**Additional Material**

**Additional File 1**

**Name:** Instructions\_for\_*TSCreator*\_making\_evolutionary\_charts.txt

**Description:** A text file which contains instruction on how to execute the TimeScale Creator software on both Macintosh and Windows operating system, how to load datapacks and generate charts.

**Additional File 2**

**Name:** Vertebrate\_evolution\_datapack\_with\_images.dpk

**Description:** *TSCreator* datapack file which includes text datapack and images for vertebrate evolution.

**Additional File 3**

**Name:** Horse\_evolution\_datapack\_making\_using\_excel.xls

**Description:** An excel file with three excel sheets showing an example of making a horse evolutionary tree: (a) “Horse Evolution” (see Appendix 2 for further details), (b) “Master Chronostrat” (age information) (c) “Output” (final output to be saved as text datapack)

**Additional File 4**

**Name:** Horse\_evolution\_datapack\_in\_text.txt

**Description:** The final output text file for horse evolution generated using the excel file provided.

**Additional File 5**

**Name:** Paleogene\_forams\_evolution\_datapack\_with\_images.dpk

**Description:** *TSCreator* datapack file for planktonic foraminifer evolution through the Paleocene-Eocene epoch.

**Additional File 6**

**Name:** Small\_foraminifer\_evolution\_tree.txt

**Description:** A small *TSCreator* datapack file of planktonic foraminifer evolution to test the evolutionary path, common ancestor tree display, tree import/export features.

**Instructions to generate vertebrate evolution tree chart**

To generate the vertebrate evolution chart shown in figure 1, follow the steps below:

1. Run the *TSCreator* program. If you don’t have the program installed in your computer, see the last section for installation instruction. The program, upon installation, will automatically load the default datapack during startup and you may have to wait for about a minute.
2. Load the vertebrate evolution datapack (Vertebrate evolution datapack with images.dpk) by clicking the menu “File->Add Datapack”.
3. Open the Settings window by clicking the settings button. Set the “Top of Interval” to be 20 Ma and “Base of Interval” to be 530 Ma in the tab named “Choose Time Interval” and “Vertical Scale” to be 0.05 (Choosing larger vertical scale values will scale the chart up).Click the checkbox to turn on the option “Add MouseOver info (popups)” and “Enable stage background for event columns”.
4. Select the next tab “Choose Columns”. You will find “Vertebrate Evolution and Ranges” column loaded at the end of the list. Uncheck all the columns except “Ma”, “Standard Chronostratigraphy”, then its sub column “Period”, “Vertebrate Evolution and Ranges” at the bottom and its sub column “Evolutionary Tree Overview”. Keep the parent column checked when you are choosing the child column.
5. Click the “Generate” button to generate the vertebrate evolution chart. You can click on the names and images to see the red rectangular region and open the popup upon clicking. To see the popup information for branches, right-button click on the red branch circles.
6. You can use the “zoom in”, “zoom out”, 1:1 (100% zoom), “zoom fit” buttons (beside the Generate chart button under the menu bar) to see and explore variable sized chart.
7. Save the chart as PDF or SVG or other image file (PNG, JPEG etc.) by clicking the menu File-> “Save ..”.
8. To explore further capabilities of *TSCreator* program, please check the tutorials and manuals in the website (URL: <https://timescalecreator.org/manual/tutorial.php>)

**Notes on Paleogene foraminifer evolutionary tree generation**

Load the Paleogene foraminifer evolution datapack (Paleogene forams evolution datapack with images.dpk) file after running the *TSCreator* program. The Top and Base age needs to be set between 20 Ma and 70 Ma for the foraminifer evolution tree to be shown on the chart. Like the previous instructions for vertebrate evolutionary tree, you will have to choose “Paleogene Planktonic Foraminifer Evolution” column and the sub columns that you want to visualize to generate chart images for foraminifer evolution tree.

**Notes on horse evolution datapack and horse evolution tree generation**

We have provided an excel file (Horse evolution datapack making using excel.xls) which can be used to generate a real horse evolutionary tree datapack (Horse evolution datapack in text.txt) similar to the sample horse evolution shown in figure 4. The excel file contains three excel sheets. The first sheet shows how each column can be populated with required information (see Appendix 2 for datapack format). The second sheet is where the age/stage information is given. The third sheet shows the final output generated from the first sheet which can be saved as a tab delimited text datapack file and can be loaded in the *TSCreator* program to generate the horse evolutionary tree.

**Instructions to test various tree display features**

To generate a small foraminifer evolution chart and use some new features to produce partial subtrees, follow the steps below:

1. Run the *TSCreator* program.
2. Load the “Small\_foraminifer\_evolution\_tree.txt” datapack by clicking the menu “File->Add Datapack”.
3. Open the Settings window by clicking the settings button. Set the “Top of Interval” to be 0 Ma and “Base of Interval” to be 45 Ma in the tab named “Choose Time Interval” and “Vertical Scale” to be 1.Click the checkbox to turn on the option “Add MouseOver info (popups)”
4. Select the next tab “Choose Columns”. You will find “Tree” column loaded at the end of the list. Uncheck all the columns except “Ma”, “Tree” column.
5. Now select the “Tree” column which will display the tree column option in the right hand side above the “Information and References” section. If you scroll down, you will see two textboxes labeled as “Input first range name” and “Input second range name”.
6. Input the species “Neogloboquadrina dutertrei” in the first textbox and “Pulleniatina spectabilis” in the second textbox. If you click on the “Show evolutionary history” button below the range name textbox, the evolutionary path tree will be instantly generated.
7. You can also click on the “Common ancestor of above ranges” button to get the name of the common ancestor in the following textbox and also generate the subtree rooted at the common ancestor.
8. Now click on the “Show All Branches” button and then click generate button to show the full tree again.
9. If you check the “Hide Ancestors” in the tree column option panel and left button click on any of the “red-dot” branch points, all the parent ranges of the range will be hidden. If the “Hide ancestors” checkbox is unchecked, only the clicked branch is hidden otherwise.
10. You can save the tree by clicking “Save tree” option which will save the tree column data selected in the left in three different format: Nexus(.nex), Newick(.nwk), TSCreator(.txt). However, this option is only allowed when you have loaded an unencrypted datapack. If you have loaded an encrypted tree datapack, the program assumes that the creator of the datapack doesn’t want to provide the full datapack except for visualization through TSCreator.

**How to install *TSCreator* program**

You can download the latest version (*TSCreator* 7.3) of the program from our website <https://timescalecreator.org/download/download.php>**.** Our program can be downloaded as Java archive (Jar) file and Windows executable file (exe). The Jar file can also be run on Linux, Chrome or any other OS using command line Java program (command: java -Xmx2G -jar TSCreatorPUBLIC-7.3\_15Feb2018.jar). You will have to first install java (<https://www.java.com/en/download/help/download_options.xml> ) on your operating system to run the downloaded *TSCreator* program.

We alsoprovidethe installer program (.dmg or .exe) for Macintosh or Windows operating system which includes a bundled Java Runtime Environment (JRE) and does not require users to install Java. We were planning to provide the installer program with this publication as additional file, but we were unable to upload due to file size limit (20 MB). We are planning to provide these programs through our website or other accessible archive.

**Further notes on *TSCreator* program installation and execution**

Users may face difficulty in running the program due to multiple Java version installation or other well documented Java related issues. A number of users had to remove all prior Java installations to resolve conflict and install the latest Java again. We also ask users to try previous *TSCreator* version (6.8) in case you are not being able to run the current (7.3) version for debugging. We encourage users to directly contact us ([azehady@purdue.edu](mailto:azehady@purdue.edu), [jogg@purdue.edu](mailto:jogg@purdue.edu)) if they are facing program installation issues or not being able to start the program upon installation. We have been providing a discussion “forum” (<https://timescalecreator.org/forum/forum.php>) and “contact us” (<https://timescalecreator.org/contactus/contactus.php>) section on our website to help users resolve such issues. Our program is constantly undergoing development in terms of adding new features, and user friendliness and we encourage you to checkout our latest versions time to time.