On Christmas Day, in sight of the Rock of Gibraltar far below we renewed our acquaintance with the clematis, in full flower, clinging to brambles for support. Later we found it growing among the branches of young olive trees. In colour the flowers are deepish primrose yellow with the faintest green flush, up to 2 inches diameter, in stalkless open bells in profusion on the hanging stems. On the higher ground we found only isolated plants; but lower down behind Algeciras, along the "Strada de Toros" — the Road of the Bulls — we found it in greater profusion. We extricated a few roots from among the brambles on the higher ground, and these survived the journey and are flourishing.

Other plants we found growing wild and in flower in late December were a most attractive white *Narcissus tazetta* variety, and *Vinca difformis*. An unlikely plant association was to see a cactus (*Opuntia*) growing out of the middle of the vinca. We were too early for miniature narcissi; but it was sufficient reward to find and bring back two such beautiful plants flowering naturally in mid-winter.

DISCUSSION GROUP REPORTS

I. CUTTING HANDLING

Chairman: David Clark
Speaker. Brian Morgan
Reporter: Paul Labous

The chairman of the group, David Clark, opened the discussion by making reference to the paper given by John Stanley and Ian Baldwin, on "Work Flow and Costings in Propagation" which set the scene for our topic.

Brian Morgan then outlined the main points at which cuttings are handled, as follows:

1. At the stock plant
2. Collection and storage of cuttings
3. Compost mixing and preparation of trays
4. Preparation and insertion (this is the "bottleneck" in the whole system)
5. Transportation to the propagation unit
6. Hygiene, e.g. application of fungicides.

Having identified the "bottleneck" as preparation and insertion of cuttings, Brian Morgan, through A.D.A.S. has developed a system which should be applicable to a wide range of nurseries, to speed up these operations This has led to an

increase of between 20% and 50% in increased throughput, to date.

The essential principle involved in the method is that once the cutting is picked up, it is never put down until it is inserted in the rooting medium, thereby saving time. The cutting material must be roughly prepared prior to this operation, by another, or other, person(s). Stripping and trimming of material is carried out by using either a Stanley model knife, or a Plas-Plug knife. Large spined subjects are trimmed with small secateurs and wounded where necessary with the blade of the tool.

David Clark opened the general discussion by focusing attention on the "bottleneck" in the system, i.e. "preparation and insertion" of cuttings. From this discussion it became obvious that there is considerable variation in the methods employed by nurserymen in this one operation. Twelve members of the discussion group used a "traditional" method, i.e. preparing cuttings separately to the "sticking" process, and nine members used the ADAS technique where preparation and sticking are combined. There is, surprisingly, less variation in the speeds obtained in this operation by different nurserymen. Trevor Price gave the rate of 25,000 cuttings in a 40 hour week with two people preparing and inserting cuttings and one junior collecting material and preparing compost and trays. This is a rate of 312 cuttings/hour. Bill Matthews gave a rate of 10,000 cuttings in a 30 hour week, per person, or 333 cuttings per hour, and Brian Humphrey reported 10,000-12,500 cuttings per person in a 40 hour week, or 250 to 312 cuttings per hour.

Brian Morgan gave the average rates under average conditions which could be achieved by his method, as 666 cuttings per hour for conifers, and up to 1000 cuttings per hour for tip cuttings, e.g. cotoneaster, for preparation and insertion only.

Dr. Phillip Gaut made the point that speed may not be the main criterion, and is it possible that a person working slower may produce a better percentage "take" ultimately than a faster worker? It was the general opinion of the group that slowness often is associated with bad workmanship and that the faster, more skillful worker probably produced a better percentage "take." This point, perhaps, needs further investigation

The discussion then turned to methods of collecting material. There are two main methods by which nurserymen are collecting as follows·

a. cutting large sections of plants and preparing them as cuttings at a later stage at another location

b. taking smaller sections which are more or less the correct size to make the final cutting.

Andre Briant for example, reports that on his nursery, large branches of the stock plant are collected for many shrubs. Material for conifer propagation, however, is collected by taking sections which are about the size of the eventual cutting. John Watts mentioned that sufficient material to produce cuttings is collected at rates of between 450 and 700/hr., the faster rate being from managed stock beds. Generally, it was agreed that the use of stockgrounds would increase the rate at which useful material was collected, although there are exceptions, depending on the species.

Some reference was made to the use of cold stores which prove most beneficial in the handling of cuttings, especially when collection has to be carried out later on in the day when temperatures may be fairly high. The reduction in physiological stresses within the plant may improve rooting, although Brian Morgan mentioned some very recent experimental work which may indicate that cuttings under stress actually root easier.

Time did not allow for an "in depth" discussion on the aspect of transportation of inserted cuttings to the propagation unit, although it was agreed that the British seed tray was too small a unit and a container about three times its size, holding about 160 tree or shrub cuttings, is probably more suitable.

Finally, the Chairman asked for ideas for future OND projects to be considered for I.P.P.S. student awards.

It was agreed that a project which investigates whether it is necessary to trim softwood or semi-ripe cuttings before insertion would not only be an excellent subject for OND work, but would also give some valuable results for use in the industry.

II HARDWOOD CUTTINGS

Chairman. Bruce Rigby
Speaker· Nat Clayton
Reporter: Mary Helliar

The chairman for this discussion group was Dr. Bruce Rigby, who opened the session with a suggestion that cost cutting in the future might well be achieved by propagating from hardwood cuttings.

Nat Clayton agreed, and said that for him the value of hardwood cuttings was as a simple system for one-year production where the main ingredients for success are:

1. quality of the wood
2. soil that can be worked in winter
3. irrigation

He went on to describe his system, which was to begin collecting and making cuttings as soon as there was some spare time in his winter work programme. He used a bandsaw to cut the wood into 6″ lengths, and bundles of 25 were plunged in sand. Cuttings were prepared from early winter and lined out from February as soil conditions permitted. No hormones were used, but any doubtful cuttings were discarded at planting. This reduced field failures and increased the percentage of saleable plants.

Nat lines out up to 90,000 cuttings per acre in slits made by discs following dunging and deep ploughing of the land. Once all lining out is finished Simazine is applied at 1 to 1½ lb (a.i.) per acre. He had also tried trifluralin with reasonable success. In late June a 12.18:18 compound fertilizer was used as a top dressing. Initially the usual range of *Sambucus*, *Salix*, *Populus*, etc. was grown, but now new lines are tried each year and, among recent successes, were deciduous viburnums and rods of *Salix aegyptiaca* chip-budded with Kilmarnock willow. However, some subjects were not so ready to root, and these were given two weeks in peat on a heated bed before being put outside. Nat's experience raised discussion on several aspects, all related to deciduous species.

First was the physiological aspect, the time to take hardwood cuttings. Work on fruit rootstocks at East Malling Research Station had shown a distinct regenerative curve, on which there were two points when the roots appear fastest and the resultant growth is best. These two periods are (1), at leaf fall, and (2) at early bud break. Garner's early work correlated rootability with a soil temperature above 45°F at 9 to 12″ depth. Philip Macmillan-Browse pointed out that leaf fall on modern vigorous stock hedges would be later, and suggested taking cuttings slightly earlier than natural leaf fall.

At present there is no explanation why rooting is better at these two specific periods, and seasonal variation, even day to day variation, frequently occurs. It is particularly obvious in fruit, where early leafing types such as quince and plum root best from autumn cuttings. Results with apple are better from cuttings taken in spring.

Generally a similar pattern is seen in ornamental lines, but most subjects root much more easily than fruit stocks. Even in the "depression period" on a regenerative curve, cuttings still root but take longer to do so.

Heinz Clasen reported that in Germany several hundred hectares of hardwood cuttings are grown in Schleswig-Holstein, and all material is collected before Christmas and cold stored until there is time to cut and prepare it in January and

February. If the cuttings cannot be stuck immediately they are kept in polythene bags in a cold store until spring.

Mention of cold storage drew other accounts of low temperature effects on rooting. Nick Dunn reported better results this year when apple cuttings, prepared and dipped in December, had been given two months cold storage before being put in heated bins Dr. Lamb at Kinsealy, similarly, had good rooting of blueberries after low temperature treatment. Heinz Clasen cited another case where *Hibiscus* cut and prepared before Christmas had been a total failure, but when cold-stored at 0.5°C until July there was 100% success.

Both Dr. Richard Harrison-Murray and David Whalley were sceptical of these results as they had tried this in their research with variable results, both among genera and from year to year. It was suggested that rootability might depend on the length of the previous growing season.

The relationship between temperature and root and shoot development drew more comment from Dr. Garner, who pointed out that roots have no dormant period, and given adequate temperature and physical conditions they will grow. Buds on shoots, however, have an inbuilt chilling requirement and, however much bottom heat is given they will not develop until they received the minimum amount of chilling. Dr. Keith Loach thought that the failure to develop shoot growth was sometimes due to insufficient carbohydrates and there was a need to produce leaves quickly that could photosynthesise.

Establishment in the field was not discussed in any depth, but Robin Currie felt that results were often affected by soil temperature and weather after insertion in the field. The main reason for deep insertion in the soil was to prevent desiccation of the cutting; however depth can be varied to determine single or multi-shoot development of the plant.

Another topic covered briefly was the possibility of using polythene mulches through which cuttings could be pushed, as Long Ashton Research Station had recommended. The problem was one of lifting, a degradable plastic is needed, but a suitable one may soon be coming on the U K. market

The following items were added in discussion: the uptake of rooting hormones by woody cuttings is better from liquid than powder formulations, "partial blanching" of *Corylus* and *Acer* stock plants at East Malling Research Station had met with some success; the difficulty sometimes encountered in rooting *Platanus* may be due to clonal variation of the hybrid (Forestry Commission work) and finally, on the subject of herbicides, Ronstar had been successfully used on *Salix* and *Populus*, and Devrinol (napropamide) incorporated into the soil

in a trial had given good results, but not when it had only been sprayed on the surface.

III. TRAINING ON THE NURSERY

Chairman: Tom Wood
Speaker: Mike Dunnett
Reporter: Leslie Morgan

Tom Wood started our discussion on the subject of training on the nursery in his role as Chairman, outlining some of his ideas about training. He then introduced Mike Dunnett, our Speaker. He put forward the following opinions and questions.

1. What are we training for?
2. We should be aiming for value for money.
3. Rates of work for trainees.
4. The role of the I.P.P.S. in training.

As for the first point raised by Mike, there were several ideas such as, an easier life for the management, motivation of the individual, and increased production.

It was felt that the second point made by Mike about value for money had been seen over the past twenty years with the increased efficiency in the nursery industry. Part of the reason for this must be training, but there is still room for improvement.

As for point three — rates of work for trainees. This was the most contentious problem as there are so many different methods and individual speeds of work involved when setting rates for the different jobs but it was felt that some rates should still be set. There were also some interesting comments on the proficiency test itself, such as is it really only for general workmen, as it only involves set tasks such as planting cuttings There was a suggestion that there should be a more advanced proficiency test involving timing of cuttings and the more technical work involved in propagation. Another point brought out at the meeting was the problem of validating improvements in our apprentices.

IAN BALDWIN: There seems to be no easy answer to this problem as it involves more work for the management as there is a need for more records on each apprentice.

TOM WOOD: Debriefing after block release may also help in validating improvement in apprentices, since it shows management interest in the individual.

As for the last point raised by Mike, a majority of members of the discussion group thought that the I.P.P.S., as a body of professional men, should put pressure on the P.T. Council, and should take a lead to formulate a policy for members to

determine standard rates for the different jobs performed by apprentices.

MARGARET SCOTT promised to send out a circular to members to get figures for propagation. It is hoped we will be able to get a good percentage of members replying to the circular It was also thought that an I.P.P.S. workshop should be held to iron out some of the further problems involved with training. One of the major problems for the Society will be to gain recognition by the official body involved with craftsmen's education so we have to apply as much pressure as possible.

QUESTIONS AND ANSWERS

1. *Cutting Handling*

N CLAYTON. The Training Board proposed a course on the ADAS handling of cuttings technique and response was so great we had to do two courses on the nursery. To see how effective the technique was we time people for the first 15 minutes doing their own method, and the last 15 minutes of the day using the new technique. Figures bear out those discussed since, in the first 15 minutes, rates varied from 17 to 61 cuttings inserted and, by the end of the course, had improved to 37 to 72. The best improvements were achieved by people who had not worked with cuttings before.

M DUNNETT Was the conclusion of the group that the traditional methods of cutting preparation should be abandoned immediately in favour of doubling output from the new method, or were other factors involved?

P. LABOUS: The new method saved time in that cuttings were not being double handled and has set a target to aim for

B. HUMPHREY: In some cases it is not practical to insert cuttings at preparation. Some growers prefer to fill and stack trays for transport to the propagation unit, and cuttings are taken there after preparation. The overall picture will vary with nursery layout and management, and box filling, cutting preparation and insertion need careful consideration. While the ADAS technique has produced a standard to aim for, it must not be taken out of context of the nursery management

2. *Hardwood Cuttings*

B HUMPHREY. A comment on London plane tree (*Platanus* × *acerifolia*) which, in fact, is a complex of clones resulting from a cross of P. *orientalis* and P. *occidentalis*. The Forestry Commission has been doing a study of the London plane for the Department of Environment and have identified a complete range of clones from those of almost pure *P. orientalis* in origin to those of almost pure *P. occidentalis*. It is quite clear that the higher the level of P. *occidentalis* genes in the

clone, the more easily it roots. The clone most common in the trade is one called 'Pyramidalis' which has a very strong P. *occidentalis* component and is the easiest clone to root. Unfortunately it is perhaps the worst clone for suckering, poor bark, and susceptibility to *Anthracnose*. So we have, unwittingly, selected out in the trade the easiest to root but the worst for performance.

L. DICK: You seem to use Simazine successfully with hardwood cuttings. Some literature suggests its use will result in cutting death

N. CLAYTON: We have been using Simazine now for 6 years with no problems, but it is not applied until the cuttings have settled and are beginning to move. We use it at 1 lb a.i./ ac.

B. HUMPHREY: We also use Simazine, applying it immediately after inserting the cuttings but at a lower rate or 0.5 lb a.i./ac.

J. EASTMAN: There is evidence to show one needs care in which formulation to use. There has been damage reported from using liquid Simazine rather than the wettable powder.

3. *Training on the Nursery*

B. HUMPHREY: This discussion group has put forward a proposal that the IPPS become more involved in aspects of training. Could they amplify how this might be achieved?

M. DUNNETT: Growers in the West Midlands have been trying to revamp National Proficiency tests for nursery stock. In coordination with four other nursery stock training groups, this has been accomplished and will be presented to the Proficiency Test Board in the future for their consideration on a national basis. The test content therefore has been adequately covered. We have gone out on a limb, however, by trying to put down rates of work speed as well as the quality element as important for the craftsman status. This is a difficult area and a contentious one. In the discussion group it was felt that this was a possible area which IPPS, as a very professional organisation, with practical members could become involved in. It would also be an excellent way for IPPS to become involved, but not too deeply, in the training scene, since there are many other training organisations. However, we felt IPPS should be seeking an identity in training and the work rate field provides the opportunity, particularly as the "cutting handling" Group was discussing just this. What needs further discussion is the "Modus operandi". In the West Midlands it was just practical to get together for discussion, but this is obviously not feasible on a national scale. A survey form was suggested which could be circulated to members. This could be returned to the Com-

mittee for correlation and averages worked out. This could then lead to "Workshop" days based on the findings of the survey. If this was successful, those recommendations could then be sent on to the National Proficiency Test Board for consideration. This type of survey would give a broad spectrum of data to work on.

D ROWELL: The effectiveness of a survey depends very much on how it is set out, and there is a service in ADAS which can be consulted on the best way to achieve the aims of a survey

B. HUMPHREY. Would members agree that IPPS should become more involved in this type of political activity?

T WOOD: IPPS in the G.B. & I Region has increased from its small beginnings to a position of having a wealth of experience and information on tap. We are an active Society and need jobs to do, and we are in an industry which needs this type of job done. We established in the Discussion Group that there was a need for this type of information. Training groups are regional, IPPS is national and more than competent to gather this type of information. A survey, if supported by the Membership, would be a powerful means of achieving the objectives and would be of great help to the industry which, after all, we are all involved in.

R FLINT: With the workshop proposal it would be possible to develop and perhaps uprate the propagation proficiency test. Possibly achieving a technician grade test which would involve more decision making activities, such as time of taking cuttings, wounding, hormones, spraying, etc., rather than the purely fundamental test of making cuttings This is a natural extension of the existing test and hopefully could be put forward to the NPTB for consideration in due course.

B. HUMPHREY: The National Proficiency Test Board is a powerful organisation with union backing and it will not be easy to penetrate their rules and regulations. It will be essential for us to set our own house in order, so to speak, and have a firm concensus of opinion based on the survey technique if we are to carry the idea on into the political arena. On behalf of the Conference I would like to pass these views and ideas on to the Committee for further action.