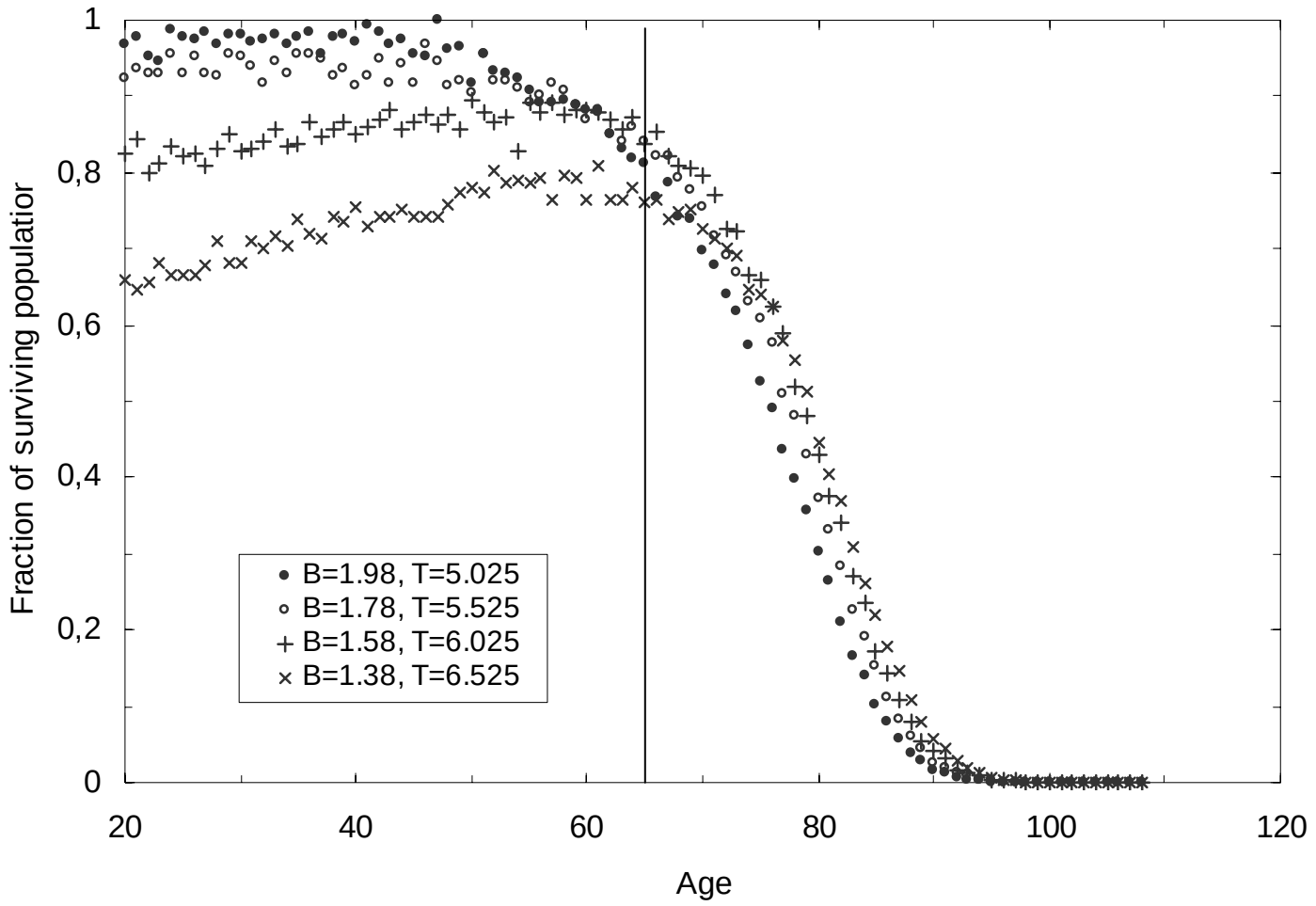
Fecundity decreases



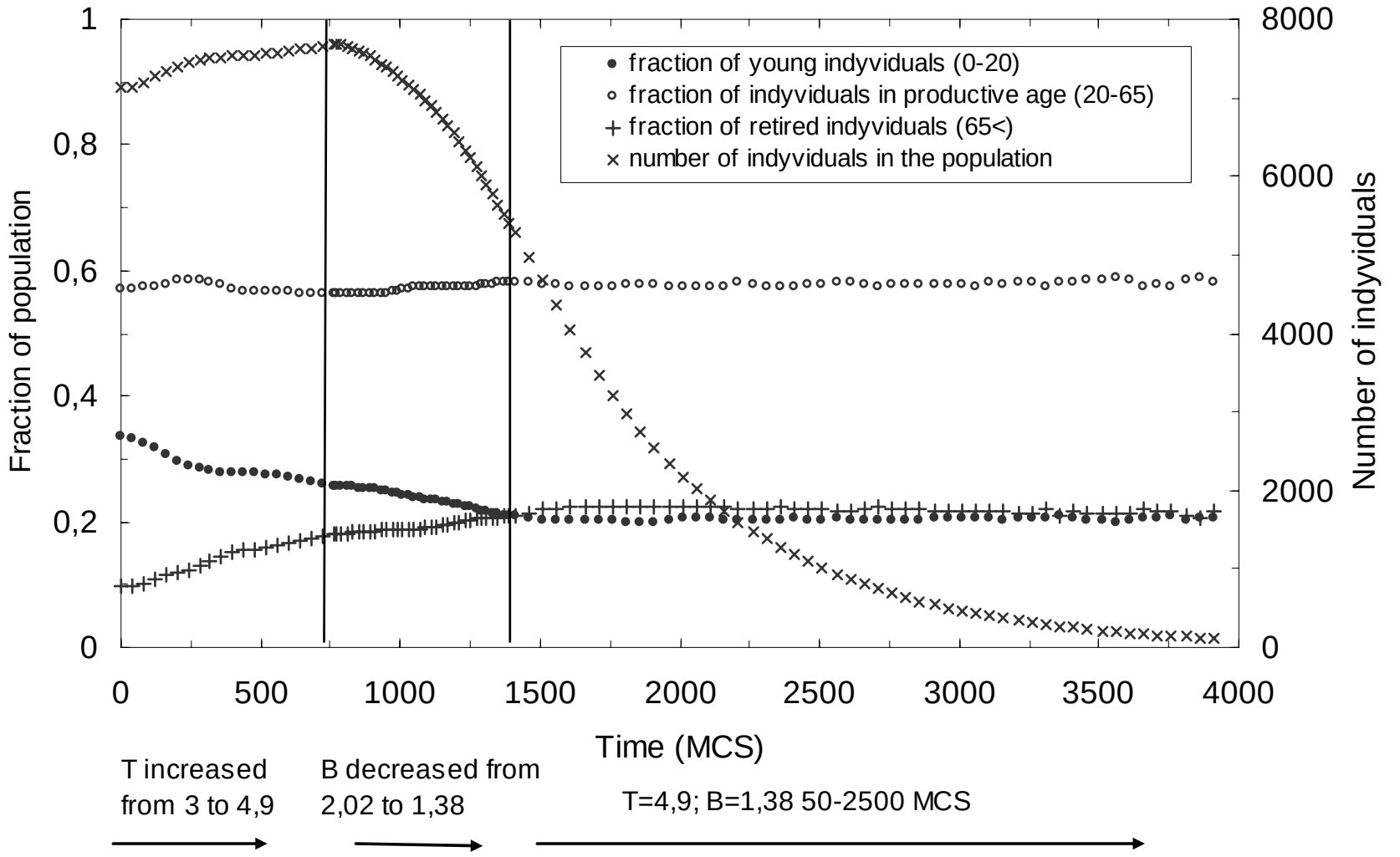
Decrease of fecundity and increase of life expectancy during the transformation in Poland



Modeling the age structure with decreasing fecundity and increasing life expectancy



Reconstruction and prediction of the age structure of population with changing parameters



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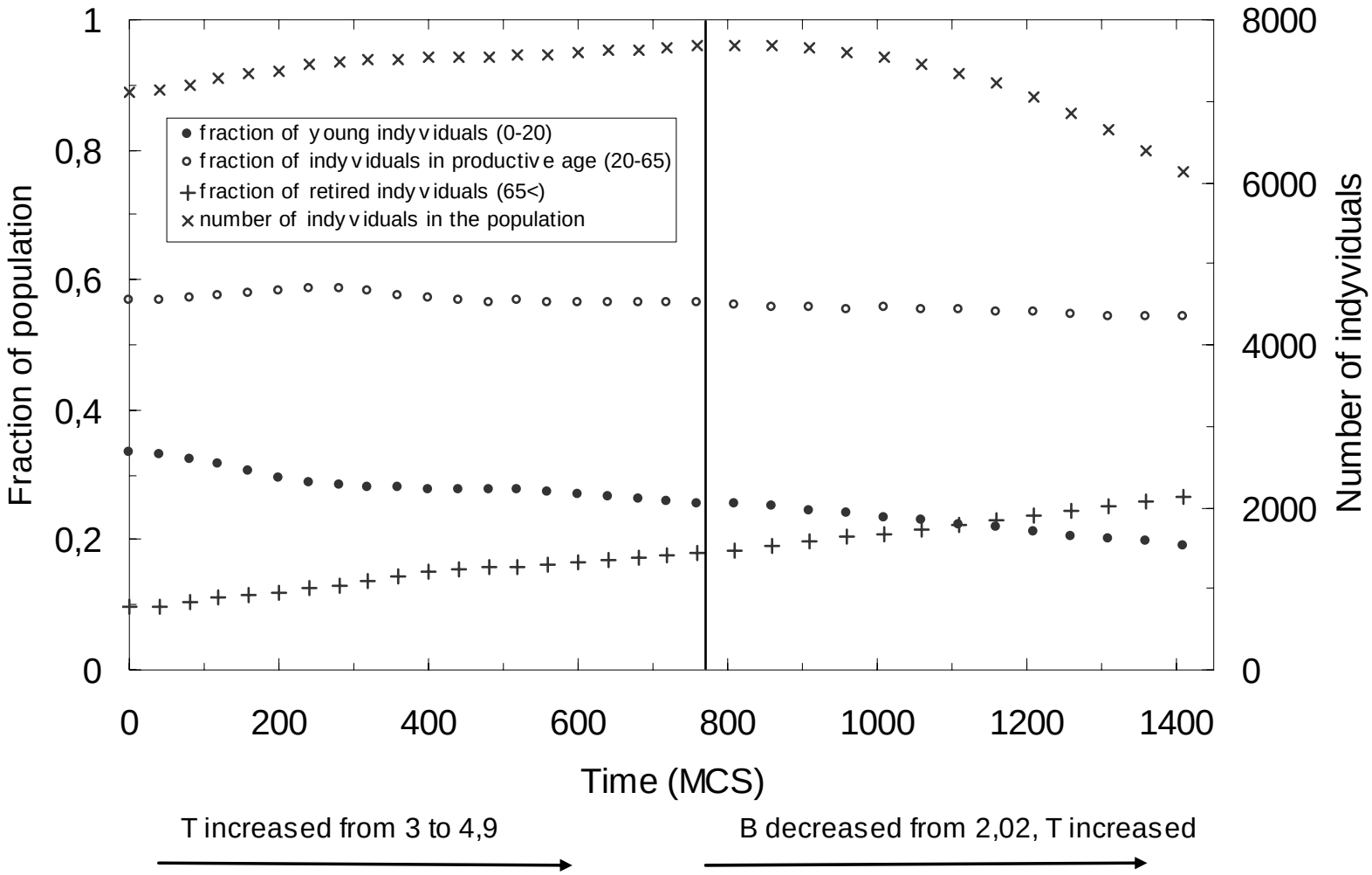


Homeostatis

- living systems are in equilibrium

Homeodynamics

Homeokinetics

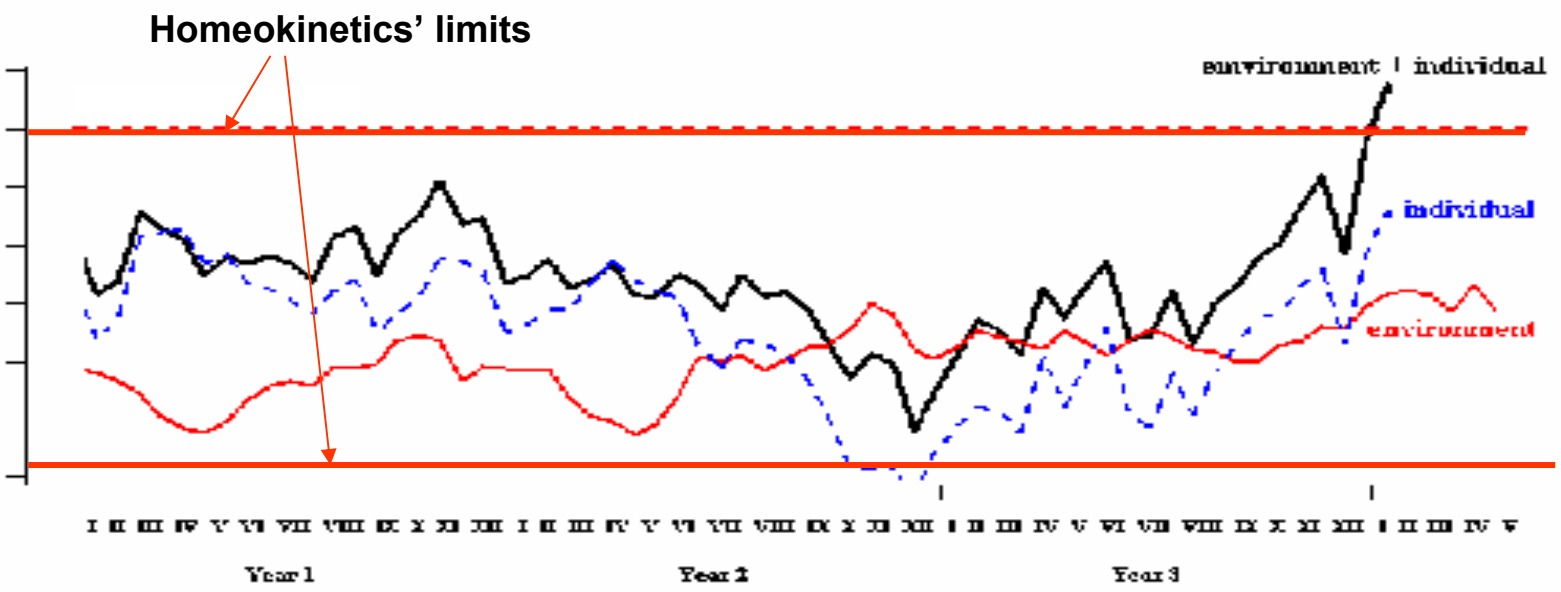
- living systems are far from equilibrium

Homeokinesis

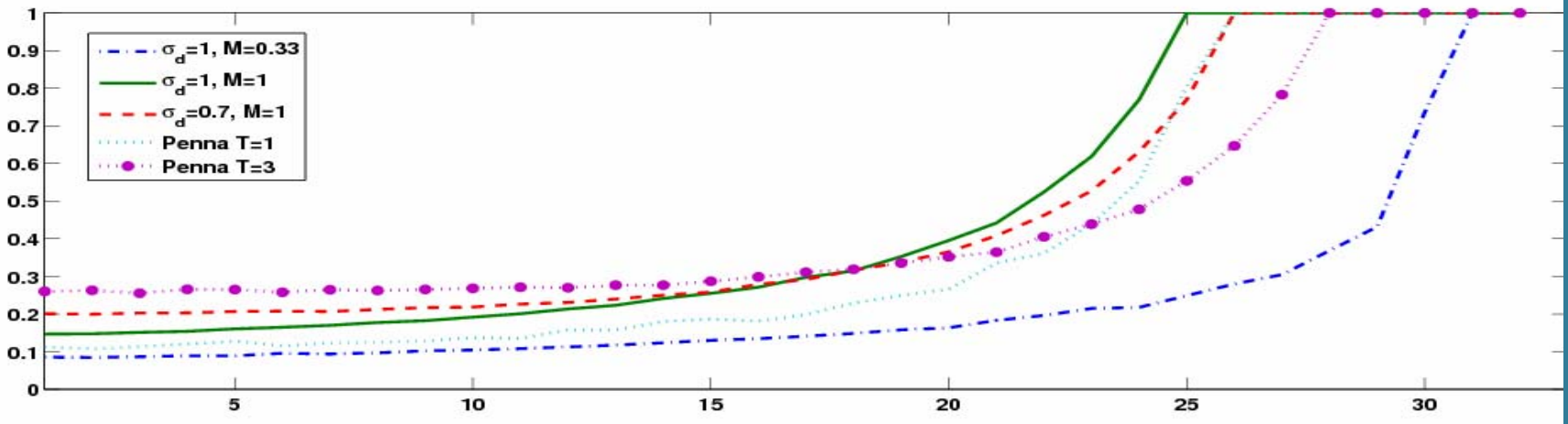
- Homeokinesis – the stability of an organism functioning in a variable external environment to maintain a highly organized internal environment, fluctuating within acceptable limits by dissipating energy in a far from equilibrium state

(Que et al..,)

Superposition of environmental and internal fluctuations



Stucture of genetic pool of populations in the Penna model and in the model with environmental and internal fluctuations



The age stucture of populations in the Penna model and in the model with environmental and internal fluctuations

Thank you for surviving my talk