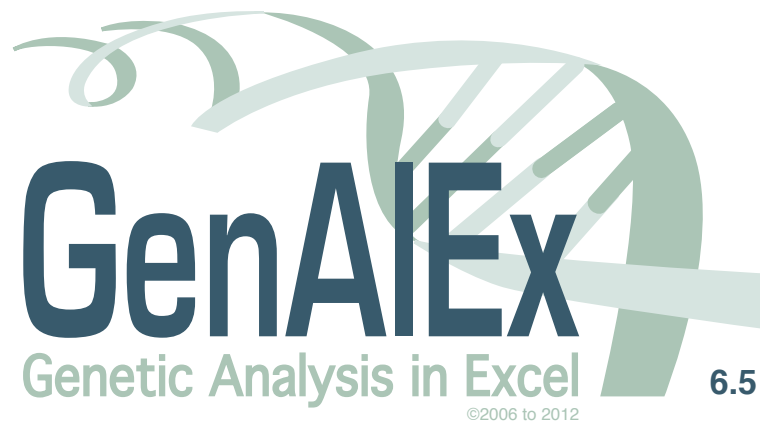


# Welcome to GenAlEx 6.5

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Peakall R. and Smouse P.E. (2012) GenAlEx 6.5: genetic analysis in Excel. Population genetic software for teaching and research – an update. *Bioinformatics* 28, 2537-2539. Peakall R. and Smouse P.E. (2006) GenAlEx 6: genetic analysis in Excel. Population genetic software for teaching and research. *Mol. Ecol. Notes* 6, 288-295.



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<http://biology.anu.edu.au/GenAlEx/>

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## Overview

GenAlEx: Genetic Analysis in Excel is a popular cross platform package for population genetic analysis that runs within Microsoft Excel. GenAlEx offers analysis of codominant, haploid and binary genetic loci and DNA sequences. Both frequency-based ( $F$ -statistics, heterozygosity, HWE, population assignment, relatedness) and distance-based (AMOVA, PCoA, Mantel tests, multivariate spatial autocorrelation) analyses are provided. In GenAlEx 6.5 we introduce exciting new features including calculation of new estimators of population structure:  $G'_{ST}$ ,  $G''_{ST}$ , Jost's  $D_{est}$ , and  $F'_{ST}$  via AMOVA, Shannon Information analysis, linkage disequilibrium analysis for biallelic data, and heterogeneity tests for spatial autocorrelation analysis. Data export is provided to more than 30 other software packages. New teaching tutorials and extra step-by-step options are included. The comprehensive independently written guide has been fully revised.

Peakall, R. and Smouse P.E. (2012) GenAlEx 6.5: genetic analysis in Excel. Population genetic software for teaching and research – an update. *Bioinformatics* 28, 2537-2539.

Freely available as an open access article from:

<http://bioinformatics.oxfordjournals.org/content/28/19/2537>

Peakall, R. and Smouse P.E. (2006) GENALEX 6: genetic analysis in Excel. Population genetic software for teaching and research. *Molecular Ecology Notes*. 6, 288-295.

The software and supporting documentation is freely available from The Australian National University, Canberra, Australia at the new URL: <http://biology.anu.edu.au/GenAlEx>

# Installation of GenAIEx 6.5

*The procedure for installing GenAIEx 6.5 is the same as for previous versions of GenAIEx.*

GenAIEx is provided as an Excel Add-in, a compiled module and its associated GenAIEx menu. Your downloaded file may initially be in the zipped format. Use the extract option to unzip the download and save the files to a dedicated folder of your choice. You can work with GenAIEx directly from this folder. Separate instructions for Excel 2003, 2010 on PC and Excel 2011 for Intel Mac are provided below.

**Notes for PC users:** We strongly recommend that you use either Excel 2003, or Excel 2010. Excel 2010 fixed a series of major issues in Excel 2007 including issues that affect the operation of GenAIEx. Importantly, calculations can be extremely slow in Excel 2007 other versions. It is also important to ensure that you have the most recent updates for your version of Excel.

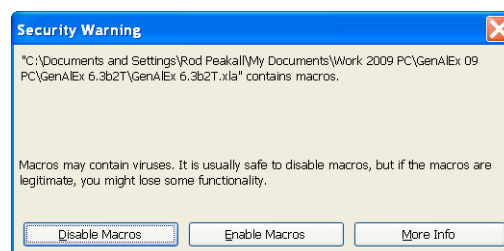
**Notes for Macintosh Users** On Macintosh computers, GenAIEx can be run in Excel 2004 and Excel 2011 (released in 2010, but badged as 2011), but not Excel 2008. This is because Microsoft removed the ability of Excel 2008 to run Visual Basic for Applications (VBA), the macro language of Microsoft Office. Note that Excel 2011 can only be run on Intel-based Macs. Be sure to read the readme file for Mac users, as there are some minor issues you need to know about. It is also critical to ensure you have the very latest update (at least 14.2.1 for Excel 2011). Several GenAIEx issues are due to bugs in early releases of Excel 2011.

## Loading GenAIEx in Excel 2003 on PC

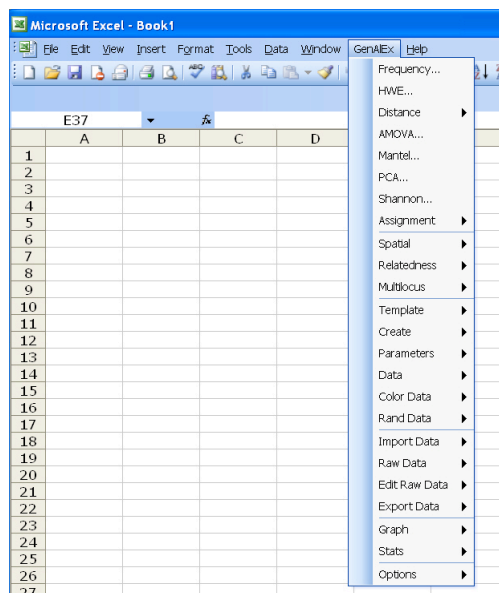
- Step 1. Copy the GenAIEx Add-in to your choice of location on your computer. This should preferably be in a dedicated folder.
- Step 2. Launch MS Excel. Choose *Open* from the **File** menu, locate the GenAIEx Add-in, then click the *OK* button.

*Tip: Alternatively, you can launch GenAIEx and Excel simultaneously by clicking directly on the GenAIEx Add-in file.*

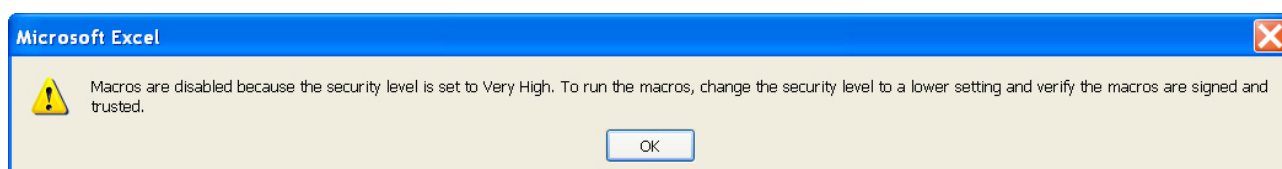
- Step 3. Depending on the settings of your Excel program, Excel may warn you that GenAIEx contains macros. Click the *Enable* button to proceed.



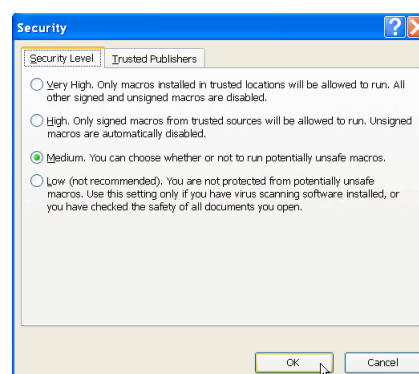
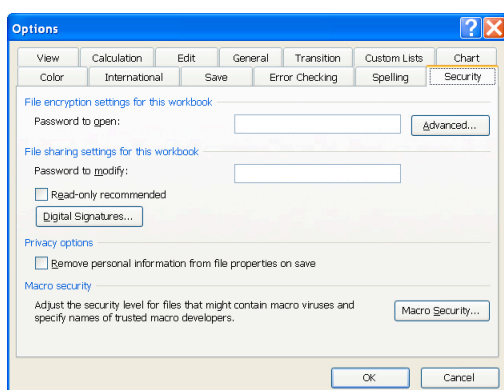
- Step 4. In a few seconds the GenAIEx splash screen will appear, click to hide, the **GenAIEx** menu will appear in the Excel menu bar, just before the **Help** menu.



- Step 5. If you do not see the security warning dialog box and/or GenAIEx does not launch, you may see the message below instead. In this case, continue to step 6.



- Step 6. From the Excel menu **Tools**, choose **Options**. At the options dialog box click the **Macro Security** button on the **Security** tab. In the next dialog box, choose **Medium** for the security level. Now return to step 1 to launch GenAIEx.

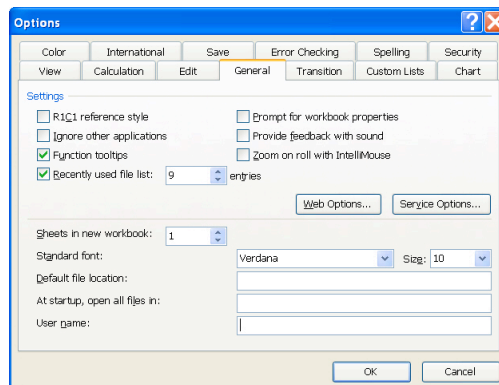


## Optimizing Font Size for GenAIEx in Excel 2003 PC

GenAIEx output is optimized for a font size of 10 pt. If not already, you should therefore set the Excel default font size to this setting.

*Note that this setting does not over ride the font settings embedded in existing worksheets. To ensure GenAIEx output is in 10 pt, you may wish to copy data (or data sheets) to new workbook that has been created after the Excel default font is set to 10 pt as outlined below.*

- Step 1. From the Excel menu **Tools**, choose **Options**.
- Step 2. At the options dialog box click the **General** tab. Set the standard font size to 10 pt.



## Loading GenAIEx in Excel 2004 on Mac

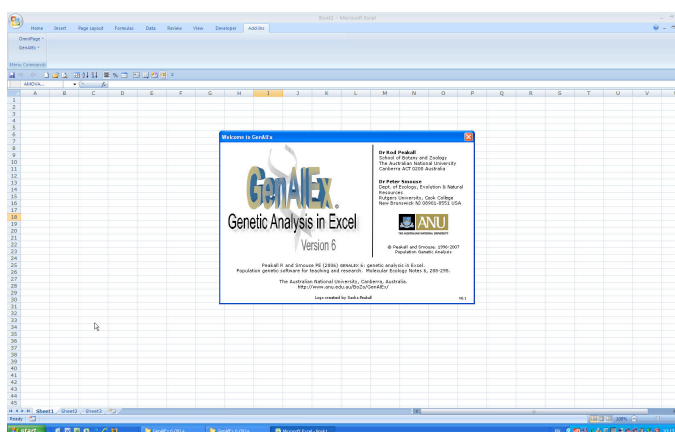
Instructions for loading GenAIEx in Excel 2004 (and setting default font size to 10 pt) on the Macintosh are essentially similar to those for Excel 2003 on PC and so are not reproduced in detail here.

## Loading GenAIEx in Excel 2007 or Excel 2010 on PC

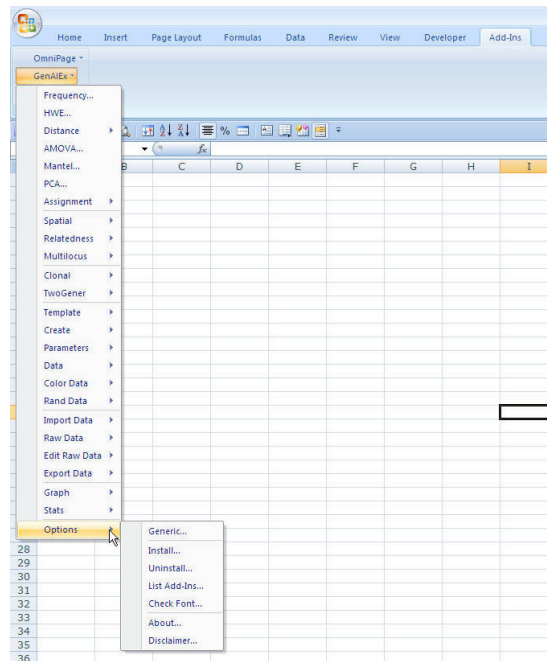
- Step 1. Launch Excel 2007 or Excel 2010.
- Step 2. In Excel 2007, open the GenAIEx Add-in via the Microsoft Office Button (top left of screen). In Excel 2010, open the GenAIEx Add-in via the **File** menu.
- Step 3. When prompted, by the Security Notice, choose *Enable Macros*.



- Step 4. Shortly the GenAIEx splash screen will appear.



- Step 5. Click the Add-Ins tab to show the Add-Ins ribbon. The GenAIEx menu will appear on the right, along with any other installed Add-Ins you may be running. When using GenAIEx you may find it convenient to turn off 'Minimize Ribbon' so that the GenAIEx menu is always accessible when the Add-Ins ribbon is shown. You can access this option by right-clicking the ribbon.

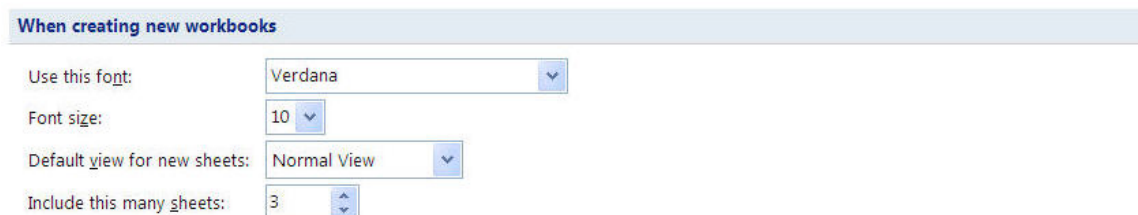


## Optimizing Font Size for GenAIEx in Excel 2007 on PC

GenAIEx output is optimized for a font size of 10 pt. If not already, you should therefore set the Excel default font size to this setting.

*Note that this setting does not over ride the font settings embedded in existing worksheets. To ensure GenAIEx output is in 10 pt, you may wish to copy data (or data sheets) to new workbook that has been created after the Excel default font is set to 10 pt as outlined below.*

- Step 1. Click the **Microsoft Office** button (top left of screen), then **Excel Options**.
- Step 2. Set the default Font Size for new workbooks to 10 pt under the option **When creating new workbooks**.



## Optimizing Font Size for GenAIEx in Excel 2010

GenAIEx output is optimized for a font size of 10 pt. If not already, you should therefore set the Excel default font size to this setting.

*Note that this setting does not over ride the font settings embedded in existing worksheets. To ensure GenAIEx output is in 10 pt, you may wish to copy data (or data sheets) to new workbook that has been created after the Excel default font is set to 10 pt as outlined below.*

- Step 1. Click the **File** menu, then click **Options**.
- Step 2. From the Excel Options dialog choose **General**.

- Step 3. Set the default Font Size for new workbooks to 10 pt under the option *When creating new workbooks*.

**When creating new workbooks**

Use this font:

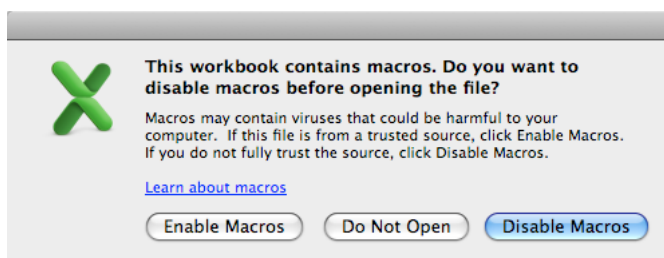
Font size:

Default view for new sheets:

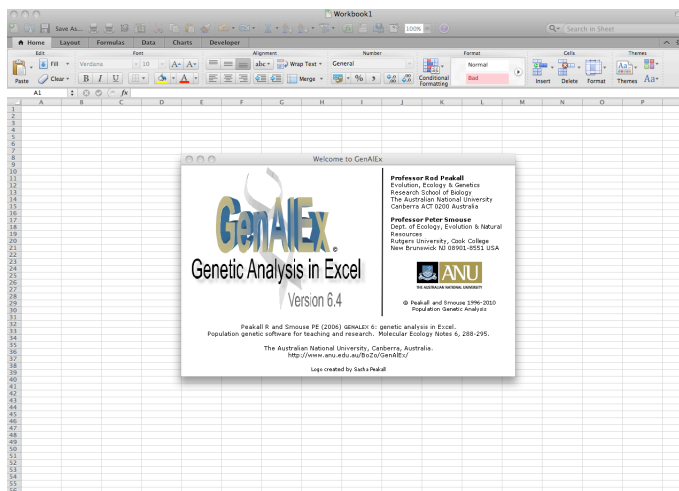
Include this many sheets:

## Loading GenAIEx in Excel 2011 on Intel Mac

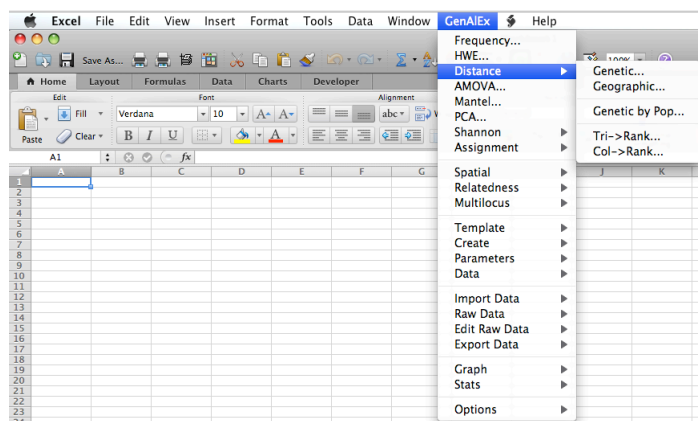
- Step 1. Launch Excel 2011.
- Step 2. From within Excel, open the GenAIEx Add-in via the **File** menu.
- Step 3. When prompted, by the Security Notice, choose *Enable Macros*.



- Step 4. Shortly the GenAIEx splash screen will appear.



- Step 5. Now you can access GenAIEx options from the **GenAIEx** menu.

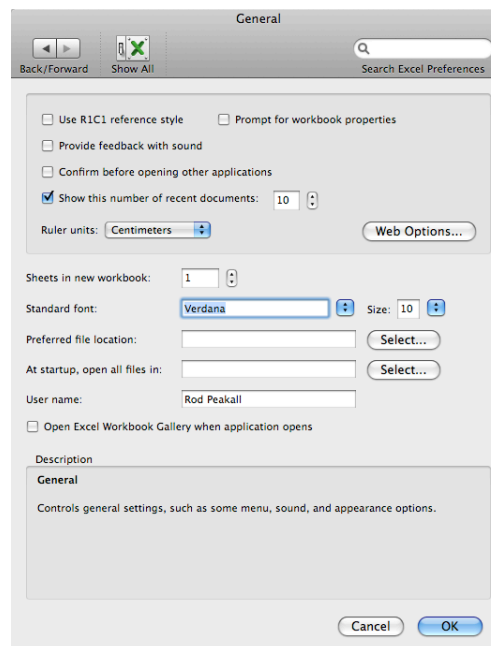


# Optimizing Font Size for GenAlEx in Excel 2011 on Intel Mac

GenAlEx output is optimized for a font size of 10 pt on both PC and Mac. If not already, you should therefore set the Excel default font size to this setting.

*Note that this setting does not over ride the font settings embedded in existing worksheets. To ensure GenAlEx output is in 10 pt, you may wish to copy data (or data sheets) to new workbook that has been created after the Excel default font is set to 10 pt as outlined below.*

- Step 1. Click the **Excel** menu, then click **Preferences**.
- Step 2. From the Excel Preferences dialog choose **General**.
- Step 3. Set the default Font Size for new workbooks to 10 pt under the option **Standard font**.
- Step 4. Excel will warn that you must restart Excel for this option to take effect.



## Learning More About GenAlEx

Extensive documentation about GenAlEx 6.5 is freely available from The Australian National University, Canberra, Australia at the new website: <http://biology.anu.edu.au/GenAlEx>

A good place to start learning about GenAlEx is to access the self-paced tutorial modules that we have provided on population genetic analysis. These tutorials are based on material we have prepared to support our various graduate workshops and provide step-by-step instructions for using GenAlEx to perform a wide range of population genetic analysis.

A Quick Start guide that includes some introductory exercises is also distributed with the GenAlEx Add-in, but should not be seen as a substitute for completing these tutorials.

The GenAlEx 6.5 *Appendix 1* document is also an invaluable source of information. This document summarizes the methods and statistics available in GenAlEx, along with more than 75 supporting references.

Finally the fully revised guide to GenAlEx 6.5 comprehensively covers the many features offered by GenAlEx.

Thank you for using GenAlEx!  
Rod Peakall and Peter Smouse