Penuim margaritaceum
Penuim interruptum
Desmidium aptogium
Desmidium Baileyi
Bambusina Brebissonii
Amphora Clevia
Gomphonema dichotomum

STUDIES IN POLLEN, V

F. M. ANDREWS, Indiana University

The methods previously reported in these studies on pollen have been improved as the work has been continued. The apparatus mentioned in the writer's fourth paper on this subject showed that the petri-dish method for pollen cultures was very convenient and excelled all others employed. This method was further improved on in the present investigations by using petri dishes, or low crystallizing dishes, of wide diameter. Petri dishes 12 cm. in diameter make possible the arranging and growing of 40 cultures on the under side of a single lid. These cultures were grown either with or without a cover glass, which, however, should be round and small so as to occupy as little space as possible. This arrangement enables one to make an observation ont only of a rather large number of cultures, but it conveniently places them in a small space for rapid comparison, and what is also of great importance surrounds each culture with precisely the same conditions for developing. In order to avoid possible confusion and for ease and convenience of correctly placing the cultures, it is advisable to cover the outside of the lid of the petri dish with a thin layer of paraffin and then, beginning near the periphery and moving toward the center, to make four concentric circles each one cm. apart. Ten radii equidistant from each other should be made across these four concentric circles. At the intersections of the concentric circles and radii the paraffin removed should be restored to a diameter of .5 cm. The figures showing the kind and strength of the ten solutions used should be placed on the peripheral end of the radii and then the paraffined side of the lid dipped for a minute in hydrofluoric acid. On the removal of the paraffin the desired figures and lines are left. It also affords the additional advantage that the peripheral figures serve for each circle of the different cultures under observation. The water used in the bottom of the petri dish, to maintain the necessary conditions of moisture, should be distilled water which has acquired a suitable temperature to avoid condensation. It is advisable to use petri dishes of good clear glass, free from waves, and with closely fitting lids which are provided with shims to prevent any lateral movement of the lid The word "tap water," so generally used, is also employed in these studies. By "tap water," however, as used in these investigations, is to be understood, not water as is available from the pipes in the laboratories, but suitable fresh water as is obtainable from wells or springs in the country and at places where contamination is not possible. Such water should be subjected to inspection and brought to the desired temperature before use. Of the pollen of more than 700 species of plants examined to date, only that of 180 different species germinated and grew to a greater or less extent in both tap water and distilled water. Among these may be mentioned *Trillium nivale* among monocots and *Dicentra canadensis* among dicots, in each of which only one pollen grain in 100 germinated in water. The pollen of 28 other species reacted in the same way. While the pollen of by far the greater number of species showed no germination in water, a good many

other species showed a much greater percentage of germination in water. For illustration, the numbers given for the following named plants will serve as examples and show the wide variance of certain pollens in this respect. Accordingly it was found that only 4 pollen grains in 100 of *Trillium recurvatum* germinated in water, *Amelanchier candensis* 6, *Mitella diphylla* 11, *Asclepias incarnata* 20, *Lilium tigrinum* 30, *Narcissus Tazetta* 35, *Tradescantia virginica* 50 in the sun and 70 in the shade, *Physocarpus opulifolia* 82, *Melilotus alba* and *Caragana arborescens* 90, and *Staphylea trifolia* 98. The number of germinations per hundred in water, as well as the solutions of sugar used, depend of course on the age and state of maturity of the pollen. This is very important in ascertaining the ability of the pollen to grow since the pollen of many plants is apt to be allowed to remain on, or less rarely, in the anther too long. On the other hand one may easily hesitate to gather what may seem to be pollen that is too young. This in some cases is a mistake since the pollen of some plants, as that of *Vaccinium stamineum*, may even germinate in the anther cavity. These points can, in any case of doubt, be determined with certainty only by careful experimentation. Familiarity with the pollen under investigation is essential in order to avoid mistaking foreign pollen for the one desired. Great differences are also shown by the same pollen in the different per cents of sugar. The very large pollen grains of certain species studied either showed no germination or else only a small percentage of germination as in the case of *Iris Germanica; Iris versicolor; Iris sambucina; Iris Florentina; Mirabilis Jalapa; Canna indica; Oxybaphus nyctagineus; Althaea rosea; Gossipium herbaceum; Ipomoea purpurea;* and *Hibiscus esculentus*. On the other hand certain very small grains as those of *Nelumbo lutea* and others showed a large percentage of germination in some of the sugar solutions. Of the genus Trillium 60 pollen grains in 100 of *Trillium erectum* germinated in 40% cane sugar; while in *Trillium recurvatum* the same number germinated in 15% cane sugar; but only 10 in 40% cane sugar. The next largest number of germinations in this genus was in *Trillium undulatum* where 37 in 100 germinated, followed by *Trillium grandiflorum* and *Trillium nivale* in each of which 30 grains in 100 grew, and then *Trillium cernum; Trillium declinatum* and *Trillium sessile* diminishing in the number of germinations per 100 in the order named. While variation in the percentage of germination of pollen grains is to be expected, the above mentioned figures represent the average of the growth of pollen as shown by many experiments. In some plants the quantity of pollen is very small, since *Mirabilis Jalapa* has only about 32 in each anther cavity, while in other plants the number of grains may be many thousand in a single anther cavity. Honey bearing plants have, comparatively speaking, little pollen, while plants without honey have a large amount of pollen. The large amount of pollen on the terminal cyclindrical spike of flowers of *Typha latifolia* and the catkin like masses of scales bearing the stamens of Pinus are well known. While the various parts of many plants have odor, bees seem to be able to detect odor in pollen.

A PRESSURE CELL

F. M. ANDREWS, Indiana University

The purpose of this pressure cell is for the study of entire plants or parts of rather large plants under direct observation and where water pressure of only a few atmospheres are employed. It consists of a base of wood A, 18 cm. long,