

## Introduction

Technology never ceases to amaze us. Staying current with all that is happening in the world of computers is hard enough. Deciding how, when, and why to allocate resources for hardware can be even more difficult. While we do not have all of the answers, there are three general concepts we think you should follow.

**Choose "leading edge" technology over "bleeding edge" technology.** We'd all like to have the latest, fastest machines on our desks, but is it wise to acquire hot-off-the-shelf products? Ask the people who purchased the first Pentium personal computers last year, which were literally hot-off-the-shelf. These early machines had severe heat distribution problems, in some cases melting other internal components! "Bleeding edge" technology may be fine for Fortune 500 companies with six figure computing budgets; for botanical gardens and arboreta we recommend "leading edge" technology. We consider a leading edge product to be proven, already in use by the mainstream, and near the beginning or middle of its perceived product life-cycle. The high-level 486-class machines now available at very reasonable prices are a good example of this. Conversely, considering price and performance, it becomes harder and harder to justify the purchase of a 386-class computer. So where does the Pentium now stand? Stay tuned -- both The Holden Arboretum and RBG Edinburgh have recently begun to use several of these machines.

Hardware should be upgraded on a regular basis. This is sometimes a difficult concept for gardens to embrace. A computer is not like the old Ford tractor that you can keep around for 15 years (although both tractor and computer may work just as well as the day they were purchased). The issue with computers is productivity. Staff time is no less valuable than any other garden asset. Consider this: we ran the following *BG-BASE* command against a 13,000 record file on both a 386/20Mhz machine and on a 486/66Mhz machine:

```
:SELECT PLANTS WITH ALIVE BY SORT.NAME
```

Both machines returned the same results. However, it took the 386 machine 42 minutes to complete the query, while it took the 486 machine 12 minutes. Let's say that you need to run this or a similar report once a week, or 52 times a year. The difference between a slow 386 machine and a fast 486 machine adds up in a hurry!

The right time to buy is now. When considering the acquisition of new hardware, we often hear of a "better" product that is "right around the corner." Should you wait? Our advice in most cases is no. There will always be something better right around the corner. Decide what you need and buy it, knowing full well that whatever you purchase will likely be out-of-date (but not obsolete) as soon as you sign the check. It is the nature of the industry that new products are announced almost daily-- you could literally wait forever!

As you wrestle with the idea of upgrading your old system, or if you are considering the acquisition of a new system, there is no need to go it alone. Please feel free to consult with us on any purchases you are considering.

Kerry S. Walter

Michael J. O'Neal

## Announcement

The *BG-BASE* user's meeting will be held at the AABGA annual conference in Pasadena, California, on Thursday, June 16, from 6:00 P.M. to 7:30 P.M. Latest developments of the software will be demonstrated, followed by a question-and-answer session. This is YOUR opportunity to guide the future development of *BG-BASE*! All current users and other interested parties are encouraged to attend.

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## Recent installations

Note: All new users of BG-BASE are using version 4, developed using Advanced Revelation.

- **Mount Holyoke Botanical Garden (December 1993)** This botanical garden, located in central Massachusetts and affiliated with Mount Holyoke College, was the first new garden to receive BG-BASE version 4. Records on the collections will be maintained by several individuals, including the Director, Propagator, and individuals from the maintenance crew. Once an initial inventory is completed, *BG-BASE* will be linked to an existing AutoCAD system maintained by the College's physical plant department to provide computerized mapping of the collections.
- **Dunedin Botanic Garden (January 1994)** *BG-BASE* crosses the equator and the international date line with installation of the software in this New Zealand botanical garden. A representative from Dunedin Botanic Garden visited The Holden Arboretum in a trial, first ever off-site installation and training program. In addition to the training, nearly 10,000 records were converted from an existing Reflex database into *BG-BASE*. Technical support is being handled primarily via electronic mail through CompuServe and the Internet.
- **University of Delaware Botanic Garden (March 1994)** Another *BG-BASE* installation lands in the Delaware Valley. *BG-BASE* will not only be used to track the botanic garden's living collections, but will also be used as a part of the curriculum for the Longwood Graduate Program. A special project will be assigned each semester to teach taxonomy and to reinforce the importance of properly documented collections. The University will also be making its *BG-BASE* data available via a gopher server on the Internet.
- **Highstead Arboretum (March 1994)** This 32 acre arboretum in Redding, Connecticut, switched to *BG-BASE* after outgrowing the Lotus 1-2-3 system they had been using. All records are being kept on a portable notebook computer so the Director (who also happens to be the

Plant Recorder!) can take the records with him wherever he goes. *BG-BASE* will also be used to manage the Arboretum's small but growing herbarium.

- **National Botanic Gardens (April 1994)** Established in 1790, the National Botanic Gardens of Ireland, located in Glasnevin (a suburb of Dublin), has a long history of botanical and horticultural research as well as plant introduction -- for instance, the first successful attempts to raise orchids from seed were carried out here in 1844. Contained on the 19.5-hectare site, the living collections number some 20,000 taxa, and include some National Collections as designated by the National Council for Conservation of Plants and Gardens (NCCPG). *BG-BASE* will be used initially to manage the living collections at Glasnevin and eventually to link plant collections of several other institutions throughout Ireland.
- **Morven Farms (April 1994)** Not your typical *BG-BASE* user, Morven Farms is a series of 13 properties located in the hills of Charlottesville, Virginia (just a short distance from Monticello). This 9000+ acre private estate is first and foremost an active cattle ranch and stud farm; however, the property also contains extensive horticultural plantings. *BG-BASE* will be used to track the thousands of new plant acquisitions that are planted each year. Existing records dating back several decades will also be entered into the system.

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## Recent upgrades

The following gardens have upgraded to version 4 of *BG-BASE* from earlier versions.

Arnold Arboretum  
Boyce Thompson Southwestern Arboretum  
Connecticut College Arboretum  
Hillier Gardens and Arboretum  
Holden Arboretum  
Royal Botanic Garden, Edinburgh  
Scott Arboretum  
U.S. National Arboretum

Many thanks to the other gardens that have ordered the upgrade. It's on the way!

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## Technical tip

In each issue of BG-BASE News we will be offering technical tips for users of BG-BASE versions 1.0 - 3.5 as well as for users of version 4.

## USING INDEXES - *BG-BASE* version 4

Indexes are important in that they allow for very rapid retrieval of data. In *BG-BASE* version 4 there are three types of indexes; Btree, Cross Reference, and Relational. In this issue we will discuss the use of Btree indexes.

Btree indexes have been placed throughout *BG-BASE* so that queries involving certain fields will run very quickly. The nice thing about Btree indexes (which didn't even exist in *BG-BASE* versions 1.0-3.5) is that they are automatically invoked, if possible, anytime you issue a SELECT or LIST command. In other words, you do not need to know anything about Btree indexes in order to use them! However, a little knowledge about where these indexes are stored and how they are used can save you a lot of time.

Consider that in some cases there may be more than one way to generate the same report. If you have a choice between using a field with a Btree index versus using a field that has not been indexed, always use the indexed field. For example, let's say you want to generate a list of plants found at a particular location. If that location were called "NURSERY" you could issue either one of the following TCL commands:

```
:SELECT PLANTS WITH CURRENT.LOCATION
= "NURSERY" AND WITH ALIVE = "A"
```

or

```
:SELECT PLANTS WITH LOCATION.NOW =
"NURSERY"
```

While these commands will yield identical results, the second command using the field LOCATION.NOW will finish in a fraction of the time, because this field has been indexed. (In this particular example the LOCATION.NOW field stores a location only if the plant is actually alive at that location -- hence, you do not need to add the phrase "WITH ALIVE", making the query even quicker.) Test these two commands yourself to see the difference in speed!

Btree indexes also support partial searches. Let's say for example that you want to generate an inventory for your entire nursery, and that your nursery location codes all begin with the letters "NURS", such as NURS-1, NURS-2, NURS-3, etc. The following command:

```
:SELECT PLANTS WITH LOCATION.NOW
STARTING "NURS"
```

would again use the Btree index, and return your records very quickly.

There are two specific characteristics you should know about Btree indexes that will help you to use them effectively. First of all, an index will not be invoked when searching for a null value. For example, you could use either one of the following commands to select a list of all living plants:

```
:SELECT PLANTS WITH ALIVE = "A"
```

or

```
:SELECT PLANTS WITH ALIVE
```

The first command will finish much more quickly because the field ALIVE has a Btree index, and we are searching for a non-null value. The second command will return the same results, but it will take much longer to run because we did not specify what ALIVE should equal.

Also, Btree indexes will not be invoked if a select list is already active (i.e., you have previously retrieved a list using GETLIST). If you are constructing a command with several different criteria, try to use a Btree index with the broadest scope first, then whittle your list down from there with additional SELECT statements.

How do you know which fields in the system have Btree indexes on them? It is easy to determine this by using the LISTINDEX command. If at TCL you type:

```
:LISTINDEX filename
```

you will see a list of all indexed fields in the file you have specified. Any Btree index displayed can then be used in a SELECT or LIST statement for rapid data retrieval.

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## Technical tip

### Creating Lists Manually - BG-BASE versions 1.0-3.5

All *BG-BASE* users know that the `SELECT` command is used to segregate a set of records from a particular file for further processing. However, it is also possible to create and save lists manually using Revelation's `TEXT` editor, without using the `SELECT` command. You may wish to do this if the desired subset of records is so diverse that a `SELECT` command would be difficult or impossible to construct, or perhaps if you already know the records you wish to work with, and creating a list manually would be quicker than using a `SELECT` command. In order to create a list manually, a bit of background information is in order.

Whenever you issue a `SAVE-LIST` command after a `SELECT` command, you are creating a record in the `LISTS` file. However, this record is only storing record keys -- the data themselves from the file used in your select statement are not actually stored here. To demonstrate this, do the following at `TCL`:

```
:SELECT 20 ACCESSIONS
>SAVE-LIST TEMP
:TEXT LISTS TEMP
```

Instead of seeing the 20 full records you have just selected from the `ACCESSIONS` file, you will only see a series of accession numbers. This is because the accession number is the record key for the `ACCESSIONS` file, and only record keys are stored in the `LISTS` file. (Press `CTRL-F9` to exit this `LISTS` record.)

Every record has a record key, which is assigned during the data entry process. In some cases the key is simply a sequential number assigned automatically by the system, while in other cases the key is assigned by the user. Keys for some of the major files are as follows:

<code>ACCESSIONS</code>	Accession number
<code>DS</code>	Sequential counter
<code>FAMILIES</code>	Family name
<code>GENERA</code>	Genus name
<code>LOCATIONS</code>	Location code
<code>NAMES</code>	Sequential counter
<code>PLANTS</code>	Acc# * qualifier
<code>PSOURCES</code>	Sequential counter

Armed with this knowledge, we can now create a list manually, without using the `SELECT` command. Suppose you want to create a list of the first 25 accessions received in 1994? Assuming that you embed the accession year as part of your accession number, you would begin by typing at `TCL`:

```
:TEXT LISTS listname
```

where `listname` is the name of the list you wish to create. (Remember, no spaces, commas, or asterisks are allowed in list names.) This will call the `TEXT` editor and present you with a blank screen. At this point you can enter the record keys, pressing `[ENTER]` after each entry to begin a new line. In our example, your list would then look something like this:

```
1-94
2-94
3-94
4-94
etc.
```

After you have entered all of the record keys, press `SHIFT-F2` to file the record. That's it! You now have a record in the `LISTS` file, just as if you had used the `SELECT` and `SAVE-LIST` commands. Like any list, these records can be retrieved using the `GET-LIST` command and displayed using the `LIST` command.

Here are a few helpful keystrokes you can use while creating a list in the `TEXT` editor:

Delete a line:	<code>CTRL-F4</code>
Insert a line:	<code>F4</code>
Save a record:	<code>SHIFT-F2</code>
Quit a record:	<code>CTRL-F9</code>
Display help:	<code>F1</code>

Creating lists manually is only possible if you already know the record keys you wish to work with. If you have this information, then using this technique may be the best way to create and store a list.

#### **NOTE TO BG-BASE VERSION 4 USERS:**

You can also manually create lists in *Advanced Revelation*. At `TCL` just use the command `EDIT` instead of `TEXT` to create the record, then press `F9` instead of `SHIFT-F2` to file the record. To display a list of all available keystrokes, press `CTRL-F9`.

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## User profile

In this issue we highlight the U.S. support center for *BG-BASE*.

**The Holden Arboretum (HOL)** in Mentor, Ohio, is one of the more active users of *BG-BASE*. Installed in 1989 and upgraded several times since then, Holden uses both the *PLANTS* and *EDUCATION* modules. *BG-BASE* is run on a Novell Netware network (version 3.12), connecting 27 PC's and 13 printers to a 66Mhz, 486 file server with 500Mb hard disk capacity. To date the system has been used to log 6800 taxa, 11,000 accessions, 1100 plant sources, and to record over 10,000 registrations for Arboretum courses.

Over 2225 feet of fiber optic cable was recently installed to link the central administrative building to the Arboretum's new Horticultural Science Center. The decision was made to use fiber optic cable to access the computer network instead of dial-in connections due to the greatly increased performance offered by fiber optic technology. Records maintained in *BG-BASE* will be accessible to research and horticultural staff located in the new building with little, if any, degradation in speed. This will become increasingly important as all propagation activities are shifted to this area and as research projects are developed using the Arboretum's living collections.

The Arboretum is also somewhat unique in that a regular function of the inventory process involves taking detailed measurements of each woody specimen. Well over half of the accessioned plants in the collection have had their DBH, canopy, and height measurements recorded in *BG-BASE*. In fact, many of these plants now have several years worth of observations.

Holden is also using *BG-Map*, mapping software designed specifically for use with *BG-BASE*. *BG-Map* allows the Arboretum to automatically generate maps that reflect the most current information stored in *BG-BASE*. This means that any changes made in *BG-BASE*, such as the changing of a plant condition or changing of a plant name, are automatically carried over to the maps. For more information on *BG-Map* contact Glicksman Associates, 1601 Church Road, Wayne, PA., 19038-4420.

## In memoriam

The botanical garden community lost a good friend on March 31st when Jennifer Quigley, the Plant Recorder at the Arnold Arboretum, passed away after a brief illness. Those of you who know the history of *BG-BASE* also know that Jennie -- more so than any one individual -- was the driving force behind what many of you see on your systems today. In fact, we can safely say that she knew more about the software than any other user in the world (to the point that it was not unusual for her to correct the authors on its usage!). Her dedication and knowledge will be forever reflected in the records at the Arboretum.

A memorial service will be held at the Arnold Arboretum on Sunday, May 15, 1994. For more information contact the Arnold Arboretum at (617) 524-1718.

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## Holden Arboretum receives grant to support *BG-BASE*

The Holden Arboretum has received a \$45,000 grant from the Stanley Smith Horticultural Trust in support of the continued development of *BG-BASE*. The funds will be used to:

- offset support office costs at The Holden Arboretum
- facilitate the continued development of *BG-BASE* in Advanced Revelation
- develop enhancements in the areas of horticultural maintenance, mapping, conservation, and data exchange

We are very pleased that we have now attracted funding from outside of the *BG-BASE* community to further develop and support the software!

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## Note

The city and zip code for The Holden Arboretum -- and consequently for *BG-BASE*, Inc. -- has changed. The new information is:

**Kirtland, OH 44094-5172**

All other information remains the same.