

these sheeting was placed directly over the cuttings. It is removed and shaken at regular intervals to remove the excess condensation. After rooting had taken place, one of the top pair of leaves was removed so as to encourage growth from the auxillary bud. This technique was claimed to produce some excellent results.

Finally, I must say how impressed I was with the excellent quality of nursery stock grown, together with the large quantity of material produced from such a small area. Boskoop being a small intensive area also meant that the nurserymen were able to maintain close liaison with the research station. This unique situation allowed frequent observation of experimental work and rapid application of promising results. In general, it is difficult to give a comparison of production between Boskoop and ourselves, as circumstances are very different, but I do feel a great deal of benefit can be derived from the observations of many of the propagating techniques used; in particular, those used for some of the high value lines.

HOW TO KEEP UP-TO-DATE

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First of all, I would like to say how very much I have enjoyed listening to the other speakers today. Each of them has discussed a particular aspect of the science of plant propagation in which he is virtually a specialist. An immense amount of experimentation has been necessary to adapt the results of pure research to practical and commercial technique. One of the most fascinating sidelines in scientific information work can be to look through the published work on a particular crop — such as chrysanthemums — over a period of years and to realize how the use of aids such as plant growth substances, soilless composts, virus-free material and precision equipment for controlling day length and temperature have taken so much of the uncertainty out of raising plants. New developments take place so quickly that one always has an uneasy feeling that one may be missing something of importance or ceasing to be in touch with the latest work; also there sometimes seems to be a great gulf between the writer of a research paper with his plot replications and computerized data and the man who wants to know, perhaps, what is the best time of year to root cuttings of his new rhododendron which might be a best-seller.

I think that the 4 most important ways of getting information are these:

1. Make full use of the advisory services.
2. Read the growers' journals.

3. Visit research stations and horticultural institutes and go to "refresher courses" whenever time permits.
4. Take an interest in original work.

I will now try to enlarge a little on each of these.

First, the National Agricultural Advisory Service exists to advise growers on the scientific, technical and business aspects of commercial horticulture. Its staff carry out experiments and investigations, often based on the results of less directly applied scientific research, and adapt the findings to local conditions. In other words, the N.A.A.S. acts as a bridge between the primary research worker and the grower. It is in touch with numerous sources of technical information overseas as well as in this country and specialists are available to advise on problems of plant disease, glasshouse management and so on. The Experimental Horticulture Stations in the different regions hold frequent open days and local growers, who know the particular problems of their area, serve on their advisory committees. Reports, bulletins and leaflets are all produced for the grower. The N.A.A.S. also serves to tell the scientist what *you* want to know — so be sure you make your needs known.

2. Growers' and trade journals. You will be familiar with your own journals and perhaps you might be interested to see some examples of their counterparts in other countries. A few examples are displayed here for you to look at. The articles they contain range from accounts of research work to practical observations by growers. Horticultural journalism has many styles and the most useful articles are those that give hard facts, not theories. Some very useful contacts can be made through correspondence in trade journals. It often comes as a surprise to see that someone else has just the same problems as you and the angle from which he has tackled it may stimulate you to put your comments in print or give you fresh ideas.

3. Take advantage of any opportunity you can grasp to visit research stations, horticultural institutes and colleges and demonstrations of new techniques. Visits to nurseries and holdings can be most rewarding; nowadays, the old fear of giving away your trade secrets if another grower crosses your doorstep is rapidly disappearing. This is quite obvious after listening to today's speakers. Even a busman's holiday can be fun; if you go abroad it is well worth visiting the local research station or horticultural trade exhibition. It is surprising and often rather humiliating to discover how many people understand English; when I was on holiday last year I had a conversation with an apple grower in a Swiss mountain village while his 10-year-old daughter acted as our interpreter where necessary and I saw on his bookshelf a handbook on grafting — written in English by a Mr. Garner. So, you see, they like to keep up-to-date too!

4. The last method of obtaining information, by reading

original work, is the one which perhaps I find the most interesting as I am working in what is known as information science. The results of research are published in various types of journal. Some, for example *Experimental Horticulture*, are aimed at the adviser; annual reports such as those from East Malling Research Station or the Glasshouse Crops Research Institute may also include a summary of work which is of particular interest to the growers. Still other papers may only be found in erudite journals such as *Nature* or *Plant Physiology* and sometimes these do not have immediate practical application. Scientific papers normally follow a standard pattern. They consist of an introduction (giving the background information), details of the experimental methods used, the results and a discussion of the findings; a bibliography provides details of related research. The important thing is not to be alarmed by the mass of data in the middle; the results and the discussion of the results by the writer are what matter most and it is as well to remember that negative results are often as valuable as positive ones. This is not always so, of course; I once saw an article (which I hasten to add was never published) which covered many sheets of paper and described in detail all the complicated treatments applied to the crop under investigation. Having read this with mounting interest I found it a sad anticlimax when the author admitted that, due to circumstances beyond his control, the plants were eaten one morning by pigs and that he was therefore not able to comment on the actual results of his work. Obviously the papers you will want to read are not like that one.

The next point is, how can one obtain them? If you find a reference to some work that you would like to see in the original, your local librarian can help. There are national inter-library lending systems linking branch and county libraries to central sources, and if you ask your librarian for an application form he will obtain the journal or publication for you, free of charge. It is just possible that the journal, perhaps an overseas one, is not normally available on loan; in this case you can get photocopies, inexpensively, through your librarian from the National Reference Library of Science and Invention (formerly the Patents Office) in London. The Commonwealth Bureau of Horticulture at East Malling, where I work, can also supply photocopies of original papers which have been abstracted in its journal *Horticultural Abstracts*. You might even be able to obtain a reprint from the author himself if you write to him.

You may probably wonder how a horticultural scientist keeps up-to-date; he, like, you, is also suffering from a surfeit of literature, and abstract journals can provide him with condensed information at regular intervals. Information services for research workers exist in most countries. *Horticultural Abstracts* (H.A.) is intended for the research worker and

adviser but many others make use of it. It is available in most main libraries, as for instance in the Kent County Library at Maidstone. You will have seen on display here the quarterly numbers of *H. T.* for 1968 which together make up the annual volume, and also an example of the 5-year cumulative index. It takes between 3 and 6 months from the time we receive the papers for abstracting to the time the abstract appears in print. We receive work from all over the world in many languages; our staff can read most of these languages, although Hebrew and Finnish have us foxed at present. When a rough survey was made of those abstracts concerned with plant propagation in the 1967 volume of *H.A.* it was found that less than 10% of the papers came from sources in the United Kingdom and Ireland. Nearly a quarter came from the U.S.A. and a tenth from the U.S.S.R. Holland supplied just under 10% (which may surprise you since we tend to hear a great deal about Dutch research work). The first volume of *H. A.* was published in 1940; it contained abstracts of 428 papers. The 1968 volume contained 8,823 abstracts. The output of scientific literature has been estimated to increase by about 10% per year, which is a terrifying thought; a bound volume of *H.A.* is no light weight!

The Commonwealth Agricultural Bureaux, which publish *Horticultural Abstracts*, form a group of Bureaux and Institutes covering all aspects of agricultural science; these include entomology, forestry, mycology, plant breeding and genetics, and soils as well as animal husbandry. We publish 19 abstract journals and one primary journal. We are subsidized very heavily by Commonwealth countries and the Republic of Ireland and this makes it possible for us to sell the journals at below cost price. Readers in the contributing countries are allowed a further discount on the cost of all but one of the journals. We distribute about 60% of our publications to foreign countries, however.

At my Bureau, in addition to the journal *H.A.*, we publish at intervals reviews formerly known as Technical Communications or Digests and now as Research Reviews. There are a few examples of these on display here. One Digest published in 1959, which some of you may own or have seen in libraries, is now out-of-print; it was compiled by Miss P. Rowe-Dutton and the subject was mist propagation of Cuttings. The names of many of the authors whose work is cited will be familiar to most of you; they include Dr. C. E. Hess, Mr. H. F. Welch, Mr. R. J. Garner and Mr. J. S. Wells. The amount of work they alone have carried out and published in the last 8 years would occupy a book and I am most interested to know that Mr. Welch has in fact just written one. Very often a scientist writes to us for a list of references on a particular subject; he may be working in isolation somewhere, perhaps in the tropics, and wants to know what has already been published. We then prepare what is known as a bibliography for him; this supplies auth-

ors, titles and sources of articles and sometimes some very brief notes summarizing the content of each article. We use the index to *Horticultural Abstracts* to obtain most of our information and this subject index (produced annually) is the key to all our work. Its preparation, it has rightly been said, "requires a greater degree of technical skill and scientific knowledge than almost any other type of work undertaken by the Bureau". Every 5 years we produce a cumulative index; the last was issued in 1966 and you can see a copy on display. Perhaps from this abstracting may sound a dull, mechanical occupation. However, each of us at the Bureau has a particular interest (we are either botanists or horticulturists) and is responsible for abstracting from journals in one or more languages. Even though the rapid scanning of articles and papers is the daily routine, sooner or later you begin to recognise names and lines of work and you cannot help becoming deeply interested in what a particular worker is doing; last year you may have read of his preliminary experiments and perhaps in a year or two you will see that this methods are being tried out on a larger scale at a research station. Soon a technique — such as, for example, the propagation of strawberry runners under mist — will be accepted in commercial practice and will then be perfected and modified through the work of nurserymen and growers such as yourselves — and it is easy to forget that not so long ago this was a new and startling idea.

It must always be remembered that an abstract is merely a condensed form of information; it can NEVER be a substitute for the original paper. Again, when we prepare our abstracts we are not writing a critical review of the work they concern — merely a summary of what the author himself has stated — and it is up to the reader to make the best use of the information. We have to be strictly impartial in our treatment of published papers; we can indicate in the abstracts whether they contain many data or whether the information is only limited or perhaps presented in the form of a review of other published work, but we cannot give advice on their use. It should also be pointed out that it could be very risky and even financially disastrous for a grower to launch out on a commercial scale using a new technique which he may have read about in a single article in a research journal. Many chemicals, for instance, may not yet have been cleared for use on certain crops. But, by all means, try out new ideas on a small scale; put down your own trials and draw your own conclusions. Personal records and observations can provide an invaluable source of information and good photographs or slides, such as those which Mr. Dummer has shown today, are particularly useful.

To re-cap then, you can always keep up-to-date if you keep in touch with:
the advisory services,

the trade journals,
the research stations, colleges and institutes,
and, if you have time, by reading some of the original research
papers possible with the guidance of an abstract journal.