

(Sexual report??) Conjugation | Paramecium | Dr. Isakhatkhatyan  
Dept. of Zoology  
Arjanta College  
Guwahati

- After several repeated Binary fission, the animal loses its vigour & it can't divide by Binary fission
- This is shown by lower Nucleo-cytoplasmic ratio (N/C)
- It's said that lower N/C ratio, is an indication of lower activity & consequent lower rate of energy production. So to gain energy the animal must undergo nuclear reorganisation to gain energy. Which is indicated by higher N/C ratio. This is done by a method called conjugation.
- There are other authorities, the opinion that shortage of food, certain chemical secreted by Paramecium, certain range of temperature & light may also induce the animal to conjugate.
- It's certain that it never takes place among the descendants (progeny) of a single individual (one clone), but always between two individuals of two different strains forming two different clones.
- The whole process takes place in the following ways:
  - The two Paramecia/Paramecia come together & attach themselves by the ventral surfaces. known as conjugants.
  - The ectoplasm breaks down at the point of attachment & an endoplasmic bridge is formed between the two animals.
  - Certain nuclear changes takes place, which is the most important part of conjugation.
    - This nucleus (small) of each conjugant moves away from the stereogonogon nucleus
  - Thus Macronucleus begins to disintegrate, breaking up to small fragments, which are later absorbed by Cytoplasm.

- Micronucleus of each divides twice, one of the division being meiotic cell division resulting four haploid micronuclei
- of the 4 - Micronuclei, 3, (three) disappear & the fourth one divides unequally forming one - small active male pronucleus & a large inactive female pronucleus.
- The male pronucleus ( $\sigma$ ) if one passes through the protoplasmic bridge, into the other individual & fuses with the female pronucleus ( $\rho$ ) forming a Zygote nucleus (Synkaryon) - but only of two nuclei.
- The two Paramecia now separate & are called Exconjugants. The fused nucleus of each divides three (three times) forming eight (8) equal sized nuclei in each.
- 4 (four) of these, 8 (Eight) become larger & form Macro/Megakaryonucleus (Megakaryonuclei). Out of these other 4, (four), three (3) disappear & the fourth divides into two.
- Both the division of the Exconjugants, resulting two individuals each having one micronucleus & two megakaryonuclei.
- In each such individuals, the micronucleus again divides & this is followed by a fission producing individuals each with one mega & one micronucleus.
- And last, from each Exconjugants four individuals are formed.

## Significance

- Increase in number (Reproduction) - As at the end of the process, there is increase in number, thus this process a kind of Reproduction.
- Rejuvenation - It means regain of lost power. It is found in each daughter amoebium as they begin to feed, grow, & finally undergo Binary fission, if required. It is also indicated by their higher r/c ratio.
- Variations - The hereditary material of the male pronucleus of one conjugant passes into the other, thus bringing about changes in the hereditary material of the fused nucleus. As this fused nucleus takes part in the formation of 4 (four) small individuals the changed characters are also called expressed in these individuals bringing about about some kind of variation in the offspring / progeny / descendants

1. Two Parametia fused as Conjugants

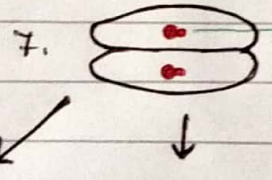
2. Macronucleus (disintegration) (divides Meiotic telophase stage) & Micronucleus divides.

3. Micronucleus divides (again)

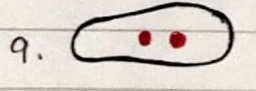
4. 3 of 4 Micronuclei disappear.

5. Micronucleus divides (unequally)

6. Smaller pronuclei are exchanged  
Zygote (Syngamion) / Syngamion



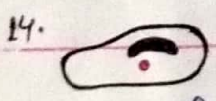
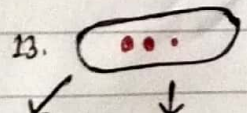
8. Parametia separate as Exconjugants



10. Zygote nucleus divides three times to form 8 nuclei



12. 4 becomes macronuclei, 3 disappear & 1 remains micronucleus



14. Fig shows - Parametium caudatum (Conjugation)