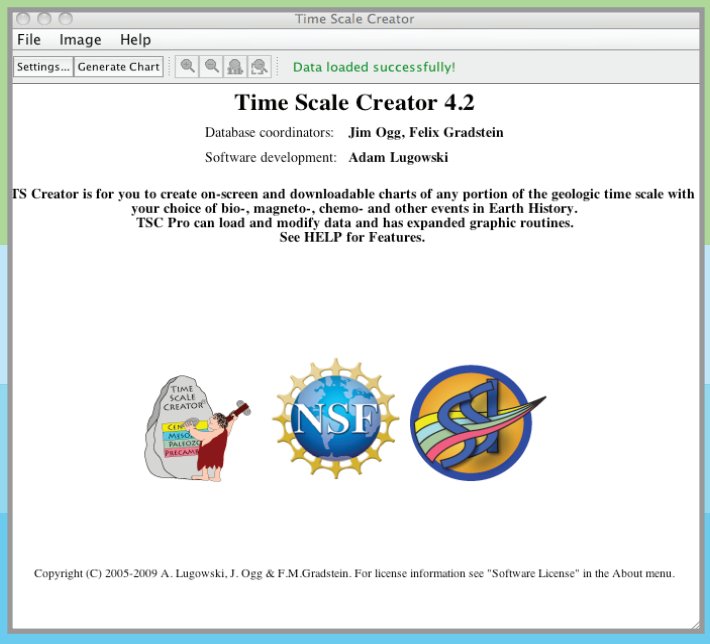
TimeScale Creator

a visualization system

Tour and Exercises



2010 Edition

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Time Scale Creator

www.tscreator.org

Reference time scales and graphical output system

Tour and Exercises

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Tour and Exercises

"*TimeScale Creator*" is an extensive time-scale database with visualization software-package in JAVA (which should work on most platforms). This version is the current phase of our dream of a general portal to Earth history, plus user-generated charts. Most of the datasets are oriented toward geologic history, but we include an optional demo datapack with some aspects of human civilization.

This *Tour and Exercises* is oriented toward a general audience.

What *TimeScale Creator* does:

(1) **Screen display** of user-selected time-span and selected columns of geologic time scale information (stages, paleontology, magnetics, sea-level, chemistry, impacts, other planets, etc.). You, the user, can change the vertical-scale, column widths, fonts, colors, titles, ordering, range chart options and many other features. Mouse-activated pop-ups provide additional information on columns and events.

(2) **Save** the final graphic as a SVG (scalable vector graphics) or PDF file for direct import into Adobe Illustrator or other common drafting software. You can also save your "settings" to recreate the charts on-screen.

(3) **Upload additional datapacks** of regional geology and transects, high-resolution isotopes, ancient cultural episodes, etc.; plus create and upload your own datasets. The ***Pro*** version, after uploading such datapacks, allows you to save the associated graphic files and to re-save merged datasets. See "*About Pro*" on the website for details, plus additional datapacks.

Internal Database (*approximately 25,000 event-ages in this version*):

There are over 300 stratigraphic columns grouped into categories, mainly spanning the past 550 million years of Earth's history (the Phanerozoic eon with animal fossils). All events are calibrated to *Geologic Time Scale 2004* (Gradstein et al., 2004, Cambridge Univ. Press) and *Concise Geologic Time Scale* (Ogg et al., 2008, Cambridge Univ. Press). You can download a full listing of columns, plus the main references, from the website.

How to use it: *(a simple step-by-step tutorial; see internal Help documents within the program for more features)*

First, if you haven't already downloaded the program, go to ***www.tscreator.org*** and install either the .jar (JAVA for most platforms) or .exe (a wrapped JAVA that avoids some system problems in some Windows versions). If you have a problem with the program under Windows, then you may need to update the JAVA – see link on the download page of the website.

Tour #1 -- Default settings

(1) **Begin** the program by double-clicking on the ***TS-Creator*** icon.

(2) **An opening screen window** appears with our main non-commercial sponsors and data-providers, and the internal database is automatically loaded (~40,000 data lines). Stretch

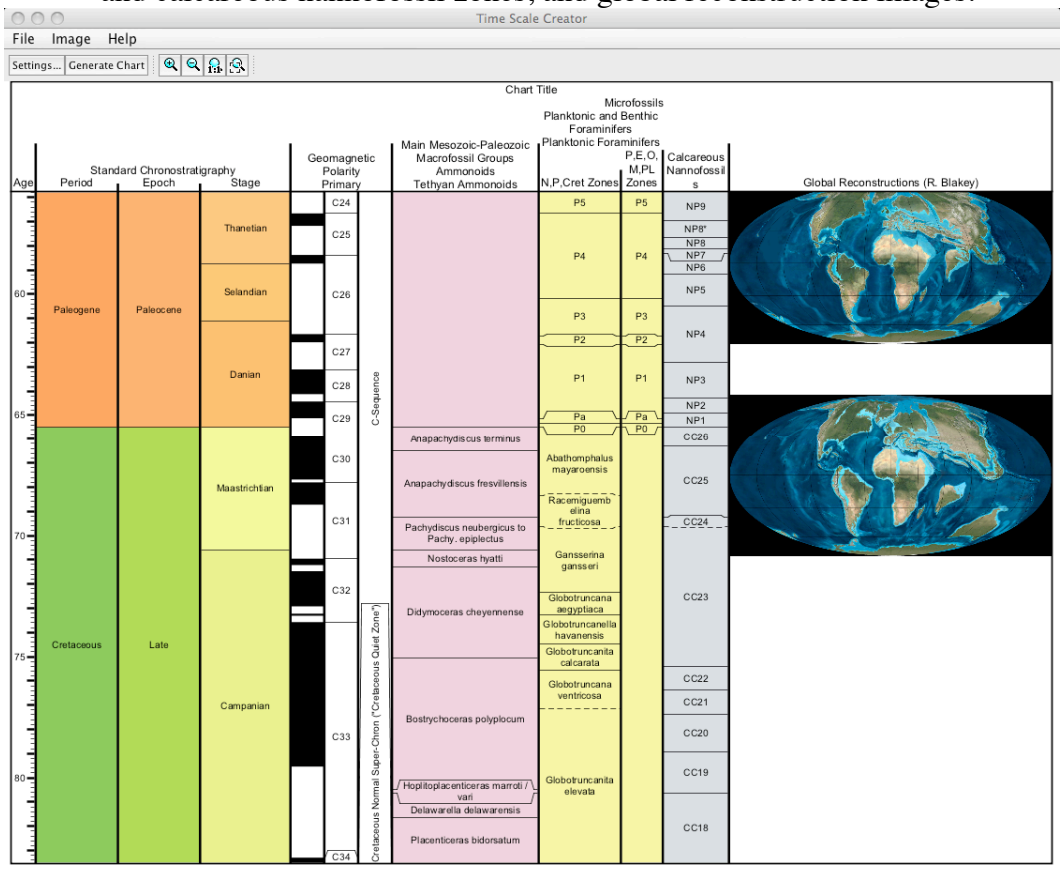
this window to fill your particular screen size, because this will determine the "fit to window" size of the output graphic display.

[NOTE: The default screen display is independent of the actual diagram, but you can rescale the image to actual size. The saved SVG graphics will be scaled according to the scales set by you, and will not be the sizing that you initially see on the screen.] Advanced users can go under the File-menu to append external databases or replace the default suite– We will give examples under the Exercises 2 and 3 below.]

(3) Click the "***Settings***" button. This opens a new window.
There are 3 tabs. Begin with "***Choose Time Interval***". For your first adventure, set the "*Top of Interval*" as "***Thanetian***" stage (55.8 Ma at top), and the "*Base of Interval*" as "***Campanian***" stage (83.5 Ma at base). [*Notice that you can also designate the Top/Bottom of the interval in millions of years.*]

(4) Click "***Generate***". A message about "*Rendering*" should be displayed. The initial run takes about 10 to 20 seconds, but later runs are generally quicker.

(5) VOILA! The image has the default set of zonations – international divisions of geologic time, magnetic polarity chrons, ammonites zones of Tethyan Realm, major planktonic foraminifer and calcareous nannofossil zones, and global reconstruction images.



This is a sampling of the array of biologic, geochemical, sea-level, magnetic and other information that has been cross-calibrated by a generation of earth scientists. In the supporting databases (a separate array, with output that is mirrored in this software), the age of all these events are computed according to their observed or statistical occurrence relative to each other, to astronomical-climate cycles and to radiometric-age control. If one calibration is changed, or

an age is updated, then all events that depend upon that calibration will also automatically adjust; therefore, new charts can be quickly produced. It is not real-time, yet – the relational databases do not directly feed into values within the visualization system – but this will come in the near future.

Tour #2 -- User-selected stratigraphic columns and other options

Now, suppose we wish to plot planktonic foraminifer datums and named global sequences through the late Campanian through mid-Paleogene (75 Ma to 60 Ma).

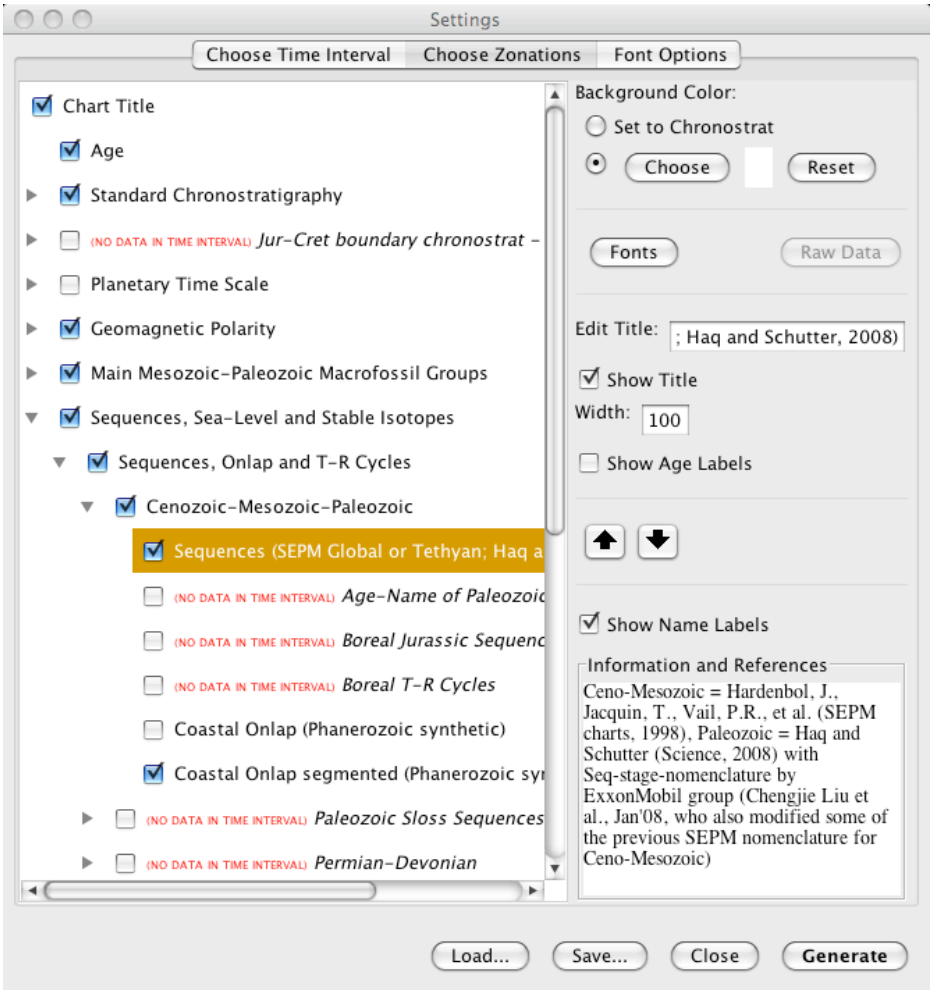
(1) First, click the ***Choose Zonations*** tab of the ***Settings*** window. The available stratigraphic columns are indicated. For now, we will turn OFF the Ammonite columns. **Open** *Main Mesozoic-Paleozoic Macrofossil Groups*. Then **open** *Ammonoids*. See the checked blue-box for *Tethyan Ammonoids* – Click the highlighted box to **OFF**.

(2) **Close** the directory of *Main Mesozoic-Paleozoic Macrofossil Groups*; and **Open** *Standard Chronostratigraphy* (top of directory listing). Click the box **ON** next to the *GSSPs* to activate that column. This will display which stages have international-ratified basal definitions or Global Stratotype Section and Points ("GSSP"). Close the directory.

(3) Next, **open** the directory *Microfossils*. Turn OFF the *Calcareous Nannofossils*. Opern the sub-directory *Planktonic and Benthic Foraminifers*, then sub-sub-directory *Planktonic Foraminifers*. Highlight the name *Planktonic Foraminifers*, and notice that the main selected sources of data appear in the lower-right box. Click the boxes **ON** next to *Foram Zone Marker* and *Other Foram FAD/LAD*. Notice on our original screen display that the column for *N,P,Cret Zones* was too narrow to adequately display the full zone genera-species names. **Highlight** the name *N,P,Cret Zones*, and notice that a set of options appears on the right panel. In the middle is "*Width*", which has a default of **100**. Change this to **150**, followed by a Return to activate that choice. Turn OFF the *P,E,O,M,PL Zones* column, which is not significantly different in this interval.

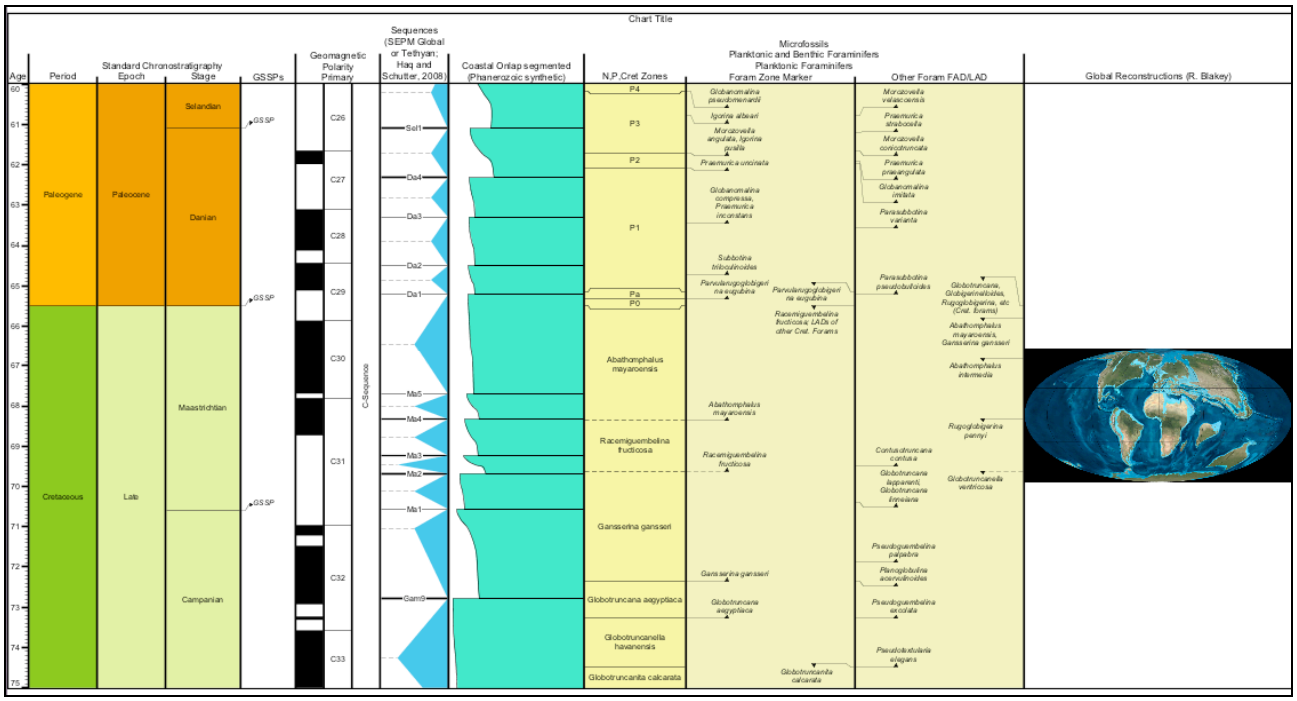
Notice the sets of options on the right-hand. You can also change the title of the column that is highlighted (*by typing in that window*), font sizes, direction of labels, move the column relative to adjacent ones, change background color, and other simple graphics. Close the Microfossil directory.

(4) We wish to add major sequences. Turn **ON** the directory *Sequences, Sea-Level and Stable Isotopes,* then open the directory, open the subdirectory *Sequences, Sea-Level and Stable Isotopes,* then the sub-subdirectory *Cenozoic-Mesozoic-Paleozoic*. Click ON *Sequences (SEPM Global or Tethyan; Haq and Schutter 2008)*, which are the major sea-level changes. To avoid excessive column labels when we are displaying only a single column within a larger suite, **highlight** the main *Sequences, Sea-Level and Stable Isotopes* and click OFF the "Show Title" box (middle of the right-hand menu of options). Then, also turn off the titles for *Sequences, Onlap and T-R Cycles*, and *Cenozoic-Mesozoic-Paleozoic*.

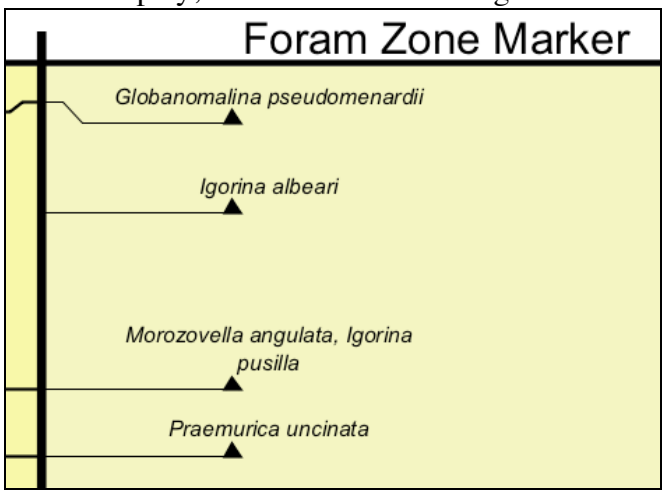


(5) Now, we want to select the time interval and enlarge the vertical scale. Click the "***Choose Time Interval***" tab at TOP of Menu window. Click **ON** the *Millions of Years* option for the Top of Interval, and enter **60**. Then, click ON the *Millions of Years* option for the Base of Interval, and enter **75**. Set the underlying vertical scale to be **2** cm per Myr on printed page (rather than the default of 1 cm per myr).

(6) Click ***Generate***. Depending on your screen size, it will be possible to read the names of the different planktonic foraminifer species that appear or become extinct through this time interval.



(7) To see this information easier, you can either use the Magnifying or Reducing icons on the upper menu, or use a bit of magic – While continuously pressing down the CONTROL key on the keyboard, hold down the left-button on the Mouse (on Mac; it might be right-button on Windows) and sweep over the region that you wish to display on the screen. You can use the side-bars on the display to pan over the magnified image. To return to the full display, either use the Reducing or 1:1 icon as needed, or tap the ***Generate Chart*** again.



Tour #3 – Pop-ups, Internet access, and selected display options

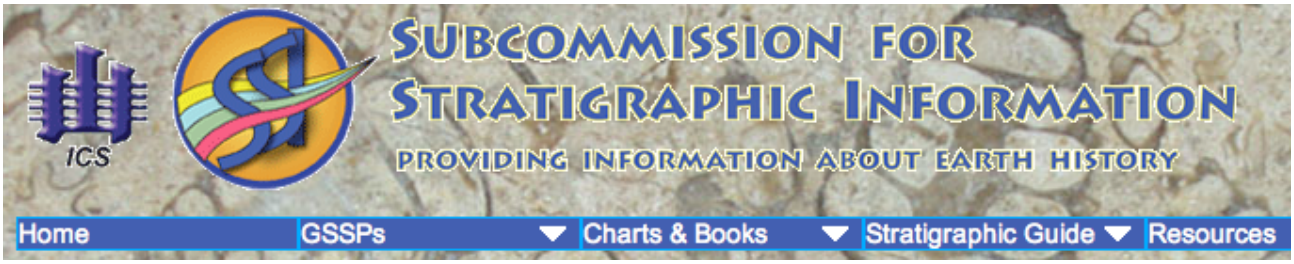
(1) **Hot-Mouse**
Now, return to the "***Choose Time Interval***" menu under ***Settings***. At the bottom, click **ON** the ***Add MouseOver info***. This will activate pop-up windows of additional information.

(2) Click the ***Choose Zonations*** tab, and click OFF the *Global Reconstructions* column to save screen space. Under the *Sequences, Sea-Level and Stable Isotopes* directory, open the sub-sub-directory with the *Sequences (SEPM Global or Tethyan)*. Highlight the name to bring

up options on the Right panel. Click ON "***Show Age Labels***" (just below the *Width* box). **Generate**.

(3) ***Age-Labels:*** Notice that all Sequence boundaries now have tiny age-labels next to the displayed names. Using the Control-mouse-sweep, you can enlarge a portion to One can display such ages for any selected zone or datum columns.
Pop-up windows: Move your Mouse-pointer over Sequence boundary "Ma5". As you put the Mouse-pointer over the name "Ma5", notice a red-dot blinks. Click directly on the text "Ma5", and a window will appear with information on the calibration of this sequence boundary.
Now, move the Mouse-pointer over the column title "*Sequences (SEPM Global or Tethyan)*", and a new pop-up window appears with the source of information. This "MouseOver" option is currently installed for all Column headers (either major or minor), Sequence boundaries, and many of the Microfossil zones and datums. Eventually, we will try to provide such background information and hot-links for the other thousands of items.
We will next see how this system acts as a gateway to other data stored around the world in our second and third exercise.

(4) **Internet links** – Move your Mouse-pointer over the title "***Standard Chronostratigraphy***". A red-dot blinks. Click on the title, and another window will appear that says: "[International Commission on Stratigraphy (2006). Click GSSP for official boundary (GSSP) definitions, status and nomenclature.]" Click on the blue-highlighted "**GSSP**". Your default browser will be activated and Internet site of ICS's Subcommission for Stratigraphic Information will be opened. Under its "GSSPs" menu is a table of the definitions of all international divisions of the geologic time scale.



Now, back to the **TimeScale Creator** display -- click on the GSSP arrow next to the base of the Maastrichtian Stage. Another window will open, which says "[The base of the Maastrichtian Stage [click GSSP for graphics] is defined …]". When you click on that **GSSP**, then the Internet sub-site will open with a detailed description and links to location map and outcrop graphics.

(5) **Saving Display Parameters** -- If you create a screen display that you like, then under ***Settings***, there are bottom-buttons that enable you to **SAVE** … a "*Settings file*" (in our ***.tsc*** format) that contains the necessary instructions for TimeScale Creator, or to **LOAD …** an earlier one to re-generate that same graphic for an audience or for additional revisions. If you are working on a major diagram, then we suggest using this feature to periodically save intermediate graphics, just in case the operating system has problems.

Details on the many other capabilities and display options are illustrated under "Features" in the Help menu (main window). You can also download the full Manual (*compiled courtesy of ExxonMobil*) from the website.

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Now, let's use *TimeScale Creator* to explore some interesting geologic events, and some of its other capilities.

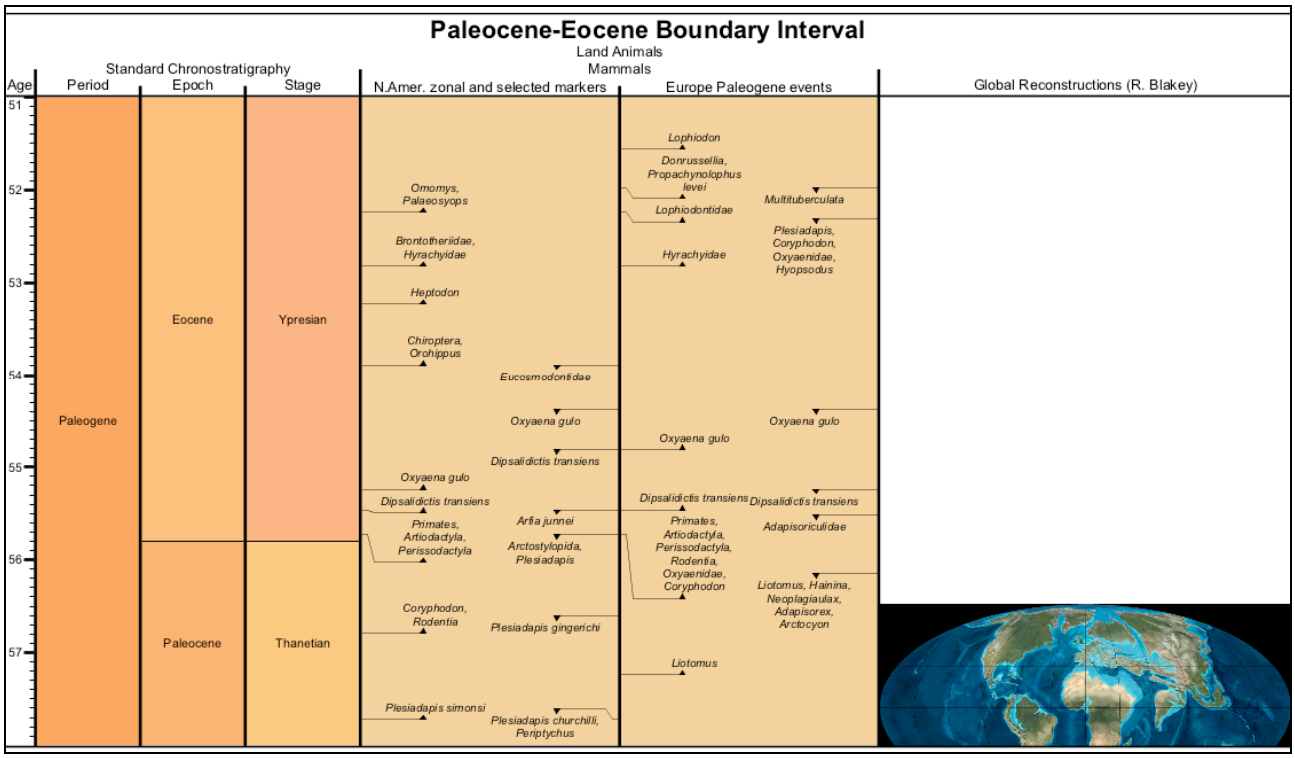
Some of the question sets were designed for undergraduates in historical geology; but you may find them interesting.

EXERCISE #1 – Global Warming

(1) **Reset display; then focus on Paleocene/Eocene boundary interval**

Under FILE (top-left of menu bar); click "Replace Data with Default Datapack". This will clear all your settings. Set up a diagram with the following: **Age** (use manual entry, and be sure to click that option) = (51 Ma top) to (58 base); **vertical scale** = 4; ***Geomagnetic Polarity*** – turn OFF; ***Microfossils*** – turn OFF. Turn ON ***Land Animals***, open the directory and turn ON ***Mammals***, then **open** it to turn ON *N.Amer. zonal and selected markers*, and *Europe Paleogene events*; and turn OFF all other Mammal columns.

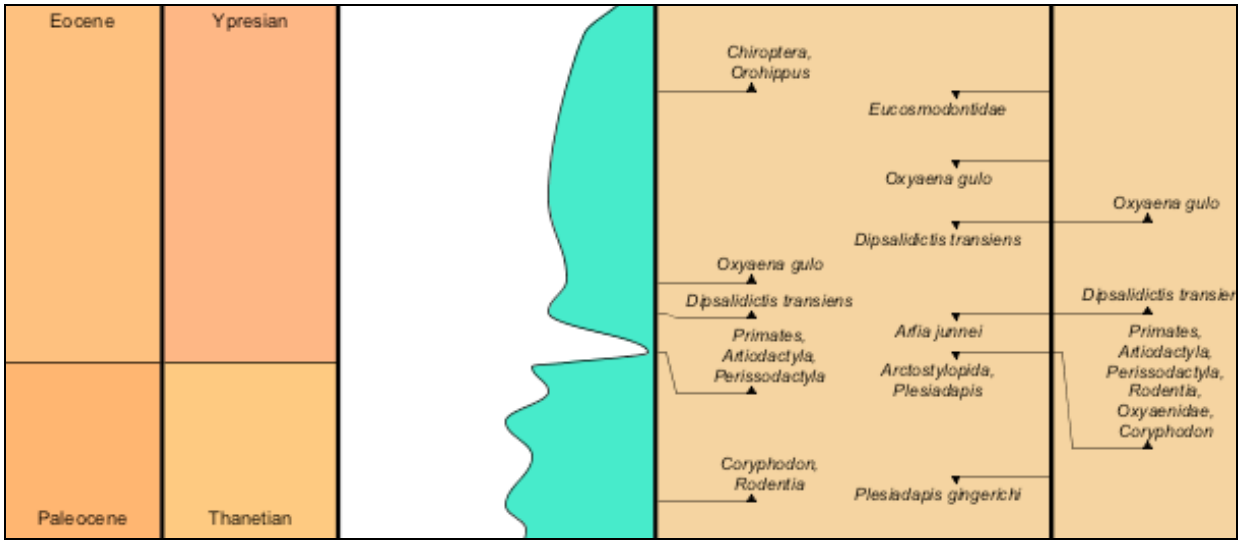
Now, let's add a title in large-font to this chart. Highlight "*Chart Title*" at the top of the Zonations menu. On the right-hand panel, change it to read "**Paleocene-Eocene Boundary Interval**". Click the **Fonts** button; and for Column Header, change the Font Size to be 24 and Bold; then Close. ***Generate***.



(2) Under <u>both</u> North America and Europe Mammals, you will see that the first appearance of **Primates** (early apes) occurred near the base of the Eocene epoch.
About 1 myr earlier, in North America, you see that ***Coryphodon*** (hippopotomas-looking browsers) and **Rodentia** (mice-squirrel-rabbit family) appeared. <u>However</u> notice that in the Europe column, these animals did <u>not</u> appear until the same time as Primates.
Therefore, one might postulate that *Coryphodons* and *Rodentia* had evolved in N. America, then migrated to Europe at the same time that *Primates* appeared on both continents. But, in the early Eocene, the only way for these animals to walk between North America and Europe was via land bridges to Asia that were near the Arctic-circle – notice the reconstruction. Hippopotomas-like animals could not survive such Arctic temperatures. Plus, the early Primates were tropical creatures that didn't thrive in North America and Europe until their human descendents arrived with warm clothing. Let us investigate this question:

- ***What happened to cause these appearances at the beginning of the Eocene?***

(3) Turn ON ***Sequences, Sea-level*** …, then under it turn <u>OFF</u> *Sequences*, Onlap … turn <u>ON</u> *Stable Isotopes*, open this sub-directory, turn ON the ***Cenozoic Marine Oxygen-18 Composite*** column. **Highlight** the name <u>*Cenozoic Marine Oxygen-18 Composite*</u> to bring up the menu of display options. Change the ***Range*** (initially –1 to 5) to be (-0.3 to 1.5); and click ***Show Scale*** (and make Step as 0.5). Turn off the "Show Title" for *Sequences* ... , and for *Stable Isotopes* ... by highlighting their names, as you did in Tour #3. ***Generate***.

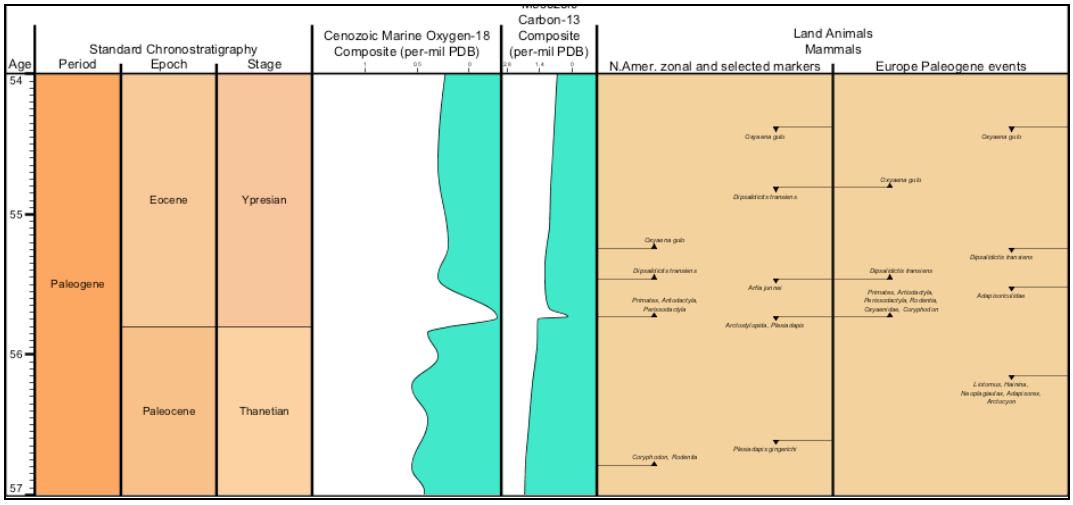


Oxygen-18 is a monitor of deep-sea temperatures, and helps indicate the temperatures in high-latitudes where these deep waters form. In an Antarctic-ice-cap-free world (which was the Eocene situation), a value of "0" is about 10-degrees C, and a value of "1" is about 6°C.

(4) This is interesting. Think about the plot, and answer the following:

- ***What was the general temperature trend of deep-waters from 58 million-years-ago through the earliest part of Eocene?***
- ***What happened to bottom-water temperature at the exact time that Primates appeared in North America and Europe?***
- ***What does this imply about the climate?***

(5) Now, what caused this? Under ***Sequences*** …, then under *Stable Isotopes*, turn ON the *Cenozoic-Mesozoic Marine Carbon-13 Composite*; then, as we did with Oxygen, highlight the name *Cenozoic Marine Carbon-13 Composite* to bring up the menu of display options. Change the Range to be (-1 to 3); Show Scale (and make Step as 1). ***Generate***.



(6) Carbon-13 of organic matter is Negative, because life prefers to use Carbon-12. This is also true for coal and oil, which are derived from organic matter. Therefore, if the global-ocean becomes more "negative", then it means that the organic carbon is being recycled back into the Earth system (especially the atmosphere). A negative shift in the Carbon-13 value by 1 is nearly equivalent to doubling the Earth's carbon-dioxide through release of stored organic-carbon. This episode is known as the "**Thermal Maximum**" of the past 70 million years.

- ***Therefore, when you look at both the carbon and oxygen, what might have happened at the base of Eocene?***
- ***What were the implications for mammals on the continents of North America and Europe?***
- ***This event marked the emergence of modern mammals. Given that coincidence, then what might happen with future global warming?***

(7) ***Possible cause.*** The bottom directory in *Zonations* menu is *Impacts, Volcanism, Tectonics*. Turn it ON; then open it to turn **OFF** *Impacts* and **ON** *Large Igneous Provinces*. Under Choose Time Interval menu, turn ON *Add MouseOver info*. ***Generate***.
The reasons for the ultra-high greenhouse and carbon-release are still debated, it appears that a massive volcanic event "North Atlantic Volcanic Province" that began the Iceland volcanic center was one of the initial triggers, followed by release of methane hydrates (very

negative carbon-13 values) from ocean sediments. Click on this event to read the pop-up window, and explore more about its extent.

EXERCISE #2 – Oil in Australia

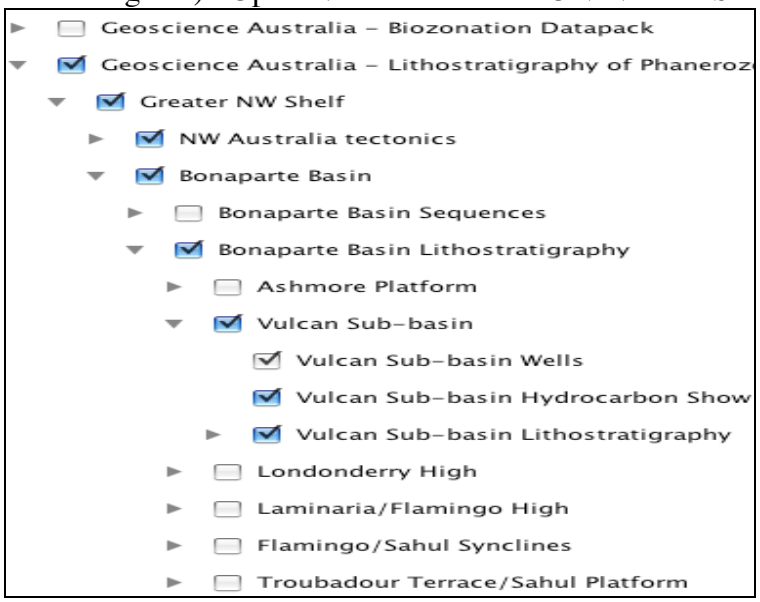
(1) **Reset display; Download and add Australia Datapack**

Under FILE (top-left of menu bar); click "***Replace Data with Default Datapack***". This will clear all your settings.

Go to the ***www.tscreator.org*** website, under Datapacks menu, download ***Australian biostratigraphy*** datapack (or follow instructions given on accessing from another class server). Unzip the file (unless it was done automatically by your operating system) to get the folder "*Australia_strat_wReconstructions*". This joint product with Geoscience Australia contains lithologic columns for all major Australian basins for the past 2.5 billion years, plus all major biostratigraphy zonations and sets of tectonic reconstructions (a total of nearly 500 columns!). We will use only a small portion.

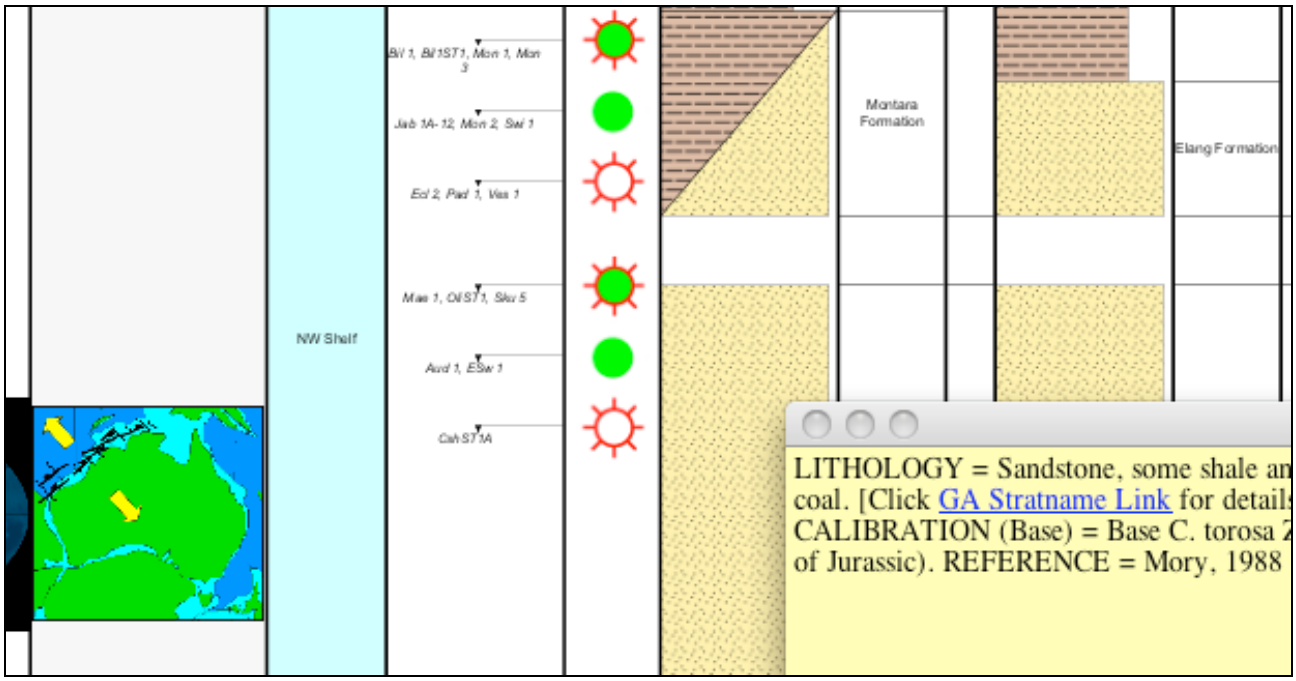
FILE (upper-left of top menu), go to *Add Datapack*. Using its finder, locate the folder "*Australia_strat_wReconstructions*", open and load the file called "***Australia_biostrat_and_basins_Dec09.txt***" (near bottom if listed alphabetically, or near top if listed chronologically). It will take a few moments to load.

Choose Time Interval of **143** to **180** Ma; with vertical scale of 1. Under ***Choose Zonations***, turn **OFF** "*Main Mesozoic-Paleozoic Macrofossils Groups*", "*Microfossils*", and "*Global Reconstructions*". Under ***Geoscience Australia – Lithostratigraphy of Phanerozoic Basins***, turn ON "*Greater NW Shelf*" (and turn off the other regions). Open "*Greater NW Shelf*" to turn ON "*NW Australia tectonics*" and "*Bonaparte Basin*" (and turn off all other basins). Open "*Bonaparte Basin*" to turn ON *Petrel* and *Vulcan* subbasins (and turn off the other regions). Open "*Vulcan*" and turn ON "*Vulcan Sub-basin Wells*". ***Generate***.



[NOTE: if you get a warning of "Don't Panic" after Generate, then try Generate Chart again. Sometimes JAVA, especially the Windows version, doesn't clear its memory usage very efficiently. SEE LAST PAGE for details. On some inefficient Windows operating systems, you may need to close the JAVA and restart the program.]

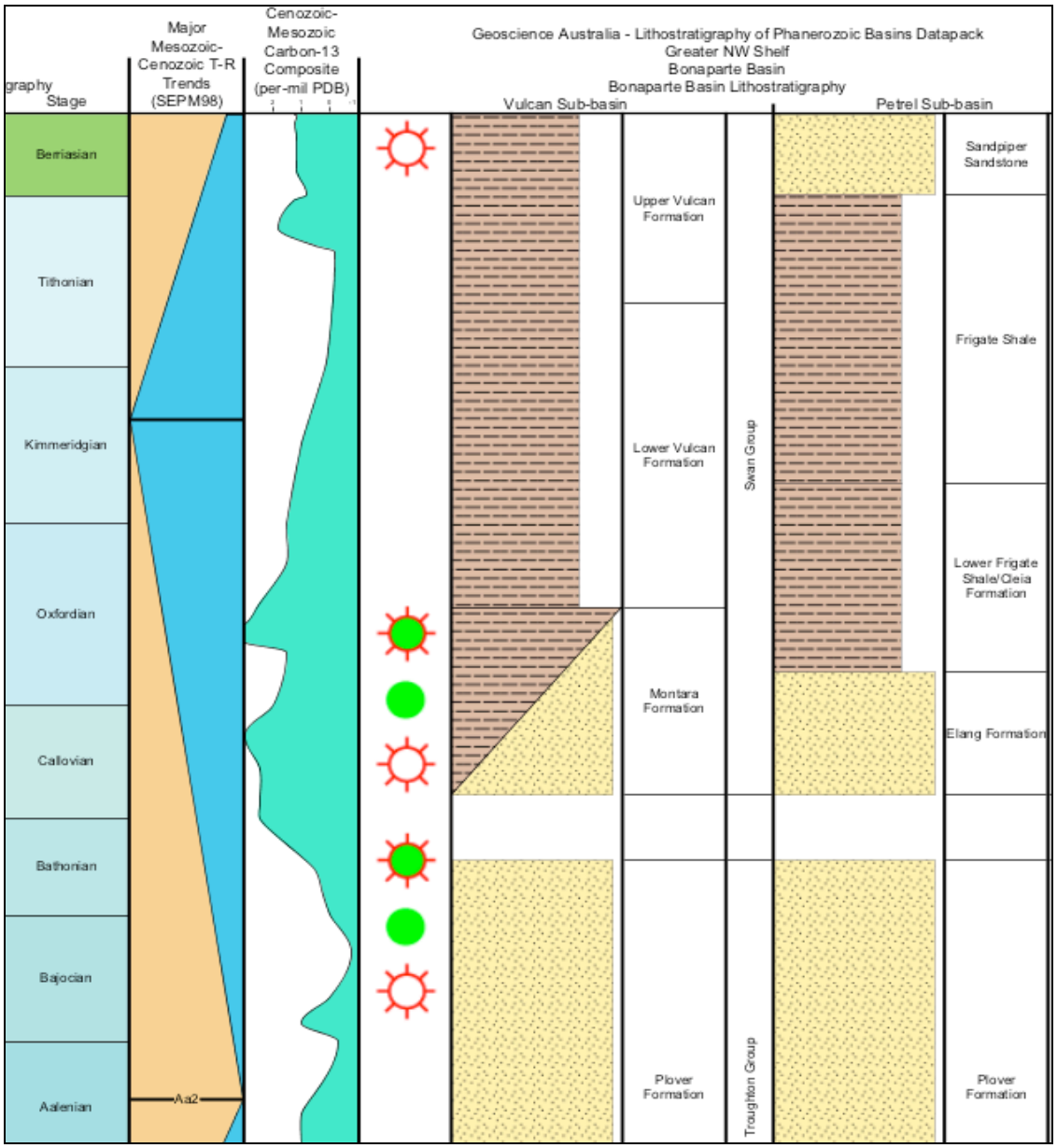
(2) This is a display of the geology of offshore Northwest Australia, an area that becoming a major gas-oil exporter to China and other regions.
Active "***Mouse-Over***", re-Generate, and click on the **Bonaparte-Basin** title. In the pop-up window, click on the basin report. This opens a website at Geoscience Australia, and a summary of that basin is presented. On its right-hand menu, you can click on geologic summaries, sub-basin location maps and other items. Now, back on *TimeScale Creator*, use the mouse to click on one of the rock units. Again, clicking on the hot-link sends a request, in this case as a search-call their Oracle database, for information on the rock formation. You can also do this to the well-names to access a separate Oracle database of well reports. Plus, the tectonic column "light-blue" events are linked to FrOG Tech summary reports on each episode. In this fashion, the on-screen display is a "GATEWAY" into information stored on the Geoscience Australia computer databases.



(3) On the lithology (rock) columns, you see are sands (dotted-yellow) and dark-clays (dashed brown). The red-green stars are oil-gas occurrences. The clayey Frigate Shale and Lower Vulcan Formations are organic-rich source rocks for these Jurassic oil-gas reservoirs; and the oil-gas migrated both up (into Upper Vulcan) and down (into Montara and Elang formation). Let us look at why there was this change from sands to dark shales.

(3) To save space, turn **OFF** *Vulcan wells*, *NW Australia tectonics*, *Global Reconstructions*, and *Geomagnetic Polarity*. Turn **ON *Sequences, Sea-Level*** …, turn ON its *Sequences and T-R Cycles* directory and turn ON the *Phanerozoic Compilations* subdirectory (only). Open that subdirectory to turn ON its *Major Mesozoic-Cenozoic T-R Trends* (only). This is a cartoon of global sea-level changes, in which the Blue-color indicates rising/falling ocean levels. [Turn OFF the *Cenozoic-Mesozoic-Paleozoic*; and to avoid excessive column titles, turn off the titles for *Sequences* ... and other sub-directory titles.]

Now, turn ON *Stable Isotope Curves*, and its *Cenozoic-Mesozoic Marine Carbon-13 Composite*; then, turn ON Show Scale (and make Step as 2). Turn OFF *Carbon-13 and Anoxic Events*. ***Generate***.



- ***What was sea-level doing during the onset and main part of the Lower Vulcan and Frigate Shale?***
- ***What was it doing during the underlying main part of Plover and during the overlying Sandpiper Sandstone or Upper Vulcan?***

(4) **Carbon balance and sea-level.** A rising sea-level causes clays and organic material to be trapped on continental shelves. Before and during the Frigate Shale, notice that the Carbon-13 curve has shifted toward the left (to more positive values). This is opposite what we saw for the base of Eocene.

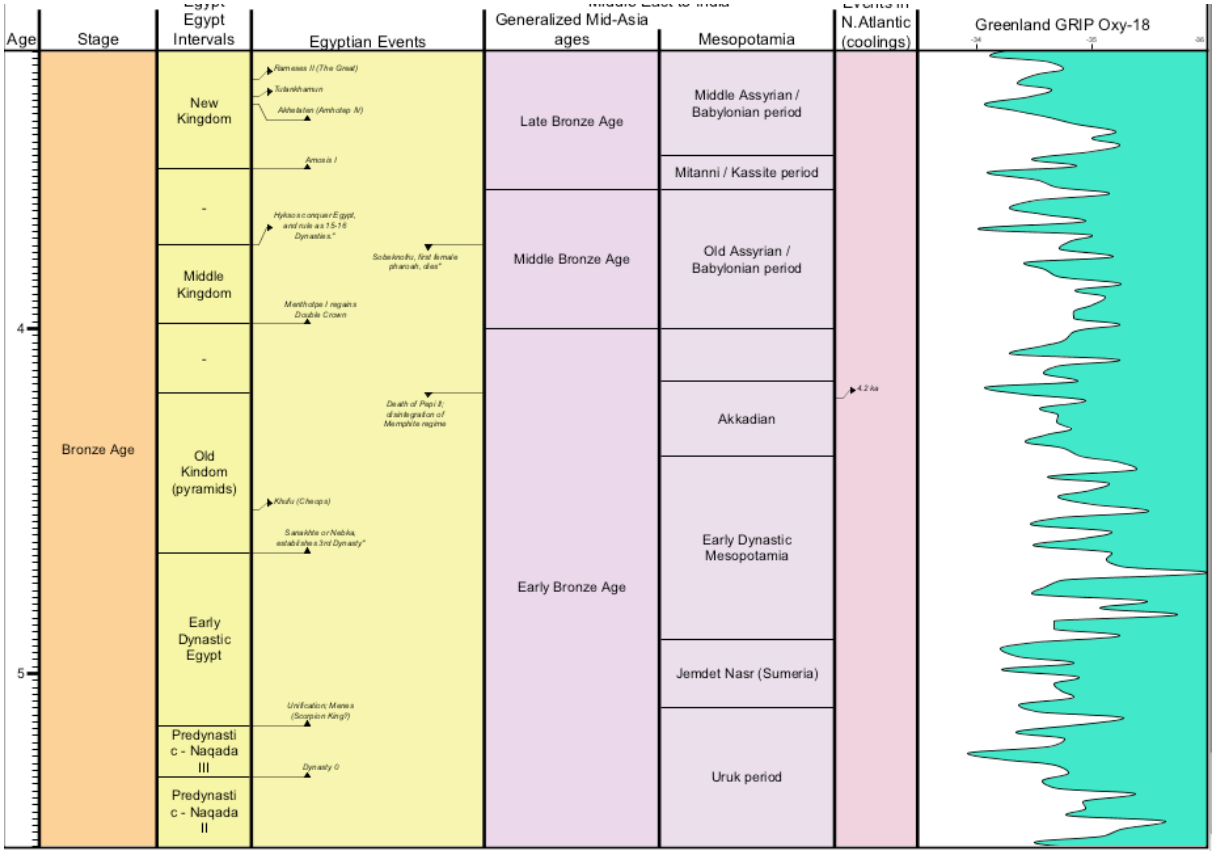
- ***What does this imply about the global carbon system?***

(5) When sea-level retreated toward the end of the Jurassic, river deltas built outward and dumped their sands onto the continental margins. These became the future oil-gas reservoirs that received the maturing hydrocarbons from the adjacent organic-rich clays. This combination of increased carbon-burial during rising global sea-level of the "Oxfordian-early Kimmeridgian" time, followed the deposition of sands during the following drop in sea-level led to the oil-gas riches of other regions, including Saudi Arabia, the North Sea and Siberia.

EXERCISE 3 – End of Pyramid civilization

For something complete different!

(1) Load our prototype for a Human Civilization time scale – From the www.tscreator.org datapack page, download the "Past 10,000 Years" datapack. Then, in TS-Creator, under FILE, click "***REPLACE*** *Data with Datapack*", and find/load the file "**Past 10000 years.txt**". This completely replaces the geological scales suite with a new one of selected archeology and ice core information. This database has been compiled from both archeology sources and the independent international drilling of Antarctic and Greenland ice cores. [NOTE: it is only a preliminary sketch of what will become a major dataset in the future.]
(2) Under Settings, choose the interval spanning the Bronze Age (3.2 Ma top; 5.5 Ma bottom); and a **vertical scale** of **10**. Under ***Zonations***, turn OFF everything, **except** *Age, Stage, Egypt*, *Egyptian Events* and *Middle East to India*. ***Generate***.
(3) Notice that the end of the Old Kingdom (pyramids) is simultaneous with the end of the Akkadian civilization in Mesopotamia; and there is a gap before the Middle Kingdom and Assyrian. Let us see what may have caused this.
(4) In Settings, click ON *Ice-Rafting* and *Greenland GRIP Oxy-18*. Highlight the name *Greenland GRIP Oxy-18*, and activate the *Show Scale* with a Step of 1. ***Generate***.



(5) A decrease in Greenland Oxygen-18 (shift to right in the diagram) is interpreted to imply that Greenland became warmer. It is thought that warm episodes that affected Greenland probably affected the entire northern hemisphere, including the region of Egypt and Mesopotamia. In contrast, a Greenland cooling is often associated with a surge in glacial icebergs, causing ice-rafting events into the North Atlantic.

- ***What climate event occurred near the beginning of the Old Kingdom?***
- ***What event occurred at the collapse of the Old Kingdom and Akkadian empire in Mesopotamia?***

(6) In Egypt and Mesopotamia, a warmer summer is associated with increased monsoonal rainfall and a higher Nile and Tigris-Euphrates river.

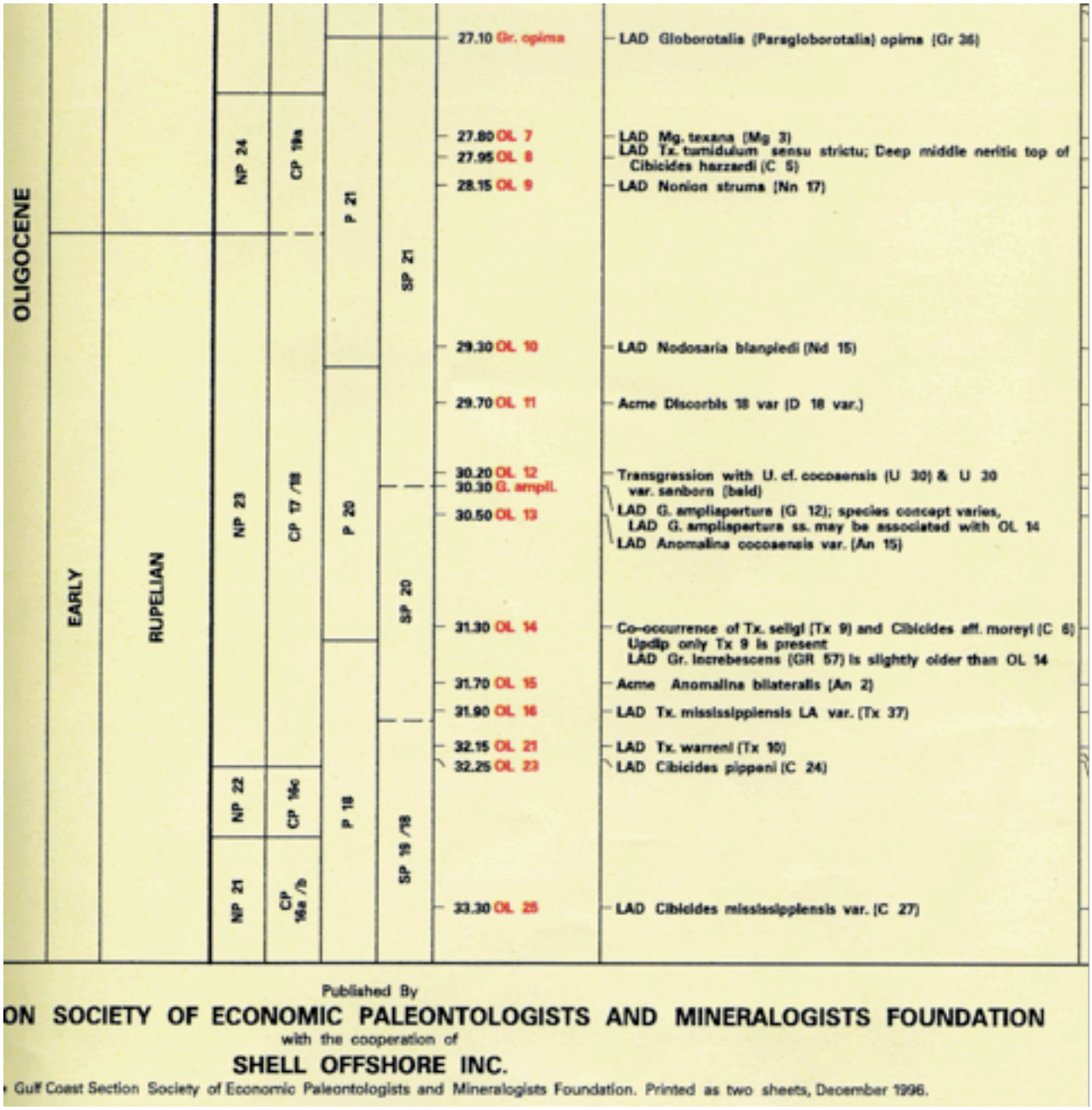
- ***What is a possible scenario for why the Old Kingdom and Akkadian empire simultaneously collapsed?***
- ***Now, if you were in modern Egypt or Iraq, would you prefer global warming, or a cooler climate? It is an interesting question for climate policy.***

(8) The Egyptian Events are also hot-linked with *Mouse-over*; and you are welcome to explore other civilizations and culture intervals.

EXERCISE #4 – Making your own datapack

(1) **Gulf of Mexico, Rupelian**

We will use the Foraminifera markers of Shell Offshore Inc. (Michael Styzen, published by Gulf Coast Section of SEPM in 1996). On the next page is a scan of just the Rupelian portion of that chart. We will make a datapack for (1) the SP "standard zones" of Shell, and (2) Shell's "OL" foraminifer markers, which are a combination of benthic and planktonic taxa.



(2) **Set-up**

You will need to open EXCEL. We will be saving the file as a tab-delimited text file. Alternatively, one can use Word, and save the file as text, but this can be more tricky to easily see the tab-columns.

We will make 3 data columns: ***Shell SP zones***, ***Shell Foram markers***, ***Shell Foram details***.

The format for data is quite simple.

A header that gives the column type (*and optional settings for color, width, etc.*)

A set of items with their ages (*and optional dashed boundaries, pop-up comments, etc.*)

The column sets are separated by a blank row.

(3) **Block (zones)**

We will enter the three SP zones with the age of their bases.

Prepare the following [*NOTE: you can probably just copy-paste each set into Excel.*]

format version:	1.3					
date:	03/12/2009					
Shell SP zones	block	50	255/255/0			SEPM chart by Mike Styzen (1996)
	TOP	27.1				
	SP 21	30.3		NOTE: LAD of G. ampli.		
	SP 20	32.0	dashed	NOTE: definition uncertain	222/255/0	
	SP 19 /18	33.8				

The first two lines are needed to notify the program what Format is being used (1.3 allows use of separate colors for each zone, if desired)

Then, a ***blank*** row.

The "Shell SP zones" are a block-type format. Let's use a default width of 50; and give it the bright-yellow color of Shell's logo (RGB is 255/255/0). The seventh column (column G) can have a pop-up comment for the column title.

Each zone is entered, then its Age (as given on this SEPM chart). Notice that the lower boundary of SP21 and SP20 are dashed on the chart – but, to see how this option works, just put "dashed" after the SP20 (which has no indicated foraminifer marker). The next column (E) is for pop-up comments. For fun, let's give zone SP 20 a light-green color (the RGB code in column F).

(4) **Datums**

Next, let us enter the OL "markers" as EVENTS. The column type is "event" (small letters), and the options for sets of markers are "LAD", "FAD" and "EVENT". We will call of these "EVENT" for now.

After a blank-row (IMPORTANT!), then enter:

Shell Foram markers	event	60	255/255/0		on	SEPM chart by Mike Styzen (1996)
EVENT						
	OL 10	29.3				
	OL 11	29.7				
	OL 12	30.2				
	G. ampli.	30.3				
	OL 13	30.5				
	OL 14	31.3				
	OL 15	31.7				
	OL 16	31.9				
	OL 21	32.15				
	OL 23	32.25				
	OL 25	33.3				

The column-header above used a slightly wider width (60). Because the data-heavy event-type columns have a default of "off" to avoid accidental overcrowding of screen displays, then we've inserted an override of "**on**" in column F of the header.

Similarly, let's compile the details of these events. There are two types used by Shell – LADs of markers, and a set of EVENTS of acme's, co-occurrences, and transgression.

After a blank-row (IMPORTANT to have before each new header!), then enter:

Shell Foram details	event	200	255/255/0		on	SEPM chart by Mike Styzen (1996)
LAD						
	Nodosaria blanpiedi	29.3				
	G. ampliapertura	30.3	dotted	species concept varies		
	Anomalina cocosensis var.	30.5				
	Tx. mississippiensis LA var.	31.9				
	Tx. warreni	32.15				
	Cibicides pipeni	32.25				

	Cibicides mississippiensis var.	33.3				
EVENT						
	Acme Discorbis 18	29.7				
	Trans. with U. cf. cocoaensis	30.2				
	Tx. sellgi and Cibicides aff. moreyi	31.3				
	Acme Anomalina bilateralis	31.7				

We have long taxa names, therefore a generous width of 200 units is used (column header line). The LAD of *G. ampliapertura* is apparently vague, therefore its marker will be dotted, and a pop-up comment is added to explain this. Note that any pop-up comments for either datums or blocks must be in column E.

Now, SAVE this Excel sheet as "TEXT (**tab-delimited**)" format. Use a name such as "Shell_Rupelian_Forams.txt".

(5) **Insert into *TS_Creator***

Let us re-set the *TS-Creator* to clear the previous datapack.

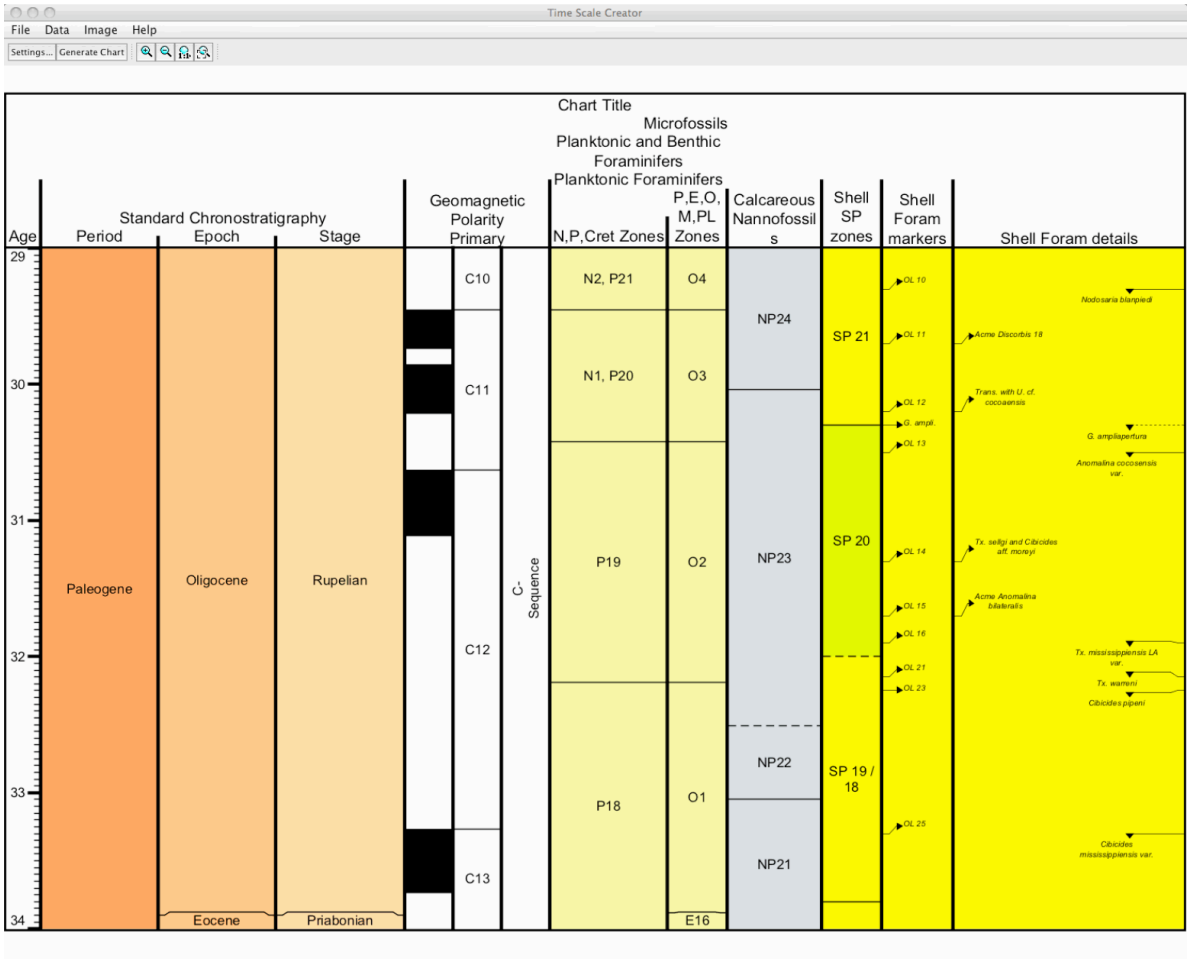
Under "File", click "*Replace Data with Default Datapack*".

Now, let us load the new Shell one that you've made – Under File, click *Add datapack*.

For the chart, we have a dense set of data. Therefore, under Settings (Time Interval), use Top of 29 Ma, Base of 34 Ma; and a Vertical scale of 4.

Click **Generate**.

Voila !! It should look like the diagram below:



We hope this is what you get, because it should work the first time. If not, then you may see an error message indicating a problem with a certain line. This is the same line as in the Excel file, and you can open that Excel file again to see what format might be wrong. Don't panic; just look at the instructions again, or ask us!

This completes our tour of the TimeScale Creator – a visualization system for both built-in and external databases of Earth's history.

We welcome your suggestions for major and minor improvements in the default database, visualization graphics, and overall system! Please convey your ideas, desires and critical evaluations to us at *jogg@purdue.edu*.
Thank you,

The TS-Creator team

****

Database coordinator – **James Ogg**
[professor, Dept. Earth & Atmos. Sci., Purdue University, Indiana; ***jogg@purdue.edu****]*
and *Chair, Subcommission on Stratigraphic Information, International Commission on Stratigraphy*
Visualization software developer – **Adam Lugowski**

Additional items -- Selected display options; "out of memory", etc.

Saving Display Parameters (Settings) – Once you've created a screen display that you like, then under ***Settings***, there are bottom-buttons that enable you to **SAVE …** a "*Settings file*" that contains the necessary instructions for TimeScale Creator to recreate that display, or to **LOAD …** an earlier one to re-generate that same graphic for an audience or for additional revisions. If you are working on a major diagram, then we suggest using this feature to periodically save intermediate graphics, just in case the operating system has problems. This setting option is also useful to standardize diagrams (fonts, arrangements, etc.).

Details on the many other capabilities and display options are illustrated under "*Features*" in the ***Help*** menu (main window).

Have fun exploring the data sets and graphic options, and we hope that you will find this suite useful for reference and generating base-graphics for your research and teaching.

NOTE: The free public TimeScale Creator does not allow you to save charts after a datapack has been added. Only the PRO version allows saving charts after uploading other datasets. See our PRO page for other features, and how to get the PRO version (which comes with a large selection of datapacks).

A word of advice during exploring – there are numerous close-spaced Foram and Nanno events in the Neogene in the current database (and an abundance of Sequences in the glacial-pulsed **Pleistocene**), so the auto-adjust software sometimes has problems to display these details unless a vertical scale of at least **4** cm per 1 million years. A similar high-density of detail occurs with the brief North American ammonite zones in the Campanian-Turonian interval and ammonite subzones within much of the Jurassic-Cretaceous. Therefore, we have placed some of this dense-detail into "additional" columns with the lesser-used secondary events, plus shortened the genera names for the ammonites and other taxa.

A MEMORY problem that may occur -- The default Java installation on some operating systems limits the amount of memory a program can use. This Java default may cause the program to occasionally display **out of memory** (especially with large or information-heavy displays after several iterations). **DON'T PANIC!** If this happens, a message will appear on the screen -- you can still save the *Settings* file to regenerate the on-screen display, and usually can save the non-displayed SVG graphic file to be opened in another graphics program or Firefox-type browser. If "***Out of Memory***" appears, then the *TimeScale Creator Pro* will also explain how to increase the Java memory allocation. In many cases, hitting "***GENERATE***" again will solve the problem! If that doesn't work, then before you restart *TSCreator* to clear Windows-memory, save your current settings (See above for SAVE/LOAD) to not loose much time.

In addition, on Window machines, the screen refresh will becomes slower and slower – again, the same JAVA problem in not clearing memory – so, save settings, then close and re-start JAVA and *TS-Creator* again.