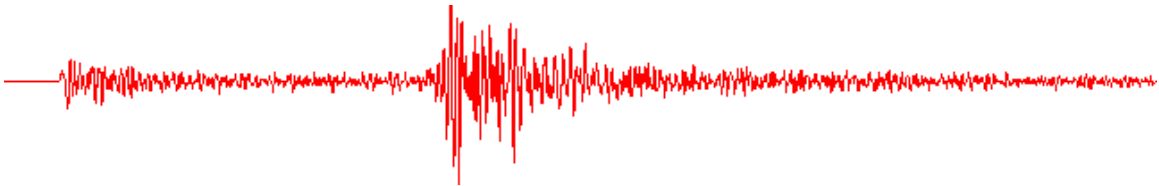# Computer Programs in Seismology

Version 3.30

Installation Guide

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Installation of Computer Programs in Seismology Version 3.30

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Table of Contents

1   Introduction

This document describes the installation of Version 3.30 of the Computer Programs in Seismology package created by R. B. Herrmann of Saint Louis University.   This installation has been tested for the Solaris operating system running on a Sun Sparc, on Linux and Windows on PC platforms and on Apple's MacOS–X system.

There are two ways of distributing this software – a special CDROM or Internet download using ftp.

1.1   CDROM distribution

The CDROM contains the source code documentation for the software and   the complete CYGWIN package for use with Windows. The installation of the software under UNIX/LINUX and MacOS-X is described in Section 2 of this document. The installation of CYGWIN and the compilation of Computer Programs in Seismology for Windows is discussed in detail in Section 3

1.2   FTP install

The distribution is available for download after completing a registration form

http://www.eas.slu.edu/People/RBHerrmann/ComputerPrograms.html

This will lead you to the ftp area for download. You will be able to get the following

```
CPSInstall.pdf  –  PDF form of this document
NP330.DATE.tgz  –  Computer Programs in Seismology distribution
                   [The DATE indicates when the package was updated. At
                     present the file is NP330.Feb-23-2009.tgz]
```

Send email to me at rbh@eas.slu.edu if you to try the binary distribution.

2   Installation on UNIX/Linux/MacOS–X

2.1   Compilers

Solaris

Either the Sun cc/f77 suite is required or the freely available gcc/g77 compilers. Precompiled gcc/g77 binary executables of these compilers are available for free at the site:

> http://sunfreeware.com

Just select the version corresponding to your operating system and architecture. There are also other interesting software packages there too.

Linux

You will need the gcc/g77 compilers and the X11 programming support files and the termcap libraries.

MacOS–X

You will require the gcc/g77 compilers. You will have to search the web for them. You may have to do a Web search for the pattern 'g77 Mac OSX'. One such link is

> http://hpc.sourceforge.net

for high performance computing using Mac OS–X on the Power PC platform. Go to

> http://hpc.sourceforge.net

for the Intel platform.

NOTE: You must ensure that the C and FORTRAN compilers are compatible: Create a simple C program –

t.c

```
#include <stdio.h>
mail()
{
      Printf("hello world\n");
}

gcc t.c –o tc
```

t.f:

```
write(6,*)'Hello world'
end

g77 t.f –o tf
```

Then execute the command

       file tc

       file tf

If the compilers are compatible the details of the file command will say that they are both for a PowerPC or an Intel platform. To know what you machine is, enter the command

       uname –a

You must also have the X11 support files, e.g., the entries in /usr/X11r6/include and the termcap/terminfo libraries.

2.2   Getting the Programs

FTP

The most recent version of the Computer Programs in Seismology package will always be available for ftp download from the site:

       ftp://ftp.eas.slu.edu/pub/rbh/PROGRAMS.330

In this directory you will find files ending in ".tgz" which are compressed "tar" files in "gzip" format.   The gzip'd files are smaller.   Also download the CPSInstall.pdf (this document).

CDROM

This is the distribution on this CDROM. The are stored in the directory/folder "/usr" in the file *"NP330.*DATE.tgz*"*

2.3   Installation of the Programs

The programs will be installed in a directory of your choosing. For example, if I place the downloaded ".tgz" files in "/home/rbh", then I would do the following:

".tgz" gzipped files: Using sh, bash or csh shells:

sh or bash	csh

for i in *.tgz
do
  gunzip –c $i | tar xf –
done
	foreach i (*.tgz)
	  gunzip –c $i | tar xf –
	end

Eventually you may remove the `.tgz` file to save space. You will not require these any more.

2.4   Compiling

Note that in the example below "rbh>" is the shell prompt indicating that you are in the "rbh" directory. If your directory name is different, the prompt will be different. Commands for you to type are indicated in bold, such as "**cd**".

First, go to the PROGRAMS.330 directory.

```
   rbh> cd PROGRAMS.330      (go to the Programs directory)
```
Then run the Setup program:

```
   rbh> ./Setup   (get correct syntax)
   Checking for existence of bin and lib directories
   Directory bin exists
   Directory lib exists
   Usage: Setup SOL WIN32 SOL-EGCS LINUX LINUX64 CYGWIN OSX
       SOL         SUN Solaris Compilers
       SOL-GNU     SUN Solaris with gcc/g77 compilers
       CYGWIN      CYGWIN 98/NT/2K/XP gcc/g77 Compilers
       CYGWIN40    CYGWIN 98/NT/2K/XP gcc/gfortran Compilers
       LINUX       Linux with gcc/g77 compilers
       LINUX40     Linux with gcc/gfortran compilers
       LINUX64     Linux 64 bit with gcc/g77 compilers
       LINUX6440   Linux 64 bit with gcc/gfortran compilers
       OSX         Apple  with gcc/g77 compilers
       OSX40       Apple  with gcc/gfortran compilers
       OSF         DEC/Compaq ALPHA cc/f77
```

To determine which to use on you system, first determine the architecture with the **uname -a** command. If you something like

32-bit Intel/AMD processor with GNU 4.X compilers:

Linux crust 2.6.22.19-0.2-bigsmp #1 SMP 2008-12-18 10:17:03 +0100 i686 i686 i386 GNU/Linux

you would use LINUX or LINUX40. The key is the i686 and Linux. Now we check the compilers.

> **rbh> which gcc g77 gfortran**
> **/usr/bin/gcc**
> **which: no g77 in (:/usr/local/bin:/usr/bin:/bin:)**
> **/usr/bin/gfortran**

Since **gfortran** is present, we verify the compiler version as follows:

> **rbh> gcc –version**
> **gcc (GCC) 4.2.1 (SUSE Linux)**
>
> **rbh> gfortran –version**
> **GNU Fortran (GCC) 4.2.1 (SUSE Linux)**

Since the compiler versions are 4.x.y, and since we have a 32-bit system, we would run

./Setup LINUX40

64-bit Intel/AMD processor:

Linux yarn 2.6.11.4-21.7-default #1 Thu Jun 2 14:23:14 UTC 2005 x86_64 x86_64 x86_64 GNU/Linux

you will use LINUX64 or LINUX6440 since this is a 64 bit processor. We now check the installed compilers:

> **rbh@yarn:~> which gcc g77 gfortran**
> **/usr/bin/gcc**
> **/usr/bin/g77**

For this system we would use **./Setup LINUX64**

Solaris:

SunOS wilip 5.8 Generic_117350-45 sun4u sparc SUNW,Sun-Blade-100

you will use SOL or SOL-GNU since you have a Solaris operating system.
To test the compilers, I can issue the command

> **which cc f77 gcc g77**
> **/opt/SUNWspro/bin/cc**
> **/opt/SUNWspro/bin/f77**
> **/usr/local/bin/gcc**
>> **no g77 in /opt/SUNWspro/bin /opt/bin /usr/ccs/bin /usr/local /usr/local/bin /usr/**
>>> **ucb /usr/bin** .

For this system , we would use **./Setup SOL**
In the future I may try to use the **configure** command to simplify this
process.

Assuming that we have the gcc/g77 compilers under LINUX, we now enter

rbh> **./Setup LINUX**   (for my LINUX system – you will
use your system type. This command will define the Makefile to use for
the system)

```
Copying VOLI/src/Makefile.LNX VOLI/src/Makefile
Copying VOLII/src/Makefile.LNX VOLII/src/Makefile
Copying VOLIII/src/Makefile.LNX VOLIII/src/Makefile
Copying VOLIV/src/Makefile.LNX VOLIV/src/Makefile
Copying VOLV/src/Makefile.LNX VOLV/src/Makefile
Copying VOLVI/src/Makefile.LNX VOLVI/src/Makefile
Copying VOLVII/src/Makefile.LNX VOLVII/src/Makefile
Copying VOLVIII/src/Makefile.LNX VOLVIII/src/Makefile
Copying VOLVIII/gsac.src/Makefile.LNX VOLVIII/gsac.src/Makefile
Copying VOLIX/src/Makefile.LNX VOLIX/src/Makefile
Copying CALPLOT/src/cmd.unx/Makefile.LNX CALPLOT/src/cmd.unx/Makefile
Copying CALPLOT/src/clib.unx/Makefile.LNX CALPLOT/src/clib.unx/Makefile
Copying CALPLOT/src/flib.unx/Makefile.LNX CALPLOT/src/flib.unx/Makefile
Copying CALPLOT/src/util/Makefile.LNX CALPLOT/src/util/Makefile
Copying IRIS/rdseed4.5/Makefile.LNX IRIS/rdseed4.5/Makefile
Copying IRIS/DOCOMPILE.LNX IRIS/DOCOMPILE
```

```
Copying CALPLOT/src/XVIG/src/Makefile.LNX CALPLOT/src/XVIG/src/Makefile
Copying CALPLOT/testf/Makefile.LNX CALPLOT/testf/Makefile
Copying CALPLOT/testc/Makefile.LNX CALPLOT/testc/Makefile
Copying CALPLOT/Utility/Makefile.LNX CALPLOT/Utility/Makefile
The proper Makefiles have been installed for your Operating System
Verify that these are correct with respect to compilers, flags
and libraries

If everything is correct, enter the command
./C for the complete distribution or
./Ccal for just CALPLOT
to make everything after you have GUARANTEED THE CORRECT PATH

Documentation is in the directory DOC in PDF format
```

If everything is correct, enter the command

   ./C   (for the complete distribution or)
   ./Ccal   (for just CALPLOT)
to "make" everything.

When the compilation is done, the executables will be in the "/bin" directory and the libraries in "/lib".

2.5 Changing PATH

In order to use the programs you must change the PATH environment parameter. First determine the name of the SHELL that you are using.

   rbh> **echo $SHELL**

You will see something like "/bin/sh", "/bin/bash" or "/bin/csh". To change the PATH we must edit a file in your login directory. For discussion, let the login directory be "/home/rbh". In the bash or C-shell, the tilde, "~", is an alias to indicate this login directory. Do the following for the appropriate shell. Recall that the Programs are installed in "/home/rbh/PROGRAMS.330" (where "/home/rbh" will be different for your computer).

/bin/sh

Edit "/home/rbh/.profile" to add the following lines after the last reference to PATH.

   PATH=$PATH:/home/rbh/PROGRAMS.330/bin
   export PATH

/bin/bash

Edit "/home/rbh/.bash_profile" or equivalently "~/.bash_profile" to add the following lines after the last reference to PATH.

   PATH=$PATH:/home/rbh/PROGRAMS.330/bin
   export PATH

/bin/csh

Edit "/home/rbh/.cshrc" or equivalently "~/.cshrc" to add the following lines after the last reference to PATH.

```
    set path = ( ~/PROGRAMS.330/bin $path)
```
When you log onto the computer the next time, the PATH will be reset. You can see the new PATH with the command

```
    rbh> echo $PATH
```
You should now see "PROGRAMS.330/bin" in the PATH listing. As an added check, you can ask the system to find a program, as in

```
    rbh> which  calxvig  plotxvig  surf96
               ~/PROGRAMS.330/bin/calxvig
               ~/PROGRAMS.330/bin/plotxvig
               ~/PROGRAMS.330/bin/surf96
```

2.6   Documentation

Documentation is in the directory DOC in both PDF format.

You are now ready to use Computer Programs in Seismology! Have Fun

To assist in using these programs, refer often to

http://www.eas.slu.edu/Earthquake_Center/CPS/TUTORIAL/

for tutorials with data sets.

2.7   Updates

Because Computer Programs in Seismology is a dynamic collection of research code, check the link

http://www.eas.slu.edu/People/RBHerrmann/CPS/cpsbug.html

often to determine new additions, new capabilities or fixes that have been applied to the code.

3 Installation on Windows using Cygwin

The Windows distribution can be made directly from the CDROM. There are three steps for a successful installation:

1.   Installation of the Cygwin package

2.   Modification of the Cygwin environment for the user

3.   Installation of Computer Programs in Seismology

3.1   Getting Cygwin

WEB

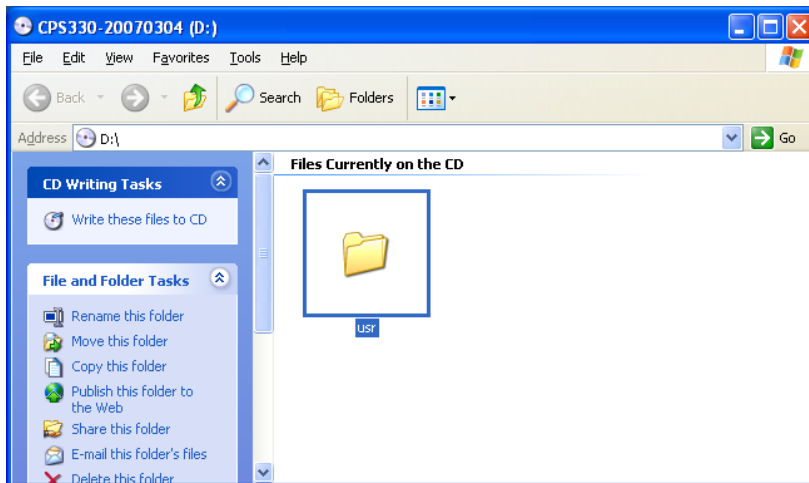Use the browser to go to the Cygwin website at http://www.cygwin.com.

Get the current version of setup.exe.

Start setup.exe from the control panel or from the run option of windows.

CDROM

Cygwin is on the CDROM in the "usr" folder.

When you insert the CDROM you will see the following:

You have two options: drag the entire folder to your hard disk or install from the CDROM. Placing everything on the hard disk will make the installation faster and perhaps more robust, although you will use about 700 Mb of disk space. If you drag, drag the *usr* folder into *C:* , which you can see in *My Computer*, so that you will now have a folder *C:\usr.*

For example if the CDROM drive is "D:", then you will want to run the program `D:\usr\setup.exe`. If you placed everything in the C: drive, click on the icon `C:\usr\setup.exe`.
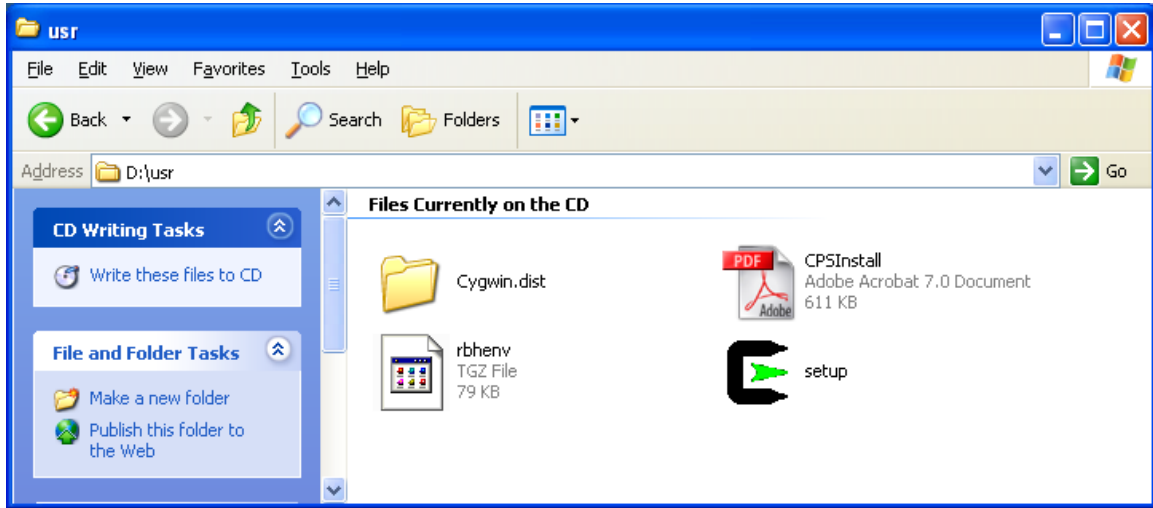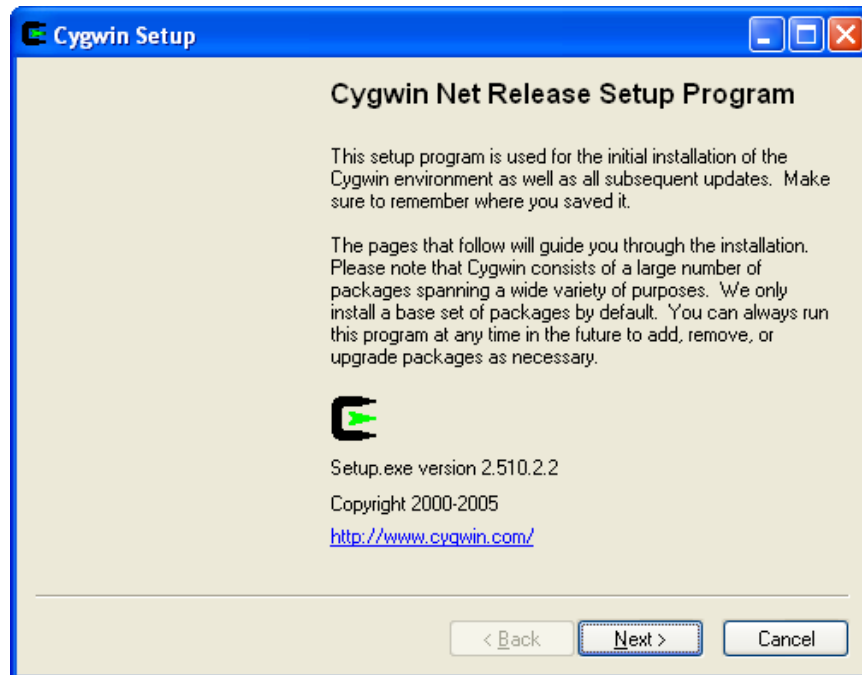

3.2   Cygwin installation

Cygwin is a Linux-like environment for Windows. This set of instructions explains how to use the provided Cygwin installation CD to install the software package Cygwin on your Windows XP computer.

1. The first thing to do is to start the Cygwin Setup.

If you install from the internet, this Setup will be on your desktop.

If you install from the CDROM/DVD, open that in "My Computer", go to the use folder, and then click on "setup." After doing this, you will see the following:

2. We now indicate the source of the installation: For the distribution CD, we will use "Install from Local Directory".
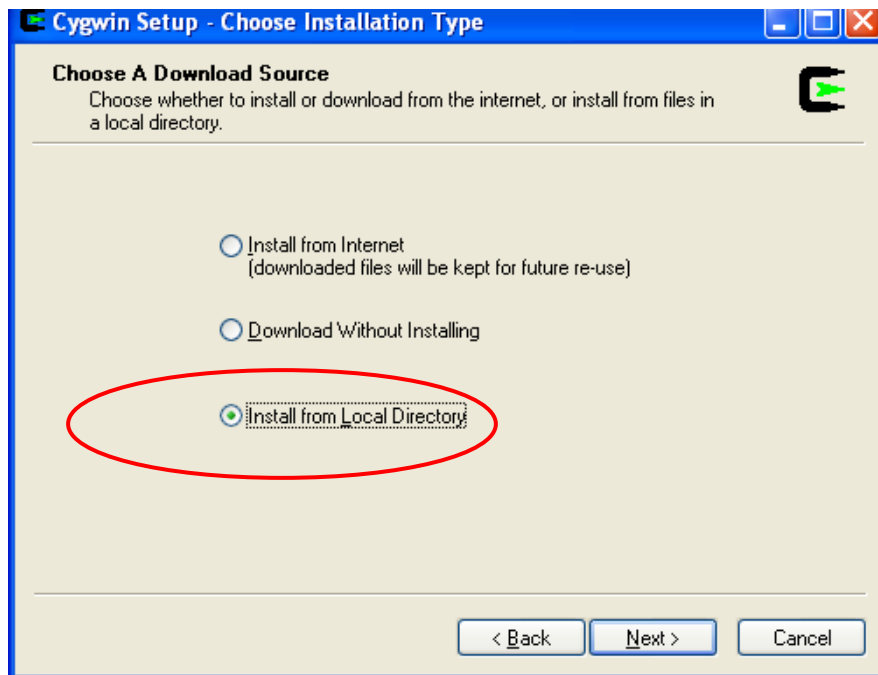
3. Now define where cygwin will be installed on your computer. The default of "C:\cygwin" is OK to use.
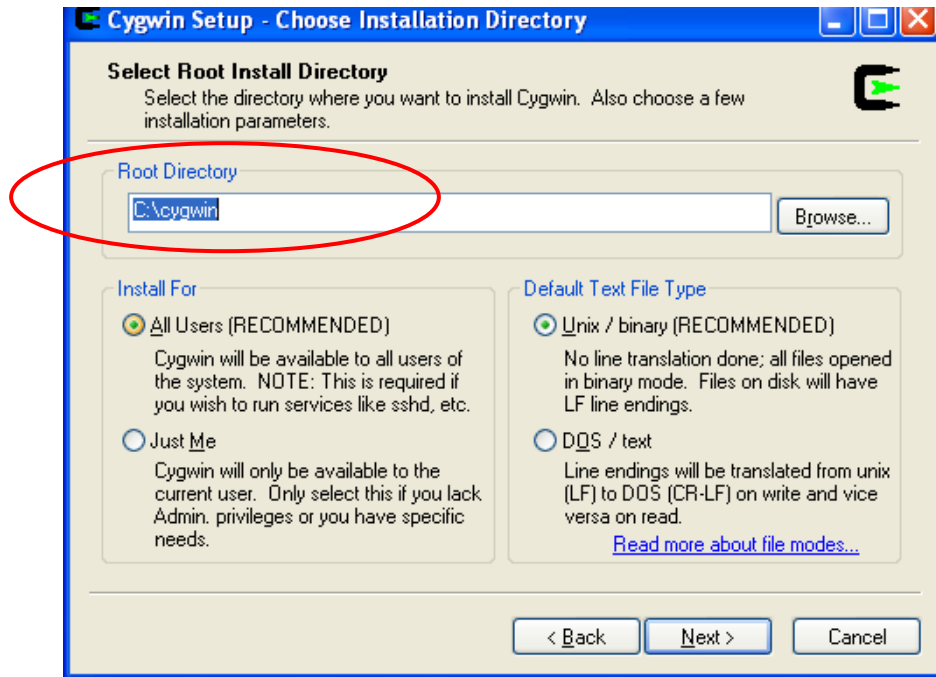
4. The program asks for the locaiton of the cygwin install package. If you install directly form the internet, I recommend that you use the location "C:\usr\cygwin.dist"

If you are installing from the CDROM/DVD on the "D:" drive, then modify the next screen to use "D:\usr\cygwin.dist".

In the figure below, the package is in the *usr* folder on the *C:* drive.
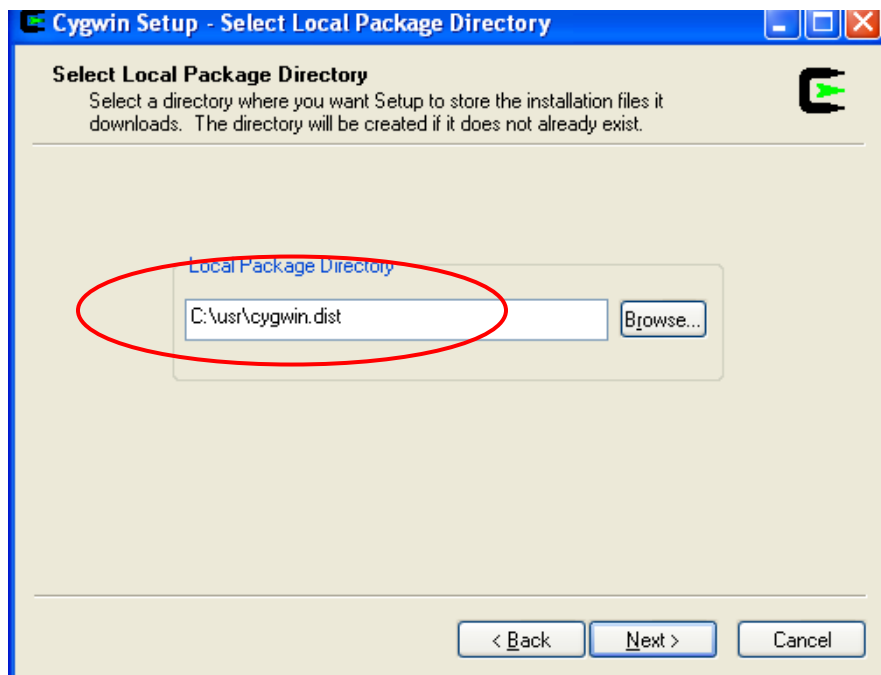
The installation program will first spend some time checking the integrity of the distribution.

5. Cygwin will now provide a menu from which you can install everything or just part of the distribution. To modify a selection, just click on the *Default* entry. **If you click on the Default entry under the upper level category *All*, then you will get the entire distribution. This is the simplest way to install but also takes the longest to isntall and requires more disk space.** If you do not have enough disk space for the entire distribution, follow instructions below to select the minimum necessary files. The window list of categories looks like this.
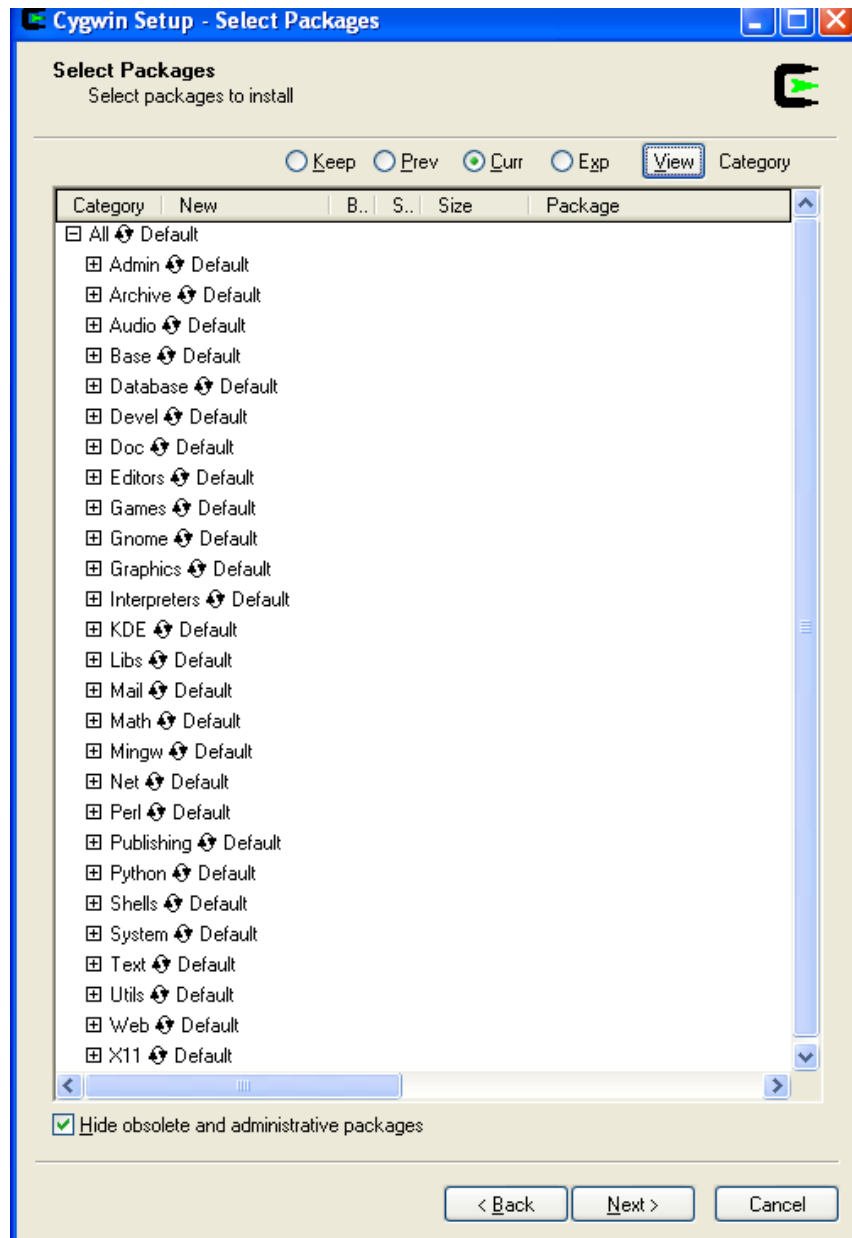
If you click the "Default" to the right of "All" all "Default" will be changed to "Install" to indicate that everything will be installed.

For a faster installation, and to use less disk space, we can install just the required minimum with the following steps:

- Make sure that the "All" is "Default"
- Open "Archive" and install (by clicking on the line): zip, unzip, sharutils
- Open "Base" and install: everything
- Open "Devel" and install: binutils, ddd, gcc, gcc-g77, gdb, libncurses, make, readline
- Open "Editors" and install: ed, vim, nedit, mined
- Open "Graphics" and install: GraphicsMagick, ImageMagick, epstool,ghostscript, gnuplot, gv, xfig
- Open "Libs" and install: openssl, ncurses, sunrpc, termcap
- Open "Math" and install: xcalc
- Open "Net" and install: openssh, openssl
- Open "Publishing" and install: tetex if you require latex – this is not necessary for running the Computer Programs in Seismology packages.
- Open "Shells" and install: xterm [note bash and ash are already selected – you need these]
- Open "Text" and install" a2ps, groff
- Open "Util" and install: units
- Open "Web" and install: wget
- Open "X11" and install: Click on the "Default" to change it to "Install" since we need everything.

  NOW CLICK "Next"

Examples: You will see displays such as shown in the next figures. Note that your distribution will have newer versions of the programs.

Cygwin Setup - Select Packages

Select Packages
    Select packages to install

○ Keep ○ Prev ⊙ Curr ○ Exp [View] Category

| Category	New	B..	S..	Size	Package
⊟ All ✪ Default					
⊞ Admin ✪ Default					
⊞ Archive ✪ Default					
⊞ Audio ✪ Default					
⊞ Base ✪ Default					
⊞ Database ✪ Default					
⊟ Devel ✪ Default					
	✪ Skip	n/a	n/a	157k	ELFIO: ELF file reader and producer implemented as a C++ library
	✪ Skip	n/a	n/a	269k	ORBit-devel: High-performance CORBA ORB (for GNOME 1.4, developi
	✪ Skip	n/a	n/a	891k	SWI-Prolog: Prolog Interpreter
	✪ Skip	n/a	n/a	104k	aalib-devel: An ascii art library (development)
	✪ Skip	n/a	n/a	154k	apr: The Apache Portable Runtime (development/documentation packa
	✪ Skip	n/a	n/a	51k	apr-util: Additional utility library for use with the Apache Portable Runtime
	✪ Skip	n/a	n/a	157k	apr1: The Apache Portable Runtime (development/documentation pack
	✪ Skip	n/a	n/a	57k	aprutil1: Additional utility library for use with the Apache Portable Runtime
	✪ Skip	n/a	n/a	128k	asciidoc: Text based document generation
	✪ Skip	n/a	n/a	176k	astyle: Artistic Style is a reindenter and reformatter of C, C++, C# and Jav
	✪ Skip	n/a	n/a	3k	autoconf: Wrapper scripts for autoconf commands
	✪ Skip	n/a	n/a	203k	autoconf2.1: Stable version of the automatic configure script builder
	✪ Skip	n/a	n/a	791k	autoconf2.5: Development version of the automatic configure script buil
	✪ Skip	n/a	n/a	3k	automake: Wrapper scripts for automake and aclocal
	✪ Skip	n/a	n/a	676k	automake1.10: (1.10) a tool for generating GNU-compliant Makefiles
	✪ Skip	n/a	n/a	245k	automake1.4: (1.4) a tool for generating GNU-compliant Makefiles
	✪ Skip	n/a	n/a	330k	automake1.5: (1.5) a tool for generating GNU-compliant Makefiles
	✪ Skip	n/a	n/a	365k	automake1.6: (1.6) a tool for generating GNU-compliant Makefiles
	✪ Skip	n/a	n/a	426k	automake1.7: (1.7) a tool for generating GNU-compliant Makefiles
	✪ Skip	n/a	n/a	500k	automake1.8: (1.8) a tool for generating GNU-compliant Makefiles
	✪ Skip	n/a	n/a	558k	automake1.9: (1.9) a tool for generating GNU-compliant Makefiles

☑ Hide obsolete and administrative packages

[< Back] [Next >] [Cancel]
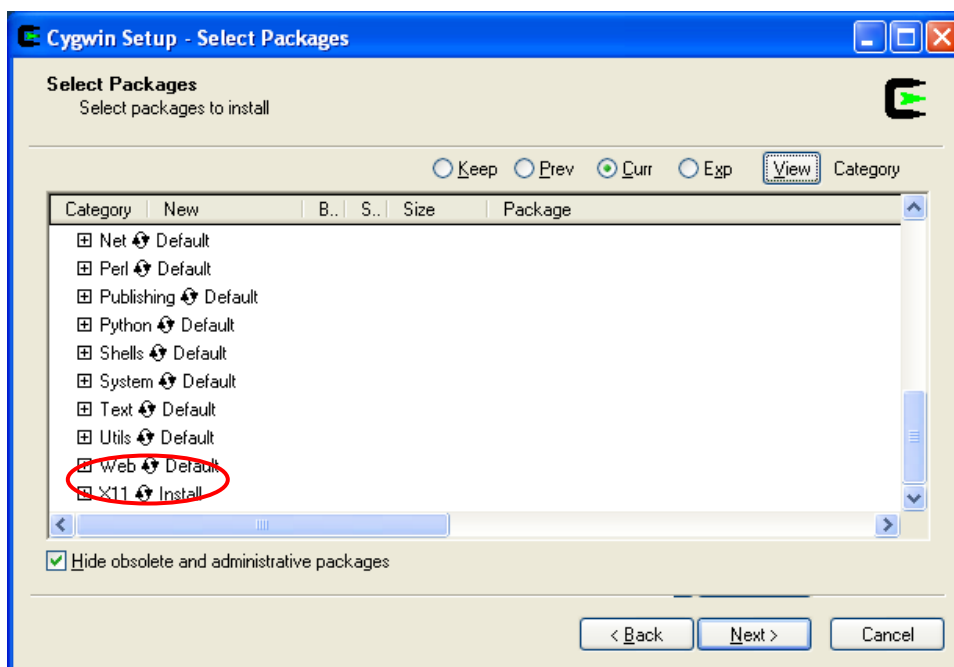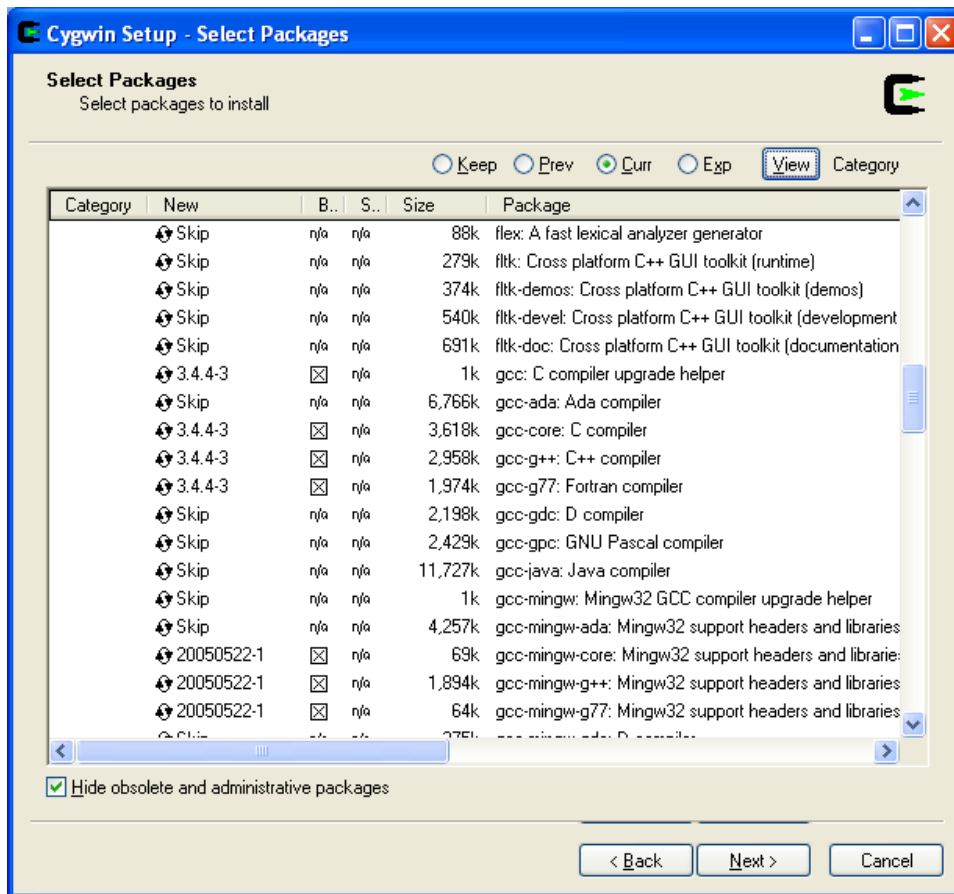
Once you see "Install" next to "X11", then you are finished selecting packages

Press "Next" to actually start the installation.

If there are any routines still required, you will see a page like this:
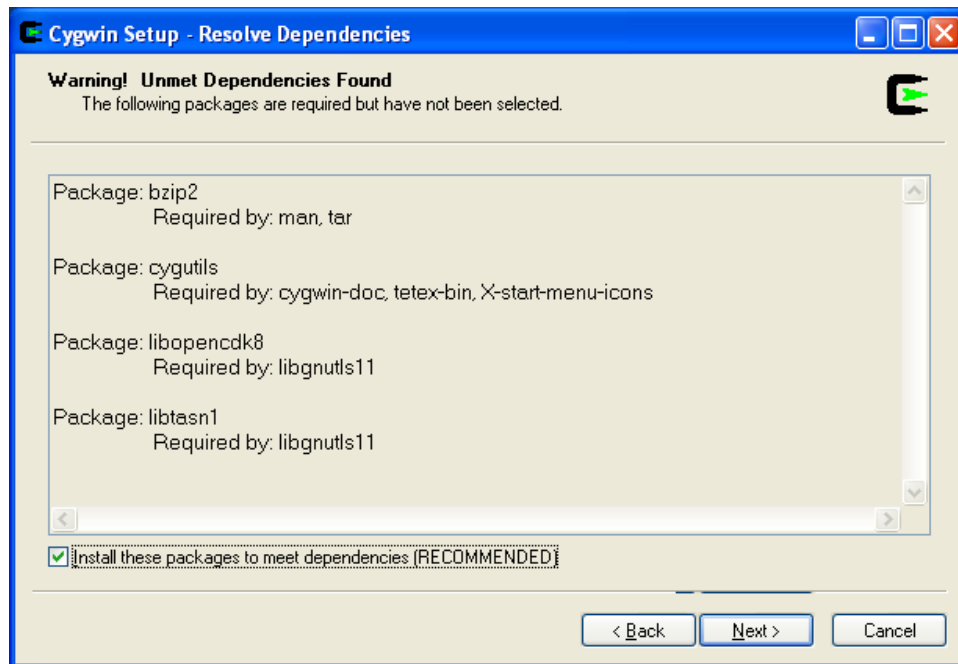
this is just a warning. When you go to the next step, the system is smart enough to find the missing routines. So click on "Next". When the installation has finished, select "Finish" to exit the setup program after ensuring that both boxes are checked.
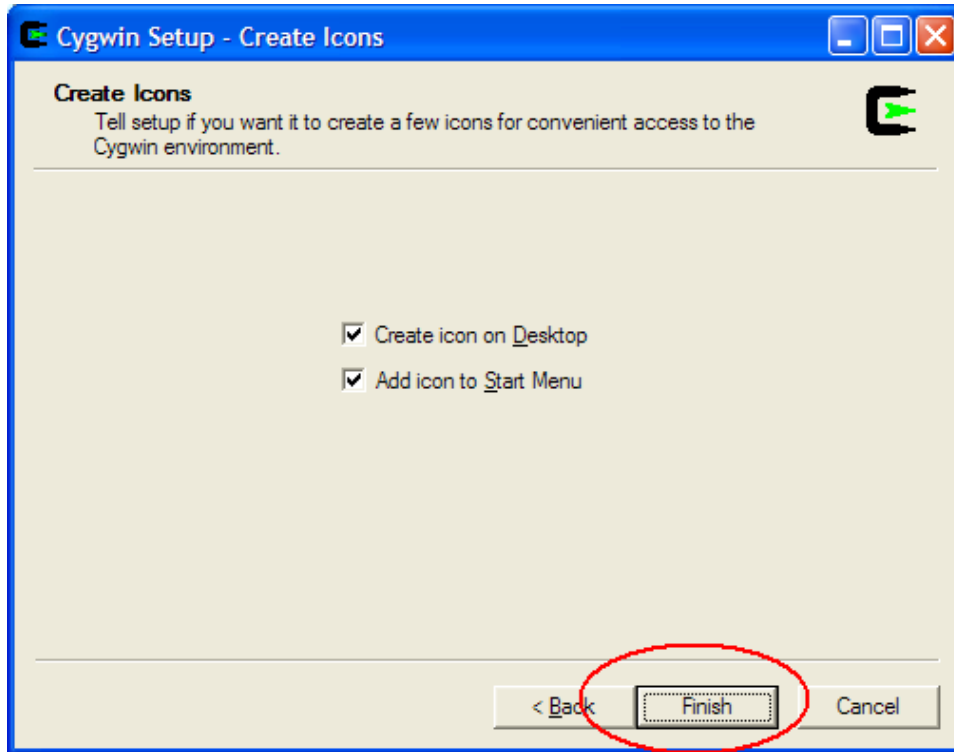
The installation is now complete. Click "OK" to acknowledge.
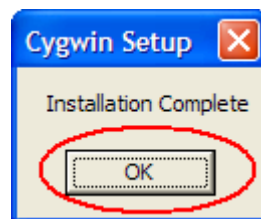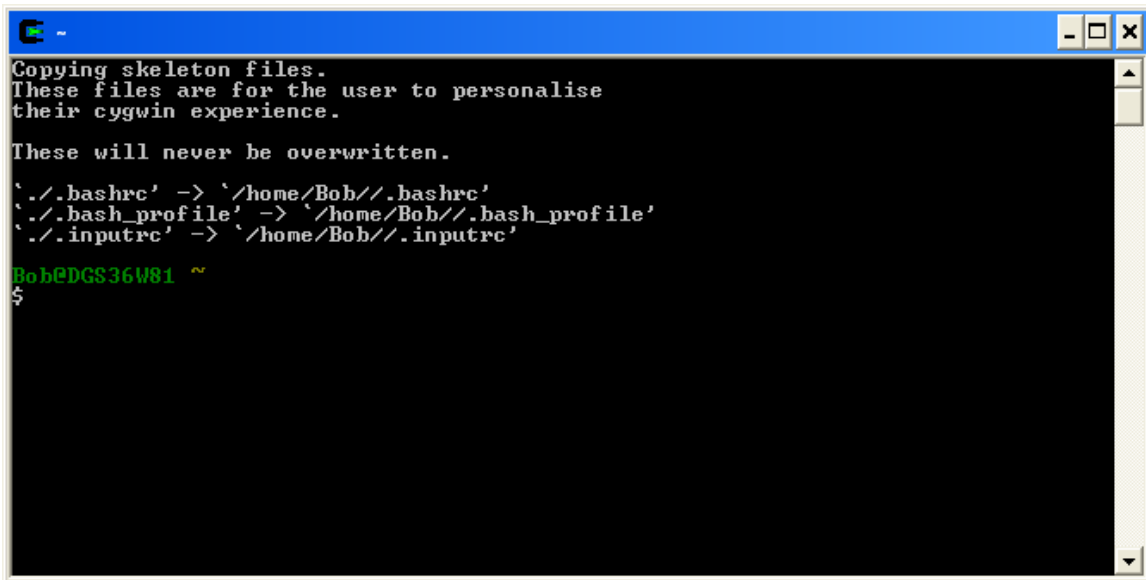
A Cygwin icon will appear on the Desktop and in the Start menu Programs tab.

Note: The entire Cygwin package is available from the official Cygwin web page http://www.cygwin.com. If you wish to add more programs or to update from the internet, if you have a high speed connection, repeat the "setup" procedure.

3.3   Modify the Cygwin environment

Start Cygwin

At this point you should have a Cygwin icon on your desktop. Click this icon. A terminal window will appear.

```
Copying skeleton files.
These files are for the user to personalise
their cygwin experience.

These will never be overwritten.

'./.bashrc' -> '/home/Bob//.bashrc'
'./.bash_profile' -> '/home/Bob//.bash_profile'
'./.inputrc' -> '/home/Bob//.inputrc'

Bob@DGS36W81 ~
$
```

3.4 CYGWIN and VISTA and XP

This advice is from   http://inst.eecs.berkeley.edu/~cs61c/sp08/assignments/proj/04/ which addressed the issue of using the X11 graphics successfully.

1. Since ash and rebaseall are installed, we will do the following steps to get around some Windows problems with multitasking.

2. exit cygwin completely by entering

```
$ exit
```

3. From windows, Start → All Programs → Accessories → Command Prompt   to bring up a command window

4. cd c:\cygwin\bin

assuming that the CYGWIN was installed into c:\cygwin

5. C:\cygwin\bin> ash

```
$ ./rebaseall
$ exit
```
6. Close the window by clicking on the 'X'

Other useful links addressing this problem are

http://www.urlfan.com/local/cygwin_tuning_guide/79162282.html

From the initial command window, determine if the program "ash" was installed with the following commands. Note that my prompt is Bob@DGS36W81 where Bob is the user name on windows and DGS36W81 is the name of the computer.

```
$ which ash
/usr/bin/ash
$ which rebaseall
/usr/bin/rebaseall
```

3.5 Modify some Cygwin files

We need to modify some startup information for Cygwin to allow it to find all the programs we want to use.

We must do this before we can start the X11 graphics. We also must get around some differences between Windows and Cygwin.

If you are not familiar with the UNIX/LINUX/Cygwin **vi** editor, you can use the Windows Notepad – however if I say you want to edit the */etc/passwd*, you will open the file C:\cygwin\etc\profile!

First start Cygwin by clicking on the Cygwin shortcut on you Desktop.

Modify the "/etc/passwd"

Windows will typically attempt to place one in a named folder under

<div align="center">C:\Documents and Settings\Owner</div>

If you log in as user "Owner". The problem here are the spaces in the folder name. One must be very careful with these spaces under the *bash* shell because spaces can only be used if they are quoted. There are two ways to handle this.

The simplest is to edit the file */etc/passwd*. Look for the entry for your user name, e.g.,

mkh:unused_by_nt/2000/xp:1009:513:mkh,U-FARLEY\mkh,S-1-5-21-632854848-2332866997-1805960406-1009**:/cygdrive/c/Documents and Settings/mkh**:/bin/bash

or something like this. Then enclose the PATH by double quotes:

mkh:unused_by_nt/2000/xp:1009:513:mkh,U-FARLEY\mkh,S-1-5-21-632854848-2332866997-1805960406-1009**:/cygdrive/c/"Documents and Settings"/mkh**:/bin/bash

T*he other, **preferred approach** is to keep all CYGWIN stuff away from the normal WINDOWS files by placing the user login directly under the CYGWIN tree.* This is done by ensuring that the user HOME directory is located directly under the CYGWIN installation, specifically that there be a

/home/Owner

directory. If /home or /home/Owner do not exist when you log in, create it using the command

> mkdir /home

> mkdir /home/Owner

Now modify the Owner entry in */etc/passwd* to read as

```
SYSTEM:*:18:544:,S-1-5-18::
Administrators:*:544:544:,S-1-5-32-544::
Admin:unused_by_nt/2000/xp:1007:513:Admin,U-DGS36W81\Admin,S-1-5-21-
524513049-1333336688-1930612807-1007:/home/Admin:/bin/bash
Administrator:unused_by_nt/2000/xp:500:513:U-DGS36W81\Administrator,S-
1-5-21-524513049-1333336688-1930612807-500:/home/Administrator:/bin/bash
Bob:unused_by_nt/2000/xp:1005:513:U-DGS36W81\Bob,S-1-5-21-524513049-
1333336688-1930612807-1005:/home/Bob:/bin/bash
Guest:unused_by_nt/2000/xp:501:513:U-DGS36W81\Guest,S-1-5-21-524513049-
1333336688-1930612807-501:/home/Guest:/bin/bash
HelpAssistant:unused_by_nt/2000/xp:1004:513:Remote Desktop Help
Assistant Account,U-DGS36W81\HelpAssistant,S-1-5-21-524513049-
1333336688-1930612807-1004:/home/HelpAssistant:/bin/bash
SUPPORT_388945a0:unused_by_nt/2000/xp:1002:513:CN=Microsoft
Corporation,L=Redmond,S=Washington,C=US,U-DGS36W81\SUPPORT_388945a0,S-
1-5-21-524513049-1333336688-19
```

You only have to worry about the **bold faced** name of the login directory. Note that there are **no** spaces.

Now exit by typing *exit* and then restart the CYGWIN program so that your environment recognizes these changes.

Modify your ".bash_profile"

You will need a way to find the programs that is independent of the system's idea. Change directory to your login directory by entering the command "cd" to get to your login directory.

> **cd**

If this does not work, edit the ".bash_profile" file there so that it looks like the following at the end:

> **export PATH=$PATH:/cygdrive/c/usr/PROGRAMS.330/bin:**

In this example, the COMPUTER PROGRAMS IN SEISMOLOGY are installed on the C: drive in a folder called "usr". Cygwin defines the Windows C: drive in a UNIX-like manner through the file path "/cygdrive/c". To see the Cygwin view of the file system, enter the command "df".

Note July 31, 2007: This is now included in the unpacking shown in the next step. So if you unpack the rbhenv.tgz you will not have to do this.

Set up your X11 environment

Now copy the archive *rbhenv.tgz* from the distribution CDROM or from the C drive as

    cd   *(the cd gets you to your home directory)*
    cp /cygdrive/d/usr/rbhenv.tgz .
or

    cd
    cp /cygdrive/c/usr/rbhenv.tgz .

and unpack it using the command:

    gunzip –c rbhenv.tgz | tar xf -

This unpacks a modified *.bashrc* startup file, which has an *alias C='cd /cygdrive/c'* and and *alias CPS='cd /cygdrive/c/usr/PROGRAMS.330'* and also the *.bash_profile* discussed above.

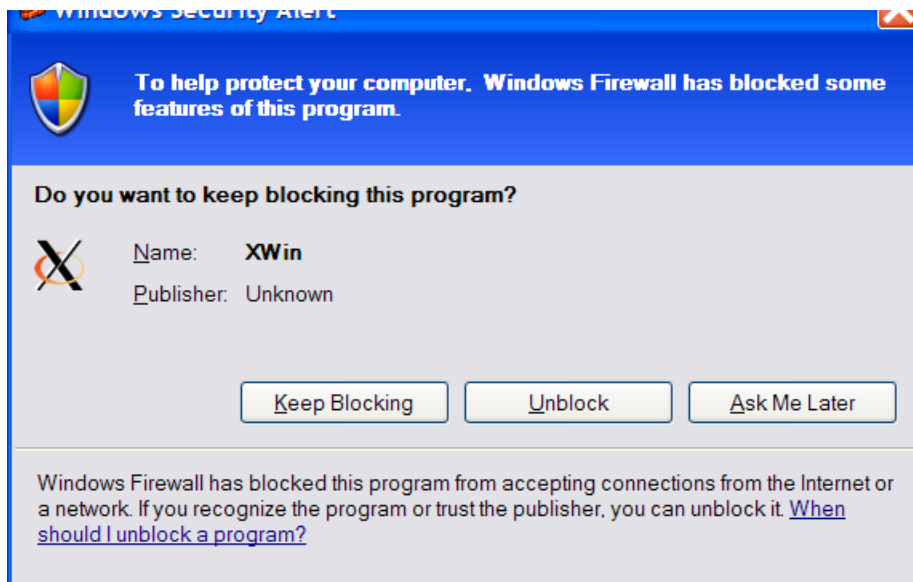In addition the *GNUstep* directory are put in the home directory.

Now close the window.

Now start Cygwin again from the Desktop shortcut.

At the prompt enter the command **xinit** as follows:

```
$ xinit &
```

When you do this the first time, Windows will display a warning:

Just Click "Unblock" The reason for that is under security patches to Windows XP, any communication between the PC and the outside world is severely limited by default. This security concern affects the initial operation of X11 programs, both those distributed as part of CYGWIN and the Computer Programs in Seismology programs plotxvig, calxvig, do_mft and do_pom.   When these programs are run the first time, an XP interface appears. Select the option that permits the use of these programs through DNS. This is necessary because X11 components inter-communicate using networking protocols.

You will now see a window like the following. There will be two xterm's terminals and the preferences have been set to have windows autoraise as you pass the mouse over them.
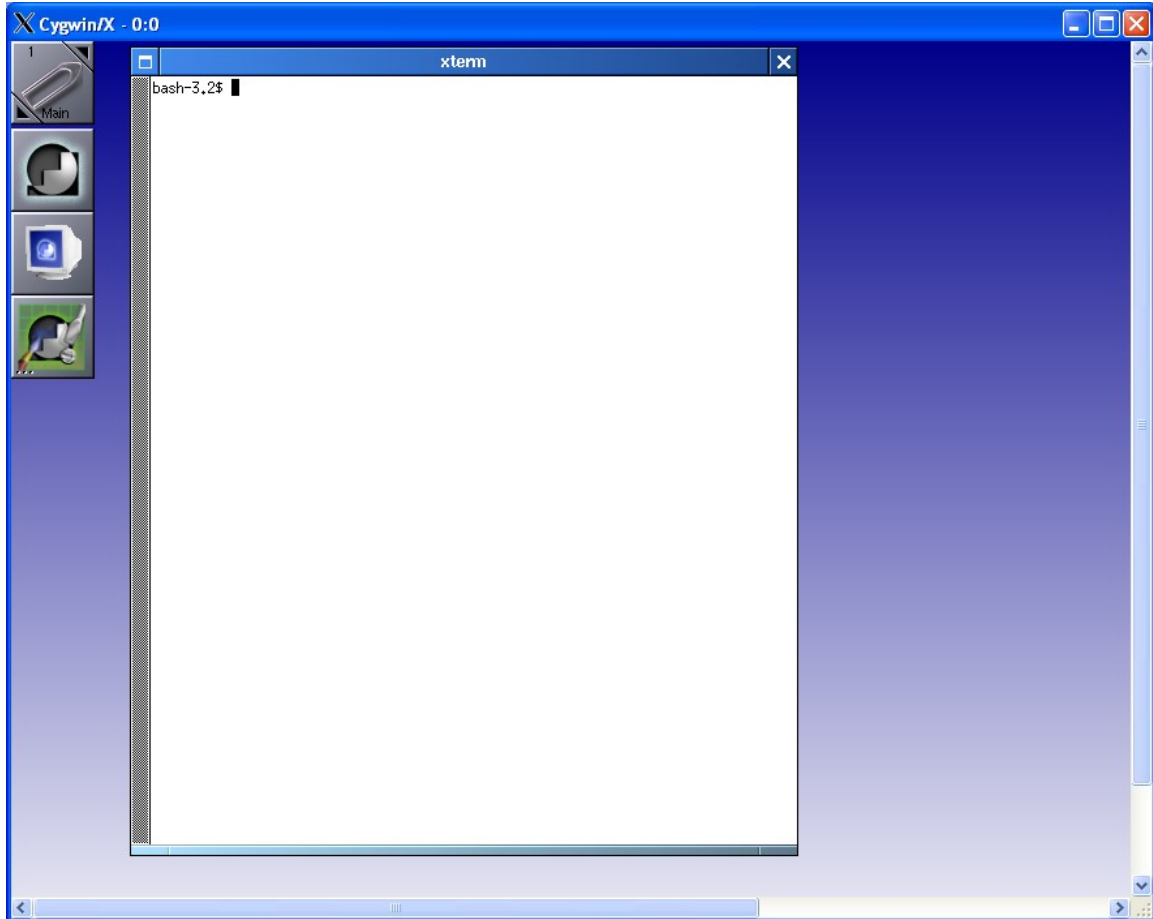
If you click on the background a menu will appear that will permit you to create more Xterms. Just click a while – you can change the background and all of the other color schemes.

An advantage of this window manager is that you can copy text in an xterm window by pushing down on the left mouse button and then dragging. This placed the information in the clipboard. If you start Word or OpenOffice under Windows, you can paste this information into a document.

You can also "ssh" to other computers if you have access to them. You can start other programs from within the X11 environment:

This X11 environment is required so that you can run the CPS programs, including **gsac.**
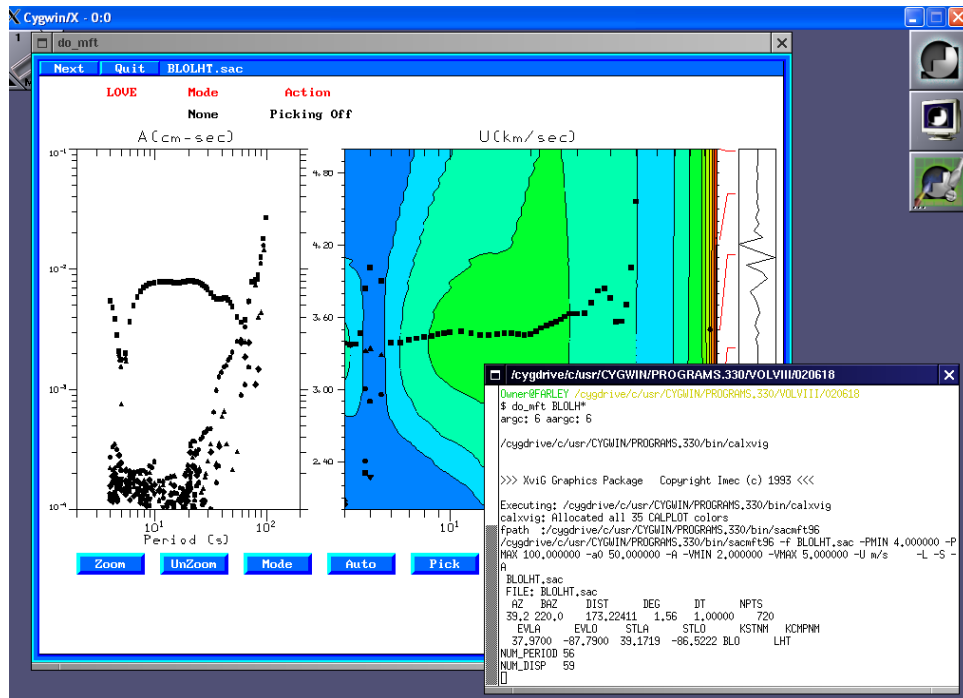
3.6 Cygwin Help

Much information is provided with the distribution. From within a Cygwin terminal window enter the command

    cd /usr/share/doc

To answer specific questions go to the Cygwin website http://www.cygwin.com at which you will find a link to a User's Guide under documentation.

Since the commands are those of Linux systems, a book on Linux or the bash shell would be useful.

3.7 Cygwin X11 Help

The fine tuning of X11 is not simple because of the fact that the X11 distribution tries to be as independent of Windows as possible. Many details of the installation are given at the Cygwin/X home at http://x.cygwin.com.

The frequently asked questions (FAQ) at http://x.cygwin.com/docs/faq will be able to assist you. The documentation is available in HTML, PDF, PS, RTF and TXT formats.

There are several important issues that must be addressed.

Keyboard

The bash shell uses certain characters: # ` ~ & % / \ { } | that may not be directly available on non-US keyboards. Windows knows about your keyboard, but X11 does not. This means that a symbol typed under Windows may not appear the same under X11.

Copy/Paste

There may be times that you wish to copy text between Windows and X11. You will not be able to copy graphics images though. Text copying can be done as follows:

You copy text to the clipboard in Windows with `Ctrl+C`. You then paste that in X11 with either a middle mouse button click or via a menu in the current application (if it has a Paste menu item).

You copy text in X11 by highlighting it and, optionally, clicking the Copy button in a menu (if the application has a Copy menu item). Leave the text highlighted just to be sure. To paste that text in Windows, press `Ctrl+V`.

The difficulty with this is that the lines of text files in Windows are terminated by a carriage return (CR) and a line feed (LF), but by just a line feed (LF) in UNIX and the way that we set up Cygwin. It is better to do the following:

On Windows, save the text as a text file under SAVE AS. Then from within Cygwin run the command "`dos2unix textfile`". This program replaces the CR LF combination by just a LF.

On X11, save the text as a textfile and then run the command "`unix2dos textfile`".

Graphics

The ImageMagick package (which requires GhostScript) permits conversion of graphics formats. For example, the Computer Programs in Seismology package graphics consists of a binary graphics metafile, which can be converted to Encapsulated PostScript. If this CALPLOT file is called `SHWMOD96.PLT`, then I can create a portable network graphics file (PNG) for insertion into MS Office documents or web pages using the commands:

```
plotnps -F7 -W10 -EPS -K < SHWMOD96.PLT > SHWMOD96.eps
convert -trim SHWMOD96.eps SHWMOD96.png
```

The "`-trim`" flag eliminates any unnecessary white space.

There are also utilities to convert to PDF, e.g., ps2pdf and eps2pdf. I prefer to convert to PDF and then use the latest version of the Adobe Acrobat Reader on the Windows side to print the information and also to send information to others.

3.8 Installation of Computer Programs in Seismology

If you did not copy the **usr** folder from the CDROM to the **C:** drive, you must perform the following steps. First, create a folder called "usr" on one of your drives or partitions. You can do this from the Windows Control Panel or from within Cygwin. Do the following to place everything on the C: drive

```
cd /cygdrive/c
mkdir usr
```

Now copy the distribution from the CD and unpack it. If the CDROM is on the D: drive just drag or copy/paste "D:/usr/NP330.tgz" to the "usr" folder. **NOTE since 2008, the name of this tarball now reflected the date it was created, e.g.,**

NP330.Feb-23-2009.tgz

From the Cygwin terminal window,

```
cd /cygdrive/c/usr
gunzip -c NP330.Feb-23-2009.tgz | tar xf -
```

This will create the folder PROGRAMS.330. To compile and install the programs we follow the procedure similar to that for the UNIX/Linux/MacOS–X systems:

```
cd PROGRAMS.330
./Setup CYGWIN
./C
```

If your SHELL path is properly set, you will be able to do the following:

```
which plotxvig
```

To test the distribution, I would do the following.

```
cd PROGRAMS.330/CALPLOT/testc
plotxvig <  PLTTST.1
```

This will draw a set of colored circles. Now try

```
make new
new
```

This test program uses the cursor and tests some of the CALPLOT library calls.

3.9 Documentation

Documentation is in the directory DOC in both PDF format.

You are now ready to use Computer Programs in Seismology! Have Fun

3.10 Updates

Because Computer Programs in Seismology is a dynamic collection of research code, check the link

http://www.eas.slu.edu/People/RBHerrmann/CPS/cpsbug.html

often to determine new additions, new capabilities or repairs that have been applied to the code. If the changes made are useful, then get the latest distribution and reinstall. You can just replace the current version on your system.

3.11 Tutorials

The codes are modified more often than the documentation. To really determine the capabilities of the package, a set of tutorials has been created, which can be found on the web at

http://www.eas.slu.edu/Earthquake_Center/CPS/TUTORIAL/

3.12 SHELL scripts

This comment applies primarily to user written shell scripts black under CYGWIN, but may also apply to other operating systems.

In sh or bash shell scripts, it is often convenient to indicate the relative location of an executable directory through the following sequence:

```
export PATH=:../bin:$PATH
```

On Windows machines, it is permissible to have a path component that looks like

:/cygdrive/c/Program Files/Common Files/Adaptec Shared/System

Note the blanks between *Command* and *Files* and between *Adaptec* and *Shared*. These will cause the export command to fail. The remedy is to use the following in SHELL scripts:

```
export PATH=:../bin:"$PATH"
```

The double quotes permit the original PATH variable to be used in its entirety. However we will set up the CYGWIN environment so that this will never happen.

3.13 Printing and Graphics for Documents and the Web

Single page graphics plots in Computer Programs in Seismology can be converted to encapsulated postscript using the command

plotnps -F7 -W10 -EPS < calplot_binary_plot_file > plot.eps

The plot.eps can be converted to a *png* using the commands

convert -trim plot.eps plot.png

if using the ImageMagick package, or

gm convert -trim plot.eps plot.png

if using the GraphicsMagick package. (If you do not have these, you can just use the **plotgif** command of the package to create a GIF image.)

The PNG file plot.png can then be included in PowerPoint of MS Word files.

If it is necessary to print something, I would do the following. First create a PostScript file using *plotnps* for *CALPLOT* graphics or *a2ps* for text files. Then use the Cygwin command ps2pdf to convert the file to an Adobe Portable Document File:

ps2pdf plot.eps

or

ps2pdf text.ps

which by default creates the files plot.pdf or text.pdf. Now go to the Windows menu and open the Adobe Acrobat Reader (which you most likely already have on your computer. You can download this free from the Adobe site). Ou can also use the Windows version of GhostScript and Ghostview (http://pages.cs.wisc.edu/~ghost/). If you were working in your home directory, then the file would be in a windows location such as

C:\cygwin\home\rbh\text.pdf

Or if you were working in the */cygdrive/c/*usr area, the Windows location would be

C:\usr\plot.pdf

The reason for using this mechanism, is that Windows software knows everything about the connected printers and the Cygwin environment does not.

The example given for converting the *plot.eps* to a Portable Networks Graphics format *plot.png* is adequate for placing a figure in PowerPoint or in a web document. If you wish to use the figure for a large poster presentation at a scientific meeting or in a Word document, then you will require more resolution so that the printed version looks good.

I created the following SHELL script called *EPSTOPNG*. I also told the system that it should be an executable by the command

rbh> chmod +x EPSTOPNG

and I placed it in my ${HOME}/bin directory so that my PATH can find it. The contents of this file are:

```
#!/bin/sh


EPS=$1
```

```
BASE=`basename ${EPS} .eps`
convert -trim -density 150x150 -resize 1000x1000 ${BASE}.eps $
{BASE}.png
```

This command strips the *.eps* from the file name, converts the EPS to a PNG using 150 dots/inch (about 60 dot/cm) and permits the image to have originally been 9 inches x 9 inches (or 22.5 cm x 22.5 cm). If you want a better looking image, change the 150x150 to a 300x300, realizing of course that the size of the file increases significantly.

You can learn more about the *convert* command by doing a

man convert

Note that we reset the PATH above so that entering *convert* gets the ImageMagick version and not the internal Windows version. There is also a program *display* which has some image editing commands and the ability to convert to many, many graphics file formats.

Additional information on commands is */usr/share/doc*

3.14 Cleanup

If you wish to update the Cygwin distribution or add more programs from the many on the disk, leave the C:\usr\Cygwin.dist folder alone. Otherwise you can remove it. You will always have the CD-ROM to get these programs. I usually leave the programs on disk.

3.15 Cygwin and LINUX

Command line processing is used. Please get any book on LINUX. The commands, editors and many other items are the same. You must know some LINUX commands in order to begin using Computer Programs in Seismology