



As Regius Keeper of the Royal Botanic Garden Edinburgh Professor Stephen Blackmore FRSE leads a world class research institute that is also a major public attraction. With living plants from 161 countries and preserved herbarium specimens from 157 countries, RBGE is a truly international organization carrying out active projects in over 40 countries. He is a passionate believer in engaging the public with the major environmental challenges of our times and to this end RBGE is developing the John Hope Gateway, a £15.7M centre currently under construction. Before joining the Natural History Museum in London in 1980, he lived and worked as a botanist in the Seychelles and Malawi. He was Keeper of Botany at the NHM from 1990 until 1999, when he moved to Edinburgh. He holds Honorary Professorships at the Universities of Edinburgh and Glasgow and at the Chinese Academy of Sciences Kunming Institute of Botany. He serves on the Boards of Botanic Gardens Conservation International, Edinburgh College of Art, the Little

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SIBBALDIA GUEST ESSAY

KEEP OR COMPOST? WHY THERE MUST BE LIFE AFTER RESEARCH FOR LIVING COLLECTIONS

Stephen Blackmore¹

The value of precious metals and gems such as diamonds and gold tends to reflect their scarcity as natural resources rather than how useful they are for practical purposes. Whether ornamental or utilitarian, their value is universally accepted and used to define values in the global market place. Plants, in contrast, are not greatly valued by society despite the enormous value of the ecosystem services they provide. Even botanic gardens sometimes regard plant accessions in their living collections as disposable once they have fulfilled their purpose. This raises an interesting question about how hard botanic gardens should work to keep all of the accessions in their living collections alive, even after they have fulfilled some particular purpose, such as use in research. Should they be kept or composted?

In 1997 I served as a member of the Science Visiting Group which undertook a peer review of the Royal Botanic Garden Edinburgh (RBGE). At that time the policy, especially for plants cultivated under glass, was to dispose of accessions of particular taxa that had been accumulated for the purposes of research once the research was

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completed, or the specialist taxonomist retired. One example concerned the living collections of Zingiberaceae which had been built up over many years to support the research interest of a particular taxonomist at RBGE. When no longer required for research many of the plants were disposed of, wherever possible by donating them to other gardens who were interested in acquiring them. However, after only a few years RBGE appointed a new Zingiberaceae research worker and the collections of that family began to be built back up again. This practice was justified on the grounds of the high costs associated with maintaining collections under glass. Although these costs are very considerable the policy worried me. Coming, as I did, from a museum background, I was aware of how fiercely museums, libraries and galleries usually resist pressure to remove items from their collections. This resistance often manifests itself as reluctance to dispose of duplicate items from the collection, by selling them, even though doing so would generate much needed financial resources. In the botanic garden context the financial benefits would not come from the sale of plants but rather from a reduction in the costs of managing the collections and the freeing up of space for other new accessions. Given the severe constraints on space, especially under glass, and the high cost of managing living collections the policy was logical, pragmatic and entirely reasonable. The basis of my concern was that it undervalued the plant accessions themselves. Since then, RBGE has revised its Accessions Policy for the living collections, adopting a much more careful approach that recognizes the conservation value of its collections. However, it is still possible for botanic gardens to be rather blasé about the value of their collections.

Why should plant specimens in a living collection be undervalued? Perhaps one reason is that few kinds of living plant can command high market prices. There are, of course, exceptions. These currently include such plants as orchids, succulents, cycads and choice alpines. Tulips and ferns have also attracted extraordinarily high prices at certain times in the past and even today some plants with medicinal properties, whether proven or not, are worth more dead than alive! Another reason for undervaluing plant accessions is the apparent ease with which they can be replaced given that botanic gardens generally share and exchange material freely. It is indeed fortunate that new plants can be propagated so much more readily than base metals can be converted into gold, despite the best efforts of alchemists over the centuries.

Even though many plants can often be multiplied quite readily there are good reasons for holding on to accessions once they have been acquired. Now that we are beginning to recognize the extent to which global biodiversity is threatened, the importance of specimens in *ex situ* collections has increased enormously. It is interesting to reflect that even in recent years, during the drafting of the *Global Strategy for Plant Conservation*, there were voices against *ex situ* conservation within botanic gardens. For many years it had been argued that the preservation of thriving populations of a species *in situ*, in its natural habitat, was the only worthy goal of conservation. Plants that survived only in botanic gardens represented failure to conserve and not success. Admirable though this attitude might seem in principle it is unfortunately clear that, far too frequently, it will

prove to be unrealistic. It is very obvious in all regions of the world that we are losing plants from the wild and that in many cases local extinction if not complete extinction is the likely fate of many plant species. We know that this will have direct consequences for other organisms that depend on those particular plants. An exclusive focus on *in situ* conservation might make sense in an otherwise stable world where protected areas might provide a permanent safe haven. We now know that we are not living in such a stable world and it is timely to revise our attitudes to the fundamental goals of conservation and our collections policies. Climate change will redraw the vegetation map of the world. It will cause the disappearance of familiar plant assemblages and the emergence of new ones, reflecting the differential ability of species to adapt or disperse. In the face of the great uncertainties posed by climate change, conservation must necessarily include both *in situ* and *ex situ* strategies. Whilst extinction will always be the worst possible outcome, the ultimate extermination of a species, we need to recognize and be concerned about the debilitating effects of the progressive erosion of biodiversity. Plants that were once abundant and widespread often become rare or restricted in range in the modern, highly-dissected landscapes of today. As plants become rarer, even before their status registers as threatened, their genetic diversity may decline, making them less adaptable to the changing environments of the future. Whilst we lack a simple index, like the price of gold, by which to measure it, I consider that scarcity in nature increases the value of living plant accessions in botanic gardens. It is likely that we will have a steadily growing number of plants that are extinct in the wild and only survive in the *ex situ* collections of botanic gardens. It is not surprising, therefore, that many botanic gardens are changing their attitudes towards their collections, seeing them as potential source material for reintroduction programmes. This alone is a good argument for holding on to collections rather than disposing of them. Just as concerns were often expressed in the past about *ex situ* conservation in botanic gardens, so too there are concerns about reintroduction programmes based on material from botanic gardens. Essentially the anxieties reflect the fact that ideally plants used to boost or re-establish wild populations should have the same genetic diversity as the original population. These concerns are valid and the simplest way of accommodating them has generally been to make sure that source material for reintroduction programmes is of local provenance. Does this mean that *ex situ* accessions in botanic gardens should not be used for reintroductions? Not necessarily. Firstly, it helps if a range of different wild-origin accessions are available in botanic gardens as potential source material. With the exception of clonal plants, there are no true duplicates in living collections. Each individual accession differs in its genetic makeup. Increasingly, the collections held in botanic gardens strive to reflect the diversity found in wild populations in nature. This, in itself, is a challenge. It is necessary first to document the diversity that exists in nature then to devise a strategy for sampling it before bringing it into cultivation where space is almost always severely constrained. This is another reason for each garden to hold on to its accessions, even if plenty of other gardens list the same species in their collection. Secondly, reintroduction programmes into botanic gardens in the country or region of origin are also important,

even if the plant material is not suitable for transfer onwards into the wild. Finally, as climate change progressively reshapes natural environments we may reach a time when any material of a key species of plant is better for reintroduction than none at all.

Whether we reach that point or not it makes sense to strive to increase the representation and diversity of the *ex situ* collection in botanic gardens for conservation purposes. After all, the investment made in building collections up is considerable and it is increasingly apparent that botanic gardens hold irreplaceable collections. They are irreplaceable because of extinctions or simply the scarcity of plants in the wild and the restrictions that may exist in collecting from shrinking populations of threatened plants. Keeping what we already have, rather than composting it, seems a sound approach.