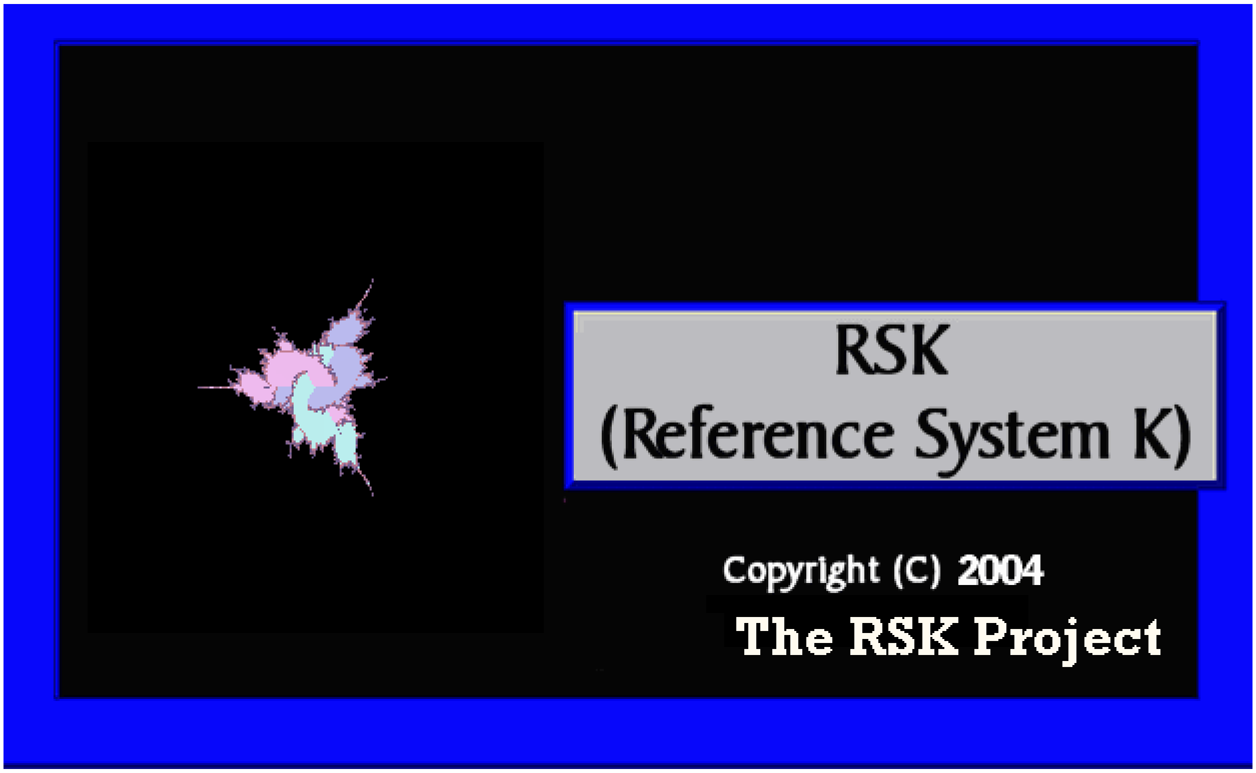

RSK Application Help

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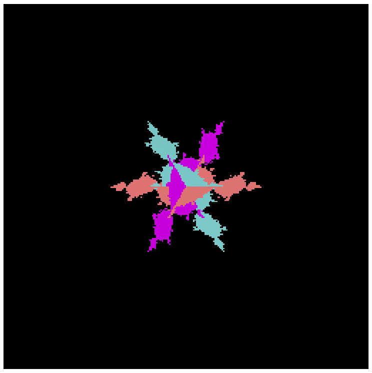

Getting Started

The Theory of the 42s, an Introduction by Walter Bishop

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1.1 Title Bar

Title Bar

The title bar is located along the top of a window. It contains the name of the application and drawing.

To move the window, drag the title bar. Note: You can also move dialog boxes by dragging their title bars.

A title bar may contain the following elements:

- Application Control-menu button

- Drawing Control-menu button
- Maximize button
- Minimize button
- Name of the application
- Name of the drawing
- Restore button

1.2 Scroll bars

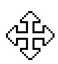
Scroll bars

Displayed at the right and bottom edges of the drawing window. The scroll boxes inside the scroll bars indicate your vertical and horizontal location in the drawing. You can use the mouse to scroll to other parts of the drawing.

1.3 Size

Size command (System menu)

Use this command to display a four-headed arrow so you can size the active window with the arrow keys.



After the pointer changes to the four-headed arrow:

1. Press one of the DIRECTION keys (left, right, up, or down arrow key) to move the pointer to the border you want to move.
2. Press a DIRECTION key to move the border.
3. Press ENTER when the window is the size you want.

Note: This command is unavailable if you maximize the window.

Shortcut

Mouse: Drag the size bars at the corners or edges of the window.

1.4 Move

Move command (Control menu)

Use this command to display a four-headed arrow so you can move the active window or dialog box with the arrow keys.

Note: This command is unavailable if you maximize the window.

Shortcut

Keys: CTRL+F7

1.5 Minimize command

Minimize command (application Control menu)

Use this command to reduce the RSK window to an icon.

Shortcut

Mouse: Click the minimize icon on the title bar.
Keys: ALT+F9

1.6 Maximize command

Maximize command (System menu)

Use this command to enlarge the active window to fill the available space.

Shortcut

Mouse: Click the maximize icon on the title bar; or double-click the title bar.
Keys: CTRL+F10 enlarges a drawing window.

1.7 Next Window

Next Window command (drawing Control menu)

Use this command to switch to the next open drawing window. RSK determines which window is next according to the order in which you opened the windows.

Shortcut
Keys: CTRL+F6

1.8 Previous Window

Previous Window command (drawing Control menu)

Use this command to switch to the previous open drawing window. RSK determines which window is previous according to the order in which you opened the windows.

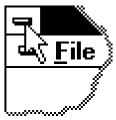
Shortcut
Keys: SHIFT+CTRL+F6

1.9 Close

Close command (Control menus)

Use this command to close the active window or dialog box.

Double-clicking a Control-menu box is the same as choosing the Close command.



Shortcuts

Keys: CTRL+F4 closes a drawing window
ALT+F4 closes the application

1.10 Restore

Restore command (Control menu)

Use this command to return the active window to its size and position before you chose the Maximize or Minimize command.

1.11 Switch to

Switch to command (application Control menu)

Use this command to display a list of all open applications. Use this "Task List" to switch to or close an application on the list.

Shortcut

Keys: CTRL+ESC

Dialog Box Options
When you choose the "Switch To" command, you will be presented with a dialog box with the following options:

Task List
Select the application you want to switch to or close.

Switch To
Makes the selected application active.

End Task
Closes the selected application.

Cancel
Closes the Task List box.

Cascade
Arranges open applications so they overlap and you can see each title bar. This option does not affect applications reduced to icons.

Tile
Arranges open applications into windows that do not overlap. This option does not affect applications reduced to icons.
Arrange Icons
Arranges the icons of all minimized applications across the bottom of the screen.

2 RSK Remote

RSK Remote

The remote provides access to many of the most-used commands in the program. Info about each button can be obtained by using the '?' located near the close box in the top right-hand corner of the remote.

2.1 New

New button

Use this button to create a new drawing window in RSK. This defaults to the opening drawing. Note: if you want to change the opening drawing, save changes as "title.bmp".

2.2 Undo

Undo button

Use this command to undo the last action. Color cycling is disabled after using Undo.

2.3 Size

Size button

This allows you to set the drawing area for a picture, independent of the Windows screen size. It also shows which size is currently in use. The aspect for the drawing is based on the ratio of X (horizontal width) to Y (vertical height.) The custom setting allows for any size/aspect that system memory will permit. The minimum size for an image is 40X30.

2.4 Colors

Color button

Use the palette editor to modify the current palette.

2.5 Abort button

Abort button

Use this command to stop drawing. Clicking inside a window's drawing area or close box (or the program close box) will also stop the drawing. Note: once a plot has started RSK continues to draw the image for that window regardless of which drawing window has the input focus, until done or aborted. You can open and close other drawing windows without affecting the current drawing, but only one drawing is active at any time.

2.6 Fvr

FVR button

The FVR button opens a dialog window for the input of fractal variables. The windows vary depending upon the fractal 'Type' selected. When making a video in the AVI mode, these windows contain many of the major variables that RSK uses between key frames in an AVI stream.

2.7 Draw button

Draw button

Use this button to draw or redraw the image for the current fractal variables. Clicking inside the draw window with the left-mouse button stops all plotting.

2.8 Rend

Rend button

For QS 3-D and MS 3-D types, the current coloring filter and lighting variables are applied. This allows you to see what the surface texture looks like before the fractal is finished drawing.

2.9 View

View button

Displays the entire plot, expanding or shrinking the image to fit in a maximized window without title bar, scroll bars or menu bar. At all other times, part of the picture is hidden by the inclusion of the title bar, toolbar, scroll bars and menu bar. To exit full-screen mode, press any key or click the left-mouse button.

2.10 ScanQ

ScanQ button

This is equivalent to Image/Scan QS command.

2.11 Light

Light button

Edit Ray-Tracing variables...

2.12 Help

Help button

Use this button to open the help index for RSK.

2.13 ScanJ

ScanJ button

This is equivalent to the Image/Scan JS command.

2.14 TK+

Tk+ button

Plot Tk+ extension.

2.15 TK-

Tk- button

Plot Tk- extension.

2.16 Clone

Clone button

Clone the current view.

2.17 MS 2-D

MS 2-D button

Change fractal type to two-dimensional MS or JS.

2.18 MS 3-D

MS 3-D button

Change fractal type to MS or JS 3-D plane.

2.19 3-D QS

QS 3-D button

Change fractal type to three-dimensional quaternion.

2.20 MC

MC button

Change fractal type to Mandelcloud.

2.21 May's Bifurcation

May's Bifurcation button

Change fractal type to May's Bifurcation.

2.22 Verhulst Bifurcation

Verhulst's Bifurcation button

Change fractal type to Verhulst's Bifurcation.

2.23 Save

Save button

Use this button to save and name the active drawing (image and data). RSK displays the Save As dialog box so you can name your drawing.

To save a drawing with its existing name and directory, use the File/Save menu command.

2.24 Open

Open button

Use this button to open an existing image file (and its data file) in a new window. You can open multiple image files at once. Use the Window menu to switch among the multiple open images.

2.25 Png

PNG radio button

Use this button to select the PNG format when loading and saving fractals. This format uses medium compression without loss of image quality.

2.26 Bmp

BMP button

Use this button to select the BMP format when loading and saving fractals. This is the default Windows bitmap format, readable by most Windows programs that use image files. This is also the fastest method of loading and saving fractals, but requires more disk space, since no compression is used. Windows keeps track of the last six BMP files saved or loaded (displayed in the Files menu.)

2.27 Jpg

JPG radio button

Use this button to select the JPEG format when loading and saving fractals. This format uses moderate compression but with some loss of image quality. This is preferable for posting to the Internet, since most browsers can display jpeg files.

2.28 Reset button

Reset button

Use this button to return variables in the dialog to their original values when the dialog was first opened. Note: some commands such as Demo/Random Julia will "refresh" most open dialog windows, since many variables are altered. The Reset button then works as if the dialog was just opened after the refresh.

2.29 Save

Save button

Use this button to save comments in the Recorder window, before selecting another button or menu command.

2.30 |||||

||||| button

Through a series of windows, this allows you to name and open an avi animation stream and choose a compression method. After choosing the frame rate (1-60) and using the file requester to name the file, you are given a choice of compression methods. You can also choose no compression for optimum view quality. (All compression methods degrade the original images, some more than others.) The first key frame in the stream is then drawn and written to the file.

Note: after the stream is opened, the size of the fractal that can be drawn is fixed at the size of the frame. No changes can be made to the size until the stream is closed.

2.31 >

> button

With this option, frames are written to a stream based on the difference between the current key frame and the previous key frame. The first key frame is written when you open a stream. The next key frame is created each time you use this option. In between you can zoom or change Fvr variables as much as necessary. The avi stream is only written to when this option is used. The last key frame is automatically saved after the 'tween' series is written. The number of frames may range from 1-1500 frames between key frames. With a frame number of 1 only the key frame is written. This allows animation to be created that incorporates all scalable variables in RSK.

Use the Cancel button to exit this dialog without initializing a new series of frames.

Check the Log Scaling box if you want the frames to be written with logarithmic space between frames, else linear space is used. Useful when zooming, where frames would otherwise be packed together at the end of the frame series.

2.32 []

[ ] button

Closes any open avi stream file. You need to do this before viewing the file or creating a new avi file. The stream is also closed when you exit RSK.

2.33 V

V button

Opens an avi file for viewing. You can preview any multimedia file by clicking on its file name. A multimedia box will appear to the right of the file list. Click on okay to open the main view window.

There are buttons to Play a file forwards or backwards, or forward automatically with Auto rewind/repeat. Click on Slow to slow down a video. Each click on Slow halves the viewing speed. A click on Stop freezes viewing and restores the view speed to normal playback.

Use the Open button to view a different avi file. Use the Save button to save the file in a different compression format. You must use a different name to save the file than the name that was used to open it. Click on the left-mouse button or any key to abort a save operation.

Note: the view avi requester can be used to preview any multimedia file, including midi files.

3 File menu

File menu commands

The File menu offers the following commands:

New	Creates a new drawing.
Open	Opens an existing drawing.
Open [JPG]	Open an existing drawing in jpeg format.
Open [PNG]	Open an existing drawing in png format.
Save	Save the active drawing.

Save As	Save the active drawing with a new name.
Save Image	Save only the bitmap for current drawing.
Save As [JPG]	Save the active drawing in jpeg format.
Save As [PNG]	Save the active drawing in png format.
Close	Close the active drawing.
Load Parameters	Load Fractal Parameters.
Load Palettes [PL]	Load palettes file.
Save Parameters	Save Fractal Parameters.
Save Palettes [PL]	Save palettes to file.
Load Master Angles	Load master angles for RSK.
Save Master Angles	Save master angles for RSK.

Import

Load Palette [PQZ]	Load QuaSZ palette file.
Load Palette [MAP]	Load a Fractint map file.
Load Texture	Load QuaSZ texture file [QTX]

Export

Save Palette [PQZ]	Save current palette.
Save Texture	Save texture file [QTX].
Save as OBJ	Save polygonized quaternion as Wavefront object.
Simplify Mesh	Simplify mesh.
Save as POV	Save polygonized quaternion as a pov triangle object.
Smooth Triangles	Convert triangle mesh to smooth_triangle mesh.
Set Max Faces	Set target face size for simplify and smooth options.
Save as WRL	Save polygonized quaternion as virtual reality file.
Save as DXF	Save polygonized quaternion as AutoCad dxf file.
Save as LFM	Save polygonized quaternion as LightFlow mesh file.
Set Max Indices	Set maximum number of vertices allocated for Q polygon.

Exit	Quit RSK.

3.1 File New command

New command (File menu)

Use this command to create a new drawing window in RSK. The image and data for the opening picture are used to create the new window.

You can open an existing data/image file with the Open command.

Shortcuts

Keys: CTRL+N

3.2 File Open command

Open command (File menu)

Use this command to open an existing data/image file in a new window. You can open multiple image files at once. Use the Window menu to switch among the multiple open images. See Window 1, 2, ... command.

You can create new images with the New command.

Shortcuts

Toolbar: 
Keys: CTRL+O

3.2.1 File Open dialog box

File Open dialog box

The following options allow you to specify which file to open:

File Name
Type or select the filename you want to open. This box lists files with the extension you select in the List Files of Type box.

List Files of Type
Select the type of file you want to open.

Drives
Select the drive in which RSK stores the file that you want to open.

Directories
Select the directory in which RSK stores the file that you want to open.

Network...
Choose this button to connect to a network location, assigning it a new drive letter.

3.3 File Open [JPG] command

Open [JPEG] command (File menu)

Use this command to load parameters and a bitmap file that were saved in jpeg format. There is an option in the file-type box to load only the bitmap too. This replaces the Open command for those who need a smaller sized bitmap file. Note: the last files list does not keep track of images loaded in JPEG format.

3.4 File Open [PNG] command

Open [PNG] command (File menu)

Use this command to load parameters and a bitmap file that was saved in png format. There is an option in the file-type box to load only the bitmap too. This replaces the Open command for those who need a smaller sized bitmap file. Note: the last files list does not keep track of images loaded in PNG format.

3.5 File Save command

Save command (File menu)

Use this command to save the active drawing to its current name and directory. When you save a drawing for the first time, RSK displays the Save As dialog box so you can name your drawing. If you want to change the name and directory of an existing drawing before you save it, choose the Save As command.

Shortcuts

Toolbar: 
Keys: CTRL+S

3.6 File Save As command

Save As command (File menu)

Use this command to save and name the active drawing. RSK displays the Save As dialog box so you can name your drawing.

To save a drawing with its existing name and directory, use the Save command.

3.6.1 File Save As dialog box

File Save As dialog box

The following options allow you to specify the name and location of the file you are about to save:

File Name
Type a new filename to save a drawing with a different name. RSK adds the extension .zp.

Drives
Select the drive in which you want to store the drawing.

Directories
Select the directory in which you want to store the drawing.

Network...
Choose this button to connect to a network location, assigning it a new drive letter.

3.7 Save Image [BMP]

Save Image

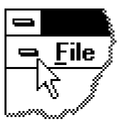
Use this command to save the bitmap image without the data file.

3.8 File Close command

Close command (File menu)

Use this command to close the window containing the active image. If you close a window without saving, you lose all changes made since the last time you saved it.

You can also close a drawing by using the Close icon on the drawing window, as shown below:



3.9 File Save As [JPG] command

Save As [JPEG] command (File menu)

Use this command to save the parameters and active bitmap in jpeg format. There is an option in the file-type box to save only the bitmap too. This replaces the Save and Save As command for those who need a smaller sized bitmap file. Note: the last files list does not keep track of images saved in JPEG format.

3.10 File Save As [PNG] command

Save As [PNG] command (File menu)

Use this command to save the parameters and active bitmap in png format. There is an option in the file-type box to save only the bitmap too. This replaces the Save and Save As command for those who need a smaller sized bitmap file. Note: the last files list does not keep track of images saved in PNG format.

3.11 File Load Parameters command

Load Parameters command (File menu)

Use this command to load a data file [.zp]. The data file contains all variables to recreate an image created previously with RSK.

3.12 File Load Palettes command

Load Palettes command (File menu)

Use this command to load a palette file [.pl]. The palette file contains 21 palettes created previously with RSK (or another version of the program.)

3.13 File Save Parameters command

Save Parameters command (File menu)

Use this command to save all data elements for the current image in a data file [.zp].

3.14 File Save Palettes command

Save Palettes command (File menu)

Use this command to save all palettes for the current session in a palette file [.pl].

3.15 File Load Master Angles command

Load Master Angles command (File menu)

Load a set of master angles to define the RSK plane angles. Note: when the RSK option is set to one of the default modes like RSK-Lxy, each time you change formulas or switch RSK modes the default .man file for that formula or mode is reloaded. With the user-defined RSK mode, the default .man files are not reloaded.

3.16 File Save Master Angles command

Save Master Angles command (File menu)

Save the current set of master angles that define the RSK plane angles.

3.17 Import

3.17.1 File Load Palette command

Load Palette [MAP] command (File menu)

Use this command to load a Fractint-type map file. The palette in the map file replaces the currently selected palette.

3.17.2 File Load Palette command

Load Palette [PQZ] command (File menu)

Use this command to load a QuaSZ-style palette file [.pqz]. The palette file contains a single palette that replaces the current palette.

3.17.3 File Load Texture command

Load Texture command (File menu)

Use this command to load variables that make up the texture and noise parameters. This also loads the palette, coloring filter, and coloring options in a texture file [qtx].

3.18 Export

3.18.1 File Save Palette command

Save Palette [PQZ] command (File menu)

Use this command to save the current palette to a QuaSZ-style palette file [.pqz].

3.18.2 File Save Texture command

Save Texture command (File menu)

Use this command to save the variables that make up the texture and noise parameters for the current figure. This also saves the palette, coloring filter, and coloring options in the texture file [qtx].

3.18.3 File Save Q Polygon [OBJ] command

Export -> Save as OBJ command (File menu)

Use this command to save a quaternion as a true 3-D object. This uses John C. Hart's Implicit code (Quaternion Julia Set server) to polygonize a quaternion formula, and then writes the triangles to a Wavefront object file. The memory requirements for this routine are high, 20MB or more for a typical Julia set quaternion rendered at 320X240. The output file can be very large too, 4MB or more, depending on the precision required. The higher the precision, the smoother the finished object becomes. Precision is set with the Steps variable in the Quaternion window, where precision=10/Steps.

Note: some formulas produce asymmetrical object files with this routine, where one side of the q polygon isn't resolved completely. Usually one side is markedly smoother in this case.

3.18.4 File Simplify mesh command

Export -> Simplify Mesh command (File menu)

When this flag is set (default on) the object meshes are simplified using Garland's mesh-simplification algorithm before outputting to a Wavefront obj or POV mesh file, resulting in a much smaller export file. Set the number of facets in the target mesh file with the Set Max Faces command. You can set the resolution of the object as high as necessary (with the Params/Steps variable) to produce a finely detailed quaternion, but the output file remains about the same. Use the smoothing feature in Bryce to smooth the resulting object mesh.

3.18.5 File Save Q Polygon [POV] command

Export -> Save as POV command (File menu)

Use this command to save a quaternion as a true 3-D object. This uses John C. Hart's Implicit code (Quaternion Julia Set server) to polygonize a quaternion formula, and then outputs the triangles to a pov file. The pov file is written as a simple scene, the triangles part of a "union" object, with camera and lighting elements compatible with POV 3.5. This can be used as a starting point for more complex compositions. The memory requirements for this routine are 20MB or more for a typical Julia set quaternion rendered at 320X240. The output file can be very large too, up to 40MB or more, at the highest precision. The higher the precision, the smoother the finished object becomes. Precision is set with the Steps variable in the Quaternion window, where precision=10/Steps.

Note: some formulas produce asymmetrical object files with this routine, where one side of the q polygon isn't resolved completely. Usually one side is markedly smoother in this case.

3.18.6 File Smooth command

Export -> Smooth command (File menu)

When this flag is set (default on) the object facets are converted to smooth_triangles before outputting to a POV mesh file. Surface normals are calculated for all triangles that share common vertices.

3.18.7 File Set max faces command

Export -> Set Max Faces command (File menu)

Set the number of facets in the target mesh file (obj or POV format.) Use the minimum number of faces to produce the quality of mesh desired. It is better to reduce faces to a minimum and do the smoothing in Bryce than to export an object at maximum resolution without mesh simplification. Object files load and smooth much faster in Bryce, and smoothing is usually necessary anyway to reduce jagged edges or blocky facets. (POV uses smooth_triangles to accomplish the same thing.) Up to 30X mesh reduction or more is possible with Garland's mesh-simplification algorithm.

3.18.8 File Save Q Polygon [WRL] command

Export -> Save as WRL command (File menu)

Use this command to save a quaternion as a true 3-D object. This uses John C. Hart's Implicit code (Quaternion Julia Set server) to polygonize a quaternion formula, and then writes the triangles to a virtual reality file. The memory requirements for this routine are high, 20MB or more for a typical Julia set quaternion rendered at 320X240. The output file can be very large too, 4MB or more, depending on the precision required. The higher the precision, the smoother the finished object. Precision is set with the Steps variable in the Quaternion window, where precision=10/Steps.

Note: some formulas produce asymmetrical object files with this routine, where one side of the q polygon isn't resolved completely. Usually one side is markedly smoother in this case.

3.18.9 File Save Q Polygon [DXF] command

Export -> Save as DXF command (File menu)

Use this command to save a quaternion as a true 3-D object. This uses John C. Hart's Implicit code (Quaternion Julia Set server) to polygonize a quaternion formula, and then writes the triangles to an AutoCad dxf file. The memory requirements for this routine are 20MB or more for a typical Julia set quaternion rendered at 320X240. The output file can be very large too, 4MB or more, depending on the precision required. The higher the precision, the smoother the finished object becomes. Precision is set with the Steps variable in the Quaternion window, where precision=10/Steps.

Note: some formulas produce asymmetrical object files with this routine, where one side of the q polygon isn't resolved completely. Usually one side is markedly smoother in this case.

3.18.10 File Save Q Polygon [LFM] command

Export -> Save as LFM command (File menu)

Use this command to save a quaternion as a true 3-D object. This uses John C. Hart's Implicit code (Quaternion Julia Set server) to polygonize a quaternion formula, then writes the triangles to a LightFlow mesh file. The memory requirements for this routine are high, 20MB or more for a typical Julia set quaternion rendered at 320X240. The output file can be very large too, 4MB or more, depending on the precision required. The higher the precision, the smoother the finished object becomes. Precision is set with the Steps variable in the Quaternion window, where precision=10/Steps.

Note: some formulas produce asymmetrical object files with this routine, where one side of the q polygon isn't resolved completely. Usually one side is markedly smoother in this case.

3.18.11 File Set Max Vertices command

Set Max Indices (File menu)

Use this command to set the maximum number of indices that are allocated by the polygonizing routine. Default is 5,000,000 indices. Use less to limit the amount of memory used while polygonizing. Use more if necessary for higher resolution. Note: unless you have an application that can use very large object files, there's a limit to how much resolution is obtainable with the polygonizing routine. Bryce has problems with object files produced by RSK that are much larger than 2.5MB (in Windows systems other than Win XP.)

3.19 File 1, 2, 3, 4, 5, 6 command

1, 2, 3, 4, 5, 6 command (File menu)

Use the numbers and filenames listed at the bottom of the File menu to open the last six drawings you closed. Choose the number that corresponds with the drawing you want to open.

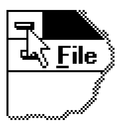
3.20 File Exit command

Exit command (File menu)

Use this command to end your RSK session. You can also use the Close command on the application Control menu. Note: if you choose to exit while plotting, the program does not terminate, but stops the plotting so the program can be safely exited.

Shortcuts

Mouse: Double-click the application's Control menu button.



Keys: ALT+F4

4 Edit menu

Edit menu commands

The Edit menu offers the following commands:

Undo	Undo last edit or zoom.
Copy	Copy the active view and put it on the Clipboard.
Clip	Define area of view and copy to clipboard.
Paste	Insert Clipboard contents.
Copy Data	Copy fractal data to buffer.
Paste Data	Copy data from copy buffer.
Master Angles	Edit RSK planar angles.
Fractal Variables	Edit fractal variables.
Size	Sets the image size.
Viewing Angles	Edit viewing angles of current figure or RSK.
Ray-Tracing Variables	Edit lighting and viewpoint variables.
Colors	Edit color palette.
Text	Edit text font and/or add text to picture.
Detail Text Font	Edit Font for Detail command.

4.1 Edit Undo command

Undo command (Edit menu)

Use this command to undo the last action. An image can be continued after an undo, if continue was enabled before the last action. Color cycling is disabled after using Undo, though.

Shortcut
Keys: CTRL+Z

4.2 Edit Copy command

Copy command (Edit menu)

Use this command to copy the active view to the clipboard. The entire view is copied to the clipboard.

Shortcut
Keys: CTRL+C

4.3 Edit Clip command

Clip command (Edit menu)

Use this command to copy a part of the active view to the clipboard. A zoom box is used to select the part to be copied. Click outside the view frame or press escape to exit this option.

Shortcut
Keys: CTRL+L

4.4 Edit Paste command

Paste command (Edit menu)

Use this command to paste from the clipboard. The clipboard must contain a bitmap. If the bitmap is larger than the view, it is clipped. The zoom cursor is used to set the left/top corner in the view where the bitmap will be pasted. Click outside the view frame or press escape to exit this option.

Shortcut
Keys: CTRL+V

4.5 Edit Copy Data command

Copy Data command (Edit menu)

Use this command to copy the fractal data for the active view to the file "c:\zcopy.zp". The current palette for the view is also copied.

Shortcut
Keys: CTRL+F

4.6 Edit Paste Data command

Paste Data command (Edit menu)

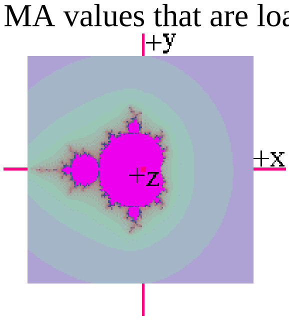
Use this command to paste the data in the file "c:\zcopy.zp" to the active view. The palette stored in the file is copied to palette 10(F11).

Shortcut
Keys: CTRL+R

4.7 Master Angles Window

Master Angles Window

View or define your own master angles for RSK. A different set is selected to modify for MS / JS 3-D, QS 3-D or MC. Click on the default button to reset angles to their default values. Note: unless you switch to User-Defined RSK as the RSK option, or save the angles in the default.man files, the angle changes are temporary. When you change formulas with one of the default RSK modes like RSK-Lxy, or switch to one of the default RSK modes, the default angles are reloaded from the appropriate default.man file. The user-defined RSK option prevents auto-reloading of the angles. However when you save a picture, the data file for that image contains whatever angles were used to create the picture. These override the default MA values that are loaded at startup.



X=0; Y=0; Z=0

The Master Angles of Image *Type: 0, MS / JS 3-D* are as depicted. The X, Y and Z-axes belong to the three-dimensional space within which the Image is being generated. Changing the MA changes the angles of orientation of that Image within this three-dimensional space.

There are three different, three-dimensional spaces within an RSK: 42_1, 42_2 and 42_3. Each 42 may be manipulated within RSK space independently.

Clockwise and counterclockwise are applied around an axis as if the view is along that axis viewing from positive end of the axis toward the negative end of the axis.

Rotating the Image by using the X [] box rotates the Image around the X-axis.
Rotating the Image by using the Y [] box rotates the Image around the Y-axis.
Rotating the Image by using the Z [] box rotates the Image around the Z-axis.

4.7.1 type master angle

Type (Master Angles Window)

This shows the set of master angles that is currently being viewed. The type will change automatically when the fractal type is changed, so if you are editing a different set of master angles than the current fractal type, click on Apply to save changes before switching to a different fractal type.

4.7.2 421 x master angle

421-X (Master Angles Window)
This adjusts the master x angle for the 421 plane. Rotating the Image by using the X [] box rotates the Image around the X-axis.

4.7.3 421 y master angle

421-Y (Master Angles Window)
This adjusts the master y angle for the 421 plane. Rotating the Image by using the Y [] box rotates the Image around the Y-axis.

4.7.4 421 z master angle

421-Z (Master Angles Window)
Adjusts the master z angle for the 421 plane. Rotating the Image by using the Z [] box rotates the Image around the Z-axis counterclockwise.

4.7.5 422 y master angle

422-X (Master Angles Window)
This adjusts the master x angle for the 422 plane. Rotating the Image by using the X [] box rotates the Image around the X-axis.

4.7.6 422 y master angle

422-Y (Master Angles Window)
This adjusts the master y angle for the 422 plane. Rotating the Image by using the Y [] box rotates the Image around the Y-axis.

4.7.7 422 z master angle

422-Z (Master Angles Window)
This adjusts the master z angle for the 422 plane. Rotating the Image by using the Z [] box rotates the Image around the Z-axis.

4.7.8 423 x master angle

423-X (Master Angles Window)
This adjusts the master x angle for the 423 plane. Rotating the Image by using the X [] box rotates the Image around the X-axis.

4.7.9 423 y master angle

423-Y (Master Angles Window)
This adjusts the master y angle for the 423 plane. Rotating the Image by using the Y [] box rotates the Image around the Y-axis.

4.7.10 423 z master angle

423-Z (Master Angles Window)
This adjusts the master z angle for the 423 plane. Rotating the Image by using the Z [] box rotates the Image around the Z-axis.

4.8 Fractal Variables

Fractal Variables (Edit Menu)
The window opened varies with the fractal type selected, and contains many of the major variables that RSK now scales between key frames of an avi stream.

4.8.1 Parameters Window

Parameters Window
There are edit controls for entering the complex constant (real and imaginary parts), min and max iterations, bailout and the min/max ranges for the real and imaginary window coordinates, or the z-space of the MS. Cj and ck are for entering hypercomplex parameters.

The more iterations are used, the longer it takes to plot a fractal, but more detail will be present. 150 iterations is the default for max iterations. Min iterations determines how close to the Mandelbrot set a point must come to be plotted. Higher values result in fewer bands around the MS. There are also the Exp edit boxes for entering exponents used in the Exponential and Newton formulas.

Related Topic:
QS 3-Ddescribes the Quaternion set generator's data-collection window.

4.8.1.1 X min box

X min box

Use this box to enter the minimum value for the horizontal range used for iteration.

4.8.1.2 X max box

X max box

Use this box to enter the maximum value for the horizontal range used for iteration.

4.8.1.3 Y min box

Y min box

Use this box to enter the minimum value for the vertical range used for iteration.

4.8.1.4 Y max box

Y max box

Use this box to enter the maximum value for the vertical range used for iteration.

4.8.1.5 c1 box

c1 box

Use this box to enter the value of the real component of the complex constant.

4.8.1.6 ci box

ci box

Use this box to enter the value of the 'i' component of the complex constant.

4.8.1.7 cj box

cj box

Use this box to enter the value of the 'j' component of the complex constant.

4.8.1.8 ck box

ck box

Use this box to enter the value of the 'k' component of the complex constant.

4.8.1.9 Minimum iterations box

Minimum Iterations box

Use this button to enter the minimum iterations for each pixel before displaying. The higher the value the less of the escape regions are shown.

4.8.1.10 Maximum iterations box

Maximum Iterations button

Use this button to set the maximum iterations for each pixel. Default is 150.

4.8.1.11 Bailout box

Bailout box

Use this box to enter the bailout value for each pixel, the maximum value of z before escaping the iteration loop.

4.8.1.12 Exp r box

Exp real box

Use this box to enter the real coefficient of the exp exponent.

4.8.1.13 Exp i box

Exp imag box

Use this box to enter the complex coefficient of the exp exponent.

4.8.1.14 OK button

OK button

Use this button to apply changes to a drawing and close the dialog window.

4.8.2 Quaternion Window

Quaternion Window

This is the data-collection window for RSK's Quaternion (QS) generator. Minx, maxx, miny and maxy are the spatial variables for framing the quaternion object. These are usually updated automatically when you use the zoom box. Min Z and Max Z define the three-dimensional space that is used to map the quaternion image. Normally Min Z is the negative of Max Z, but Min Z can be adjusted in the positive direction to shear off the front of the quaternion object. This has the effect of exposing the insides of a quaternion. The quad complex constant consists of c1, ci, cj and ck respectively. Maxiter and bailout are the same as max iterations and bailout in the MS Parameters window. Step and Fine are pitch adjustments that bear on the quality of the plot at an expense of lengthier calculations. There are also the Exp edit boxes for entering exponents used in the Exponential and Newton formulas.

In a 3-D space, the program iterates coarse points (Steps) then finer points (Fine Tune). It looks for those points that define the boundary between being in the set and those outside of the set. The final presentation is all of those points on the boundary (or as close to the boundary but inside of the set as the program can find) that "face" the viewer and those points are colored according to the rendering and lighting options selected.

4.8.2.1 X min box

X min box

Use this box to enter the minimum value for the X range used for iteration.

4.8.2.2 X max box

X max box

Use this box to enter the maximum value for the X range used for iteration.

4.8.2.3 Y min box

Y min box

Use this box to enter the minimum value for the Y range used for iteration.

4.8.2.4 Y max box

Y max box

Use this box to enter the maximum value for the Y range used for iteration.

4.8.2.5 Z min box

Z min box

Use this box to enter the minimum value for the Y range used for iteration.

4.8.2.6 Z max box

Z max box

Use this box to enter the maximum value for the Y range used for iteration.

4.8.2.7 c1 box

c1 box

Use this box to enter the value of the real component of the complex constant.

4.8.2.8 ci box

ci box

Use this box to enter the value of the 'i' component of the complex constant.

4.8.2.9 cj box

cj box

Use this box to enter the value of the 'j' component of the complex constant.

4.8.2.10 ck box

ck box

Use this box to enter the value of the 'k' component of the complex constant.

4.8.2.11 Max iter box

Max Iter box

Use this box to enter the maximum iterations for each pixel. Default is 150 for MS and 10 for JS.

4.8.2.12 Steps box

Steps box

Use this box to enter the number of Steps each pixel is iterated. Higher values produce smoother quaternion surfaces, but the plot takes longer. For a finished plot use at least a value equal to or greater than the width of the draw window.

4.8.2.13 Fine tune box

Fine Tune box

Use this box to enter the number of Fine Tuning steps each pixel is iterated. Higher values produce smoother quaternion surfaces, but the plot takes longer. For a finished plot use 40 or greater.

4.8.2.14 Help button

Help button

Use this button to get help on all the options of the dialog window.

4.8.2.15 Apply button

Apply button

Use this button to apply changes to a drawing without closing the dialog window.

4.8.2.16 Cancel button

Cancel button

Use this button to cancel changes that have been applied since the dialog was first opened and close the dialog window. Note: some commands such as Demo/Random Julia will "refresh" most open dialog windows, since many variables are altered. The Cancel button then works as if the dialog was just opened after the refresh.

4.8.2.17 OK button

OK button

Use this button to apply changes to a drawing and close the dialog window.

4.8.3 MandelCloud Window

MandelCloud Window

There is a choice of seven different orbital-type fractals. When you select one of these from the Function drop-down box, the default parameters for that fractal type are automatically set.

The color type sets the criteria by which each pixel is colored. This can be based on how many times a pixel is repeatedly plotted or "hit", the number of iterations before a pixel is plotted "iter" or one of the loop indexes that is referenced when the pixel is plotted "x" or "y", or a combination of the coloring methods. The indexes may not be used in some of the orbital functions.

For the MandelCloud fractal type, increasing the Grid size and Iterations increase the density and detail of the plot.

Skip is used by some of the orbital fractals to allow the orbits to "settle". The first n# points are omitted from the plot.

Notes: when you zoom into a MC or other orbital plot you are actually "magnifying" a portion of the draw window, instead of altering the x/y ranges. (With orbital fractals, also known as "strange attractors", the x/y ranges do not have the same relationship to the "attractor" as they do with Mandelbrot sets. The default x/y ranges for each orbital fractal are set so the entire attractor is revealed, though the attractor can be truncated by reducing the ranges.) After magnifying a portion of the window, you can alter the Grid size and iterations to increase the resolution of the magnified region and Apply changes, or click on New to revert to the default image.

4.8.3.1 MandelCloud Function

Function box

There is a choice of seven different orbital-type fractals. When you select one of these from the Function drop-down box, the default parameters for that fractal type are automatically set.

4.8.3.2 MandelCloud color type

Color Type box

The color type sets the criteria by which each pixel is colored. This can be based on how many times a pixel is repeatedly plotted or "hit", the number of iterations before a pixel is plotted "iter" or one of the loop indexes that is referenced when the pixel is plotted "x" or "y", or a combination of the coloring methods. The indexes may not be used in some of the orbital functions.

4.8.3.3 MandelCloud Grid

Grid size box

Increasing the Grid size increases the density and detail of the plot.

4.8.3.4 MandelCloud Iterations

Iterations box

Increasing the Iterations increases the density and detail of the plot.

4.8.3.5 MandelCloud Skip

Skip box

Skip is used by some of the orbital fractals to allow the orbits to "settle". The first n# points are omitted from the plot.

4.8.4 Window: Bifurcation

Bifurcation Window

Here you define x and r ranges for the bifurcation-type fractal, maximum and minimum iterations, the color type and starting position of x, the growth factor. You can define x and r ranges manually or they are updated automatically when zooming. The default button returns all variables to their initial values.

4.8.4.1 bufurbox: Bifurcation Color Type

Color Type

The color type sets the criteria by which each pixel is colored. This can be based on how many times a pixel is repeatedly plotted or "hit", the number of iterations before a pixel is plotted "iter" or the loop indexes that is referenced when the pixel is plotted "x" or the "rate of change" at the points's escape, or the product of "rate" and "x".

4.8.4.2 bufurbox: Left

Left

Use this box to enter the minimum value for the horizontal range used for iteration.

4.8.4.3 bufurbox: Right

Right

Use this box to enter the maximum value for the horizontal range used for iteration.

4.8.4.4 bufurbox: Top

Top

Use this box to enter the maximum value for the vertical range used for iteration.

4.8.4.5 bufurbox: Bottom

Bottom

Use this box to enter the minimum value for the vertical range used for iteration.

4.8.4.6 bufurbox: Minimum Iterations

Minimum Iterations

Use this button to enter the minimum iterations for each pixel before displaying. Default varies with type of bifurcation.

4.8.4.7 bufurbox: Maximum Iterations

Maximum Iterations

Use this button to set the maximum iterations for each pixel. Default varies with type of bifurcation.

4.8.4.8 bufurbox: X

X

Use this box to enter the starting growth factor for the bifurcation plot.

4.8.4.9 Default button

Default button

Use this button to return variables to their default values.

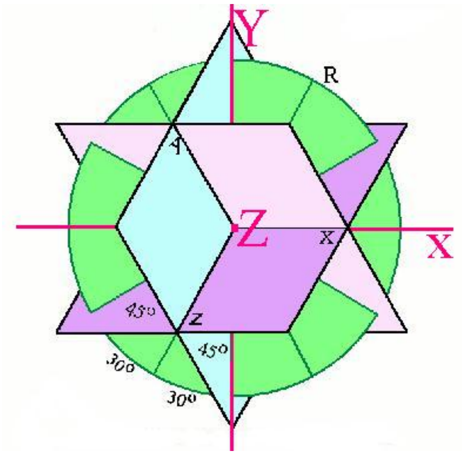
4.9 Size

Size (Edit menu)
This allows you to set the drawing area for a picture, independent of the Windows screen size. It also shows which size is currently in use. The aspect for the drawing is based on the ratio of X (horizontal width) to Y (vertical height.) The custom setting allows for any size/aspect that system memory will permit. Videos are limited to the standard 4/3 vga aspect or 1/1.

4.10 Viewing Angles

Viewing Angles (Edit menu)
This allows you to change the rotational angles for a 3-D figure or RSK while preserving the default master angles. This is useful for creating videos that show RSK rotating around various axes in a linear fashion.

Plane R lies within the plane of the page and the X, Y and Z-axes of plane R are in red. The x, y and z-axes of RSK are in black. The Z-axis of plane R is through zero and perpendicular to the plane of the page.



Viewing Angles axes of rotation:
X, Y and Z are axes of plane R.
X and Y lie in the plane of the page and Z is perpendicular to the plane of the page.

Spinning RSK by using the X box rotates RSK around the X-axis of plane R.
Spinning RSK by using the Y box rotates RSK around the Y-axis of plane R.
Spinning RSK by using the Z box rotates RSK around the Z-axis of plane R.

Note: when making a video, the Viewing Angles act as incremental angles between frames, rather than absolute viewing angles. This allows you to use 180 degrees in two successive "Write Frames" (for a cumulative rotation of 360 degrees) without readjusting the Viewing Angles values each time. To reverse the direction of the rotation, use a negative value for the viewing angle(s).

4.11 Edit: Lighting Variables

Lighting Variables Window

The Light Point variables (lightx thru lightz) determine the direction of the light source used in the ray-tracing algorithm. The ViewPoint represents the angle at which the object is ray-traced, which can affect Phong highlights. This has no effect on the camera view.

The Lighting variables shininess, highlight, gamma and ambient are used to adjust ambient light and highlights. The ranges for these variables appear beside their label. Decreasing the shininess value increases light reflected by the object and the apparent sheen on the object's surface. The ambient value controls the amount of ambient light that illuminates the object. The highlight value increases or decreases the specular (Phong) highlighting, while the gamma value increases or decreases the intensity of the light source's illumination. Once a plot is started, the lighting variables and light point can be changed without redrawing the object.

Click the Apply button to redisplay a plot after changing the lighting variables or light point. Click the Okay button to close the Ray-Tracing Window, applying new settings, if the variables were modified. Click on Cancel to revert to the state that existed when the ray-tracing window was opened. Click on Defaults to set the lighting and viewpoint variables to the built-in defaults for these variables.

4.11.1 Lightbox: LightPoint X

LightPoint X

The Light Point variables (X through Z) determine the direction of the light source used in the ray-tracing algorithm.

4.11.2 Lightbox: LightPoint Y

LightPoint Y

The Light Point variables (X through Z) determine the direction of the light source used in the ray-tracing algorithm.

4.11.3 Lightbox: LightPoint Z

LightPoint Z

The Light Point variables (X through Z) determine the direction of the light source used in the ray-tracing algorithm.

4.11.4 Lightbox: ViewPoint X

ViewPoint X

The ViewPoint represents the angle at which the object is ray-traced, which can affect Phong highlights. This has no effect on the camera view.

4.11.5 Lightbox: ViewPoint Y

ViewPoint Y

The ViewPoint represents the angle at which the object is ray-traced, which can affect Phong highlights. This has no effect on the camera view.

4.11.6 Lightbox: ViewPoint Z

ViewPoint Z

The ViewPoint represents the angle at which the object is ray-traced, which can affect Phong highlights. This has no effect on the camera view.

4.11.7 Lightbox: Shininess

Shininess

Decreasing the shininess value increases light reflected by the object and the apparent sheen on the object's surface.

4.11.8 Lightbox: Highl.ight

Highlight

The highlight value increases or decreases the specular (Phong) highlighting.

4.11.9 Lightbox: Gamma

Gamma

The gamma value increases or decreases the intensity of the light source's illumination.

4.11.10 Lightbox: Ambient

Ambient

The ambient value controls the amount of ambient light that illuminates the object.

4.11.11 Lightbox: Diffuse

Diffuse

The diffuse value controls the amount of diffuse light that illuminates the object.

4.11.12 Lightbox: Phong Linear

Phong Linear

This applies Phong highlights using a linear algorithm.

4.11.13 Lightbox: Phong Sinusoidal

Phong Sinusoidal

This applies Phong highlights using a sinusoidal algorithm.

4.11.14 Lightbox: Phong Exponential

Phong Exponential

This applies Phong highlights using an exponential algorithm.

4.11.15 Cancel button

Cancel button

Use this button to cancel changes that have been applied since the dialog was first opened and close the dialog window. Note: some commands such as Demo/Random Julia will "refresh" most open dialog windows, since many variables are altered. The Cancel button then works as if the dialog was just opened after the refresh.

4.11.16 Defaults button

Defaults button

Use this button to return variables to their default values.

4.12 Colors

Colors

Use the palette editor to modify the color(s) in use.

The Palette Editor window can be opened on RSK Remote, Color or from the Menu bar, Edit, Colors. In the Palette Editor, you can:
"?" Click the "?" and put the question mark on any button. That will give you information about that buttons function.

There are copy and spread options to smooth or customize the existing palettes in RSK. You can then save all the palettes in a .pl file, or by saving the entire function and bitmap

Colors are shown in 8 groups of 32 colors. With RSK, a palette is actually 65536 colors, with each succeeding color (except the last) followed by 255 colors that are evenly spread from one color to the next.

"Smooth" creates a random palette with a smooth transition between colors.

Use the Smooth button and edit box or slider bar to create a random color palette with a smooth color spread between the selected number of color boxes. The default, smooth "0", creates a palette with a smooth color spread between every 32nd box, or eight spreads for a palette of 256 colors. Smooth "1" creates a random color in every color box. Smooth "2" creates a random color selection with a smooth color spread between every other box. Smooth "3" creates a random color selection with a smooth color spread between every third box. Etc. Box 1 (background) and box 256 (set color) remain unchanged. To ensure continuity in the escape zones of a plot, the last color group is spread to the color of the second color index, thus forming a "circular" palette. Exception: for n = 253, the palette made is non-circular.

"Palette Name" Shows the current palette's name.

"Save Palette" Saves the current palette's name and colors to the designated "To Pal #" number.

Palette number registry: Click "Color" on the Menu bar then "Palettes." This is the list of 21 different palettes that are currently being used by the active Image window. When you save an image with an associated .zp file, these 21 palettes, along with other pertinent image information, are saved in the .zp file.

Use the RGB-slider controls to edit any color in the palette. Select Copy to copy any color to another spot in the palette. Select Spread to define a smooth spread of colors from the current spot to another spot in the palette. Copy and Spread take effect immediately when you select another spot with the mouse button. "Cancel" cancels a "Spread" or "Copy" operation before completion. In RSK, colors do not cycle smoothly when you adjust the RGB/HSV sliders. This would be too slow with true color. (It is important to realize that palettes are software-simulated in RSK, since 24-bit color supports no hardware palettes, so color cycling and palette switching are not fast operations.) The Apply button is used to map color changes to an image after you are done adjusting the sliders.

In the RGB mode, colors are made up of three components: red, green and blue. Each component varies from 0 (no color) to 255 (the brightest color.) Each color index may be selected individually with the mouse and its RGB components altered with the slider bars.

In the HSV (Hue, Saturation, Value) mode, color spreads are based on HSV values instead of RGB values, which in some cases results in brighter color spreads. The Hue can vary from 0 to 6, or red, yellow, green, cyan, blue and red for 0, 1, 2, 3, 4, 5 and 6 respectively. Saturation can vary from 0 to 1, with the most intense colors at the upper limits. At a Saturation value of zero, the colors are gray scale from black to white, depending on the amount of Value. Value determines the brightness of the color, from 0 to 1.

Right-click on any point on the main window and the palette color for that pixel will be displayed in the palette editor. You can use any of the color-cycling keys (after clicking on the main window) to see the effects of the cycling in the palette editor window. Note: color cycling and color-selection-from-pixel only works when the image has been drawn in the current session. If you load a pre-existing image file, you must redraw it to cycle colors, etc. Anti-aliasing, 3D height fields, undoing an action and hsv filtering also disable color cycling.

Use Reset to reset the colors of the palette in use, to where it was before it was cycled or modified. Note: if you change palettes with one of the function keys, any modifications to a previous palette are unaffected by the Reset button.

Use Undo to reverse the last change to the current palette.

Use Reverse to reverse the order of the colors in the palette. This affects only those colors in the start-color to end-color range. This is useful for reversing divide-by-eight palettes, etc., for orbit-trap pictures that require a reversed palette.

Use Neg to create a palette that is the complement of the current palette.

Use SRG to switch the red and green components of all palette colors.
Use SRB to switch the red and blue components of all palette colors. SRB and SRG are disabled in HSV mode. You can use these buttons to form eight different palettes by repeatedly switching red, green and blue components.

You can save a changed palette in different ways.
1. In the Palette Editor window (RSK Remote, Color), type in a new name in the "Set Palette Name" box []. Then choose one of the 21 different palettes locations to save your new color

scheme. When this image window is closed (X'ed), any color changes to the Palette registry for that image will be lost unless the image is saved with an .xp file or the registry is saved as in (2) below.

2. File, Save Palettes [PL]. You can save the current 21-palette registry under a file name. (Set up a folder in RSK named "Palette" for .pl files?) That palette registry can then be opened with File, Load Palettes [PL} for use by another Image window.

The default palette registry is titled "TITLE." If you have a favorite palette registry, you may save that palette registry as "TITLE" and the new saved palette registry will overwrite the old registry and become the default palette registry. (You must have a "TITLE.pl" for the default palettes file!)

Note: unless you click on Reset before exiting the editor, changes are retained in the palette edited, no matter which way you close the editor (Okay button or close box.)

4.12.1 Reverse button

Reverse button

Cycle color indexes in reverse direction. If Color cycling is not turned on, each click of this button cycles the indexes backwards one step.

4.12.2 Neg Button

Neg button

Use Neg to create a palette that is the complement of the current palette.

4.12.3 SRG Button

SRG button

Use SRG to switch the red and green components of all palette colors. This is for RGB mode only.

4.12.4 SRB Button

SRB button

Use SRG to switch the red and blue components of all palette colors. This is for RGB mode only.

4.12.5 H/R Button

H/R button

The H/R button switches between the R/G/B mode and the H/S/V mode of adjusting color values.

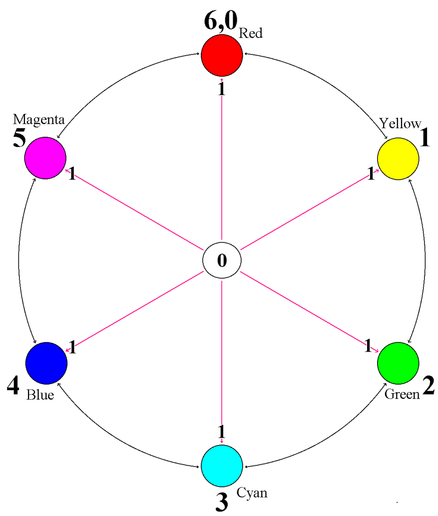
RGB: Each color box in the palette is a mixture of three colors: Red, Blue and Green, the R/B/G color choices. In the R/G/B mode, the amount of red, green or blue can be varied from 0 (no color) to 255 (the brightest color).

R=255, G=255, B=0 is Yellow
R=0, G=255, B=255 is Cyan
R=255, G=0, B=255 is Magenta.
R=255, G=255, B=255 is White
R=0, B=0, G=0 is Black

All other colors with different brightness and intensities are different combinations of Red, Green and Blue values.

HSV: Each color box in the palette is a mixture of a color, the Hue; the brightness of that color, the Saturation; and the vividness of that color, the Value.

Hue determines the basic color and varies from 0 to 6 in a color wheel:



Saturation varies from 0 to 1: the spokes of the color wheel.

0 - White
1 - Full color

1.5 is halfway between white and the color determined by the value of Hue and Value. When Hue equals 4, Value equals 1, an S value of 0.5 is a light blue halfway between white and full color blue. Saturation determines the brightness or intensity of the color.

Value varies from 0 to 1: Also the spokes on the wheel but with black in the center instead of white. Value is a gray scale.

0 - Black
1 - Full color

1.5 on the V scale is halfway between black and the color determined by the value of Hue and Saturation. Value determines how vivid the chosen color is.

4.12.6 Spread Button

Spread button

Select Spread to define a smooth spread of colors from the current spot to another spot in the palette.

4.12.7 Copy Button

Copy button

Select Copy to copy any color to another spot in the palette.

4.12.8 Cancel Button

Cancel button

You can cancel a copy or spread operation with the Cancel button.

4.12.9 Undo button

Undo button

Use Undo to reverse the last change to the current palette.

4.12.10 Okay Button

Okay button

Click on Okay to exit the palette editor, applying unmapped color changes to picture (if color-cycling is enabled.)

4.12.11 Apply Button

Apply button

In RSK, colors do not cycle smoothly when you adjust the RGB/HSV sliders. This would be too slow with true color. The Apply button is used to map color changes to an image after you are done adjusting the sliders.

4.12.12 Reset Button

Reset button

Use Reset to reset the colors of the palette in use, to where it was before it was cycled or modified. Note: if you change palettes with one of the function keys, any modifications to a previous palette are unaffected by the Reset button.

4.12.13 Smooth Button

Smooth button

Used to create a random color palette with a smooth color spread between the selected number of color boxes. Smooth "0" creates a palette with a smooth color spread between every 32nd box, or eight spreads for a palette of 256 colors. Smooth "1" creates a random color in every color box. Smooth "2" creates a random color selection with a smooth color spread between every other box. Smooth "3" creates a random color selection with a smooth color spread between every third box. Etc. Box 1 (background) and box 256 (set color) remain unchanged. To ensure continuity in the escape zones of a plot, the last color group is spread to the color of the second color index, thus forming a "circular" palette.

Note: For n = 253, the palette made is non-circular. If an orbit-trap rendering is selected (in Render/MS Rendering Options), a special non-circular palette of one color spread (indexes 1-256) is created when the smoothing number is zero. If the Split palette variable is used (in Color/MS Coloring Options), the random palette is split into n# sections suitable for multi-colored orbit-trap pictures in the Carlson style.

4.12.14 Smooth box

Smooth box and slider bar

Used with the Smooth button when creating a random palette. Enter a number between 0 and 233 to control the degree of smoothness in the palette.

4.12.15 Palette Name box

Palette Name box

Shows the current palette's name. You can change this by entering a new name and clicking on Save Palette.

4.12.16 Save Palette Button

Save Palette button

This saves the current palette's name and colors to the designated "To Pal #" palette index.

4.12.17 To Pal # box

To Pal # box

This defines the palette index (1-21) that is used by the Save Palette button to save the current palette.

4.12.18 Red Slider

Red slider

Use the RGB/HSV-slider controls to edit the red or hue component of any color in the palette.

4.12.19 Red edit box

Red edit box

Shows red/hue value of selected color index.

4.12.20 Green Slider

Green slider

Use the RGB/HSV-slider controls to edit the green or saturation component of any color in the palette.

4.12.21 Green edit box

Green edit box

Shows green/saturation value of selected color index.

4.12.22 Blue Slider

Blue slider

Use the RGB/HSV-slider controls to edit the blue or value component of any color in the palette.

4.12.23 Blue edit box

Blue edit box

Shows blue/value magnitude of selected color index.

4.12.24 Forward Button

Forward button

Cycle color indexes in forward direction. If Color cycling is not turned on, each click of this button cycles the indexes forward one step.

4.12.25 Reverse button

Reverse button

Use Reverse to reverse the order of the colors in the palette. This affects only those colors in the start-color to end-color range. This is useful for reversing divide-by-eight palettes, etc., for orbit-trap pictures that require a reversed palette.

4.12.26 Cycle Button

Cycle button

Turn on or off color cycling. Color cycling shifts the color indexes forward or backward continuously.

4.13 Edit Text command

Text (Edit menu)

Use the Edit/Text command to annotate a finished picture. You can change font size, type, and text color or format text into multiple lines. This is useful for adding copyright/author info or comments. Use Undo to erase text that has just been added.

4.14 Edit Detail Text Font command

Detail Text Font (Edit menu)

Change the font size, type and/or color of the font used with the Image/Detail command.

5 Image menu

Image menu commands

The Image menu offers the following commands:

Draw	Draw the picture.
Detail	Detail graph.
Superimpose, 2-D Grid	Superimpose 3-D QS using 2-D grid.
Superimpose, 3-D Grid	Superimpose 3-D QS with 3-D grid.
Superimpose, 4-D Grid	Superimpose 3-D QS with 4-D grid.
Scan JS	Scan Mandelbrot border for Julia set.
Scan QS	Scan Mandelbrot border for quaternion Julia set.
Auto Remote	Open remote automatically at startup.
Auto Sound Alert	Enable or turn off sound alerts.
Auto Defaults	Enable defaults for RSK master angles, RSK lighting and Julia
Type complex constant.	
Auto Time	Show time used to plot image.
Abort	Abort drawing.
Continue	Continue drawing.
Zoom	Zoom into rectangle.
New View on Zoom	New view on zoom.
Clone	Clone current view.
Dive	Peel off outer layer of quaternion.
Full Screen	View image full-screen.
Reset Ranges	Reset Coordinates.
Set All Planes Equal	Set parameters for 422 and 423 to the parameters of 421
421	Switch to plane 421.
422	Switch to plane 422.
423	Switch to plane 423.
RSK-Rxy	Switch to right-handed reference frame, xy orientation.

RSK-Lxy	Switch to left-handed reference frame, xy orientation.
RSK-Rxz	Switch to right-handed reference frame, xz orientation.
RSK-Lxz	Switch to left-handed reference frame, xz orientation.
User-defined RSK	User-defined reference frame.

5.1 Image Draw command

Draw command (Image menu)

Use this command to draw or redraw the image for the current fractal variables. Clicking inside the draw window with the left-mouse button stops all plotting.

5.2 Image Detail command

Detail command (Image menu)

Add descriptive text and axis lines to picture. Text varies with type of fractal drawn.

5.3 Image Superimpose (fixed grid) command

Superimpose command, 2-D grid (Image menu)

Superimpose quaternions on a 2-D grid. For every point regularly spaced on an x / y grid, for the width and height of the draw window, the point is tested as a MS. Non-escaping points are drawn as quaternion Julia sets, each successive Julia set superimposed on the last. The palette is randomized for each QS. Disabled when the fractal type is not quaternion. A dialog window is opened before proceeding to define the number of steps in the x and y directions. Points are spaced equally according to the width / height aspect of the draw window.

5.4 Image Superimpose (3-D grid) command

Superimpose command, 3-D grid (Image menu)

Superimpose quaternions on a 3-D grid. For every point regularly spaced on an x / y / z grid, for the width and height of the draw window, the point is tested as a MS, using three dimensions of the z space. Non-escaping points are drawn as quaternion Julia sets, each successive Julia set superimposed on the last. The palette is randomized for each QS. Disabled when the fractal type is not quaternion. A dialog window is opened before proceeding to define the number of steps in the x and y directions. Points are spaced equally according to the width / height aspect of the draw window. The z direction uses 1 / 1 spacing based on the min Z and max Z variables in the quaternion FVR window.

5.5 Image Superimpose (4-D grid) command

Superimpose command, 4-D grid (Image menu)

Superimpose quaternions on a 4-D grid. For every point regularly spaced on an x / y / z /w grid, for the width and height of the draw window, the point is tested as a MS, using all four dimensions of the z space. Non-escaping points are drawn as quaternion Julia sets, each successive Julia set superimposed on the last. The palette is randomized for each QS. Disabled when the fractal type is not quaternion. A dialog window is opened before proceeding to define the number of steps in the x and y directions. Points are spaced equally according to the width / height aspect of the draw window. The z direction uses 1 / 1 spacing based on the min Z and max Z variables in the quaternion FVR window. The w direction uses the same ranges as the z variables.

5.6 Scan JS

Scan JS (Image menu)

This is equivalent to the Shift+J hot key. Enabled when the Type is Mandelbrot. A Julia set is generated in sector 2. Once you find an interesting quaternion set using "J", another window is opened that sets the fractal parameters to those in the exploratory qjulia window. The parameters in the exploratory window revert to their original Mandelbrot settings when you exit this mode. Note: if "New View on Zoom" has been disabled or an AVI stream has been opened then the expanded Julia set is drawn in the current window and the mode is immediately exited.

5.7 Scan QS

Scan QS (Image menu)

This is equivalent to the Shift+G hot key. Enabled when the Type is Mandelbrot. A quaternion Julia set is generated in sector 2. Once you find an interesting quaternion set using "G", like the J command another window is opened that sets the fractal parameters to those in the exploratory qjulia window. The parameters in the exploratory window revert to their original Mandelbrot settings when you exit this mode. Note: if "New View on Zoom" has been disabled or an AVI stream has been opened then the expanded Julia set is drawn in the current window and the mode is immediately exited.

5.8 Image Auto Remote command

Auto Remote command (Image menu)

With this command enabled (on by default), the remote is opened immediately at program startup. Handy if you find the remote useful and do not want to click on the toolbar button each time the program starts up.

5.9 Image Auto Alert command

Auto Sound Alert command (Image menu)

A sound clip notifies the user when a drawing is completed or canceled. By disabling this command the completion exclamation is suppressed and also any alert that contains a message box. Note: some sound clips are automatically generated by Windows, or there is no text alert for a given error condition. In these cases the sound alert is unaffected by the Auto

Alert command. RSK saves the condition of this option at session's end, so if you disable it and close the program, the option will be disabled when you restart RSK.

5.10 Image Auto Defaults command

Auto Defaults command (Image menu)

With this command enabled (on by default), the RSK master angles automatically default to the angles saved in the default .man files (located in the startup directory). By disabling this, the default master angle files are not automatically loaded each time you change RSK mode or formula. Also, this command allows the program to reset lighting values to match the current RSK mode. If you disable this then the lighting values will not change when you change RSK modes and the lighting may appear dim. This command allows the program to preset the Julia complex constant to -1 for most formulas or -i for the loxodromic formula. By disabling this the Julia constant does not change when you change from Mandelbrot type to Julia type. This option also allows certain palettes to be the default for fractal types like bifurcation, MS 2-D and the 42X image planes. If you disable this then palettes will not change when you select a new fractal type or switch 42X planes.

Hint, if you start with the default angles for a given RSK mode or formula, then you can disable "Auto Defaults" and modify angles, lighting or Julia constant to suit your own preferences. Re-enable the command if something does not look right and you need to start over. RSK saves the condition of this option at session's end, so if you disable it and close the program, the option will be disabled when you restart RSK.

5.11 Image Auto Time command

Auto Time command (Image menu)

With this command enabled (on by default), the time that an image takes to plot is displayed when the plot is complete. RSK saves the condition of this option at session's end, so if you disable it and close the program, the option will be disabled when you restart RSK.

5.12 Image Abort command

Abort command (Image menu)

Use this command to stop drawing. Clicking inside a window's drawing area or close box (or the program close box) will also stop the drawing. Note: once a plot has started RSK continues to draw the image for that window regardless of which drawing window has the input focus, until done or aborted. You can open and close other drawing windows without affecting the current drawing, but only one drawing is active at any time.

5.13 Image Continue command

Continue command (Image menu)

Use this command to continue a MS 2-D or QS 3-D drawing that has been paused. The continue command is disabled with RSK, bifurcation, MC and MS 3-D images.

5.14 Zoom

Zoom (Image menu)

Turns on zoom mode, so that detail of the current plot may be magnified. Alternatively, just click inside any drawing window, move the mouse, and the zoom box will appear. Using the mouse, move the zoom box over the portion of the plot you wish to magnify. Hold the left mouse button to shrink the box or the right button to enlarge it. Use the up and down arrow keys to squash or expand the box, changing the aspect of the image. You start a zoom by pressing the space bar. You abort a zoom by clicking outside the main window or in the title bar, or by pressing the escape key. The program will begin a new plot at the new coordinates. You may zoom in by defining a box inside the current drawing area. You zoom out by drawing a box outside the current drawing area. The outer zoom limits are between -1000 and 1000. The precision is that of double precision (64 bits)
Notes: Zooming into a three-dimensional MS is not supported. Zooming into a quaternion set is mostly for reframing, as detail is usually not enhanced. For Mandelcloud and other orbital type fractals, there is limited support for zooming. It is actually a "magnifying" mode where a portion of the draw window is expanded to fill the window. The entire MC set is calculated each time but only the magnified section is displayed, so it may take some time before the magnified section is plotted. Magnify can be applied only once to a complete MC set, but the Grid size and Iterations can be increased to show more resolution in the magnified section. Click on Apply in the Fractal Variables window to apply modified variables to the magnified plot, or New to cancel magnify mode and redraw the full MC set.

5.15 Image New View on Zoom command

New view on zoom (Image menu)

With this option enabled, a new window is opened with each zoom, instead of the zoom box area replacing the original image. Ignored in avi mode.

5.16 Image Clone

Clone (Image menu)

A new draw window is opened that contains the same fractal data as the window it was opened from. This is useful for comparing minor changes in texturing options, etc. Similar to using the copy/paste data commands except that all figures are copied to the new view.

5.17 Dive

Dive (Image menu)

Select Dive to go beneath the surface of a quaternion. Some quaternions have a smooth border that does not show the turbulence below the surface. Using the Dive option strips off the border layer to reveal what is underneath.

5.18 Full Screen

Full Screen (Image menu)

Displays the entire plot, expanding or shrinking the image to fit in a maximized window without title bar, scroll bars or menu bar. At all other times, part of the picture is hidden by the inclusion of the title bar, toolbar, scroll bars and menu bar. To exit full-screen mode, press any key or click the left-mouse button.

5.19 Reset

Reset Ranges

Resets the real X and imaginary Y ranges in the MS and QS Parameters windows to [-2.0] <= x <= [2.0] and y = +/-2.0 * image aspect.

5.20 Set all plane parameters equal

Set All Plane Parameters Equal

Sets most fractal parameters for planes 422 and 423 to those of plane 421. The affected variables include iterations, bailout, x/y ranges, complex constant, fractal type, exp values, formula, coloring options and quaternion or orbital variables. This is useful to create symmetrical RSK figures that have the same JS, MS or QS.

5.21 421

421

Switch to plane 421. This enables you to modify parameters, lighting and coloring method, etc. for the plane. Some fractal types, such as bifurcation and MC, are only implemented as MS 2-D and use plane 421 as the default plane.

Notes: Orientation defaults to right-handed view (RSK-Rxx). If you want to see a single plane with the left-handed orientation, reverse the polarity of the x ranges (xmin = xmax, xmax = xmin.) and set Viewing Angles to [0,0,180].

5.22 422

422

Switch to plane 422. This enables you to modify parameters, lighting and coloring method, etc. for the plane. Used with one of the RSK modes like RSK-Rxy.

Notes: Orientation defaults to right-handed view (RSK-Rxx). If you want to see a single plane with the left-handed orientation, reverse the polarity of the x ranges (xmin = xmax, xmax = xmin.) and set Viewing Angles to [0,0,180].

5.23 423

423

Switch to plane 423. This enables you to modify parameters, lighting and coloring method, etc. for the plane.

Notes: Orientation defaults to right-handed view (RSK-Rxx). If you want to see a single plane with the left-handed orientation, reverse the polarity of the x ranges (xmin = xmax, xmax = xmin.) and set Viewing Angles to [0,0,180].

5.24 RSK-Rxy

RSK-Rxy

This is the right-handed version of the RSK mode that uses xy orientation. RSK uses three orthogonal planes to display a 9 dimensional space-time figure.

Notes: The planes can contain MS 3-D, QS 3-D or MC fractal types. When you switch to a default RSK mode such as RSK-Lxy, the default .man file for that mode is reloaded and user-changes are lost.

5.25 RSK-Lxy

RSK-Lxy

This is the left-handed version of the RSK mode that uses xy orientation. RSK uses three orthogonal planes to display a 9 dimensional space-time figure. In this case the polarity of the x ranges is reversed (from RSK-Rxy) and for MS 3-D or MC 3-D all three planes are rotated 180 degrees around the z-axis. The 180-degree rotation is the same as setting Viewing Angles to [0,0,180].

Notes: The planes can contain MS 3-D, QS 3-D or MC fractal types. When you switch to a default RSK mode such as RSK-Lxy, the default .man file for that mode is reloaded and user-changes are lost.

5.26 RSK-Rxz

RSK-Rxz

This is the right-handed version of the RSK mode that uses xz orientation. RSK uses three orthogonal planes to display a 9 dimensional space-time figure.

Notes: The planes can contain MS 3-D, QS 3-D or MC fractal types. When you switch to a default RSK mode such as RSK-Lxy, the default .man file for that mode is reloaded and user-changes are lost.

5.27 RSK-Lxz

RSK-Lxz

This is the left-handed version of the RSK mode that uses xz orientation. RSK uses three orthogonal planes to display a 9 dimensional space-time figure. In this case the polarity of the x ranges is reversed (from RSK-Rxz) and for MS 3-D or MC 3-D all three planes are rotated 180 degrees around the z-axis. The 180-degree rotation is the same as setting Viewing Angles to [0,0,180].

Notes: The planes can contain MS 3-D, QS 3-D or MC fractal types. When you switch to a default RSK mode such as RSK-Lxy, the default .man file for that mode is reloaded and user-changes are lost.

5.28 User-defined RSK

User-defined RSK

This mode allows you to set your own RSK angles with the Edit/Master Angles editor (and/or Viewing Angles editor) and retains the angles when changing formulas.

Notes: When you switch from a default RSK mode to User-defined RSK, the master angles and "handedness" (left or right) remains the same as the default mode. When you switch to a default RSK mode such as RSK-Lxy, the default .man file for that mode is reloaded and user-changes are lost.

6 Formula menu

Formula menu commands

The Formula menu offers the following commands:

z^2+c	Standard Mandelbrot set.
cz(1-z)	Alternate Mandelbrot set.
c(z-(1/z))	Alternate Mandelbrot set.
$z^2+j+kzn$	Phoenix formula.

6.1 z^2+c

z^2+c

Standard Mandelbrot set popularized by B. Mandelbrot.

6.2 cz(1-z)

cz(1-z)

Alternate Mandelbrot set.

6.3 c(z-(1/z))

c(z-(1/z))

Alternate Mandelbrot set.

6.4 z^2+j+kzn

z^2+j+kzn

Phoenix formula, where j and k are coefficients of the complex constant and zn is the value of z at the previous iteration.

6.5 z^3+c

z^3+c

Cubic Mandelbrot set.

6.6 z^exp+c

z^exp+c

Exponential Mandelbrot set.; exp may be complex using the exp_imag variable (in Parameters window) as its imaginary component.

6.7 Loxodromic

Loxodromic

A Mandelbrot set based on logarithmic spirals, by Thomas Kromer.

6.8 Verhulst donor

Verhulst donor

The Verhulst bifurcation formula used as an escape-type formula.

6.9 Popcorn

Popcorn

The "time discrete dynamic system" used as an escape-time formula, by Clifford A Pickover. From his book "Computers Pattern Chaos and Beauty."

6.10 Newton

Newton

Newton's method applied to z=z^exp_real-c, where exp_real (in Parameters window) is an integer 1-99.

6.11 Newton Sine

Newton Sine

Newton's method applied to z=sin(z)-c.

6.12 User-Defined Formula Window

User-Defined Formula

Here you enter your own custom formula, using a syntax similar to that used in Fractint. Click on the Example button to see a sample formula with initialization sequence, the formula itself and a bailout sequence. For a complete list of variables, operators and functions recognized by the RSK formula parser, please see Parser Information.

About formula syntax: The use of parenthesis is necessary around complex exponents or variables. E.g.: '(z-i)^(1.5e)'. Up to 500 user-named-complex variables and constants may be included in a formula. A variable must begin with a letter and may contain numbers and letters only. A variable may be up to 9 characters long. A constant may be up to 20 digits long, including the decimal point. RSK uses syntax similar to Fractint's formula style with an initialization section, followed by the main formula, and an optional bailout routine. Comments may be entered on the same lime with a proceeding ';'. Some variables such as 'pixel' and p1 are named after Fractint's predefined variables. These are provided to allow RSK users to more easily convert Fractint formula types to RSK use. However, RSK does not prompt you to enter values into p1 (the cr and ci boxes). Since p1 is used in the iteration process as 'c', p1 cannot be used as a variable independent of c. A ':' terminates the initialization section. Multiple phrases may be entered in the main formula or initialization sections on the same line by using the terminator ',' between phrases. Use ctrl-enter to terminate a line in the formula box. An optional bailout routine may be entered as a phrase at the end of the formula. If the bailout phrase equals a value other than TRUE during iteration, the iteration loop is exited.

6.12.1 Formula box

Formula box

Here you enter your own custom formula, using a syntax similar to that used in Fractint. Click on the Example button to see a sample formula with initialization sequence, the formula itself and a bailout sequence.

7 Type menu

Type menu commands

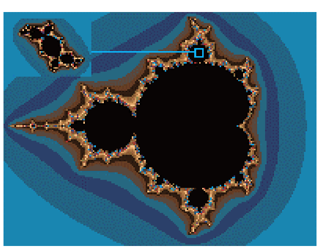
The Type menu offers the following commands:

Mandelbrot	MS plot based on complex Z plane, orbit starts at zpixel
Julia	Julia set.
2D MS / JS	Set fractal type to two-dimensional Mandelbrot / Julia mapping.
3D MS / JS	Set fractal type to 3-D MS / JS mapping.
3D QS	Set fractal type to 3-D quaternion mapping.
MandelCloud	Set fractal type to mandelcloud.
May's Bifurcation	Set fractal type to May's bifurcation.
Verhulst's Bifurcation	Set fractal type to Verhulst's bifurcation.
Tk+	Tk+ extension of MS or QS
Tk-	Tk- extension of MS or QS.

7.1 Mandelbrot

Mandelbrot

Mandelbrots base their mapping on varying inputs of complex C, which corresponds to the min/max values set in the Parameters window. The initial value of Z is set to the value of the pixel being iterated. If the complex constant (entered in Parameters window) is non-zero this has the effect of deforming the orbits of the MS.



Julia from Mandelbrot

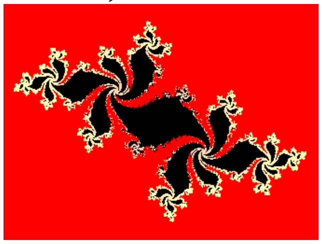
The Mandelbrot set is an infinite set of Julia sets. Every point inside of the set iterates to a different Julia set.

7.2 Julia

Julia

Julia sets normally have a fixed complex C, with varying inputs of Z, which corresponds to the min/max values set in the Parameters window. This option generates the so-called 'filled-in' Julia set, which includes non-escaping points as well as the Julia set.

An attractive point has a basin of attraction and every basin of attraction has a boundary. A boundary is a point on a one-dimensional line, a line of points in two dimensions or an area of points in three dimensions. The boundary borders a domain. This boundary is known as a Julia set, named for Gaston Julia (1893-1978), a French mathematician.



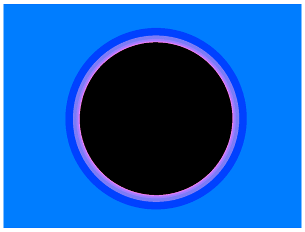
A Julia set with a period five.
C = (-0.5398, 0.5378$_i$)
$-2 < x < 2; -1.5 < y_i < 1.5$

Julia sets are defined as the set of points that border and separate basins of attraction of an attractive cycle. Every point inside of a Julia set iterates toward an attractive fixed point or points. The period number indicates the number of attractive fixed points for the orbit of Z_1. Julia sets with a period of two or more have an intricate structure with a fractal dimension. The Julia sets that will be explored are those associated with the Mandelbrot set. The Mandelbrot set is a donor set, an infinite catalog of Julia sets. Every point inside of the Mandelbrot set iterates to a Julia set.

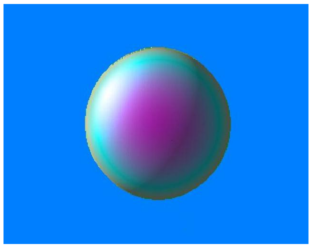
The same formula that is used to calculate a Mandelbrot set is used to calculate a Julia set, ($Z_1 = Z^2 + C$), but the application of the values of C and Z are modified. A grid (1024 x 1024) on a complex plane ($-2 < x < 2; -2 < y_i < 2$) is set. At each point on the grid, Z is set to the pixel value (x, y_i) and C is set to a selected value from inside of the Mandelbrot set and remains fixed at that value. The iterative routine is applied to each point on the grid in turn: Z_1 = ZPIXEL2 + C_{FIXED}. After the first iteration, Z_{PIXEL} is reset equal to Z_1 and C_{FIXED} remains the same.

The period number of the Julia set is derived from the location of C inside of the Mandelbrot set. If C is from a disk in the Mandelbrot set with a period five, then, when iterating the Julia set, each pixel that iterates to a bound state will iterate toward five attractive fixed points and are assigned the same color. Those points outside of the Julia set iterate to infinity.

Figure JSA, the Julia set is a circle with a radius of one. Each Z_{PIXEL} that is within this Julia set is within the basin of attraction of zero and forward iterates to zero. All points outside of the Julia set iterate to infinity. Zero and infinity are attractive points.



JSA C= (0, 0_i), a period 1
(-2<x<2, -1.5<y_i<1.5)



JSB C= (0,.0, 0_i,), a period 1 in three dimensions.
-2<x<2, -1.5<y_i<1.5)

Figure JSB applies the iterative routine to each pixel on a grid (1024 x 768) on a complex plane ($-2 < x < 2$, $-1.5 < y_i < 1.5$) with Z set at Z_{PIXEL} and C set at the fixed value (0, 0.0_i).

In a three-dimensional complex space, with C = 0, the Julia set is equal to a sphere with a radius of one. In four-dimensional complex space, the Julia set formed with C = 0 is a hyperspace sphere of radius one. As C increases from (0, 0_i), the Julia set becomes a distorted circle. As C increases from (0, 0_i, 0_j), the Julia set becomes a distorted sphere.

7.3 Type 2-D MS command

2D MS (Type menu)

Change the type to a 2-D MS or JS.

7.4 Type 3D MS command

3D MS (Type menu)

Change the type to a 3-D MS or JS.

7.5 Type 3-D QS command

3-D QS (Type menu)

Change type to a 3-D quaternion Mandelbrot or Julia set.

7.6 Type MandelCloud command

MandelCloud (Type menu)

Change the fractal type to MandelCloud. Defaults to 2-D type, but 3-D type can be selected with MS 3-D. Inside the FVR window you can also change this to one of six other "orbital-type" fractals.

7.7 Type May's Bifurcation command

May's Bifurcation (Type menu)

Change the fractal type to May's Bifurcation. Full zoom is supported.

7.8 Type Verhulst's Bifurcation command

Verhulst's Bifurcation (Type menu)

Change the fractal type to Verhulst's Bifurcation. Full zoom is supported.

7.9 Type Tk+ command

Tk+ (Type menu)

Plot Tk+ extension. The fourth dimension variable ck (in Parameters window) when non-zero has the affect of deforming a Mandelbrot or Julia set. This command plots the difference in escape times using the deforming variable ck when zero then non-zero. Sort of a time tunnel into the fourth dimension... Ck is set to .5 as default.

7.10 Type Tk- command

Tk- (Type menu)

Plot Tk- extension. The fourth dimension variable ck (in Parameters window) when non-zero has the affect of deforming a Mandelbrot or Julia set. This command plots the difference in escape times using the deforming variable ck when non-zero then zero. Sort of a time tunnel returning from the fourth dimension... Ck is set to .5 as default.

8 Render menu

Render menu commands

The Render menu offers the following commands:

Add Noise	Add noise to coloring.
Factors	Edit noise factors.
Reset Noise Seed	Re-seed random noise generator.
Texture Scale	Set scaling factor for texture.

MS Render Options	Rendering options that apply only to MS (Orbit traps, Biomorph, Decomposition, Torus, etc.).
Symmetry->	Horizontal, vertical or XY symmetry.
Phoenix	Rotate mapping 90 degrees.

8.1 Add Noise

Add Noise

Add noise to (quaternion) image texture. A variation of Perlin's noise algorithm is used to add natural randomness to a quaternion image's coloring.

8.2 Factors

Factors

Edit noise factors. The blend variable determines how much noise is added to an image. The higher the blend, the more pronounced the noise appears. This also tends to darken an image, which can be compensated for by decreasing Gamma (Lighting variables window). The Grain variable determines the frequency of the noise. The higher the grain, the noisier the image appears. You can adjust how the noise maps to an image by changing the scale factors. Higher scale factors make the image noisier on the respective axis (x, y and z.)

The Surface Warp variable allows you to apply the same noise to a (quaternion) figure's shape also, like a surface filter. Small values are best for creating realistic surface variations, like stone and wood grain. Gaussian changes the phase of the noise. This can result in more realistic noise textures. Select Planet, Check, Barber, Tooth or Wood to vary the type of noise from the Original Perlin noise type. Effect varies with the formula and fractal type selected. The Marble factor is used to create realistic marble textures. Try combining a high Marble factor (plus or minus) with a low Grain factor.

8.2.1 Noise grain

Grain (Noise factor)

The Grain variable determines the frequency of the noise. The higher the grain, the noisier the image appears.

8.2.2 Noise blend

Blend (Noise factor)

The blend variable determines how much noise is added to an image. The higher the blend, the more pronounced the noise appears. This also tends to darken an image, which can be compensated for by decreasing Gamma (Lighting variables window).

8.2.3 Noise scale x

Scale X (Noise factor)

You can adjust how the noise maps to an image by changing the scale factors. Higher scale factors make the image noisier on the respective axis (x, y and z.)

8.2.4 Noise scale y

Scale Y (Noise factor)

You can adjust how the noise maps to an image by changing the scale factors. Higher scale factors make the image noisier on the respective axis (x, y and z.)

8.2.5 Noise scale z

Scale Z (Noise factor)

You can adjust how the noise maps to an image by changing the scale factors. Higher scale factors make the image noisier on the respective axis (x, y and z.)

8.2.6 Noise surface warp

Surface Warp (Noise factor)

The Surface Warp variable allows you to apply the same noise to a (quaternion) figure's shape also, like a surface filter. Small values are best for creating realistic surface variations, like stone and wood grain.

8.2.7 Noise marble

Marble (Noise factor)

The Marble factor is used to create realistic marble textures. Try combining a high Marble factor (plus or minus) with a low Grain factor.

8.2.8 Noise gaussian

Gaussian (Noise factor)

Gaussian changes the phase of the noise. Use this to add variety to the noise textures.

8.2.9 Noise planet

Planet (Noise factor)

Noise type based on multi-colored planetary scene.

8.2.10 Noise check

Check (Noise factor)

Noise type based on check pattern.

8.2.11 Noise barber

Barber (Noise factor)

Noise type based on barber-shop pole.

8.2.12 Noise tooth

Tooth (Noise factor)

Noise type based on saw tooth envelope.

8.2.13 Noise wood

Wood (Noise factor)

Wood-like noise type.

8.2.14 Noise original

Original (Noise factor)

Noise texture based on original Perlin envelope.

8.3 Reset Noise Seed

Reset Noise Seed

The random noise generator is re-seeded. Use this to create variations on the noise texture.

8.4 Texture Scale

Texture Scale

Opens a window to edit texture scaling factors for quaternions that use a coloring filter or coloring method like Atan coloring. The higher the scaling factors, the more repetitive the texture becomes. Scale X, Y and Z are used to adjust the repetitive rate of the coloring filter, based on its variables, "x", "y" and "z", respectively. You can adjust the Scale X, Scale Y or Scale Z factors to make the texture asymmetrical on the x, y or z-axis. The scaling factor's associated variable (x, y or z) must be included in the coloring filter for this to have any effect on the image texture. Scale A is used to adjust the texture intensity for the Atan, Bof60, Potential and Distance coloring options.

8.4.1 Texture Scale X

Texture Scale X

Scale X is used to adjust the repetitive rate of the coloring filter, based on its variable "x. You can adjust the Scale X factors to make the texture asymmetrical on the x-axis. The scaling factor's associated variable (x) must be included in the coloring filter for this to have any effect on the image texture.

8.4.2 Texture Scale Y

Texture Scale Y

Scale is used to adjust the repetitive rate of the coloring filter, based on its variable "y". You can adjust the Scale Y factor to make the texture asymmetrical on they axis. The scaling factor's associated variable (y) must be included in the coloring filter for this to have any effect on the image texture.

8.4.3 Texture Scale Z

Texture Scale Z

Scale Z is used to adjust the repetitive rate of the coloring filter, based on its variable "z". You can adjust the Scale Z factor to make the texture asymmetrical on the z-axis. The scaling factor's associated variable (z) must be present in the coloring filter for this to have any effect on the image texture.

8.4.4 Texture Scale A

Texture Scale A

Scale A is used to adjust the texture intensity for the Atan, Bof60, Potential and Distance coloring options.

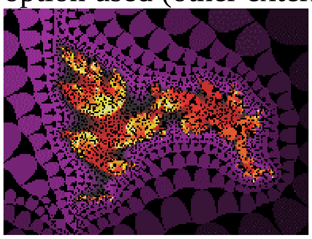
8.5 MS Rendering Options

MS Rendering Options

In this window the following rendering methods are available (for MS-type fractals only)

Biomorph

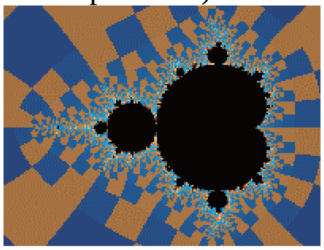
Biomorphs test the real Z and imaginary Z values after breaking the iteration loop. If the absolute value of either is less than the preset zlimit, the point is mapped as part of the set. This method produces biological-like structures in the complex plane. Normally the biomorph tendrils are colored in the set color (the color reserved for non-divergent or inner points.) With the Set Only flag on, the tendrils are colored according to the color-scaling option used (other external points are colored in the background color.)



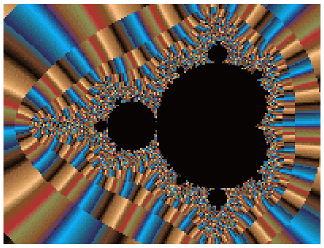
Decomposition

When a Decomposition flag is set, you have the option of performing either a binary or continuous decomposition. Toggle the External/Internal option for either an external or internal decomposition. An external decomposition decomposes points that are outside the complex set. An internal decomposition decomposes the complex set. For Mandelbrot/Julia curves, z-arg is broken into two parts for a binary decomposition. Continuous decomposition breaks z-arg into n parts, where n=angles (0-255).

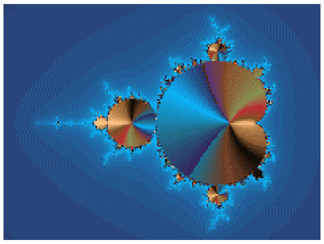
(Consult The Beauty of Fractals by Peitgen & Richter for a mathematical explanation of decomposition.)



Binary Decomposition



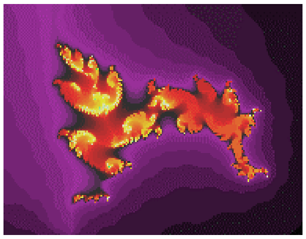
Continuous External



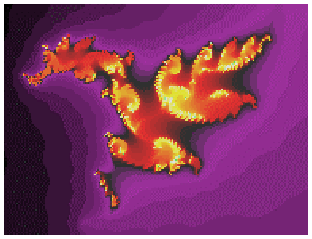
Continuous Internal

Inversion

The Invert flag inverts the plane around a circle. Select Auto Coords to let RSK calculate the center coordinates and circle radius. You can zoom on an inverted picture as long as radius and center coordinates remain the same.



Original picture



Inverted

Switch

When a Switch flag is set, you have the option of switching the real and imaginary parts of Z, or switching Z for C. The real part of Z is exchanged with the imaginary part of Z after each iteration. Using this technique with the Mandelbrot set produces a tricorn-like plot. When Z is switched for C, you get Mandelbrot sets from Julia sets and vice versa.

Orbit Traps

This includes methods that trap the orbit of a point if it comes in range of a pre-specified area or areas.

The Epsilon-Cross method colors points only if the absolute value of Z-real or Z-imaginary is less than or equal to Epsilon (a small value.) Other points are mapped at the time they blow up (exceed the zlimit.) This produces hair-like structures that branch wildly from the complex set boundaries. Note: Epsilon pictures use palette index 255 for the background color.

The Globe method uses a circular area around the origin to map a point's orbits. This produces sphere-like structures.

The Ring method uses an area formed by two circles around the origin to map a point's orbits. This produces ring-like structures.

The Four-Circles method (Paul Carlson) uses four circular areas to map a point's orbit. This produces sphere-like structures.

The Square method uses an area formed by two squares around the origin to map a point's orbits. This produces ring-like structures with right angles.

The Petal method (Paul Carlson) also uses four trap areas to form flower-like patterns.

The Outside Radius variable is used to define the size of the trap areas. Start with .02 and increase or decrease to taste. The Inner Radius variable opens a window inside the "stalks" or trap areas. Use Exclude to skip the first n# iterations from the trap zone. This is sometimes necessary with the Epsilon orbit method, to eliminate stray stalks and clarify the image.

To produce the maximum 3-D effects (as Phil Pickard and Paul Carlson do) with these options, the inside coloring method Linear Map must be set, and the Color Scaling variable should be equal to –1.2*Radius. Also the palette should be changed to one continuous spread, the brightest color in palette index #2 and the darkest color in palette index # 256. This style of palette is automatically and randomly generated by the Smooth button in the Colors editor when the Smooth box is set to zero and an orbit-trap method is selected.

Torus
Pixels are mapped around a torus, and then expanded to fit the drawing area. A generalized form of Earl Hinrichs' torus method, variables are provided for center x and center y to define the c and z radii and may both equal 0.0. Results will vary with the formula used, but resembles the warping effect found in hypercomplex images. Two versions of this method are provided: the Pixel method which uses pixel values to map the torus to the fractal space, and the Two-Pi method which uses an initial rectangle 2 pi by 2 pi to map the torus to a fractal image. With the Two-Pi method, when you zoom the rectangle's size and starting points are changed to match the zooming area. The rectangle's coordinates are saved with the fractal. If you turn off the torus flag after zooming and then reinitialize the torus flag, the rectangle reverts to a 2X2 area, so the image will change accordingly.

8.5.1 Binary

Binary Decomposition

For Mandelbrot/Julia curves, z-arg is broken into two parts for a binary decomposition.

8.5.2 Continuous

Continuous Decomposition

Continuous decomposition breaks z-arg into n parts, where n=Angles (0-255).

8.5.3 External

External Decomposition

An external decomposition decomposes points that are outside the complex set.

8.5.4 Internal

Internal Decomposition

An internal decomposition decomposes the complex set.

8.5.5 Angles

Angles

Continuous decomposition breaks z-arg into n parts, where n=Angles (0-255).

8.5.6 Biomorph

Biomorph

Biomorphs test the real Z and imaginary Z values after breaking the iteration loop. If the absolute value of either is less than the preset zlimit, the point is mapped as part of the set. This method produces biological-like structures in the complex plane. Normally the biomorph tendrils are colored in the set color (the color reserved for non-divergent or inner points.) With the Set Only flag on, the tendrils are colored according to the color-scaling option used (other external points are colored in the background color.)

8.5.7 Color

Biomorph Color
Selects the palette index to color the bio-tendrils (0-255).

8.5.8 Switch Z For C

Switch Z for C
When Z is switched for C, you get Mandelbrot sets from Julia sets and vice versa.

8.5.9 Switch Zreal w/ Zimag

Switch Zreal w/ Zimag The real part of Z is exchanged with the imaginary part of Z after each iteration. Using this technique with the Mandelbrot set produces a tricorn-like plot.

8.5.10 Invert

Inversion

The Invert flag inverts the plane around a circle. Select Auto Coords to let RSK calculate the center coordinates and circle radius. You can zoom on an inverted picture as long as radius and center coordinates remain the same.

8.5.11 Auto Coords

Invert -- Auto Coords
Select Auto Coords to let RSK calculate the center coordinates and circle radius.

8.5.12 Radius

Invert -- Radius
The Invert flag inverts the plane around a circle whose diameter is determined by the Radius variable. Select Auto Coords to let RSK calculate the center coordinates and circle radius.

8.5.13 Center X

Invert -- Center X
The Invert flag inverts the plane around a circle whose center coordinates are determined by the Center X and Y variables. Select Auto Coords to let RSK calculate the center coordinates and circle radius.

8.5.14 Center Y

Invert -- Center Y
The Invert flag inverts the plane around a circle whose center coordinates are determined by the Center X and Y variables. Select Auto Coords to let RSK calculate the center coordinates and circle radius.

8.5.15 Epsilon

Epsilon
The Epsilon-Cross method colors points only if the absolute value of Z-real or Z-imaginary is

less than or equal to the Outer Radius (a small value.) Other points are mapped at the time they blow up (exceed the zlimit.) This produces hair-like structures that branch wildly from the complex set boundaries. Note: Epsilon pictures use palette index 255 for the background color.

8.5.16 Globe

Globe

The Globe method uses a circular area around the origin to map a point's orbits. This produces sphere-like structures

8.5.17 Ring

Ring

The Ring method uses an area formed by two circles around the origin to map a point's orbits. This produces ring-like structures.

8.5.18 Four Circles

Four Circles

The Four-Circles method (Paul Carlson) uses four circular areas to map a point's orbit. This produces sphere-like structures. .

8.5.19 Square

Square

The Square method uses an area formed by two squares around the origin to map a point's orbits. This produces ring-like structures with right angles.

8.5.20 Petal

Petal

The Petal method (Paul Carlson) also uses four trap areas to form flower-like patterns.

8.5.21 Outside Radius

Outside Radius

The Outside Radius variable is used to define the size of the trap areas. Start with .02 and increase or decrease to taste.

8.5.22 Inner Radius

Inner Radius

The Inner Radius variable opens a window inside the "stalks" or trap areas.

8.5.23 Exclude

Exclude

Use Exclude to skip the first n# iterations from the trap zone. This is sometimes necessary with the Epsilon orbit method, to eliminate stray stalks and clarify the image.

8.5.24 Pixel Method

Torus – Pixel Method

Pixels are mapped around a torus, and then expanded to fit the drawing area. A generalized form of Earl Hinrichs' torus method, variables are provided for center x and center y to define the c and z radii and may both equal 0.0. Results will vary with the formula used, but resembles the warping effect found in hypercomplex images. The Pixel method which uses pixel values to map the torus to the fractal space. If you turn off the torus flag after zooming and then reinitialize the torus flag, the rectangle reverts to a 2X2 area, so the image will change accordingly.

8.5.25 Two-Pi Method

Torus – Two-Pi Method

Pixels are mapped around a torus, and then expanded to fit the drawing area. A generalized form of Earl Hinrichs' torus method, variables are provided for center x and center y to define the c and z radii and may both equal 0.0. Results will vary with the formula used, but resembles the warping effect found in hypercomplex images. The Two-Pi method uses an initial rectangle 2 pi by 2 pi to map the torus to a fractal image. With the Two-Pi method, when you zoom the rectangle's size and starting points are changed to match the zooming area. The rectangle's coordinates are saved with the fractal. If you turn off the torus flag after zooming and then reinitialize the torus flag, the rectangle reverts to a 2X2 area, so the image will change accordingly.

8.5.26 Center X

Torus -- Center X

Center X and Y define the c and z radii of the torus map and may both equal 0.0.

8.5.27 Center Y

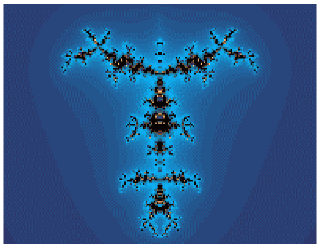
Torus --Center Y

Center X and Y define the c and z radii of the torus map and may both equal 0.0.

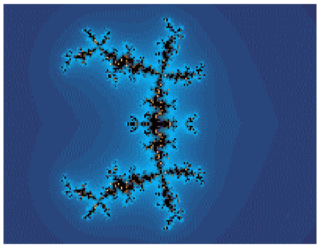
8.6 Symmetry

Symmetry

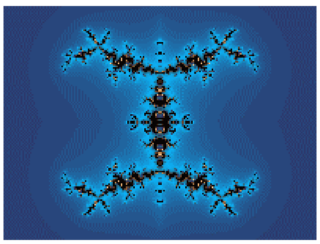
This produces a mirror image from left to right (vertical) or top to bottom (horizontal) or both (xy). You can zoom with symmetry, but the results will be uncertain if the zoom box is off-center on the window.



Vertical symmetry



Horizontal symmetry

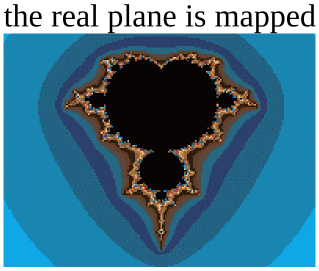


XY symmetry

8.7 Phoenix

Phoenix

The Phoenix flag rotates the planes, so that the imaginary plane is mapped horizontally and the real plane is mapped vertically.



This option is normally used for mapping Phoenix curves (Shigehiro Ushiki), which are Julia-related curves based on the formula $f(z+1)=z^2+p+qz$. 'p' and 'q' are constants, and the 'z' term of 'qz' is actually the value of z^n-1, or the previous value of z before the current iteration. 'Zn' is reserved by RSK to represent this value, while the complex constant set in the Parameters window becomes 'p' and 'q'. The real part of the complex constant is 'p' and the imaginary part of the constant is 'q' (when the Phoenix option is chosen).

If the Phoenix flag is used with the Mandelbrot option, 'j' and 'k' should be used as the constants, since the complex constants p and q are already used as the starting value of 'z0'.

9 Color menu

Color menu commands

The Color menu offers the following commands:

MS Coloring Options	Coloring options for MS fractal types.
QS Coloring Options	Coloring options that apply only to QS fractal types.
Palette #1-21	Use one of 21 palettes.
Cycle	Cycle Colors.

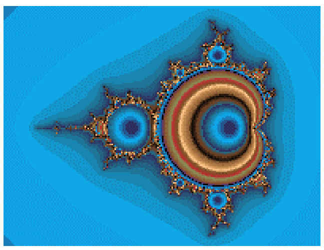
9.1 MS Coloring Options

MS Coloring Options

Inside Coloring Options

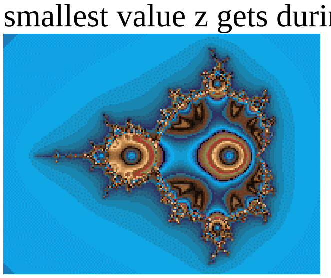
Level Curves
Level-curves map the set points based on the value of Z. This allows the inside of the complex set to be color-scaled.

Log Map
produces colored bands on the inside of the complex set. Points are mapped according to what the value of z is at final iteration.



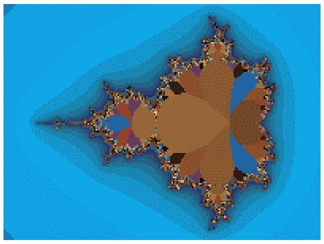
Log Map

Small Log
produces circular patterns inside the complex set. Points are mapped according to the smallest value z gets during iteration.



Small Log

Indexed Log
is mapped according to the escape time it takes z to reach its smallest value.

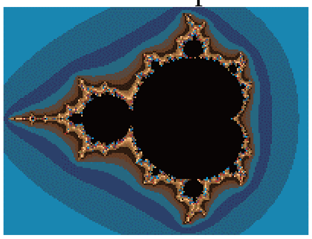


Indexed Log

Linear Map is mapped like Log Map (with the mapped value of the function at its final iteration applied to the color palette) and produces 3D-like effects with orbit-trap renderings. Period uses periodicity to color points inside the MS.

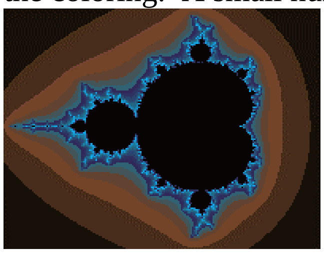
Outside Coloring Options

Iteration
The Iteration option uses the point's escape time.



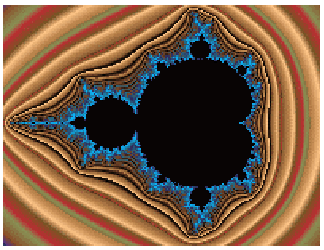
Escape-time coloring.

Log Palette
A point is colored based on its logarithmic escape. The QFactor controls the smoothness of the coloring. A small number from 10-20 works best here..



Log coloring.

Continuous Potential
A point is colored based on its continuous potential (when it blows up.) The QFactor controls the smoothness of the coloring. A higher number from 2000-20000 works best here.



Continuous-Potential coloring.

Angle uses the absolute value of a point's exit angle (theta.) This is the atan method in Fractint. Angle-Iteration uses the angle formed by the difference between a point's last two exit values and subtracts the point's escape time. This is Paul Carlson's atan method.

Set Only
The Set Only flag plots all outside points in the background color.

Color Scaling
This variable acts as a palette multiplier or divider, depending on whether the value entered is less than or greater than 1.0. The palette color is divided by the scaling factor to speed up or slow down color changes. For level curves and orbit-trap pictures, use a negative cutoff value to maintain a smooth palette. This ensures that the multiplier is used before the (floating-point) palette values are converted to (integer) palette indexes. For pictures that use a log palette (excluding orbit-trap images) a value of .01 is usually optimal for color scaling. Any positive value will work for the Continuous Potential method, though a small negative value will also produce interesting results. The Iteration method can use a small value of .0039 to .00039 to cover the complete palette. A value of 2.0 to 4.0 works well with the Angle and Angle-Iteration coloring methods.

The **Carlson Extensions button** selects the Set Only flag as well as the Linear map coloring method, and sets the Color Scaling variable to –(Orbit-trap) Radius*1.2. This automates the process of producing Paul Carlson's 3-D like fractals, when used in conjunction with an orbit-trap method (see MS Rendering dialog.)

Split Palette by n# (1-128) is used to assign different colors to the orbit-trap tendrils. A value of 4 will split the palette into four-color spreads so that tendrils will alternate through these four color ranges. With a Smooth setting of 0 in the Colors editor, the Random palette generator will automatically produce a palette suitable for the number of splits used.

9.1.1 Log Map

Log Map produces colored bands on the inside of the complex set. Points are mapped according to what the value of z is at final iteration.

9.1.2 Small Log

Small Log produces circular patterns inside the complex set. Points are mapped according to the smallest value z gets during iteration.

9.1.3 Indexed Log

Indexed Log is mapped according to the escape time it takes z to reach its smallest value.

9.1.4 Linear Map

Linear Map is mapped like Log Map (with the mapped value of the function at its final iteration applied to the color palette) and produces 3D-like effects with orbit-trap renderings.

9.1.5 Period

Period uses periodicity to color points inside the MS..

9.1.6 None

None uses palette index 256 to color points inside the MS.

9.1.7 Iteration

Iteration option uses the point's escape time to color points outside the MS.

9.1.8 Log Palette

Log Palette -- A point is colored based on its logarithmic escape. The QFactor controls the smoothness of the coloring. A small number from 10-20 works best here..

9.1.9 Continuous Potential

Continuous Potential -- A point is colored based on its continuous potential (when it blows up.) The QFactor controls the smoothness of the coloring. A higher number from 2000-20000 works best here.

9.1.10 Angle

Angle uses the absolute value of a point's exit angle (theta.) This is the atan method in Fractint.

9.1.11 Angle-Iteration

Angle-Iteration uses the angle formed by the difference between a point's last two exit values and subtracts the point's escape time. This is Paul Carlson's atan method.

9.1.12 QFactor

QFactor

The QFactor controls the smoothness of the coloring. A small number from 10-20 works best for Log Palettes, while higher number 2000-20000 is best for Continuous Potential.

9.1.13 Set Only

Set Only plots all outside points in the background color.

9.1.14 Carlson Extensions

The **Carlson Extensions button** selects the Set Only flag as well as the Linear map coloring method, and sets the Color Scaling variable to –(Orbit-trap) Radius*1.2. This automates the process of producing Paul Carlson's 3-D like fractals, when used in conjunction with an orbit-trap method (see MS Rendering dialog.)

9.1.15 Color Scaling

The **Color Scaling** variable acts as a palette multiplier or divider, depending on whether the value entered is less than or greater than 1.0. The palette color is divided by the scaling factor to speed up or slow down color changes. For level curves and orbit-trap pictures, use a negative cutoff value to maintain a smooth palette. This ensures that the multiplier is used before the (floating-point) palette values are converted to (integer) palette indexes. For pictures that use a log palette (excluding orbit-trap images) a value of .01 is usually optimal for color scaling. Any positive value will work for the Continuous Potential method, though a small negative value will also produce interesting results. The Iteration method can use a small value of .0039 to .00039 to cover the complete palette. A value of 2.0 to 4.0 works well with the Angle and Angle-Iteration coloring methods.

9.1.16 Split palette by

Split Palette by n# (1-128) is used to assign different colors to the orbit-trap tendrils. A value of 4 will split the palette into four-color spreads so that tendrils will alternate through these four color ranges. With a Smooth setting of 0 in the Colors editor, the Random palette generator will automatically produce a palette suitable for the number of splits used.

9.2 QS Coloring Options

QS Coloring Options

Coloring Filter
Here you define an hsv filter based on a real function. A generalization of Earl Hinrichs' sine-wave coloring method, the function can be any formula, up to 80 characters, that uses the z components x and y. X and y are the real and imaginary parts of the last z value in the iteration loop. This is a sample function: sin(x+y)+cos(x*x). The Magnify slider is used to control the intensity of the filter. Use the Random Filter button to generate a coloring filter with random functions. The level box controls the complexity of the random filter.

The trig and exponential functions translated include sine (sin), arc sine (asn), cosine (cos), arc cosine (acs), tangent (tan), hyperbolic tangent (th), hyperbolic sine (sh), hyperbolic cosine (ch), log (log), natural log (ln), power (pow), arc tangent (atn), absolute value (abs), exponential (exp) and square root (sqr.)

The math functions are * (multiply), - (subtract), / (divide), and + (add).

The constants are PI and E (ln (1)), plus any floating-point number up to 9 digits (including the decimal point).

The power function (x to the y power) is entered in standard notation: x^y', with optional parenthesis necessary around complex exponents or variables.

Note: Range limits exist for arguments to these functions: exp, arc sine, hyperbolic sine, arc cosine, hyperbolic cosine, arc tangent, and hyperbolic tangent (+/-100.0 for the exponential, +/-200.0 for hyperbolic functions, +/-1.0 for the arc functions), the log functions (must be >0) and the power function (x must be integral and non-zero when y<0, and 0^0 is undefined). Square root is undefined for x<0. No filtering is done when these limits are exceeded.

Syntax for an acceptable formula is AS([XY])+bs([xy]).... up to 80 characters per formula.

Algebraic notation is supported to a limited degree. E.G. you can enter a variable as 2x^2, instead of 2*x*x.

A and B are optional constants.

S is an optional trig function (1 to three letters: 1 will work for sine, cosine and tangent, but use the above abbreviations for the other functions. X and Y are the standard variables. The '+' could be any of the math functions.

The parser interprets up to 10 levels of parenthesis. Use parenthesis to separate complex expressions. Use parenthesis to embed trig functions within other trig functions, etc.

Atan Coloring
Uses an algorithm by David Makin to color a quaternion image. The angle of each point (as it escapes the quaternion border) is used to color the image.

Bof60 Coloring
A variation of the Bof60 algorithm found in the classic Pietgen/Ricter text, The Beauty of Fractals, adapted by David Makin, is used to color a quaternion image. The smallest magnitude of z (found while calculating the quaternion border) is used to render the image.

Potential Coloring
The escape value of z (at the quaternion border) is used to color the image.

Distance Coloring
The distance of z from zero (at the quaternion border) is used to color the image.

9.2.1 Function box

The **Function box** is used to enter a coloring filter, up to 80 characters. Use the Random Filter button to generate a coloring filter with random functions.

9.2.2 Magnify value box

The **Magnify value box** is used to enter the magnify value, instead of using the slider. Value can range from 1-100.

9.2.3 Magnify Slider

The **Magnify slider** is used to control the intensity of the filter. Value can range from 1-100.

9.2.4 Atan Coloring

Atan Coloring uses an algorithm by David Makin to color a quaternion image. The angle of each point (as it escapes the quaternion border) is used to color the image.

9.2.5 Bof60 Coloring

Bof60 Coloring uses a variation of the Bof60 algorithm found in the classic Pietgen/Ricter text, The Beauty of Fractals, adapted by David Makin, is used to color a quaternion image. The smallest magnitude of z (found while calculating the quaternion border) is used to render the image.

9.2.6 Potential Coloring

Potential Coloring uses the escape value of z (at the quaternion border) to color the image. .

9.2.7 Distance Coloring

Distance Coloring uses the distance of z from zero (at the quaternion border) to color the image.

9.2.8 Random Filter button

Random Formula button

Use this button to create a random coloring formula whose complexity is controlled by the Level box.

9.2.9 Level box

The **Level box** controls the complexity of the random filter generated by the Random Filter button.

9.3 Palette 1-21 command

Palette command (Palette menu)

Switch to palette #.

9.4 Cycle Colors

Cycle command (Colors menu)

Cycle color palette forward or backward depending on the cycle direction last chosen. You can click on the Forward or Backward button in the Colors editor to change direction. Default direction is Forward if the Colors editor has not been opened.

Note: Color cycling is only enabled if a drawing has been recently drawn and the Undo key was not just used.

10 View menu

View menu commands

The View menu offers the following commands:

Toolbar	Shows or hides the toolbar.
Status Bar	Shows or hides the status bar.

10.1 View Toolbar command

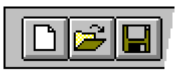
Toolbar command (View menu)

Use this command to display and hide the Toolbar, which includes buttons for some of the most common commands in RSK, such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

See Toolbar for help on using the toolbar.

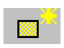
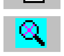
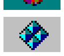
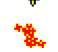
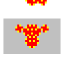
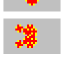
10.1.1 toolbar

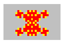
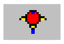
Toolbar



The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in RSK,

To hide or display the Toolbar, choose Toolbar from the View menu (ALT, V, T).

Click	To
	Open the RSK Remote that contains shortcut buttons for many common tasks and options in RSK
	Open a new drawing window in RSK
	Open an existing drawing. RSK displays the Open dialog box, in which you can locate and open the desired file.
	Save the active drawing or template with a new name. RSK displays the Save As dialog box.
	Edit fractal parameters.
	Edit image size.
	Edit lighting variables
	Edit palette.
	Draw image from current parameters.
	Zoom into rectangle.
	Show picture full-screen.
	Reset ranges.
	Draw Mandelbrot set, and/or turn off symmetry
	Draw Julia set, and/or turn off symmetry
	Apply Horizontal symmetry to image
	Apply Vertical symmetry to image

 Apply XY symmetry to image
 Rotate image 90 degrees counter-clockwise (Phoenix view)
 Display info about RSK.

10.2 View Status Bar Command

Status Bar command (View menu)

Use this command to display and hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and keyboard latch state. A check mark appears next to the menu item when the Status Bar is displayed.

See Status Bar for help on using the status bar.

10.2.1 status bar

Status Bar

The status bar is displayed at the bottom of the RSK window. To display or hide the status bar, use the Status Bar command in the View menu.

The left area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. This area similarly shows messages that describe the actions of toolbar buttons as you depress them, before releasing them. If after viewing the description of the toolbar button command you wish not to execute the command, then release the mouse button while the pointer is off the toolbar button.

The right areas of the status bar indicate which of the following keys are latched down:

Indicator	**Description**
CAP	The Caps Lock key is latched down.
NUM	The Num Lock key is latched down.
SCRL	The Scroll Lock key is latched down.

11 Window menu

Window menu commands

The Window menu offers the following commands, which enable you to arrange multiple images in the application window:

Cascade	Arranges windows in an overlapped fashion.
Tile	Arranges windows in non-overlapped tiles.
Arrange Icons	Arranges icons of closed windows.
Size Desktop	Size drawing area to window frame.

Window 1, 2, ...   Goes to specified window.

11.1 Cascade

Cascade command (Window menu)

Use this command to arrange multiple opened windows in an overlapped fashion.

11.2 Tile

Tile command (Window menu)

Use this command to arrange multiple opened windows in a non-overlapped fashion.

11.3 Arrange Icons

Window Arrange Icons Command

Use this command to arrange the icons for minimized windows at the bottom of the main window. If there is an open drawing window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this drawing window.

11.4 Size DeskTop

Window Size DeskTop Command

Use this command to size the active drawing window to its frame size. Use after Tile command to reduce white space around a drawing that is smaller than screen size.

11.5 1, 2, ...

1, 2, ... command (Window menu)

RSK displays a list of currently open drawing windows at the bottom of the Window menu. A check mark appears in front of the drawing name of the active window. Choose a drawing from this list to make its window active.

12 A/V menu

A/V menu commands

The A/V menu offers the following commands:

Open AVI Stream   Open AVI file for writing and draw initial frame.

Write Frames	Write frames to AVI file.
Close AVI Stream	Close an existing AVI stream.
View AVI	View an AVI animation file.
Super AVI, 2-D Grid	Make video with Superimpose (2-D grid) command.
Super AVI, 3-D Grid	Make video with Superimpose (3-D grid) command.
Super AVI, 4-D Grid	Make video with Superimpose (4-D grid) command.
Cycle Avi	Make video with Color Cycling.

12.1 Open Avi Stream

Open Avi Stream…

Through a series of windows, this allows you to name and open an avi animation stream and choose a compression method. After using the file requester to name the file, you are given a choice of compression methods. The compression methods include Intel Indeo Video®, Microsoft Video 1 and Cinepak Codec by Radius. (All compression methods degrade the original images, some more than others.) The first key frame in the stream is then drawn and written to the file.

Notes: It is a good idea to use the default setting of No Compression when initially creating an AVI video. This takes up more disk space but avoids undesirable artifacts and image losses caused by over compressing the file. Using the Save button in the View AVI window you can compress the AVI file with any compression mode available and you still have a loss-less version as backup. After the AVI stream is opened, the size of the fractal that can be drawn is fixed at the size of the frame. No changes can be made to the size until the stream is closed.

12.2 Write Frames

Write Frames…

With this option, frames are written to an AVI stream based on the difference between the current key frame and the previous key frame. 15 frames make a second of animation. The first key frame is written when you open an AVI stream. The next key frames are created each time you use this option. In between you can zoom or change key variables as much as necessary. The stream is only written to when this option is used. The last key frame is automatically saved after the 'tween' series is written. The number of frames may range from 1-9999 frames between keys. With a frame number of 1 only the key frames are written. This allows animation to be created that incorporates all scalable variables in RSK.

Use the Cancel button to exit this dialog without initializing a new series of frames.

Check the Log Scaling box if you want the frames to be written with logarithmic space between frames, else linear space is used. Useful when zooming, where frames would otherwise be packed together at the end of the frame series.

12.3 Close Avi Stream

Close Avi Stream

Closes any open avi stream file. You need to do this before viewing the file or creating a new avi file. The stream is also closed when you exit RSK.

12.4 View Avi

View Avi…

Opens an avi file for viewing. You can preview any multimedia file by clicking on its file name. A multimedia box will appear to the right of the file list. Click on okay to open the main view window.

There are buttons to Play a file forwards or Backwards, or forward automatically with Auto rewind/repeat. Click on Slow to slow down a video. Each click on Slow halves the viewing speed. A click on Stop freezes viewing and restores the view speed to normal playback.

Use the Save button to save the file in a different compression format. You must use a different name to save the file than the name that was used to open it. Use the Open button to view a different avi file (or one that has been newly compressed using the Save button.)

Note: the view avi requester can be used to preview any multimedia file, including midi files.

12.5 Super Avi, 2-D grid

Super Avi, 2-D grid

You are prompted to define the grid Steps then an Avi stream is opened with the standard video options and uses the "Superimpose, 2-D grid" command to create a video. A frame is written for each permutation of the Superimpose process.

12.6 Super Avi, 3-D grid

Super Avi, 3-D grid

You are prompted to define the grid Steps grid then an Avi stream is opened with the standard video options and uses the "Superimpose, 3-D grid" command to create a video. A frame is written for each permutation of the Superimpose process.

12.7 Super Avi, 4-D grid

Super Avi, 4-D grid

You are prompted to define the grid Steps then an Avi stream is opened with the standard video options and uses the "Superimpose, 4-D grid" command to create a video. A frame is written for each permutation of the Superimpose process.

12.8 Cycle Avi

Cycle Avi

When this option is selected, each frame of the video being created is color-cycled one step forward or backward, depending on the cycle direction last chosen; defaults to Forward if the Colors editor has not been opened. You can change the direction of the cycling with the Forward and Reverse buttons in the Colors editor window. Cycling can also be halted or restarted by selecting or deselecting this option before each "Write Frames" command is issued.

13 Demo menu

Demo menu commands

The Demo menu offers the following commands, which illustrate various features of RSK:

Random Julia	Generate random Julia fractal.
Random Quaternion	Generate random quaternion fractal.
Start Recording	Record construction sequence.
Load Construction Sequence [CS]	Load and display construction sequence [.cs]

13.1 Random Julia

Random Julia (Demo menu)

A random Julia fractal is generated from the currently selected formula. Many of the built-in options of RSK are selected on a random basis, and the Mandelbrot space of the formula is scanned for an interesting Julia set. This routine provides a fast intro to many options in RSK that the user may be unfamiliar with: no knowledge of fractal science/math required! See the hot keys section also for a description of the 'J' command.

13.2 Random Quaternion

Random Quaternion (Demo menu)

A random quaternion fractal is generated from the currently selected formula. Like Random Julia, the formula is scanned to find an interesting Julia set, and then the parameters are adjusted to produce a quaternion image. To enable this command set the fractal type to QS 3-D. Hint: in its default configuration (exp = 3) the Newton formula doesn't produce a usable quaternion. Try setting the real exponent (Quaternion parameters window) to a negative value.

See the hot keys section also for a description of the 'G' command.

13.3 Start Recorder

Start Recording (Demo menu)

When you execute this command a file requester pops up so you can name the constructions sequence file [cs] to be created. The recorder window is then opened and RSK starts to track menu commands and Remote buttons, and when a dialog window is closed, if fractal data has changed. Some menu commands (and their Remote shortcuts) like the File menu options are not recorded, as well as the usage or results of certain operations like Edit/Colors, Edit/Size, zooming (Image/Zoom), scanning (ScanQ and ScanJ), maximizing, etc. See below for a complete list of menu commands that are not recorded. You can add text to the recording window for descriptions of operations that are not handled by the recorder. Construction sequences are to provide a basis for hands-on tutorial exchanges. These illustrate how to construct certain figures in RSK, and do not replace Help information on the commands themselves. After stopping the Recorder, you can view the new construction sequence via the Load Construction Sequence menu option.

Note: use the Stop button in the Recorder window to save the construction sequence and halt recording. If you close the Recorder box using the Close [x] box, you may lose any construction steps that have not been added to the cs buffer. The Recorder mode remains active until you click on the Stop button or the **Demo/Stop Recording** menu option.

Menu commands (and their Remote shortcuts) that are not recorded:
All File menu commands (Save As and Open buttons)
Edit/Undo (Undo button)
Edit/Copy
Edit/Clip
Edit/Paste
Edit/Copy Data
Edit/Paste Data
Image/Auto Remote
Image/Auto Alert
Image/Abort (Abort button)
Image/New View on Zoom (disabled while recording)
Image/Render (Rend button)
Image/Full Screen (View button)
View/Toolbar
View/Status bar
All Window menu commands
A/V View AVI (V button)
All Demo menu commands
All Help menu commands

13.3.1 Recorder textbox

Text box for Recorder (Demo menu)

Here you view the text that the Recorder generates for each step needed to build an image. If some of the steps are unrecorded or you want to add comments as you go to explain certain procedures, enter them in the text box and click on the Save button before proceeding with the next step.

13.3.2 Stop

Stop button

Use this button to save the current construction sequence, its bitmap image and data file, and stop recording. You can then view the complete construction sequence via the **Demo/Load Construction Sequence** option.

13.4 Load Construction Sequence

Load Construction Sequence [CS] (Demo menu)

Here you view a previously saved construction sequence file, and follow along the steps necessary to make a certain figure in RSK. The original bitmap and data file of the constructed figure are also loaded and displayed. A few sample [cs] files are included in the default cs directory. There are do-menu commands, Remote button selection and Applying new window data to complete the construction sequence.

14 Help menu

Help menu commands

The Help menu offers the following commands, which provide you assistance with this application:

Getting Started	Tutorial for new users of RSK.
Index	Help index.
Hot Keys	Quick reference to RSK's hot keys.
Built-in Formulas	Quick reference to RSK's built-in formulas.
Parser Info	Quick reference to RSK's parser variables and functions.
Bibliography	Sources for fractal information and complex numbers.
About RSK	About the program.

14.1 RSK an introduction

The Theory of the 42s

Space, the Final Frontier

What is space? Space surrounds us and extends far out to the ends of the universe. Space also extends down; down into the sub-atomic realm where energy forms quarks and electrons and even further down until the boundaries of space and time meet. This is where the fabric of space exists. This is where there exist membranes between dimensions: boundaries between the separate dimensions of space. And, it is down within this realm that energy conglomerates into the forms of matter: energy that form the patterns that we know of as electrons and quarks.

The "Theory of the 42s" is a theory of energy that takes on the form of matter through determinate patterns within a ten-dimensional space-time structure: nine spatial dimensions and time. Determinate patterns, patterns expressed as bound states, are generated within the dimensions. The basic equation used to create the patterns that represent the bounded states of energy within the different dimensions is $Z_1 = Z^2 + C$. The determinate patterns created within the different dimensions represent separated energy configurations. At the smallest reaches of space and time, the boundaries between dimensions are real. Determinate patterns exist within one dimension then to extend into the next dimension to form a part of the whole.

RSK is a nine-dimensional spatial structure where determinate patterns of energy form. RSK is composed of three different, three-dimensional structures: 42_1, 42_2 and 42_3. Each 42 is a specific, and distinct, polarized, three-dimensional reference frame. The different configurations of three 42s create different configurations in RSK. RSK itself can be left- (L) or right- (R) handed. RSK can have a xyz (xy) or an xzy (xz) configuration. Within these configurations of RSK, the determinate fractals reside that represent energy patterns that create electrons and quarks.

There is no "correct" pattern that shows exactly the structure of energy as a sub-atomic particle. The exploration of the patterns within the structure of RSK is an exercise of discovery of the fractal geometry of an unseen world.

Then there is time. Time is a dimension and the time-dimension is just as real as the other spatial dimensions. We live in the space-time continuum, the passage of space through time. A progression over time, an AVI Stream, can be used to show evolving energy patterns that exist through time.

A Mandelbrot Set is a representation of a two-dimensional determinate state of an energy form. A quaternion set is a three-dimensional representation of that form within one 42. An AVI Stream is a representation of a three-dimensional representation evolving in time.

Colors are used to distinguish the major forces of the subatomic world within a 42. Each color, and shades of the color, can be used to project the determinate bounded energy of a force.

The electromagnetic force:	Pink; r255, g0, b255.
The weak force:	Turquoise; r100, g255, b255.
The strong force:	Purple; r170, g0, b255.

(The strong force within a 42, purple, is different from the "colors" that are used to distinguish gluons (red, green and blue) the force carriers of the strong force in the theory of Chromo dynamics.

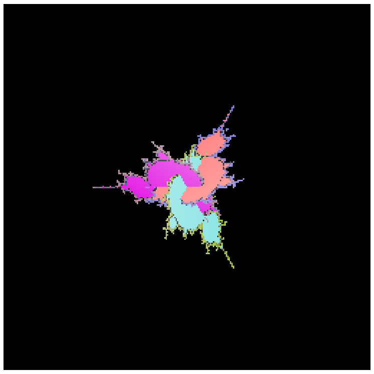
Different combinations of electromagnetic, weak and strong force 42s combine in RSK to form different quarks. Click "File," "Open [BMP+ZP]," "Look in: [(file folder) RSK Pictures]," Double-Click "Electron" or "Up Quark." The picture is a configuration that represents a pattern within RSK that represents part of the energy pattern within a particle. Each picture within the "RSK Pictures" folder has a "Help" file that gives the sequence of commands on how that figure was created. You can open a "New" file and follow the "Construction Sequence" to create your own graph. Play with the factors to create new images and save these images in your own file folder, "My Folder."

Walter Bishop

14.2 Getting Started

Getting Started

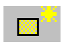
Welcome to RSK!



This is a short tutorial that will cover basic commands and background material necessary for a new user to create an initial picture with RSK. Following this is a brief animation tutorial that discusses the fundamentals of AVI creation. For help on any menu command, press F1 while the command is highlighted.

For quick instruction on how to produce some of the different types of images that RSK can generate, there is a "construction sequence" setup. Construction sequences are loaded via the Demo menu. The construction sequence will show you an image and then give you the instructions to follow to produce that image. Each construction sequence will start with "New," a new drawing window in which the fractal image will be generated. The construction sequence will ask you to go to the following locations to affect the different commands:

Menu Bar (the line of commands at the top of the main screen below the Title Bar)
Each command in the Menu Bar produces a list of items that can be chosen to affect different commands and/or changes to an image.

Tool Bar (the line of buttons below the Menu Bar)
Each of these buttons is a shortcut to a command in the Menu Bar. Move the cursor over the button and a descriptive window will show the command for that button. For instance:  on the Tool Bar opens a new drawing window.

RSK Remote is a Dialog Window with shortcut buttons to commonly used Menu commands. RSK Remote commands apply to the "active" window.

RSK allows multiple windows to be open at the same time while insuring that any changes that are made with the different commands only affect the "active" Image Window. To select an Image Window as active, click on the Title Bar on top of that image. In the Title Bar of each Dialog Window is the "Image Name" (or Image #) of the corresponding Image Window.

When executing a command in a Dialog Window (a pop-up window for command entry), the command may be implemented by "**Apply**" (applies the command and leaves the Dialog Window open) or "**OK**" (applies the command and closes the Dialog Window). Cancel and X close the Dialog window without making any further changes. (In some cases Cancel differs from X in that it tries to restore the values of variables to when the dialog was first opened, before changes have been applied. X just closes the window and leaves changes in place that have been applied. Some menu commands like Random Julia cause all the dialog windows to be "refreshed", so their Cancel buttons no longer see variables as having been changed before the "refresh". So if you wish the changes that have been applied to be maintained, use the X to close the window.) A "**Default**" button resets to the default values command selections. "**Help**" and "**?**" provide help instructions for a Dialog Window or context help for a selected button or edit box.

Animation tutorial:

Creating an AVI file that morphs an image is real simple.
1) You start with the image you want to morph.

2) Open an AVI stream (A/V Open AVI Stream... follow dialogs), and the initial image will be redrawn and added to the AVI stream. (Saves the current image as an .avi image as the starting image for the morphing process.)

3) Change key factor(s) in the image such as complex c and Apply the changes.

4) Execute the AVI command "A/V Write Frames..." and select with the scroll bar, or enter in the edit box, how many frames you want the morphing to take place over. Click on Okay.

5) The figure will be morphed and the intermediate frames added to the AVI stream. During this time the image will be redrawn for each frame. You will be able to watch the transformation take place (except for the rendering on 3-D images, which is too fast to see before the next frame is drawn.)

6) Wait until all the frames are drawn (no user input is required. Most mouse actions will stop the morphing process and you will lose frames.)

7) To continue the sequence Repeat from step 3 as many times as you want.

8) Execute "A/V Close AVI Stream". AVI file is closed and ready to view.

9) A/V View AVI... Inside AVI View box there are buttons to Open and Save an AVI file. Save is used to change the compression option to make the AVI file smaller. When you get to Step 2 it is a good idea to use the default of "No compression" to get a loss-less video, then choose a compression option later with the Save button to make a file suitable for emailing. An uncompressed video can be very large. Use the Open button to view the compressed file. Sometimes the compressed file can turn up undesirable artifacts in the image. If this happens, you can reload the uncompressed video and try some other compression mode or "quality" setting.

This completes the Getting Started tutorial. Be sure to read the hot keys and built-in formulas sections for additional info. Have a look at **The Theory of the 42s** by Walter Bishop for an introduction to RSK's basics. The Bibliography lists reference material for a better understanding of the fractal types and functions contained in RSK.

14.3 Index

Index command (Help menu)

Use this command to display the opening screen of Help. From the opening screen, you can jump to step-by-step instructions for using RSK and various types of reference information.

Once you open Help, you can click the Contents button whenever you want to return to the opening screen.

14.4 Hot Keys

Hot keys

Ctrl+F1-Ctrl+F9,Ctrl+F11, Ctrl+0-Ctrl+9 --- change to one of 21 color palettes -- useable during plotting.
Ctrl+F12 holds the palette of the most recently loaded function.

Shift-I -- Superimpose quaternions along a fixed grid. For every sixteenth point regularly spaced along the x and y-axis, for the width and height of the window, the point is tested as a MS. Non-escaping points are drawn as quaternion Julia sets, each successive Julia set superimposed on the last. The palette is randomized for each QS. Disabled when the fractal type is not quaternion.

Shift-P -- Superimpose quaternions along a user-defined grid. The cursor changes to a crosshatch where you define axis lines passing through the point. Click on a point inside the draw window to start the superimposing process. (Works best if the point lies on the MS border, but some formulas like the Phoenix formula are less exacting.) For every fourth point regularly spaced along these axis, for the width and height of the window, the point is tested as a MS. Non-escaping points are drawn as quaternion Julia sets, each successive set superimposed on the last. The palette is randomized for each QS. Disabled when the fractal type is not MS 2-D *and* Mandelbrot.

Shift-J --- grab a point from Mandelbrot set (real and imaginary parts) and draw corresponding Julia set. Cursor changes to a crosshatch, which you position over the area of interest in the Mandelbrot set (redrawn in sector 1, so all points of the MS are accessible.) Then click the left-mouse button and a Julia set is drawn immediately in sector 2 at size 100 and with iterations of 150. This is a fast exploratory mode for finding interesting Julia sets that can also be used where the Mandelbrot set is discontinuous as in the Phoenix formula. Note: once you find an interesting Julia set, press Return/Enter or the space bar and another window is opened with the Julia type set (if New View on Zoom is enabled.) The parameters in the MS window revert to their original settings when you exit this mode (by pressing the 'Esc' key.)

Shift-G -- like "J", except that a quaternion set is generated in sector 2, and some parameters are changed temporarily to suit quaternion plots. Once you find an interesting quaternion set using "G", press Return/Enter or the space bar and another window is opened that sets the fractal parameters to those in the exploratory qjulia window. The parameters in the MS window revert to their original settings when you exit this mode. The mode remains active until you press the 'Esc' key.

Shift-D -- use the mouse to examine pixel depth in a drawing. By clicking with the left-mouse button on any area in the current fractal, the pixel's depth and bailout values are displayed in the status bar, along with the pixel's coordinates. Useful to locate Mandelbrot islands while zooming on an image. Click on the title bar or press Esc to exit this command.

Shift-T -- annotate a picture with text. Cursor changes to a crosshatch, which you position over the area where you want the text to start. Then click the left-mouse button to transfer any text (from the Edit/Text window) to the picture. Can be used with Undo. Use the Edit/Text command to change font, text color or format text into multiple lines. This is useful for adding copyright/author info or comments to a finished picture.

14.5 Built-in Formulas

Built-in Formulas

1) z^2+c --- the standard Mandelbrot or Julia set.
2) cz(1-z) --- the self-squared dragon set.
3) c(z-1/z) --- alternate Mandelbrot or Julia set.
4) $z^2+j+kzn$ --- Phoenix curve (Ushiki).
5) z^3+c --- cubic Mandelbrot or Julia set.
6) z^exp+c --- Exponential Mandelbrot set.; exp may be complex using the exp_imag variable (in Parameters window) as its imaginary component.
7) Loxodromic -- a Mandelbrot set based on logarithmic spirals, by Thomas Kromer.
8) Sinus -- a loxodromic MS variation by Thomas Kromer.
9) Verhulst's donor -- Donor formula based on Verhulst's bifurcation.
10) Popcorn -- the "time discrete dynamic system" used as an iterative formula, by Clifford A Pickover
11) Newton -- Newton's method applied to z=z^exp-c, where exp (in Parameters window) is a

complex number; abs(exp_real)<=99 and abs(exp_imag)<=20.
12) Newton Sine -- Newton's method applied to z=sin(z)-c.

14.6 Parser

Parser Information

Functions (capital letters are optional, and parenthesis are necessary around complex expressions)

The following information takes the form "standard function" ---"form used by RSK to represent standard function".

sine z --- sin(z) or SIN(Z); where Z can be any complex expression
hyperbolic sine z --- sinh(z) or SINH(Z)
arcsine z --- asin(z) or ASIN(Z)
cosine z --- cos(z) or COS(Z)
hyperbolic cosine z --- cosh(z) or COSH(Z)
arccosine z --- acos(z) or ACOS(Z)
tangent z --- tan(z) or TAN(Z)
hyperbolic tangent z --- tanh(z) or TANH(Z)
arctangent z --- atan(z_) or ATAN(Z)
cotangent z --- cotan(z) or COTAN(Z)
arccotangent z --- acotan(z) or ACOTAN(Z)
e^z --- exp(z) or EXP(Z) -- the exponential function
natural log of z --- log(z) or LOG(Z)
absolute value of z --- abs(z) or ABS(Z)
square root of z --- sqrt(z) or SQRT(Z)
z squared --- sqr(z) or SQR(Z)
real part of z --- real(z) or REAL(Z)
imaginary part of z --- imag(z) or IMAG(Z)
modulus of z --- mod(z) or MOD(Z) or |z| -- (x*x + y*y)
conjugate of z -- conj(z) or CONJ(z) -- (x-yi)
flip(z) --- flip(z) or FLIP(Z) -- exchange real and imaginary parts of z (y+xi)
polar angle of z -- theta(z)

if/then/endif – if (argument), then (phrase) endif -- if argument is true then do phrase else skip phrase ('then' tag is optional, but a comma should follow argument or put 'if (argument)' on separate line)

if/then/else/endif - if (argument), then (phrase) else (phrase) endif -- if argument is true then do phrase else skip phrase and do alternate phrase ('then' tag is optional, but a comma should follow argument or put 'if (argument)' on separate line)

Note: if/then/endif and if/then/else/endif loops can be nested only when endifs follow each other at the end of the loops. For example: "if (argument) if (argument) then (phrase) endif

endif".

Math operators

+ --- addition
- --- subtraction
* --- multiplication
/ --- division
^ --- power function
< --- less than
<= --- less than or equal to
> --- greater than
>= --- greater than or equal to
!= --- not equal to
== --- equal to
|| --- logical or (if arg1 is TRUE(1) or arg2 is TRUE)
&& --- logical and (if arg1 is TRUE and arg2 is TRUE)

Constants and variables

complex constant --- c or C, read/write.
complex conjugate --- cc# or CC#, read-only.
e --- e or E -- 1e^1 -- 2.71828, read/write.
i --- i or I -- square root of -1, read/write.
iteration --- iter# -- iteration loop counter
j --- j or J -- real part of the complex constant, read-only.
k --- k or K -- coefficient of the imaginary part of the complex constant, read-only.
Note: j and k are the actual values of the complex constant terms as they are used in the iteration process, so will vary when the Mandelbrot option is used.
m --- m or M or pixel --a complex variable mapped to the pixel location as defined by the z coordinates entered in the Parameters window, read/write.
maxit -- the maximum number of iterations, as set in the Parameters window, read only
p --- p or P -- real constant used in phoenix maps; uses the real part of the complex constant when the Phoenix option is chosen, read-only.
p1 – the complex constant entered in the cr and ci gadgets, read-only.
pi --- pi or PI -- 3.14159, read/write.
q --- q or Q -- real constant used in phoenix maps; uses the imaginary part of the complex constant when the Phoenix option is chosen, read-only
x --- x or X -- real part of Z, read/write.

y --- y or Y -- coefficient of the imaginary part of Z, read/write.

z --- z or Z -- function value at any stage of the iteration process, read/write.
zn or ZN -- the value of z at the previous stage of iteration, read-only.

14.7 Bibliography

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14.8 About RSK

About RSK

>>>>> RSK™ v1.16 ©2004 by The RSK Project

RSK requires a true-color video adapter for best results. It may work in 16-bit (high color), but this has not been tested thoroughly.

Memory requirements for RSK vary with the size of the drawing area RSK opens on, ranging from approximately 3 megabytes memory for a 640X480 area to 48 megabytes for a 2048X1536 area.

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