

ONLINE CLASS : INDUSTRIAL & ENVIRONMENTAL MICROBIO

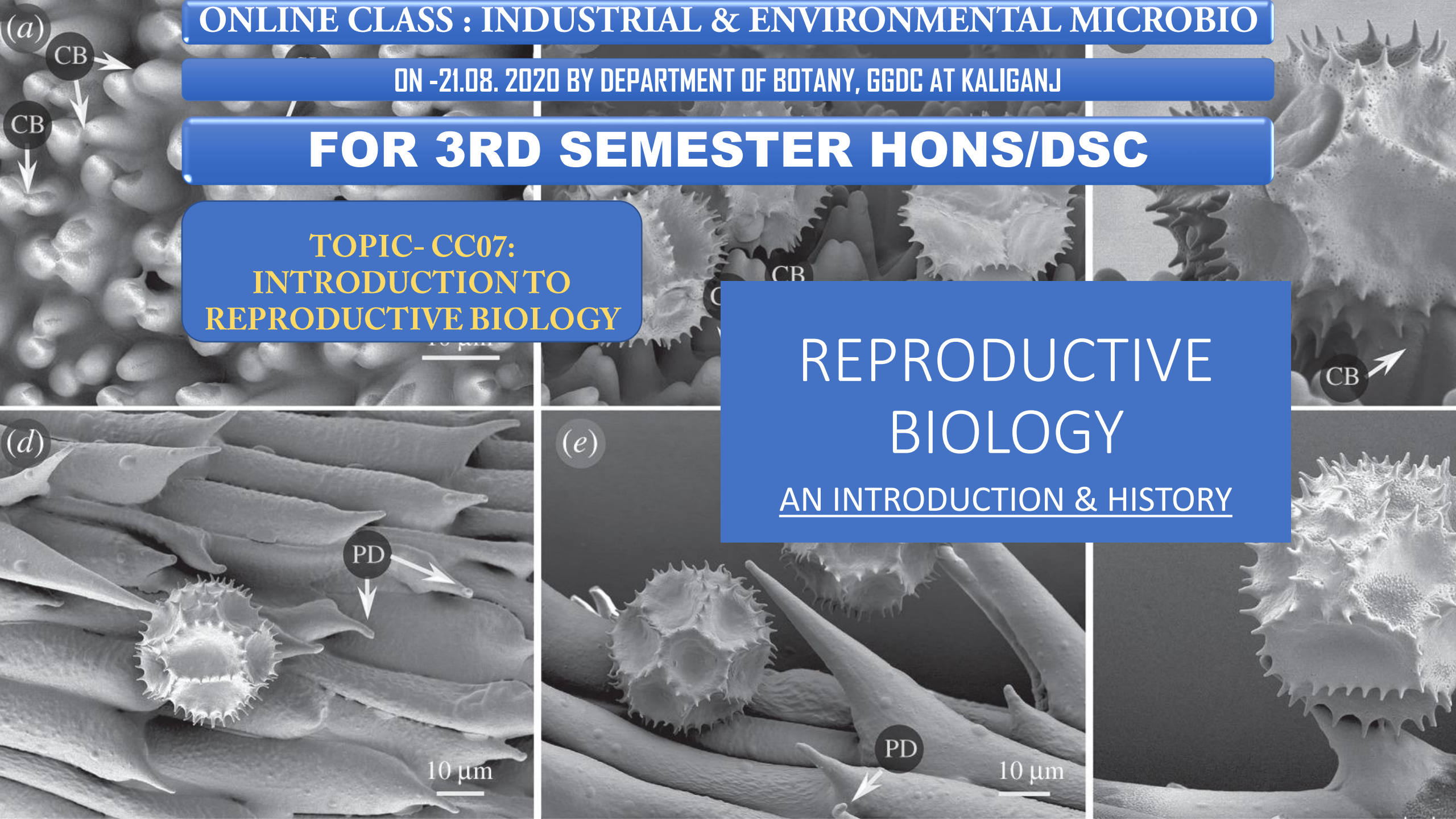
ON -21.08. 2020 BY DEPARTMENT OF BOTANY, GGDC AT KALIGANJ

FOR 3RD SEMESTER HONS/DSC

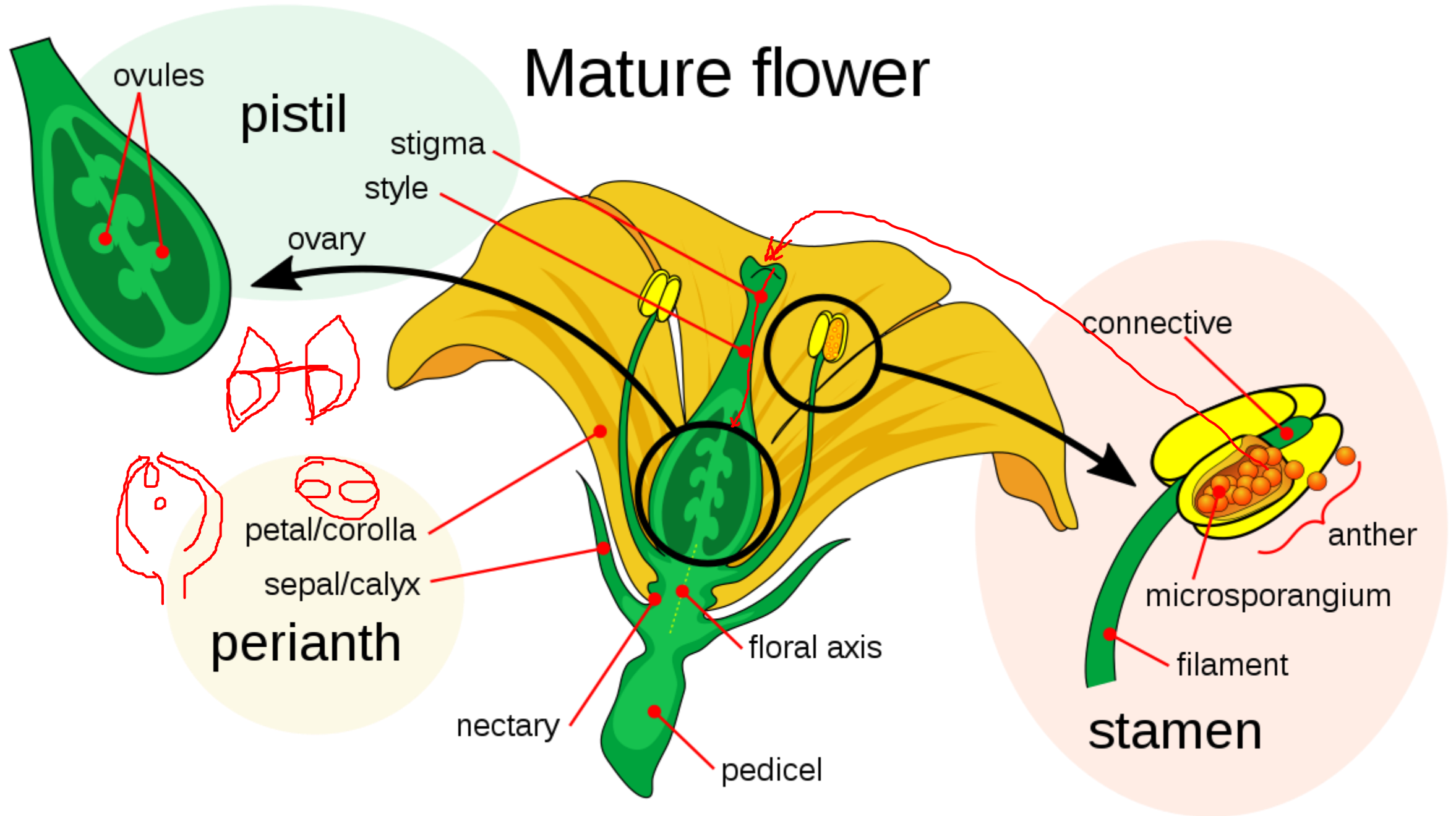
TOPIC-CC07:
INTRODUCTION TO
REPRODUCTIVE BIOLOGY

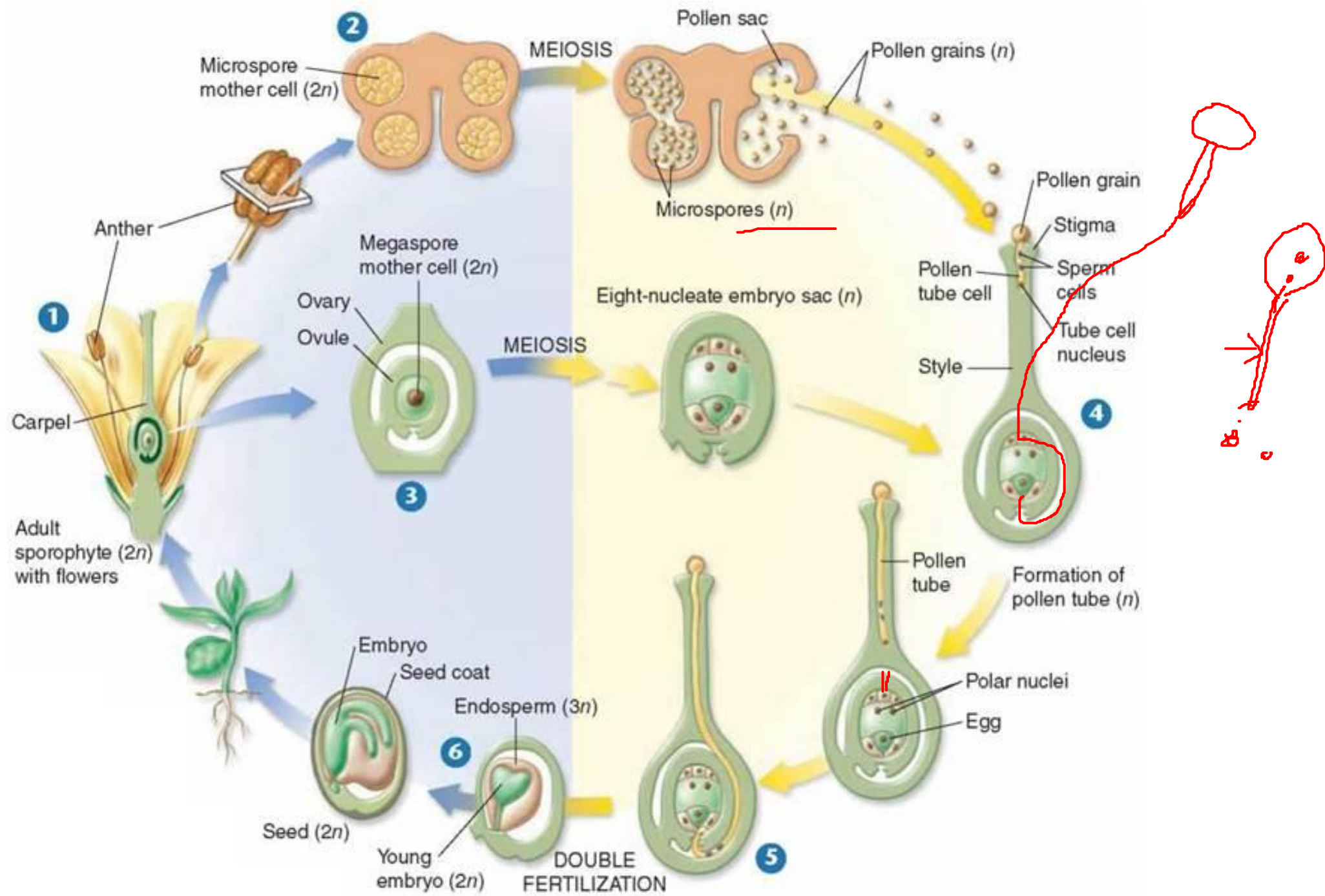
REPRODUCTIVE BIOLOGY

AN INTRODUCTION & HISTORY



Mature flower



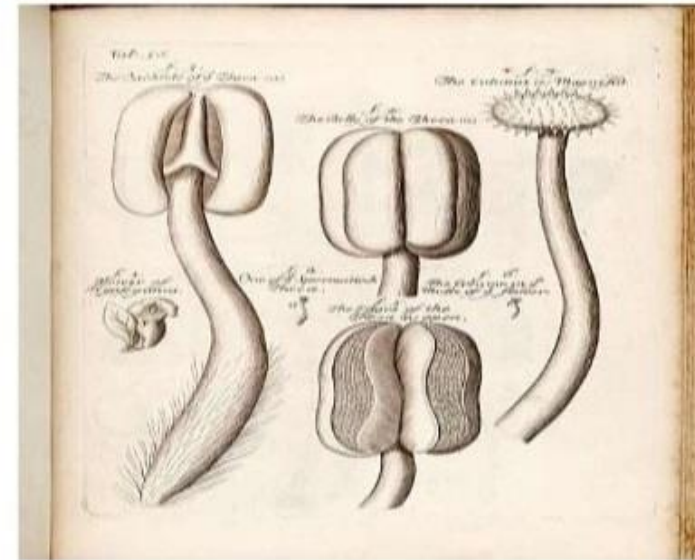


Leeuwenhoek (1677)

- with the invention of the microscope the actual observation of the sexual cells took place.

Grew (1682)

- "Anatomy of Plants,"
 - first explicit mention of the stamens as the male organs of the flower. ✓



Stamens, The Anatomy of Plants, Nehemiah Grew, 1682.

Rudolph Jakob Camerarius (1694)

- "De sexu plantarum."

✓ - Establish sexuality in Mercurialis annua and Morus indica.

- similar findings with Ricinus and Zea mays.

• - "In the plant kingdom, the production of seed, which is the most perfect gift of nature and the general means of maintenance of the species, does not take place unless the anther have previously prepared the young plant contained in the ovary."

• Concluded that some kind of interaction between the stamens and carpels is necessary for the production of seed-bearing fruits.



Mercurialis annua



Morus indica

✓
♂
♀
+

Joseph Gottlieb Kolreuter (1761)

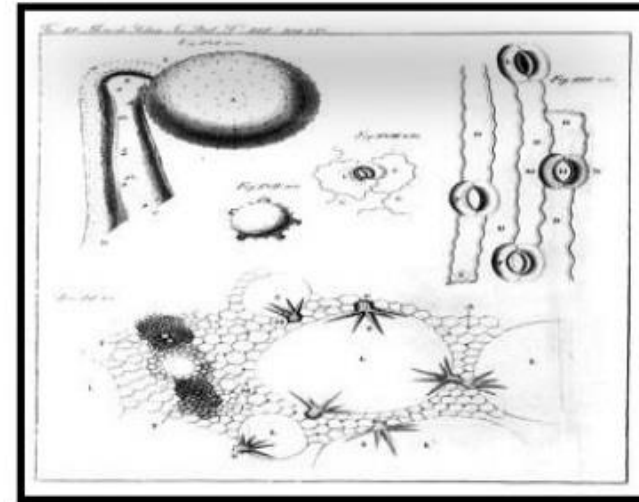
- Published four parts of a treatise
--dealing with his experiments on sex in plants.
- Highlighted the significance of pollination in seed setting and gave a detailed account of role of insects in pollination.
- He also produced hybrids in Nicotiana, Dianthus, Matthiola and Hyoscyamus.



Giovanni Battista Amici (1824)

- **Discovery of the Pollen Tube.**
- while studying the stigma of *Portulaca oleracea*
 - the pollen grain split open and sent out a kind of tube or "gut" which grew along the side of the hair and entered the tissues of the stigma.
- (1830)-

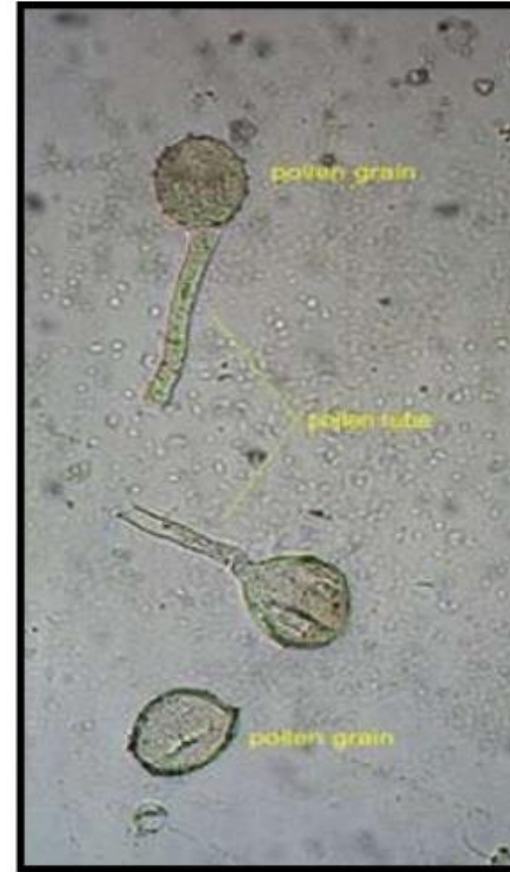
" Is the prolific humor passed out into the interstices of the transmitting tissue of the style, as Brongniart has seen and drawn it, to be transported afterwards to the ovule, or is it that the pollen tubes elongate bit by bit and finally come in contact with the ovules, one tube for each ovule?"



Drawing of the pollen tube

Robert Brown (1831 , 1833)

- saw pollen grains on the stigmas and pollen tubes in the ovaries of certain orchids and asclepiads but was uncertain as to whether the tubes were always connected with the pollen grains.



Pollen with Pollen tube

Matthias Jakob Schleiden(1837)

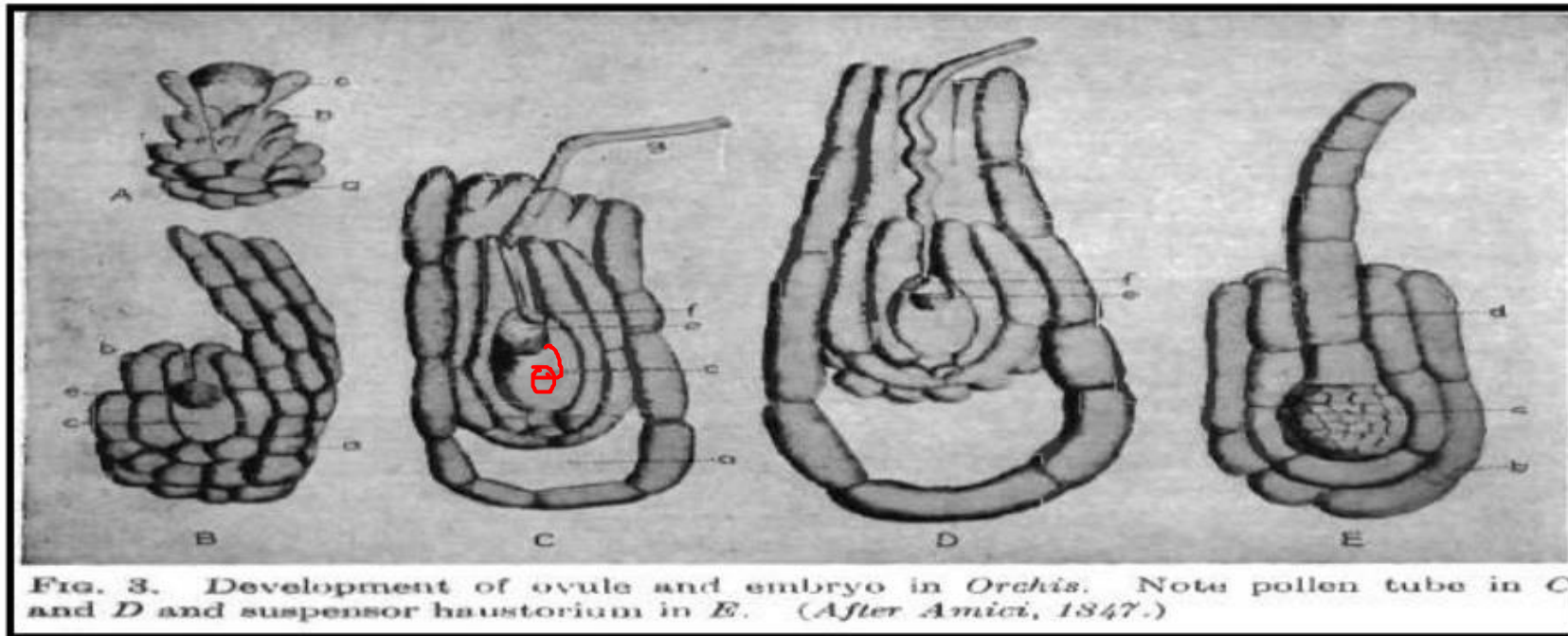


- **Schleiden's Theory of the Origin of the Embryo.**
- ~~the extremity of the pollen tube~~ pushes the membrane of the embryo sac before it and directly becomes the embryonic vesicle, which then undergoes a number of divisions to produce the embryo.
- To him the embryo sac was, therefore, a sort of ~~nidus~~ or incubator within which the ~~end of the pollen tube was nourished~~ to give rise to the new plantlet.



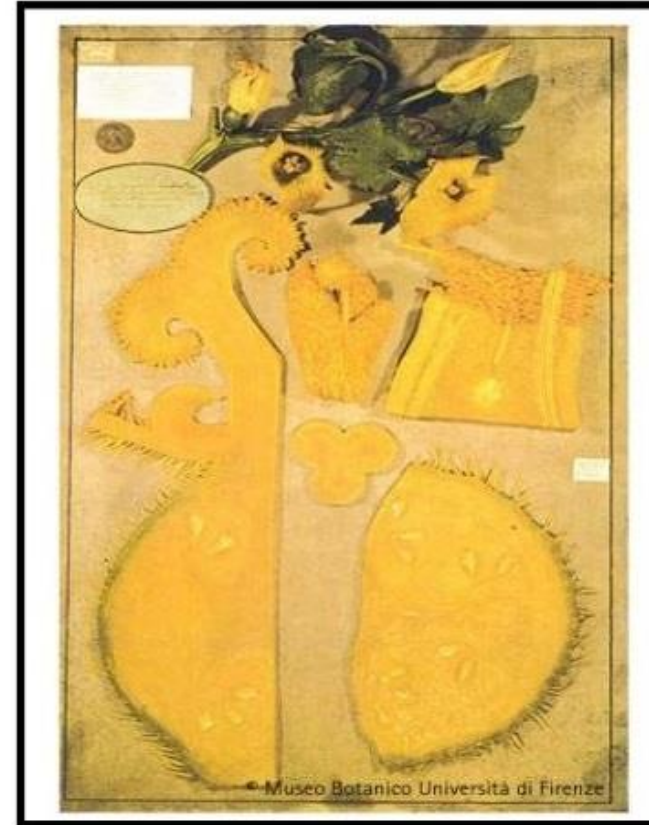
Amici(1842)

- Discovery of the True Relation between the Pollen Tube and the Embryo.
- In a meet at Padua-prove that in *Orchis* the embryo did not arise from the tip of the pollen tube but from a portion of the ovule which was already in existence and was fertilized by the fluid in the tube.



Schleiden (1845)

- ----reply them as meaningless objections.
- He described some fresh observations on *Cucurbita*
- *and* offered to demonstrate complete truth of his own to anyone who visited him.



Fertilisation in *Cucurbita*

Schacht (1849)

- brought out a large monograph- with 26 plates and a considerable number of drawings. These were beautifully executed, but in every case he mistook the egg cell for the tip of the pollen tube.

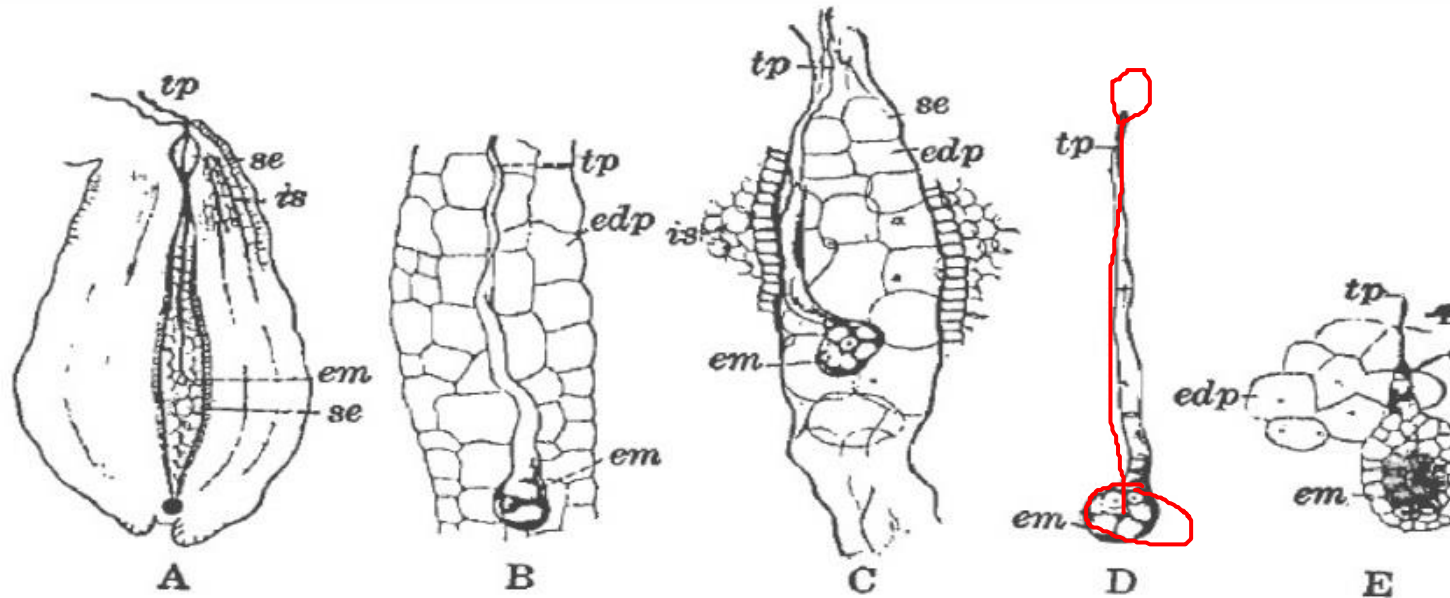
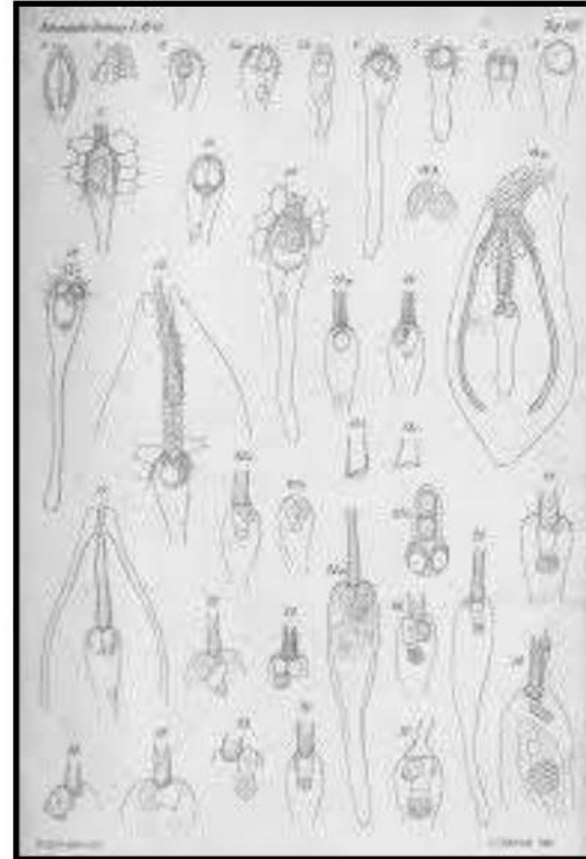


FIG. 6. The so-called development of embryo from pollen tube in *Martynia lutea* (*tp* = pollen tube; *em* = embryo; *edp* = endosperm; *is* = integument; *se* = embryo sac). A, l.s. ovule. B-D, stages in development of "pollen-tube embryo." E, older embryo, together with a few of the surrounding endosperm cells. (After Schacht, 1850.)

Wilhelm Hofmeister (1849)

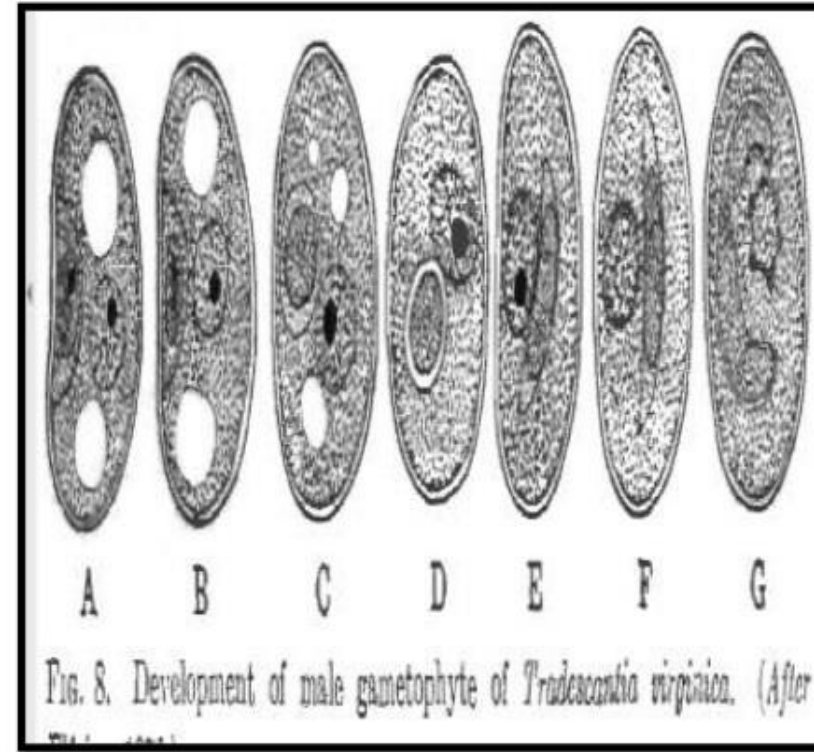
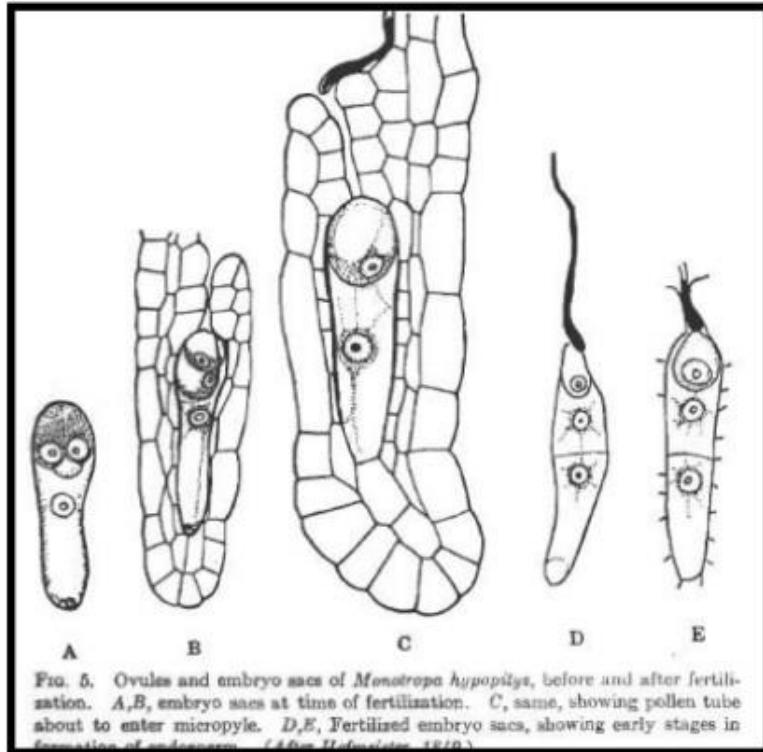


- Published his observations on 38 species belonging to 19 genera of angiosperms
- showed that in every case the embryo originated from a preexisting cell in the embryo sac and not from the pollen tube.
- **Thus, ended the fierce controversies between Schleiden and his opponents.**



Hofmeister (1848)

- Discovery of the Nature and Development of Male and Female Gametophytes.
- Development of Ovules and embryo sacs of *Monotropa hypopitys*.
- Development of male gametophyte of *Tradescantia virginica*.



Hofmeister (1848)

- the process of tetrad formation in *Tradescantia*.

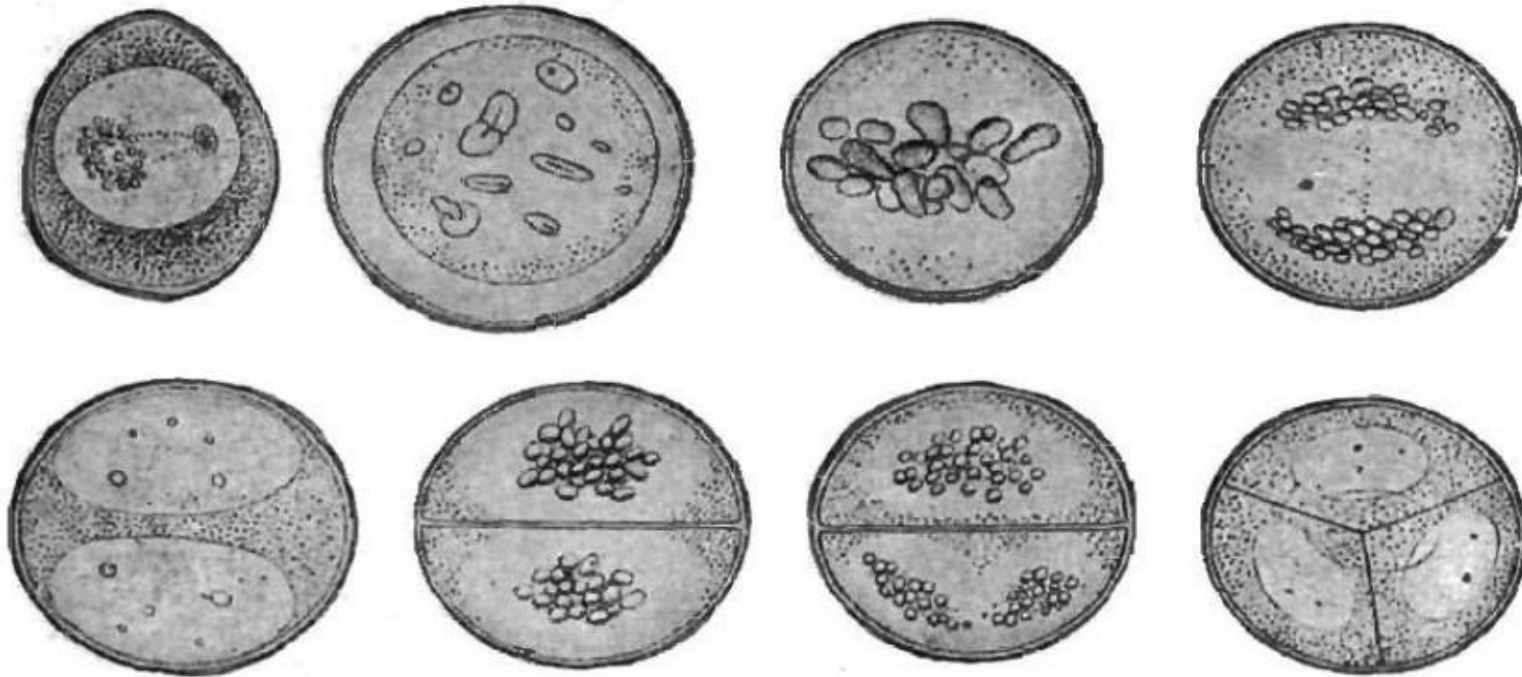
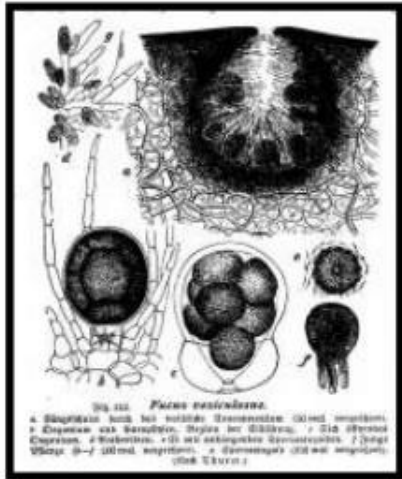


FIG. 7. Stages in formation of microspore tetrads in *Tradescantia*. (After Hofmeister, 1848; reproduced from Sharp, 1943.)

A red line graph on a white background. The line starts at a medium height on the left, dips down to a minimum point, and then rises steadily to a higher point on the right. The line is slightly jagged, suggesting it might be a hand-drawn or digitized line.

- Dis

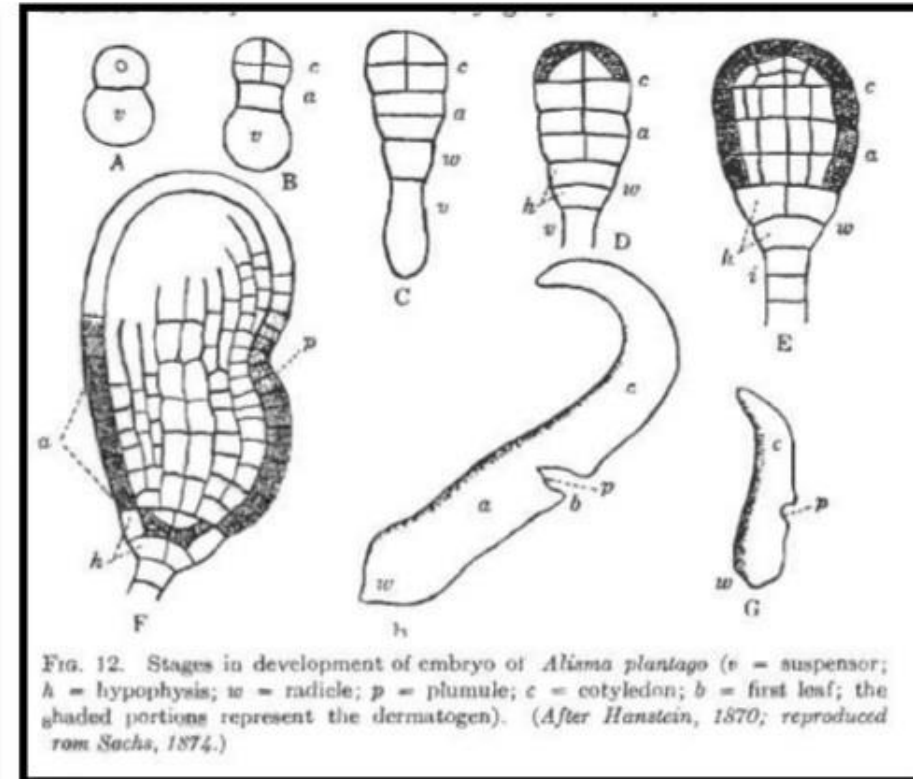
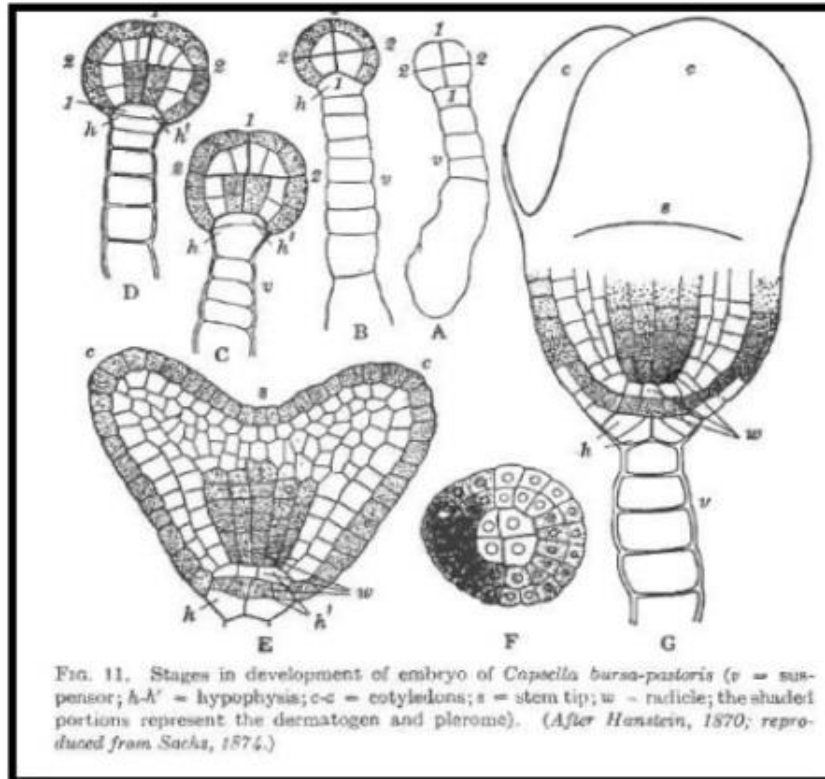




Hanstein (1870)

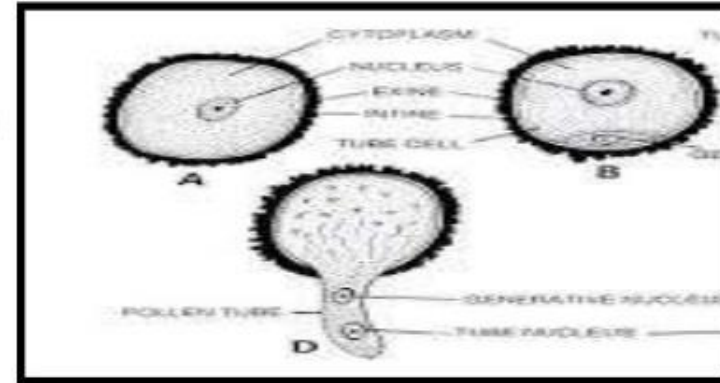
- Discovery of the Embryo.

- was the first to follow the sequence of early divisions in the development of the embryo.
- He gave a detailed description of the embryogeny in Capsella and Alisma.

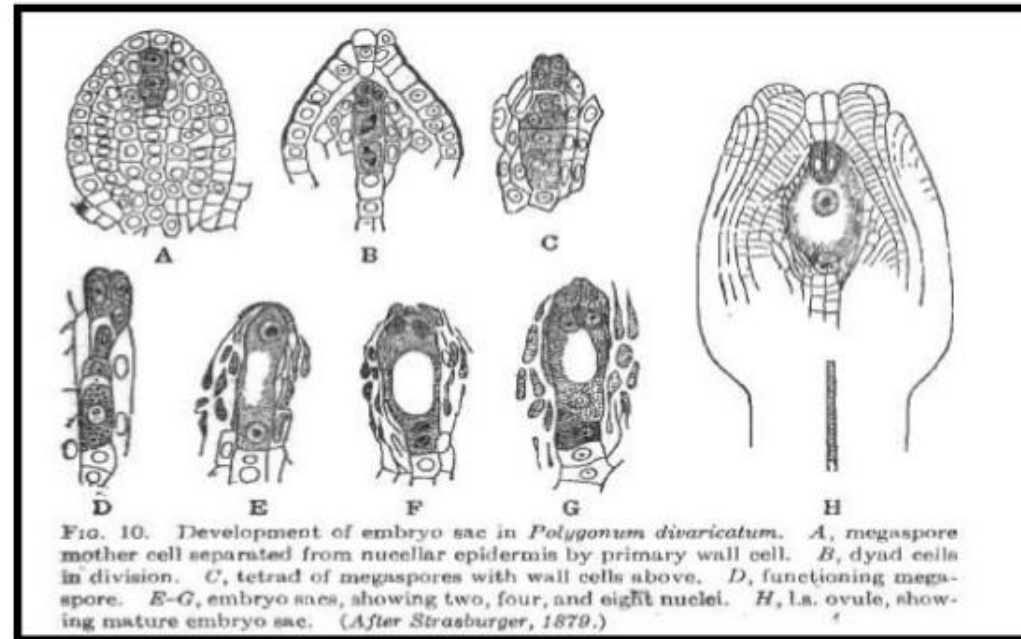


Edward Strasburger(1877)

- 1884-demonstrated the wide spread occurrence of the binucleate condition in pollen grains.

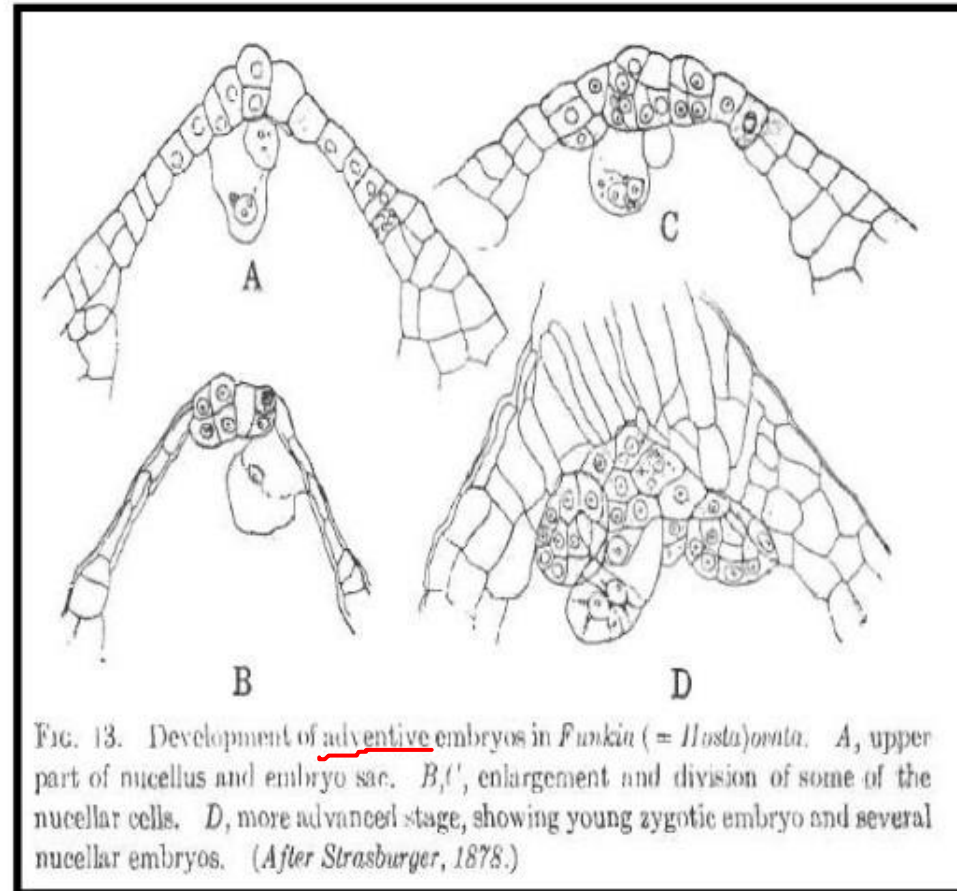


- Worked out organization of the embryo sac in *Polygonum divaricatum*.



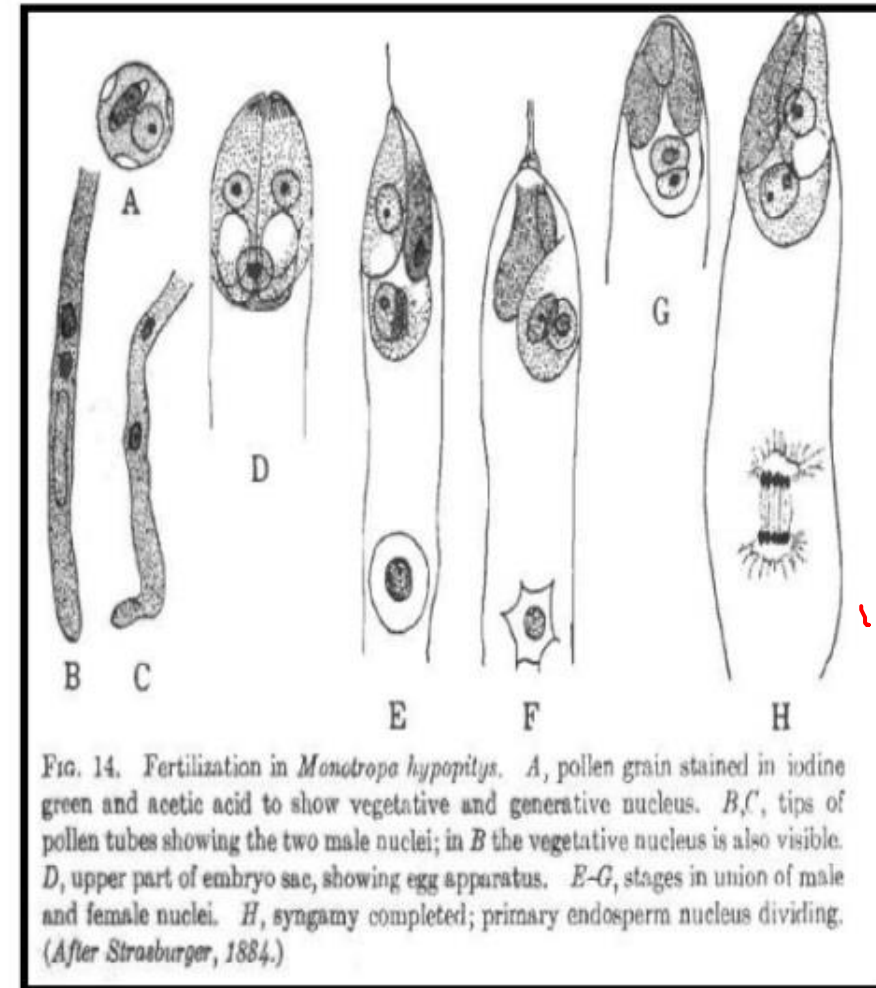
Strasburger (1878)

- demonstrated for the first time that
in *Funkia* (= *Hosta*) *ovata*,
Coelebogyne (= *Alchornea*)
lilicifolia,
Nothoscordum jragrans, and
Citrus aurantium, the nucellar
cells lying close to the apex of
the embryo sac become richly
protoplasmic and divide to
form small groups of cells
which project into the cavity of
the embryo sac and grow into
embryo.



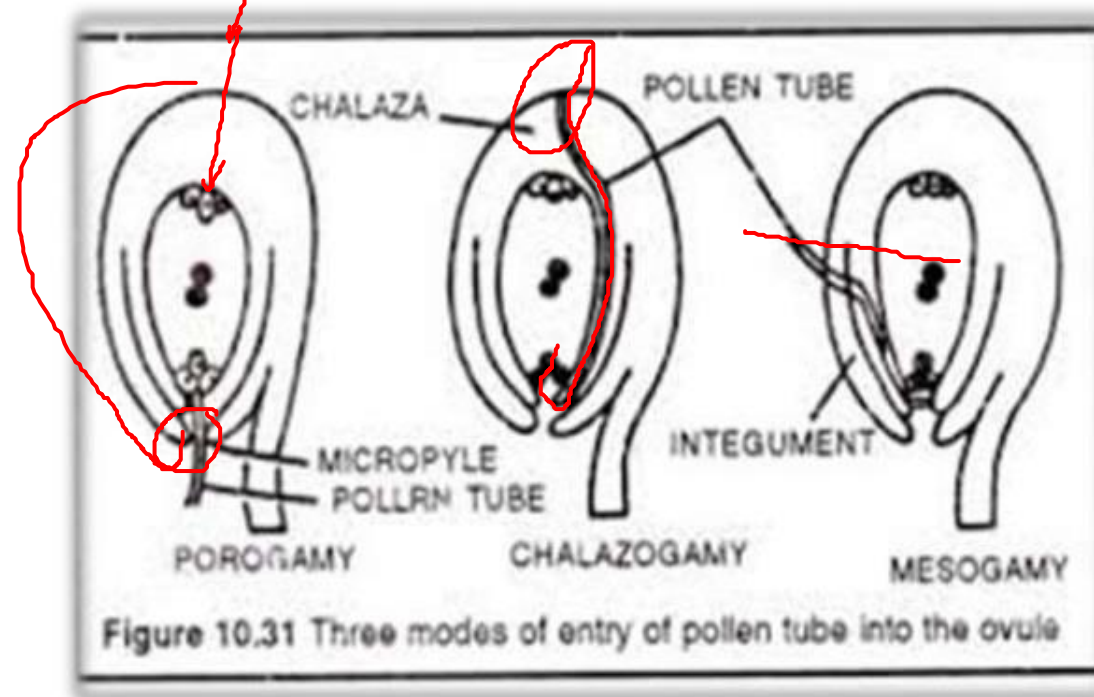
Strasburger (1884)

- Discovery of SYNGAMY
- Paper entitled --
"Neue Untersuchungen über den
Befruchtungsvorgang bei den
Pflanzen" --
----syngamy in *Monotropa hypopitys*.
- 1887-demonstrated --development of
embryo sac from the megaspore
mother cell cells.
- The synergids regarded as modified
structures assisting in the process of
fertilization.



Melchior Treub(1897)

- The phenomenon of chalazogamy
- reported that in Casuarina pollen tube enters through the chalaza .
- Later investigations showed that there is no uniformity in the mode of entry of the pollen tube into the embryo sac.

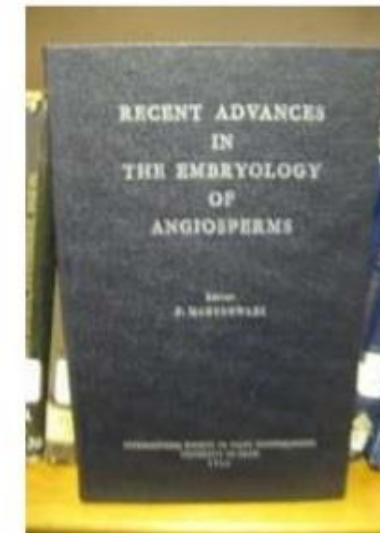
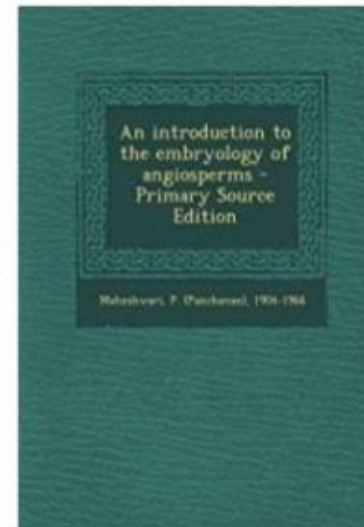


50s of 20th century

- India took lead in embryology

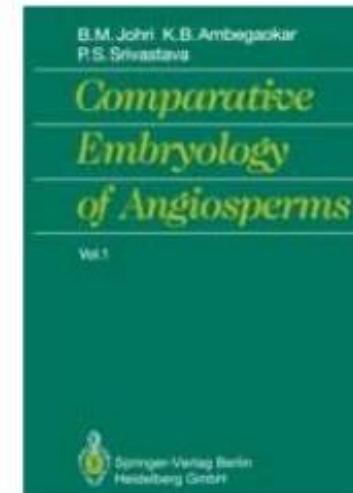
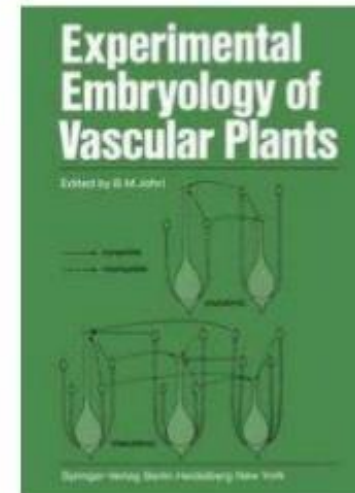
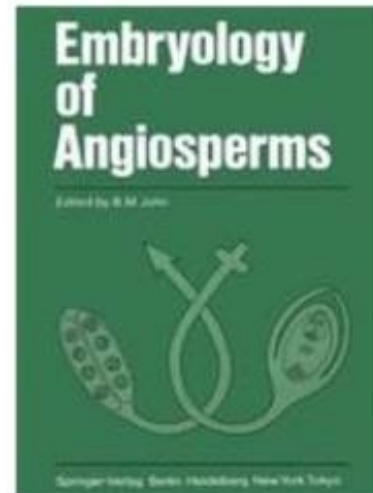
PANCHANAN MAHESHWARI

- **1950** -Book "An Introduction To The Embryology Of Angiosperms") is an masterly exposition.
- Followed by an edited volume (1963) "Recent Advances in the Embryology Of Angiosperms".



Brij Mohan Johri

- (1982)-“Embryology Of Angiosperms”.
- -(1984)-
“Experimental Embryology Of Angiosperms”.
- -(1992)-Comparative Embryology Of Angiosperms”.



PRESENT

- **General plant embryology** explains-
the basic laws of the origin and development of generative and embryological structures
(sporogenesis, gametogenesis, endospermogenesis, embryogeny, apomixis).
- **Comparative plant embryology** -
studies embryological processes in various species in order to
obtain data for solving problems of systematics and phytogeny.
- **Specialized plant embryology** -
is devoted to the study of embryological processes in
the plants of individual systematic groups.
- **Experimental plant embryology**-
recreates the course of development of plant-organisms in order to
reveal the functional, biochemical, and genetic nature of embryonic
processes.

REFERENCES

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- Johri, B. M. 1984. The embryology of Angiosperms. Springer Verlag.
- Maheshwari, P. 1950. An introduction to the embryology of Angiosperms. McGraw Hill book Co., Inc., NY .

