herbarium vouchers kept. It is probable that many anomalies in the phytochemical and cytological literature are attributable to misidentifications like these.

The preserved specimen is the only object to which data and information, current and future, applies. Preserving only the information on a specimen label would preserve only the presumed identity of the taxon. Clifford *et al.* maintain that living material can be substituted for dried collections. This is nonsense: first, it may not be possible to re-collect the species in the field, and second, comprehensive dried collections from the total distribution range give a far better idea of a species' variability than limited live collections. Further, large, living plant collections would take up expensive greenhouse space and garden facilities. So what money would have been saved?

What stability there is in the classification system is there because the material is available for restudy, fresh material is added from remaining populations, and newer techniques are applied to gather more data. This enhances the scientific value of the material that has been studied as it bears the determinavits (identification labels) of generations of revisers and links it to their and other scientists' publications.

The science of plant biogeography, which depends on the accurate identification of plants and a knowledge of where they were collected, would cease to be a viable discipline if herbarium holdings were destroyed. The demise of biogeography would make it difficult to reconstruct past climates given that many plants are sensitive trackers of climatic change. An important tool for the study of global warming would no longer be available. A similar case could be made for lichens, which are valuable in monitoring atmospheric pollution, and algae, which can monitor water pollution.

The literature-based taxonomic system proposed by Clifford *et al.*, which decides, for example, nomenclature priority on published descriptions and not type specimens, is unworkable. A specimen allows renewed interpretation and description; a published description is only one person's, sometimes prejudiced, interpretation.

The importance of making both type specimens and associated herbarium material available for study is shown by the example of the legume species *Astragalus setiferus*. If only the type specimen had been preserved we would probably not know, as we do now, that this species actually belongs to *Cornulaca* in the Chenopodiaceae. It was the critical study of more complete later collections that enabled the species to be correctly placed. There is also the problem of taxonomic uncertainty, best illustrated by the publication in the 1890s of four different classifications of the tribe Asclepiadeae (Asclepiadaceae). Any reassessment of these differing classifications will have to be based on a study of the same material.

The preservation of well-curated plant specimens in dried or liquid state in herbaria is an essential and basic scientific goal. If there is "massive duplication" that exists for some taxa in some large herbaria then there seems to be a good case to distribute that valuable material more equitably around the globe. Although some large European and US herbaria may be "creaking at the seams", many countries in the Southern Hemisphere do not have a national collection of preserved plants. In such countries, naming is often done by matching against the limited collections in universities and government departments. Despite this, the naming service is probably one of the most important taxonomic services provided to farmers, doctors, hospitals, herbicide companies, gardeners, foresters, environmentalists, conservationists, entomologists, mammalogists, ethnobotanists and ecologists in developing countries.

The real issue at stake is not that herbaria are overcrowded, or that scientific fashion seems to render herbarium taxonomy redundant or that it will be made superfluous by molecular systematics. Rather, it is that although politicians scarcely question the national and regional preservation of cultural artefacts, they fail to understand the real economic significance of the natural 'artwork' of the world, often the resources for manufactured resources. Herbaria are arks of biological diversity, which should be be esteemed for their immense aesthetic, intellectual and scientific contribution to the broader communities they serve, rather than be pulled down and their contents and expertise thrown to the winds.

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SIR—The Commentary by Clifford *et al.* is irresponsible and thoughtless. The authors say that accurate identification of taxa is of prime importance to most biological research, but they devalue the importance of herbarium specimens (except type specimens) as the basis for all botanical classification. Herbaria contain evidence of where a plant occurred and how its appearance varied over time and space, providing physical and biological parameters of the history, biology and relationships of the taxon. It is impossible to obtain these data other than by examining herbarium specimens. As the plants of the world disappear, herbaria will become a primary means of studying and understanding the principles that govern the fate of those that are left.

Type specimens of species names are essential to fix their position in the nomenclatural system. But they are not necessarily typical of the morphological variation of a species. To be an effective tool for research, a herbarium must contain a geographical and morphological range of each species.

As new methodologies revolutionize taxonomy, herbarium material is re-examined to produce up-to-date classifications. The suggestions by Clifford *et al.* that plants can be re-collected ignores the fact that in many cases the original plant populations no longer exist or have been significantly changed. Moreover, the preserved specimens obviate the need to re-collect rarities, and re-collection is often costly or impracticable. With modern technologies, herbarium seeds have been used to resurrect species extinct in the wild. Many published descriptions are inadequate: a specimen is worth a thousand words. A recent study of the Australian Orchidaceae, for example, revealed that many of the names of the Australian orchids were misapplied by people who had relied on descriptions rather than referring to the original specimens.

We regard our herbaria as the most valuable asset in our broad-based research programmes. In studies of diversity, cytology, plant chemistry, agriculture, forestry and medicine, herbaria are the most cost-effective method of encompassing variation. Improvements in our knowledge depend to a large extent on the quality and selection of materials collected since the previous revision; this applies particularly to unexplored regions. Herbaria, therefore, must grow. The cost of maintaining specimens as part of a broader research programme is relatively small.

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