BREEDING AND SELECTING RHODODENDRONS AND AZALEAS

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I would like to talk to you today about plant breeding. It is nothing new to many of you. Most of you have done some of it. The question is how successful we are in breeding plants. Some propagators hybridize plants just for pleasure and the possible chance that a marketable seedling will result. Some propagators are more critical and use a system for their hybridization. This, of course, is the best method.

The first step is to write down what is wanted from a cross. Do we want to gain hardiness, compactness, certain foliage color, or improved flower texture?

The next step is to find out all we can about the parent plants we intend to use. This is important. Even though the parent is attractive, recessive undesirable characteristics may appear in its offspring. Therefore, we need to know the origin of the parent plants in order to predict what we may expect from the next generation. Our breeding record is shown in Table 1.

I set out many years ago to try to develop an azalea that would withstand the occasional −29°C (−20°F) temperatures that we experience in northern Ohio. Many of the parents we tried were failures. However, we made one cross that seemed very favorable. We used a very hardy Japanese-Korean azalea, *Rhododendron yedoense* var. *poukhanense,* with an *R. obtusum* × *R. kaempferi* cultivar to give desirable color. We obtained about 200 seedlings from this cross and, of these, only three or four had the improved color and good growth habit we wanted. We took two of these and crossed them with a *R. kaempferi* type of azalea called 'Carmen.' This cross gave us several good choices with large flowers and varying growth habits. We continued working with the offspring from this cross until we got what we wanted — an attractive azalea that could withstand our weather. Years ago we grew all our azaleas in field rows with no protection. This was certainly a test for winter hardiness, and we lost many. We did not mind as long as we had at least a couple that could survive. It was from these few seedlings that we started.

We continued to improve the evergreen azalea until we now have a number of them on the market. But we are not satisfied yet. Now we are working with evergreen azaleas that are hardy and yet can be forced during the winter and used for

Table 1. Breeding record.

CROSS ________	YEAR ____
SEED PARENT NAME ________	
POLLEN PARENT NAME ________	
RESULTS OF CROSS ________	
SEED GERMINATION ________	AMT. SEEDLINGS ____
AMT. TRANSPLANTED IN FLATS ________	IN POTS ____
EVALUATION ________	YEAR ____
HARDINESS ________ GROWTH HABITS, UPRIGHT ____	
BROAD UPRIGHT ____ LOW COMPACT ____	LOOSE ____
FLOWERS: COLOR ____ BLOTCH ____	REVERSE ____
FORMATION: AMT. PETALS ____ SINGLE ____	TRUSS ____
HOSE-IN-HOSE ____ DOUBLE ____ SIZE ____	TEXTURE ____
FOLIAGE SHAPE ____ COLOR ____ SIZE ____	TEXTURE ____
GLOSSY ____ HAIRY ____	FALL, WINTER COLOR ____
HABIT OF GROWTH: GOOD ____ FAIR ____	POOR ____
EVALUATION RESULTS: GOOD ____ FAIR ____	POOR ____
GROW ON FOR FURTHER TESTS ________	ELIMINATE ____

greenhouse culture. We want something that can be used as a permanent gift, not one that will freeze as many greenhouse azaleas do. We do have a number now that are being used for forcing for Easter.

As we worked further, we became interested in deciduous azaleas. We had been growing *R. molle* for a number of years. However, we found that growers were losing interest in plants of this type because of *Botrytis* and other fungus problems. We had a number of deciduous azaleas from Europe and found we had some that looked very promising. Several were almost free of *Botrytis*. We used these to do our breeding and discovered the disease-free characteristic will pass on to the seedlings. We are now developing them for the truss-type flowers as many of these are loosely flowered around the plant. Some of these seedlings have very large flowers in a wide range of colors. These characteristics will make deciduous azaleas good items for the garden trade.

Third, a continuous spray program keeps the stock disease-free. And finally, our own records are constantly used as a guideline for improving previous methods.

We have also been involved in breeding rhododendrons, whose flower types are shown in Figure 1. Originally we had many growing problems because of the poor type of plants that were available. At first I bought anything that had a nice color. However, not all rhododendrons will grow in all areas. *Rhododendron catawbiense* and *R. maximum* are the only two species that are reliably hardy in our area. We began breeding using these two species and have added others to our program as we went along. We are now working with the *R. yakusimanum* and are getting very good results.

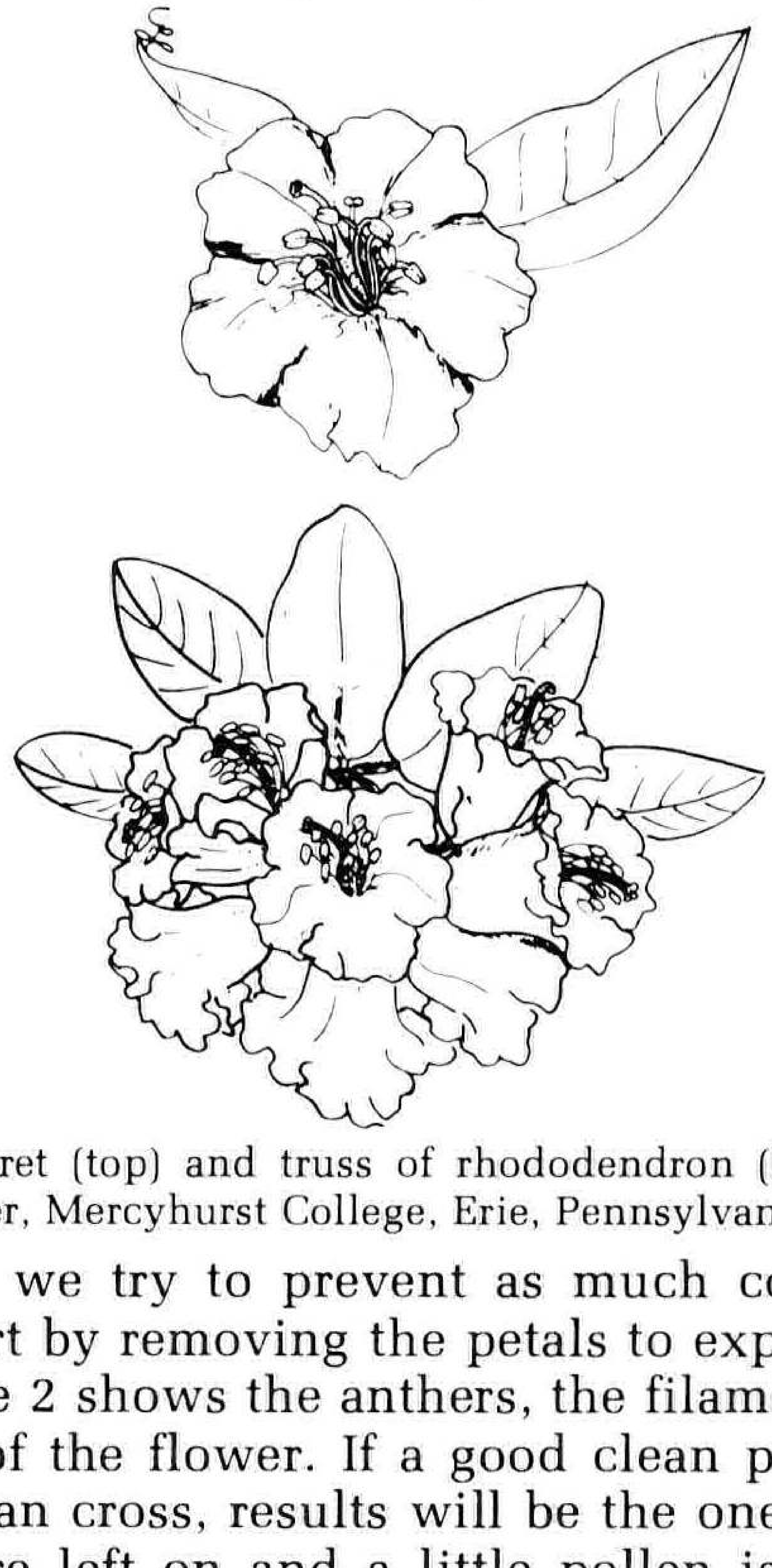

Figure 1. Single floret (top) and truss of rhododendron (below). Drawing by Leslie Eller, Mercyhurst College, Erie, Pennsylvania.

In breeding we try to prevent as much contamination as possible. We start by removing the petals to expose the stamens and pistil. Figure 2 shows the anthers, the filaments, stigma and the other parts of the flower. If a good clean pollen is used to make a good clean cross, results will be the ones desired. However, if petals are left on and a little pollen is dabbed on the pistil, results are unpredictable. We start by removing the petals from an unopened bud, exposing the pistil and the stamens. We then remove the stamens and put the desired pollen on the pistil. The pistil itself attracts no insects, which improves the chances for a clean cross that is free of contamination. Figure 3 shows the pistil developing into a seed pod. An entire seed pod, or capsule, and a cross-section of the seed in the pod are also shown in Figure 3. The process of making the cross is shown in Figure 4.

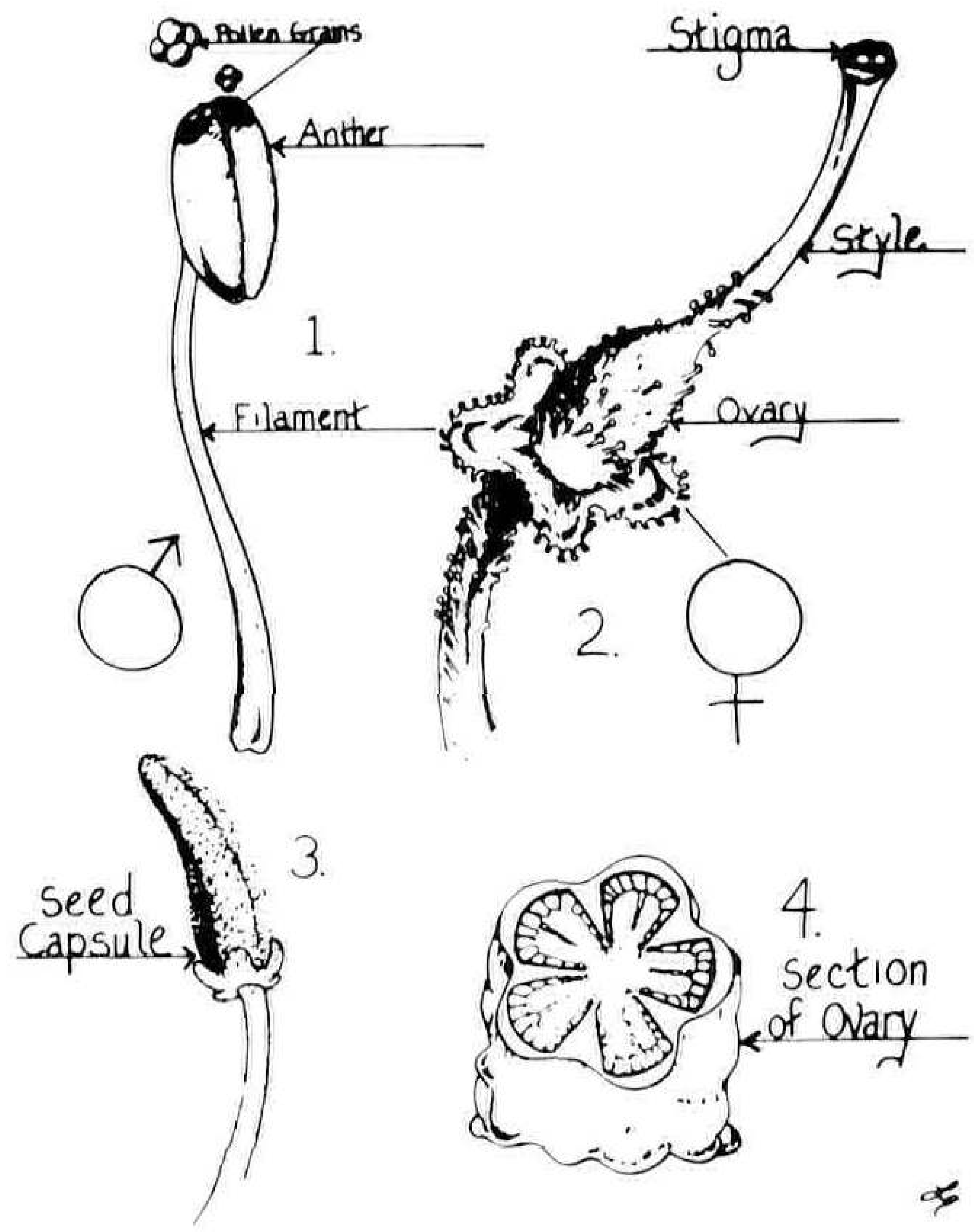

Figure 2. Flower structure of rhododendron showing separate flower parts. Drawing by Leslie Eller, Mercyhurst College, Erie, Pennsylvania.

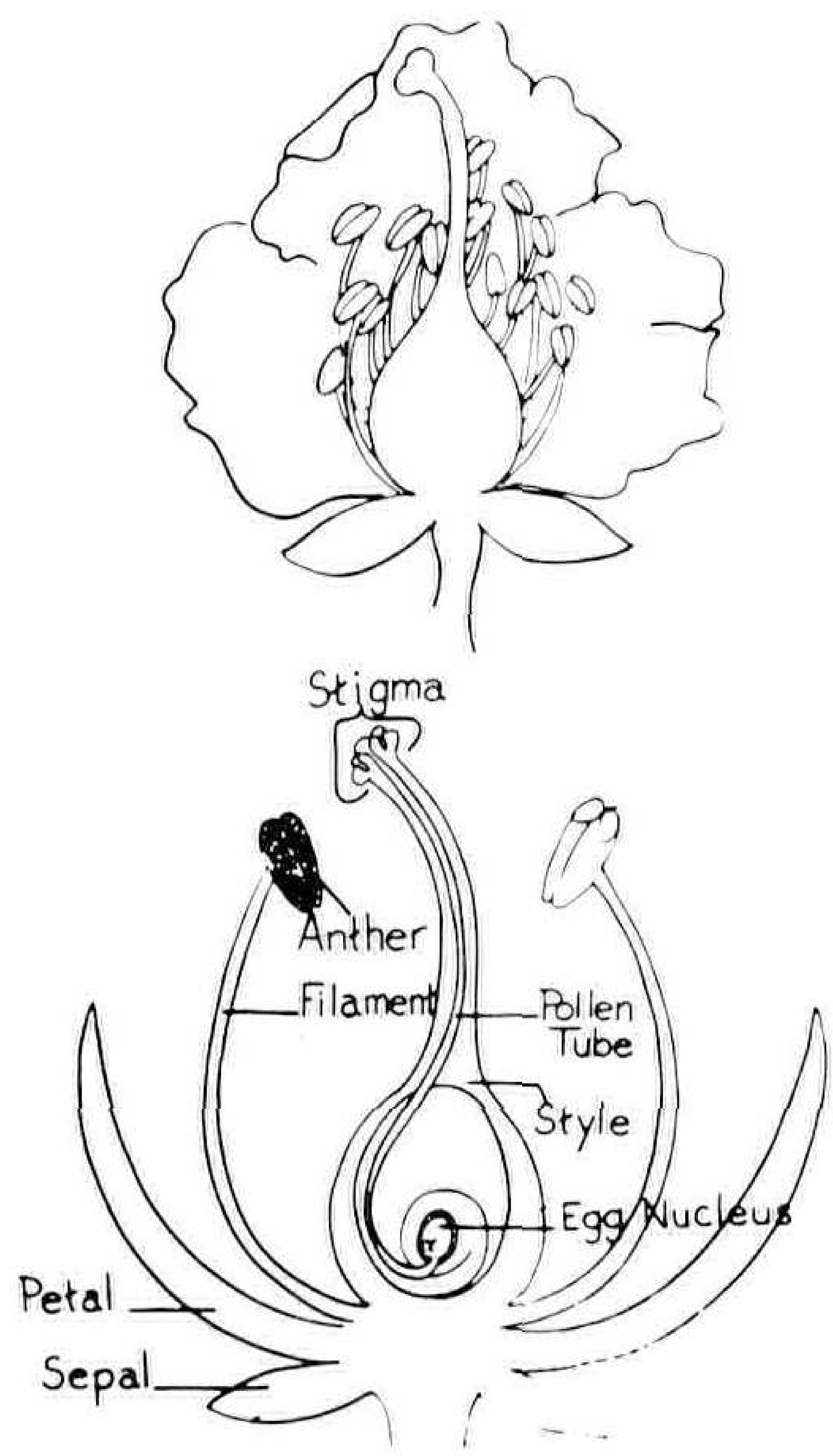

Figure 3. Reproductive parts. Ovary cross-section. Drawing by Leslie Eller, Mercyhurst College, Erie, Pennsylvania.

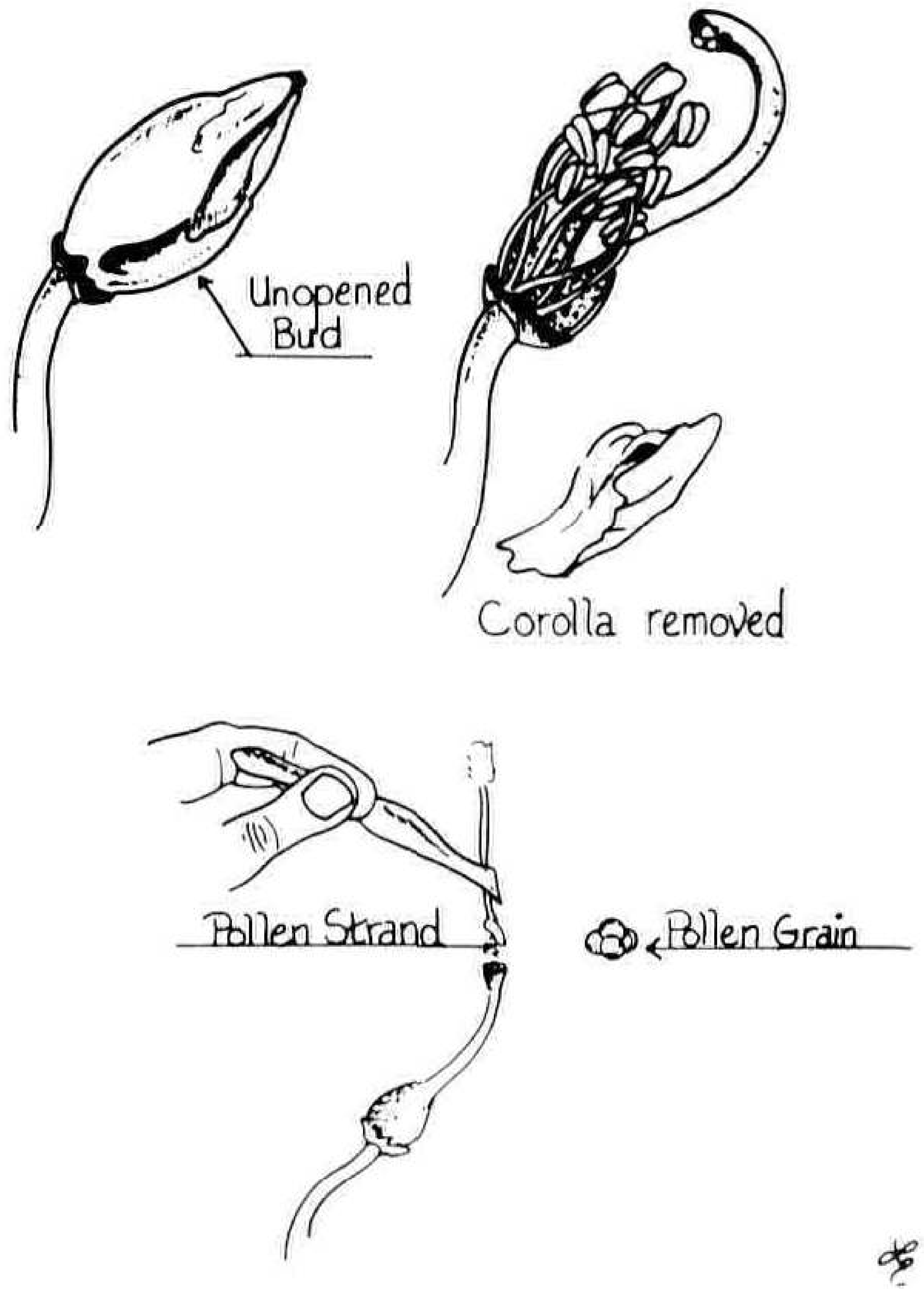

Figure 4. Pollination of pistil; stamens removed. Drawing by Leslie Eller, Mercyhurst College, Erie, Pennsylvania.

The capsules should be harvested while green and then allowed to dry. Seeds are very small and must be planted on top of the planting mixture. They must, of course, be kept moist. We usually have 35 to 50 percent germination. We use a planting board, which we make from fiberglass. There are 280 pins in the board that mark the flat and make it easy to insert the seedlings. To help in handling the tiny plants we use a large pencil painted with nail polish on the end so that the peat moss will not stick. We have been transferring seedlings to beds in the lathhouse in the spring. However, we plan to put everything in pots from now on. We intend to eliminate all field growing.

We have more trouble growing in the beds than we do in pots. We have trouble with bark splitting, especially on the one year plants. It is due to the heavy mulch that we use and the difference in the temperatures in the mulch and the air, which causes this cracking on the stem. In the cans we get very few cracks.

The plants will be in 4-liter containers in two years. We have 55 greenhouses where seedlings are kept. After containerizing they are grown in full sun until fall when they are moved into quonset houses and covered during the winter. Sales usually start in April before it is necessary to move plants back to the field.

This is a summary of the work we are doing with rhododendrons and azaleas. We are constantly changing and attempting to improve our techniques. In closing, I would like again to emphasize the importance of keeping records. It is only on the basis of written information that a logical procedure can be developed.

PROPAGATION IN UNHEATED HOUSES

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Until a few years ago, we though it was necessary to heat every house throughout the cold season. Each house was equipped with a butane-burning Modine heater set at 15.5°C (60°F). Our heating bill during the period of October through March was over $6000 for heating seven houses, a typical expense for our area. With the spiraling cost of operation and equipment, we are always searching for ways to cut costs.

During the fuel shortage of 1976 we decided we must find a method that would produce a crop without requiring so much fuel. Since then we have experimented with houses closed at each end, with houses open at each end, with different soil mixes and with other variations in technique. Although we are not certain exactly why, I can tell you about the methods that have worked for Cottage Hill and perhaps you can adapt these methods to your own operation.

Over the last few years we have developed a heating method for our propagation that has saved us an increasing amount each winter. While this method does not eliminate heat entirely, it cuts our winter gas expense to a fraction of our original cost.

Success in propagation depends on a few basic rules. Cuttings must be taken from disease-free stock. Cleanliness throughout the operation is essential. And certainly we must keep accurate records for both information and comparison with future crops.

At Cottage Hill we take cuttings from young, healthy and vigorous container grown plants. The young plants yield a cutting that will root within a shorter period than a cutting taken from old overgrown stock. Secondly, a continuous spray program keeps the stock disease-free. And finally, our own records are constantly used as a guideline for improving previous methods.

In the past our cuttings were made during the early part of