

CHAPTER 5

physical curation

*He had read...that the process of
arranging one's thoughts
in good order was often helped by an
equally careful
ordering of external objects.*

—A. Wilson

A wooden herbarium cupboard with specimens in folders.

Physical curation involves the preparation of herbarium specimens and their handling, storage, and conservation within the herbarium. Methods for specimen storage are based on certain conventions, but have been customised around the world by many different herbaria. Consequently, numerous methods are practised. The methods outlined in this chapter highlight what we see as the most practical and efficient systems for curating a specimen collection.

Storing specimens

Groups of specimens are stored in species covers, which are in turn stored in genus covers.

Species covers

For species covers, firm acid-free paper is used. When folded in half, the cover should be slightly larger than a mounting sheet (550 mm × 420 mm unfolded).

The taxon number (obtained from a revision or Flora), species name, and author should be written in pencil on the outside of the cover, in the bottom right-hand corner. It can be useful to include distribution information on the species cover.

Information pertaining to the species, such as copies of references, notes on similar species, distinguishing characters and uses, common names, photographs, maps, and magazine articles, is best

kept in its own species cover, marked “Notes” or “Literature” at the beginning of each species. A separate file at the beginning of a family or genus can be used to store information about that family or genus.

Genus covers
Strong folders are used for holding a few species covers containing specimens. It is best to use thin card or



Genus cover showing genus name, numbers and geographical area at the bottom.



Specimens and folders.

thick paper, acid-free, slightly larger than a mounting sheet when folded (570 mm × 430 mm unfolded) with a central spine (two folds 1 cm apart). The genus name and number should be written in permanent ink; species names are written in pencil, because they are more subject to change. The genus and species names, numbers, and geographical area labels are usually placed at the bottom, which makes it easier to search through a pile in the cupboard without having to pull the pile out completely. Colour-coded hanging tags make it easier to distinguish different regions (or countries).

Type covers

Type covers indicate the presence of type specimens. Even if the specimen is a photograph or a fragment of a type, it should be placed in a type cover. Strong acid-free paper is folded in a special way to ensure better protection and to keep the specimen from falling out when the cover is handled. To make the cover conspicuous, a coloured band (by convention red) is printed or marked along the bottom edge.

TIP

Write the genus and species names at the bottom of the back outside cover for specimens stored on the top shelf of tall cupboards, so that they can be read from below.

guidelines for handling specimens

- When working with specimens, take **all** specimens from a shelf.
- Place a card with your name in the pigeonhole so that other workers know where specimens are.
- Keep cupboard doors closed to prevent insects and dust from entering.
- Never write on a specimen's main label; if writing on the mounting sheet, use pencil and keep it to the minimum.
- Specimens should always be kept horizontal and flat and must never be bent; hold both sides of the sheet when handling specimens; when carrying specimens, place them on a sheet of cardboard.
- Never shuffle specimens as the edges of sheets may cut underlying specimens.
- Look through specimens by stacking and unstacking each specimen individually with the plant facing up. Do not page through specimens like pages in a book, or stack specimens with the plant facing downwards.
- Never rest an object on a specimen.
- Specimens can be damaged by sunlight, dust, wind, and moisture, and should always be protected when not in use. If specimens are left out of a cupboard, they must be covered with a cardboard sheet.
- When storing specimens, do not pack them tightly onto one shelf; do not overfill genus and species covers.
- When replacing specimens in the cupboard, make sure the sheets are all aligned, as protruding edges may be damaged.

TIP

This page can be photocopied and handed out to visitors for instructions on how one expects them to handle specimen collections.

Write the details in archival ink on the bottom right of the cover, stating kind of type, name of taxon, reference for publication of the type, collector and collector's number, family number and genus number (where applicable). Locality—at least country—can also be useful. For more information on types, see “Type specimens”.

Labelling specimens

Labels are very important parts of herbarium specimens and should be thoroughly glued down to prevent tearing.

The following kinds of labels are used on specimens:

- **Main label:** The basic data label, specifying essential information, is placed at the bottom right hand side of the mounting board.
- **Original field label:** Usually placed at top left hand side of the mounting sheet. Any tags used by the collector are mounted with the specimen.
- **Nomenclature labels:** Placed as close to the main label as possible, in the nearest available space. If no space is available, it can be glued on one side only with the label over the plant (preferably not obscuring taxonomically important characters, such as flowers, or the base of the plant). These labels include the following:
 - **Det.** (*determinavit* = determined) or **Conf.** (*confirmavit* = confirmed) labels give the date and name of the plant and

Det. 20	Conf. 20.....			
Cited as..... in..... by.....	Collected for the National Cancer Institute			
SHEET I	SHEET II	SHEET III	SHEET IV	HERB. HORT. BOT. REG. KEW.
TYPE SPECIMEN	ISOTYPE	HOLOTYPE	LECTOTYPE	

Various types of labels.



Type cover and specimen.

person who did the identification or confirmed the name. Duplicates of such specimens, not seen by the person who identified the original, should be labelled with the words “ex num.” (*ex numero* = from the number), meaning another specimen with this number was identified.

- **Cited or Quoted labels** record that the specimen has been cited in a publication. Such labels give the plant name, the reference, the author, and date of publication.
- Various small labels with other information are usually placed near the bottom of the sheet. Examples of such labels include the following:
 - Sheet I, II or III where more than one sheet represents a specimen (see page 27 for example)
 - Type specimen
 - Voucher specimen
 - Cross-references to the ancillary collections
 - Notes concerning removal of pollen or other material
 - Quarter-degree grid reference
 - Treatment for insects (type and date)
 - “Flora of Tropical East Africa”, an example of a specimen that forms part of a collection of a particular area.
 - Origin of specimen, for example, “Ex herb. Harare” (*ex herbariom* = from the herbarium)
 - Herbarium name label (can be a part of main label or a stamp)

Producing labels

The following guidelines are useful when creating labels for specimens:

- Use unglazed and acid-free bond paper of good quality.
- Self-adhesive labels such as *Det.* slips or *Cited* as labels should be of archival quality. Ordinary self-adhesive labels fall off after a while, or can become transparent or discoloured. Alternatively, use acid-free paper labels, glued with permanent adhesive such as wood glue or methylcellulose.
- Avoid using correcting fluids on labels, as they are very acidic and can damage the paper over time.
- Labels should preferably be printed or typed. If hand-written, use permanent, waterproof, black ink.
- Photocopies of labels will suffice for duplicates.

Accession numbers

There are various uses of the term accession number. It most commonly refers to the number in a register (usually a book) kept to record all incoming specimens that are incorporated in the herbarium. It can also occasionally refer to the number given when computerising the collection. If there is no register and no collector's number (usually recorded as *s.n.*; *sans numero* = without a number), the specimen can be given a herbarium accession number.

TIP

Laser printer toner is permanent and is of archival quality. Bubble jet and Deskjet ink is NOT waterproof.

Filing specimens

Plant specimens are arranged either systematically or alphabetically; sometimes a combination of the two systems is used. For a comprehensive summary of classification systems, see Brummitt (1992).

Alphabetical arrangement

In an alphabetical arrangement, families, then genera within the families, and finally the species within these genera, are arranged alphabetically. Alphabetical arrangements are seldom used at the family level, sometimes at the genus level, and frequently at the species level. The advantage of an alphabetical system is that it is easy for the non-specialist to find taxa. The disadvantage is that related—and therefore similar—taxa are placed far apart, so that identification by matching becomes more difficult. (A Quick Guide can overcome this disadvantage; see “Quick Guides”.) Errors can also creep in easily; for exam-

ple, a taxon can be filed under an old name as well as under another name, without it being noticed.

Systematic arrangement

Within a systematic arrangement, similar families and genera are placed close to one another, facilitating identification by matching. The two most commonly used systems by which families are arranged, are

- Dalla Torre & Harms. 1900–1907. *Genera Siphonogamarum*. This arrangement is usually referred to as the Englerian system, as *Genera Siphonogamarum* is a numerical arrangement of the system of Engler and Prantl's *Die Natürlichen Pflanzenfamilien*. This is the basis of the system used at PRE.
- Bentham & Hooker. 1862–1883. *Genera Plantarum*. This work is the basis of the system used at Kew.

When a systematic arrangement is used, it can be difficult for the non-specialist to find families and to incorporate new material into the collection, as this requires specialist knowledge and a good reference to the filing system. Another disadvantage is that a major change in the systematic arrangement, resulting from recently published research, can make it necessary to change the physical arrangement of much of the collection.

Further subdivisions

Within both the systematic and alphabetical systems, the specimen arrangement can be subdivided further into major and then minor geographic regions or floristic regions (for example, *Flora zambesiaca* region, *Flora of southern Africa* region). An example of a geographical arrangement is that used at PRE. The major regions used for each genus are FSA (Flora of southern Africa), Tropical Africa (rest of Africa), Indian Ocean Islands, Sub Antarctic Islands, and Extra Africa (rest of the world). Within these, most are subdivided further into countries (for example, Angola, Zambia), or Floras (for example, *Flora zambesiaca*, *Flora of Tropical East Africa*).

Within species, geographical subdivision into province, grid reference, or region is often used. Geographical arrangement facilitates identifying by matching or searching for a specific specimen. In addition, incorrectly identified specimens would stand out if their distribution did not match.

Indexes and cupboard lists

An index makes it easier to work with the collection. If files are arranged systematically, family and genus numbers can be obtained from literature sources such as Dalla Torre & Harms

(1958). For easy reference, make an alphabetical list of the relevant genera and their numbers.

A cupboard list is an alphabetical list of species in each genus, showing their numerical sequence in the collection. The numerical sequence is obtained from a revision or Flora in which the species are arranged phylogenetically and then numbered. The reference to the publication should be included on the list.

How to arrange specimens

1. Sort species into filing order using either systematic (phylogenetic) or alphabetical order.
2. Subspecies, varieties, and formas follow files of the typical subspecies (where the subspecies name repeats the species name).
3. Place specimens named only to genus rank (for example, *Aloe* sp.) in a file marked *spp.* (= plural of species) at the end of the files for that genus.
4. File specimens of doubtful identification at the species level—mark with *cf.* (*confer* = compare), *aff.* (*affinis* = related to, has affinities with, but is not) and *sp. near* before the species name—with the main collection under the species that they most closely resemble.
5. File hybrid specimens in a separate cover, clearly marked as *hybrid*, at the end of one parent, cross-referencing the other parent's file to show that it exists.
6. Mark specimens that are as yet not described with *sp. A*, *sp. B* or *sp. 1*, *sp. 2*, or *sp. = Acocks 2135*. Place those representing the same taxon together in a species cover at the end, just before the main *spp.* files.
7. File naturalised species in the main collection, with the file labelled *Naturalised*.
8. Cultivated taxa can go into a separate cultivated plant collection, or into the main collection in files marked *Cultivated*.
9. Garden escapes (not yet naturalised), exotics, and aliens can be filed in the main collection.
10. Place types at the beginning of the genus to which they belong, in alphabetical order, for easy retrieval and for protection against frequent handling. Alternatively, house types separately from the main collection.

TIP

When filing each specimen, check that it matches the others in the file. Sometimes labels are switched in mounting. Be suspicious of needing a new species cover for one specimen.

TIP

For durability, lists can be placed in plastic bags. Using bags that are not permanently sealed makes later updates easier. Zip-closure bags are useful—they can be opened for adding notes but remain sealed otherwise.

Any new species described after publication and therefore not numbered, are added, in alphabetical order, at the end of the list for the genus.

The most recent synonyms should also be included in the list (in alphabetical order) as follows: the synonym is included in parentheses with an = sign preceding it, followed by the current name for example, (= *A. nitens*) *A. rupestris*.

Attach the list to the cupboard door near the genus, or mount it on a herbarium sheet and file it at the start of the genus.



Quick Guides

A Quick Guide is a reference collection that consists of one representative specimen (rarely more) of each taxon. The Guide is kept separate from the main collection and is an invaluable aid for identification. Even if the main collection is arranged alphabetically, the Quick Guide should be arranged systematically; in this way, similar taxa will be close to each other.

How to compile a Quick Guide

1. Choose either one specimen with “average” characters for each taxon or more if there is a wide variation.
2. File identification information in the first file of the genus. Such information includes keys, distribution information, and notes on important diagnostic characters. Illustrations of the range of variability of characters can also be incorporated. It can also be useful to write the main diagnostic characters and broad locality in pencil on the specimen.
3. Add cupboard lists to the Quick Guide.
4. For extra protection, place each specimen in a plastic bag; Quick Guide specimens are handled much more often than those in the main collection.
5. Don't use rare and type specimens. Photocopy these specimens and use the copies in the Quick Guide.
6. List or obtain photocopies or scanned images of specimens from other herbaria of taxa not represented in the collection, but which could occur in the floristic region dealt with by your herbarium.



A researcher doing a plant identification.

Computerisation

Computers have become indispensable in the modern herbarium and are used to write reports and articles, produce specimen labels, record loans, and to capture and store plant information. They can also be very powerful communication tools through the Internet, e-mail, and the World Wide Web.

Before any herbarium starts to computerise its specimen information, thought should be given to the purpose and long-term maintenance of a database. If the purpose is not clear or there is no long-term commitment to maintain the database, it is better to seek advice on whether computerisation would be of any value.

Information should not be captured indiscriminately. It is important that the database is structured correctly and planned carefully. Communicate with experts and use the correct software.

Advantages

Computerising a herbarium collection has many advantages:

- Computerisation enables the user to access large quantities of data, with the potential to expand analytical research.
- Once computerised, specimen data can be changed or corrected easily.
- It is simple to add additional fields to the database when needs change.
- Herbaria can be managed more effectively with maximum use of botanical information.
- Data can quickly be extracted in different formats to assist researchers and herbarium workers.
- It is a straightforward task to get statistics to aid herbarium management, for example, how many specimens there are in the herbarium or in a specific plant group.
- Distributions of plants are always a very popular output. If either quarter-degree or point data was captured, distribution maps can be produced with little effort using computer software such as ArcView or MAPPIT.
- Other outputs are also possible, for example, a list of species per quarter-degree grid square, a list of species in a genus, a list of plants collected by a specific collector, or a list of plants flowering in a specific period. This information facilitates planning for collecting trips, as it highlights areas and species that are under-collected.

**My computer keeps doing what I tell it to do,
not what I want it to do!**

Disadvantages

There are, however, also a few disadvantages associated with computerisation:

- Keeping up with new technology, maintenance of hardware and software, licensing, and virus protection are costly necessities.
- Staff training is costly and time-consuming.
- The process of computerisation is time-consuming.
- Constant quality control is needed. The information in the database can only be useful if data is captured accurately; therefore, the input and output have to be monitored continually.
- Database maintenance is dependent on long-term commitment from herbarium staff and takes much time.

The PRECIS system

One of the most important components of herbarium computerisation is to capture the label information of all specimens in the herbarium. For this purpose, southern African countries have access to a database system called PRECIS, an acronym for National Herbarium, Pretoria (PRE), Computerised Information System. This database stores information from herbarium specimen labels, thereby maintaining a comprehensive electronic record of the collections in a herbarium. This information is then accessible for manipulation in a variety of ways, such as the generation of maps, specimen labels, and checklists.

The PRECIS database has three components:

- Specimen PRECIS: specimen records and information
- Taxon PRECIS: plant names, with synonyms, and literature references
- Curatorial PRECIS: exchanges, loans, and dispatch lists

The Specimen PRECIS database is used to capture the collector label information of herbarium specimens. Information recorded by the plant collector on the original specimen label, as well as additional information (for example, type and voucher), is stored. This database is now widely used in Africa. An additional feature of the specimen database system is that specimen records entered by a herbarium can be made available to other herbaria using the same system. The database can be ordered from the National Herbarium, Pretoria, along with a manual (Prentice & Arnold 1998) of instructions on how to use PRECIS.

The Taxon PRECIS database stores information on plant taxa, for example, names and synonyms, as well as references to descriptions, treatments and illustrations of taxa. It can be expanded

to include various other sets of information on plant taxa, such as floristic data (flowering times, altitude, habit, habitat, plant height), which is generally coded and searchable, or descriptive data, which is not coded and is searchable on keywords only. Separate datasheets for medicinal, economic, or horticultural uses, for example, can be developed to add to the electronic data set.

The Curatorial PRECIS database keeps track of specimens that are sent out on loan or exchange programmes and specimens submitted for identification.

You can also generate detailed user-specified reports at the family, genus, and taxon levels, or for a single collector. Output constitutes all the information entered for each specimen (such as grid, latitude and longitude, collector's number, and date of collecting). Outputs currently available include listings of grid references for taxa from which computer-generated distribution maps can be produced, using the National Botanical Institute's MAPPIT programme. Draft or final specimen labels for mounting on specimen sheets may also be printed.

Geographical Information Systems

Geographical Information Systems (GIS) technology has the potential to expand the applications of botanical databases through processes such as overlay of collection site data with natural resource and political data. The botanical GIS allows spatial queries, a function that a herbarium database cannot perform independently. It would enable the identification of new areas to search for rare species, based on the occurrence of habitat characteristics matching those of known collection sites. In this way, it could become an important tool in studies of endangered species and conservation efforts (Rhoads & Thompson 1992).

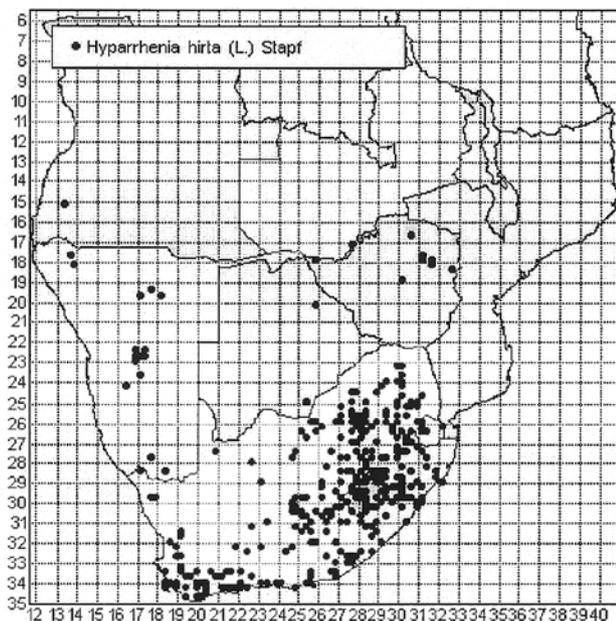
Because of highly variable locality information, there is much botanical data locked into databases that cannot be easily analysed using GIS. When locality is recorded using precise measurements, a variety of maps can be created and it is possible to overlay the distribution data with topographical, geological, or other environmental data. Precise distribution information, for example, decimal degrees, should be attached to computerised

TIP GIS technology enables the user to capture, maintain, update, manipulate, analyse, and display geographically referenced information. A GIS consists of hardware, software, and geographic data.

specimens where possible. Distribution information should be in one of the following formats: grid reference; degrees, minutes and seconds; or decimal degrees. If the specimen label only has a description of the locality, but no latitude–longitude information, a gazetteer or map should be used to find the precise locality. In the PRECIS Specimen Database, the corresponding quarter-degree grid reference is automatically inserted, once the longitude and latitude values have been entered. The quarter-degree grid reference of the specimen locality should only be entered when degrees, minutes and seconds, or decimal degree values are not available.

```
*LEGEND
=Hyparrhenia hirta
(L) Stapf
1713DA
1813BB
1917BC
1917CA
2025BB
2216BD
2216DB
2216DD
2217AD
```

Part of the list of grid references for *Hyparrhenia hirta*.



Distribution map of *Hyparrhenia hirta* generated using MAPPIT.

Data input

The following types of information on herbarium specimens can be computerised:

Locality refers to the exact position of a specimen and is recorded both descriptively and according to the map or grid reference. The closest reference point (such as nearest town or well-known landmark) and the precise locality of the specimen are usually recorded. This information is obtained from maps (1:250,000 or smaller) together with a GPS (Global Positioning System) instrument.

Habitat Information can speed up the process of finding a specific species in the database when used in combination with locality data. It is also useful for locating a rare species that needs monitoring. Habitat information from the database can also be incorporated in publications, as was done in *Grasses of southern Africa* (Gibbs Russell *et al.* 1990).

Collector Information is the most useful way of keeping track of a specimen.

Date of Collection can indicate flowering or fruiting times, because good herbarium material should be fertile (with flowers or fruit). Such information is useful for the timing of field trips, for example, when you need to collect fruit for a genus under revision. Flowering and fruiting times can also be included in a publication.

Collection dates play an important role in conservation work, as they may indicate species that should be considered for a Red Data List or for conservation planning. Possible habitat changes can be inferred from large discrepancies between collecting dates, or when a species appears not to have been collected for a long time. A case in point is *Prionanthium ecklonii*, first collected in 1775, next in 1975, and thereafter only twice in the 1980s, indicating a very rare species that may have disappeared from its former distribution range.

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MAPPIT is a DOS-based programme that converts a list of quarter-degree grids, grids, or point data into a distribution map. Base maps for the entire African continent, as well as many individual African countries, are available. The programme can be obtained from the Database Manager, National Botanical Institute, Private Bag X101, Pretoria 0001, South Africa. A Windows-based version is being developed.

In addition, through analysis of collection dates, the date of introduction and the spread of weeds and other alien species can be determined.

Type Specimen records in herbarium collections give researchers an indication of which herbarium to apply to for the loan of types when doing research.

Data output

Once specimen data has been recorded in a database such as PRECIS, you can generate distribution maps, species lists, and gazetteers from the data.

Distribution maps

A grid reference or map is crucial for each specimen if the data is to be used to create distribution maps. Once this information has been recorded in the database, distribution maps for each taxon can be generated and these have many applications. Maps are like symbols or illustrations; there is no language barrier and information can be interpreted quickly.

Maps can be drawn on a national or regional basis, indicating the number of species or specimens per grid square. In addition to showing each herbarium how its collections are made up, such maps indicate areas that are under-collected and are invaluable in the planning of general collecting field trips.

Maps are also useful when doing identifications: if there is no record of the particular taxon in or near the locality of the specimen under consideration, it may mean the identification is wrong. One can see this at a glance when looking at a map. It can also indicate that the locality given, or the label attached, is incorrect. Points on a map that appear as outliers from the main distribution could mean that a particular specimen has been incorrectly named or encoded; this is useful for quality control of the collection and the information in the database.

In addition, maps are an invaluable source of information to scientists involved in research on specific taxa or groups of plants. For example, when a new species is published, maps are included to show the extent of distribution. Such maps increase the information available on the species being described and show possible geographical links with similar species.

Projects such as Threatened Species Programmes utilise Red Lists and conservation planning lists that also benefit from maps. By analysing distribution maps one can identify candidates that are possibly threatened by looking at the taxa that

appear to have a restricted distribution or a limited number of collections. Maps can be used as the starting point in conservation actions to see which areas may need to be conserved, and provide historical distribution of taxa whose range have become reduced or taxa that have become extinct. Moreover, weed distribution can be monitored through mapping. This helps with control and possible prevention of alien plant invasions, as the distribution maps alert botanists to areas where particular weeds are found.

Gazetteer

The computerised information can also be used to compile a gazetteer of place names by combining grid references and locality names. This can be a valuable product of PRECIS in countries where a gazetteer is not yet available.

Lists

Lists of species per grid can be generated on a national or regional basis. An indication of the biodiversity of an area can be obtained by listing all taxa recorded. Such an area can either be small and local—a National Park, for example—or regional, like the SABONET countries. Such lists can be used as the basis of checklists for collecting trips. Other types of lists include flowering times and collectors' names. Lists can also be generated on request for interested members of the public.

System maintenance

Technology changes at a rapid pace. Staff working with computers should be informed about software and should make a point of learning to use new versions of, for example, a word-processing programme. As new and updated software is required every few years, computers should be upgraded regularly. Components that can be upgraded include the hard disk drive and the motherboard. An extra CD-ROM drive can also be installed. It is therefore unnecessary to purchase new computers every time more advanced software is required.

If expertise is not available in-house, a good relationship with a reputable computer dealer is important as computers have be-

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T Making backups of all the information on your computer is the most important component in system maintenance. Regular monthly back-ups should be adequate. In addition, we recommend that computers are defragmented and optimised regularly using software such as Norton Utilities.

come very specialised and not every herbarium worker has a keen interest in computer hardware.

Loans

One of the services that many herbaria offer is sending out specimens on loan to researchers all over the world. As a scientist, you can also request loans from other herbaria to help you in your work.

Selecting specimens to send out on loan

Unless the person requiring the loan has made special requests, we recommend that you select

- Only fertile material.
- Specimens representing the full range of variation in form, including flowers (both male and female if unisexual) and fruits. Include specimens with coppice shoots and shade forms.
- Specimens representing the full range of distribution: geographical area, altitude, and habitat type.
- Any unusual specimens—they may be hybrids or new species.

Once you have chosen the specimens, check that the herbarium name or stamp, the country, and locality are on every specimen. Also make photocopies of any drawings, letters, or notes that may be useful to the researcher.

Finally, in the herbarium, fill in a summary loan sheet, giving the following details:

- Date on which the loan was sent
- Researcher's name and institution
- Number of specimens of each taxon sent

File this sheet in the first file of each genus, or the family file if many genera are concerned. PRE uses a mounting sheet with a distinctive yellow band at the bottom for such lists. This serves as a record of the loan in the herbarium over and above the official records kept by the despatch office. Its presence will alert workers to specimens being absent and their space will be reserved.

Handling requests for loans

If possible, send all the material that is requested. If the entire collection of a species is requested, however, it is advisable to retain a few representative specimens so that identification services can continue. Some herbaria stipulate that only half the specimens of any one species may be lent at one time. Postage costs may also limit the amount of material being sent to an-

other institution. Remember that any repairs needed should be done before the loan is sent.

Pack the material carefully, with each specimen individually protected by a flimsy. Place a cardboard sheet at the bottom and the top of the pile, as well as between every 20 or so specimens. Strap the pile securely and wrap in waterproof and shock-absorbing material, such as bubble wrap. Place the wrapped pile in a reinforced mailing box to prevent the specimens being squashed and damaged. No more than 100 specimens should be placed in one box. Note type specimens are packed separately and sent via airmail.

A letter to the borrower should state the number of sheets or specimens on loan. In addition, the letter should include the conditions of the loan. Time limits may be imposed, but should not be too stringent—a year is adequate, with the possibility of renewal on request. A condition should be made that loaned specimens be annotated before they are returned, and that they be packaged very carefully to avoid damage in transit. Some herbaria have a policy of never lending types or historically important specimens. In such cases, it is convenient to have photographs of valuable specimens that can be supplied on request.

If the loan is not returned within the required period, send a letter to the loan recipient. When the loan is returned, promptly acknowledge the receipt of the loan and include confirmation of the number of sheets and of their condition. Decontaminate specimens before replacing them in the herbarium.

Requesting loans

If a researcher at your herbarium needs specimens from another herbarium, you can request such specimens on loan. Write a letter of request to the curator, specifying the family, genus, and species of the required specimens, as well as the synonyms under which the material might be filed. Geographic area of interest should also be stated.

Decontaminate the material as soon as it arrives. Examine the specimens for damage in transit to establish that the damage did not occur while the material was in your hands. If repairs are



Don't forget to select specimens from the spp. files (see page 44), since these may contain new species or interesting records that can be correctly named by the researcher.



NATIONAL
BOTANICAL
 INSTITUTE

The Compton Herbarium

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 E-MAIL: beyers@nbict.nbi.ac.za
 WEBSITE: <http://www.nbi.ac.za>

RESEARCH AND SCIENTIFIC SERVICES

CONDITIONS FOR LOAN OF HERBARIUM SPECIMENS

Thank you for requesting our material on loan. We trust that it provides useful data for your research project. All research workers using this loan material are respectfully requested to observe the following conditions:

1. Loans are made only to approved botanical **INSTITUTIONS** and not to individuals, solely for the purpose of monographic and revisionary studies. The loan request should specify the scope of the work and whether material will be removed for anatomy, chemotaxonomy or palynology.
2. Loans are made for a **PERIOD OF 12 MONTHS** and should be returned at the earliest opportunity, preferably in their entirety. **TYPE SPECIMENS** must be returned within **6 MONTHS**. Application for the extension of loans should be made in writing, prior to the expiry date.
3. **LOANS MAY NOT BE TRANSFERRED** from one institution to another. In special cases written permission may be obtained from the Curator. Specimens may not be moved from the premises of the borrowing institute for study (e.g. to private residences).
4. A herbarium specimen is an **ARCHIVAL RECORD** which should be treated in a manner that will conserve it for future study. No existing writing, drawings, photographs, annotations, tickets, labels or determinavit labels already on the sheet may be removed, altered or defaced in any way.
5. Herbarium specimens should be handled with care and should be **STORED** under safe, dry and dust-free conditions in insect-proof cases. Type specimens should remain in their red-bordered covers except during actual examination.

Example letter: Conditions for loan of herbarium specimens.

6. If **DISSECTION AND THE REMOVAL OF PARTS** has been permitted by the Curator, this should be done judiciously. Material may be removed only when there is sufficient quantity to allow this.

If pollen or anatomical samples are removed, a small dated voucher label should be affixed to the sheet stating the purpose for which the sample was removed and by whom the study was undertaken. A duplicate voucher (such as a permanently mounted slide or in the case of electron microscopy, a photograph) could be placed in a labelled envelope attached to the sheet.

7. **ALL SPECIMENS BORROWED MUST BE ANNOTATED BEFORE THEY ARE RETURNED.** Please use small determinavit or confirmavit labels which are printed, typed or written in indelible ink. Commercial adhesive labels are not of archival quality.

When a previous annotation requires no change of name or authorship, the annotation may be in the form of a confirmation.

The annotation label should bear the name of the taxon and its author, the name of the annotator and the date of the annotation.

Specimens that cannot be accurately named, or those belonging to groups other than the ones under consideration, should be annotated as far as possible.

Annotation labels should be affixed so that they do not cover any printing, writing, or material on the sheet.

Labels designating type material should be affixed to all type sheets when these are not already present.

8. **PACKAGING AND POSTAGE REQUIREMENTS FOR RETURN OF LOAN.** Herbarium sheets should be held between boards securely strapped together and surrounded by waterproof and shock-absorbing material and placed in a reinforced mailing box. The box should be securely bound to avoid damage in transit. When returning a loan, local herbaria should register the parcel and overseas herbaria should clearly state that the material is for scientific purposes only with a NIL customs value.
9. Reprints of **PUBLICATIONS** based upon our collections are appreciated and should be addressed to: The Curator, Compton Herbarium, Private Bag X7, Claremont, 7735, Republic of South Africa.

Example letter: Conditions for loan of herbarium specimens (cont.).

.loan no:		File no:		Date:		
03030		12/1/2		02/27/2004		
Sent to:			From:			
The Curator			The Director			
Compton Herbarium			National Botanical Institute			
Kirstenbosch Research Centre			Private Bag X101			
NBI Kirstenbosch			Pretoria, 0001			
Private Bag X7			South Africa			
Claremont						
7735 South Africa			No. of specimens: 372			
For attention:						
Taxa sent: Campanulaceae						
Description: Herbarium specimens on loan						
IMPORTANT: Please refer to loan conditions (appended separately)						
* Check specimens when received						
/ Check specimens before returning						
LIST NO.	PRECIS NO.	COLLECTOR	COLL NO.	PLANT NAME	TYPE	* /
1		GALPIN, E.E.	2265	Wahlenbergia galpiniae Schltr.	T	___
2		GALPIN, A.	2059	Wahlenbergia galpiniae Schltr.		___
3		MEDLEY-WOOD, J.	6677	Wahlenbergia grandiflora Brehmer	T	___
4		SCHLECHTER, F.R.R.	4601	Wahlenbergia grandiflora Brehmer	T	___
5		SCHLECHTER, F.R.R.	11126	Wahlenbergia lasiocarpa Schltr. & Brehme	T	___
6		SCHLECHTER, F.R.R.	11108	Wahlenbergia schlechteri Brchmer	T	___
7		SMITH, C.A.	80	Wahlenbergia sp.		___
8		GILLET, M.C.	1074	Wahlenbergia sp.		___
9		HOUGHTON COLLEGE	5	Wahlenbergia sp.		___
10		GILMORE	9	Wahlenbergia sp.		___
11		MOGG, A.O.D.	9640	Wahlenbergia caledonica Sond.		___
12			P1196	Wahlenbergia sp.		___

Example letter: PRE loan dispatch list.



NATIONAL
*B*OTANICAL
 INSTITUTE

Our reference: _____

Date: _____

Dear Sir

REQUEST TO EXTEND A LOAN PERIOD

We would like to request an extension of the return of loan(s) no. _____
 comprising _____ specimens of _____
 for study by _____ of this institute for a further period of **six/twelve** months.

Thank you kindly

for Director Research: NBI

Example letter: Request to extend a loan period.

**NATIONAL HERBARIUM
NATIONAL BOTANICAL INSTITUTE
PRIVATE BAG X101, PRETORIA, SOUTH AFRICA**

Ref. 12/1/2

02/26/2004

The Curator
(Address)

OUTSTANDING LOAN

Dear Sir / Madam

According to our records the following loan is overdue:

Loan number: 03025
Sent to you: 07/10/2003
Attention:
Description: 364 Campanulaceae herbarium specimens
Returned to date: 0

We should appreciate the outstanding specimens being returned to PRE at the earliest possible opportunity. If they are still required for research purposes, please indicate this on the attached reply form and return it to us to request an extension of the normal twelve-month loan period.

If your records show that you have already returned this loan, please make an appropriate note on the reply form, and send it back to us so that we can try and locate the specimens in our herbarium.

Yours faithfully

Assistant Curator: Services

Example letter: Outstanding loan.

OUTSTANDING LOAN REPLY FORM

Ref: 12/1/2

The Curator
Compton Herbarium
Kirstenbosch Research Centre
NBI Kirstenbosch
Private Bag X7
Claremont
7735 South Africa

Date: _____

The Director
National Botanical Institute
Private Bag X101
Pretoria
0001
South Africa

With reference to loan number 03025, dated 10/7/2003:

- | | | |
|----|---|--------------------------|
| 1. | Study of the material is now complete. All specimens will be returned within 6 - 10 weeks. | <input type="checkbox"/> |
| 2. | Part of the material is still required for further study, for which a twelve-month extension period is requested. The remaining specimens will be returned within 6 - 10 weeks. | <input type="checkbox"/> |
| 3. | All the outstanding specimens are required for further study and a twelve-month extension period is requested. | <input type="checkbox"/> |

Additional remarks:

Signature

Designation

Example letter: Outstanding loan reply form.

UNIVERSITY OF CAPE TOWN



Bolus Herbarium

University of Cape Town
Private Bag
Rondebosch 7701
Republic of South Africa
Telephone: 650 3773
Fax: 650 4041

26 October 2001

The Curatrix
National Herbarium
National Botanical Institute
2 Cussonia Avenue
Private Bag X101
Pretoria
0001

Dear

RE: LOAN REQUEST

Dr _____ a fellow researcher of the Bolus Herbarium currently engaged in research in the Asclepiadoideae - Ceropegieae (Apocynaceae), would like to borrow the material in your herbarium of the genera *Ceropegia* and *Brachystelma* for a phytogeographic account of these genera.

Dr _____ would also like to borrow your material of the genus *Tylecodon* for a revision of this taxon in conjunction with a broader project on the phylogeny of the southern African Crassulaceae.

Whilst in our care the specimens will be kept in archival conditions at all times.

With thanks
Yours sincerely

Example letter: Loan request form.



NATIONAL
BOTANICAL
 INSTITUTE

COMPTON HERBARIUM
 Kirstenbosch Research Centre

NOTE: In 1996, the Stellenbosch Herbarium (STE) was merged with the Compton Herbarium (NBG).
 All STE collections should now be cited under NBG.

RECEIPT FOR HERBARIUM SPECIMENS (NBG & SAM)

To:
 Ms
 National Herbarium
 National Botanical Institute
 Private Bag X101
 PRETORIA
 0001

From:
 The Curator
 Compton Herbarium (NBG)
 & South African Museum Herbarium (SAM)
 National Botanical Institute, Kirstenbosch
 ☒ Private Bag X7, CLAREMONT 7735
 Cape Town SOUTH AFRICA
 ☎: (021)799-8800/Direct 799-8769 Fax: (021)761-4151
 E-mail: roux@nbict.nbi.ac.za <http://www.nbi.ac.za>

Date: 11 November 2003

FOR IDENTIFICATION

NUMBER OF PACKAGES

 1

NAMED SPECIMENS RETURNED

SURFACE MAIL

GIFT/EXCHANGE

AIR MAIL

BY HAND

Details of Specimens:—

Specimens (Crassulaceae) for identification sent by Dr _____ : (University of Kansas)

Collections Manager

We are sending you herbarium specimens as indicated above. Please verify the contents of this consignment upon its arrival and acknowledge receipt by signing the **GREEN FORM** and returning it to The Curator, Compton Herbarium, National Botanical Institute, Kirstenbosch Research Centre, Private Bag X7, CLAREMONT 7735, Cape Town, South Africa. Retain the **WHITE FORM** for your records.

Signed:.....

Date:.....

PLEASE SIGN AND RETURN.

Example letter: Receipt for herbarium specimens.



NATIONAL
*B*OTANICAL
INSTITUTE

Our reference: _____

Date: _____

Dear Sir

HERBARIUM EXCHANGES AND GIFTS

Thank you for the _____ you sent us.

We appreciate receiving the specimens as _____

Yours sincerely

for Director Research: NBI

Example letter: Herbarium exchanges and gifts.

How to re-file returned loans

When a loan of specimens is returned and has been checked off on the loan list, it has to be re-filed in the herbarium. The specimens should now all have a *det.* or *conf.* label, giving the plant name, date, and the researcher's signature. (The revision based on the loan will probably not yet have been published.) These authenticated specimens can be placed at the front of files to assist identifications.

No Name Changes

These specimens can be returned to their original files.

Names Changed to Existing Names

1. Do not change the name on the original label—the date on the *det.* label should indicate the latest name.
2. Make labels for specimens that have been seen by the researcher, but are without *det.* labels. Include the name of the researcher and the date on which it was collected.
3. Enter name changes into the database.
4. If the Quick Guide specimen has not been authenticated, update the Quick Guide using an authenticated specimen.
5. Re-file the specimens.

New Names

New, unpublished species names are referred to as *ined.* (*inedita* = unpublished writings) until they are published. Once the name has been published, it may be necessary to update other information about the specimens.

1. Place all specimens of each *ined.* taxon in a new species cover, labelled with the new name and the word *ined.*
2. File specimens alphabetically at the end of the genus, before the *spp.* files.
3. Quick Guide specimens of *ined.* taxa can be made, but mark them clearly as such.
4. *Ined.* specimens can be used for identifications by matching, since descriptions and keys will not yet have been published; however, identified specimens must be clearly marked as *ined.*

TIP

If you don't have time to do the re-filing of the loan straight away, put the specimens in temporary paper folders by species and store them in a cupboard. This will make the loan more accessible.

needed, do them immediately. Verify the number and sequence of the sheets, and acknowledge receipt of the loan in writing.

Specimens on loan from another institution are a special responsibility:

- Store the specimens under dust-proof and insect-proof conditions and handle them carefully.
- Obtain permission before detaching or dissecting parts of a specimen.
- Place dissections in envelopes on the sheets.
- Never modify the original label.
- Place labels confirming or re-identifying a name as close as possible to the main label. *It is as important to confirm a previous identification as it is to give a new name.* Record the date of annotation, and use your full surname, not merely your initials.
- If the herbarium providing the loan does not allow the researcher to attach labels to the specimens, send the labels with the collectors name and number separately; the herbarium staff can then attach the labels themselves.
- Comply with any other conditions made by the loaning herbarium.
- Acknowledge loans in published papers, and send reprints to the institutions that lent specimens for the study.
- Return the loan when the stated period expires, unless an extension is granted. If you require an extension, apply in writing at least a month before the expiry date.
- When returning the loan, confirm the number and sequence of sheets. Pack the loan carefully—damage in transit is often due to careless packing. For more information on packing specimens, see “Handling requests for loans”.

Removing samples from specimens

Every herbarium needs to have a policy dealing with requests for research material to be used, for example, for anatomy, palynology, phytochemistry, cytology, DNA studies, and so on. Parts of specimens have to be removed to provide material for such requests. Use the following questions as guidelines in formulating your herbarium's policy:

- Are the herbarium specimens regarded as archival records, not to be tampered with, or are they free to be used as resource material for taxonomic research?
- How rare is the taxon concerned?
- Can one allow material of common taxa to be removed?
- Is the researcher merely saving time and effort by having specimens sent to them or would the researcher have great difficulty coming to collect their own material?
- Has the herbarium material been treated in some way (for

example, poisoned or microwaved) that may affect research results?

- Will the study contribute to the taxonomy of the plant group?

If removal of material is allowed, keep the following points in mind:

- Do not remove material from type specimens and other historical specimens.
- Attach a small label to the specimen, giving notice of the detachment (plant part, name and location of the recipient, and date).
- Advise visitors on your herbarium's removal policy; visitors should not remove parts of specimens without permission.

Remounting and repairing specimens

Specimens that are handled often may become detached and require re-strapping or re-glueing. This should be done as soon as the problem is noted. Remounting and repairing may also be necessary for the following reasons:

- If specimens are mounted on board of inappropriate quality or size, or on board that has become damaged or fragile with age.
- If two different gatherings have been mounted together, either deliberately, as practised in the past, or accidentally because they have not previously been recognised as a mixture.
- If specimen labels start to fade—labels written in non-archival ink fade with age.
- Insect damage.

Use the following guidelines when remounting and repairing specimens:

- When two different species mounted on one sheet are divided, it is important that divided parts have cross-references to each other, stating "Separated from—". This is a safeguard if an error is made when dividing a sheet, for example, by leaving the wrong label with the specimen.

- When a sheet is divided, the collector's number is annotated by adding alphabetical letters: one remains as *Smith 3486* and the other becomes *Smith 3486A*. Note that a cited specimen retains the original number.
- Preserve all labels and notes written directly on the mounting board.
- Replace a faded or fragile label with a newly copied version, but remember to keep the original in an envelope. Glue the envelope to the mounting board, preferably in the top left-hand corner.
- When remounting a strapped specimen, remove the specimen by disengaging the gummed paper straps with forceps; remove the label or cut around it; then remount the specimen and glue the original label to the new mounting board.
- When remounting a glued specimen, detach the specimen from the sheet only if it can be done without harming the specimen. Otherwise, cut the sheet around the specimen and label(s), and remount the entire cut sheet on a new sheet.
- If only part of the specimen has detached from the sheet, there is no need to remount the specimen in its entirety: repair it by glueing or strapping the plant to the original board.
- If the mounting board is of good quality, but too small or too light, just glue the board to a sheet of the appropriate size and weight.
- If insects have damaged the specimen, clean by lightly brushing away powdered parts and treat immediately (see "Treating infestations"). Make a note on the specimen that it has been treated, the name of the poison used, as well as the date on which it was treated.

Duplicates

Duplicate specimens provide extra material to send to other herbaria either as gifts, or as exchange material. If possible, each duplicate specimen should have the complete range of stages represented in the original collection. Sterile or incompletely named specimens should not be sent to other herbaria. Duplicate specimens are usually sent unmounted. ▲

