

USER'S MANUAL FOR METAGRAF

INDEX

WORKING IN 2-D.

UNDERSTANDING METAGRAF:

- [Objects Description.](#)
- [Possible Operations Description.](#)
- [Controls Description.](#)
- [Objets Buttons Description.](#)
- [Sliders Description.](#)
- [Editor's Use and Capabilities Description.](#)
- [Screen Information Description.](#)

WORKING WITH METAGRAF:

- [Objects Creation.](#)
- [Transforming Objects](#)
- [Manipulating Objects](#)
- [Use of Files](#)

TEXT CREATION :

- [Text Possibilities.](#)
- [Use of Text Controls.](#)
- [Text on Paths.](#)

GENERAL AND LAST-MINUTE ITEMS :

- [Summing up.](#)
- [Geometrical attachments.](#)

OBJECT DESCRIPTION

[INDEX](#)

LISTING OF AVAILABLE OBJECTS:

Generally speaking, we can assert that METAGRAF includes any necessary element for making any kind of drawing. In some cases, these elements, named OBJECTS, are repeated just for functionality or user friendliness reasons, for example, OVAL and CIRCLE. The latter can be drawn by four different ways.

Afterwards, we'll explain the reasons of this "overwealth".

Here comes the listing:

- Point
- Line
- PolyLine
- Rectangle
- Oval
- Circle
- Arc
- Polygon
- Curve
- Spiral
- Arrows
- Postscript Text
- LaTeX Text
- Curved Text
- Pictures and Images

And now, yet at an alpha stage but usable, there are a couple of new objects:

- Import of external Postscript drawings
- Mathematical functions written in a standard way

All these objects can be transformed with the usual affine transformations.

On the other hand, the thickness, type of line, color and fill are modifiable.

Here are some examples:

- [Point.](#)
- [Spiral.](#)
- [Text.](#)

- [Big Arrow.](#)
- [Closed Cubic Curve.](#)

The above images show some interesting particularities not very common. That is, in the text image we've included a math formula which has suffered the following transformations:

- 50% increase of vertical scale over the horizontal one,
- To all the image a 30% slope has been applied, so they resemble italics.

Now, we will explain every object construction in detail.

POINT.

The object is just a pair of coordinates that define it, the same definition as MetaPost. Besides, on the fly, METAGRAF allows to choose the thickness and color trough the color dialog.

LINE.

Similarly, the object line is drawn very easily. It's done the same way as MetaPost, with typical variables: thickness, color and type of line (dotted thick, dotted thin,...summing up seven different types to select).

POLYLINE.

This object is the same as the POLYGON but not (necessarily) closed.

RECTANGLE.

This is a special object. But now, we'll state that is a closed cycle made of four lines that link four points. The possibilities of thickness, color, type of line,... are the same that LINE possibilities.

Nonetheless, the METAGRAF rectangle is not necessarily 90 degrees from the start, it may get to a not rectangle paralelogram. Afterwards we will say more about.

OVAL.

In MetaPost the oval is made of four cubic curves, that start from the middle points of the sides of a rectangle and end in the points of the neighbour side. The control points are choosen following D. Knuth "algorithm". The OVAL, because of being built from a rectangle, has the same transformations as rectangles, so that it can be [circumscribed](#) into a non rectangular paralelogram.

CIRCLE.

There're four kinds of circles available in METAGRAF. The first and easier one is the oval we've seen in the previous section. We just choose a rectangle that is a square. This is a very common trick of graphic programs, but it's not comfortable for the user, because require grid adjusting all the time, to get a real circle. Even at that conditions, it's not "comfortable".

The standard circle used in METAGRAF is in fact a modified oval. The only difference is that in this case, the rectangle is a square and the relationship among sides has been fixed. A complex routine allows the drawing of the circle with most ease as we'll later see.

On the other hand, the system devised for the arc drawing, allows 360 degrees arcs, that is, a circle.

Finally, there's a special circle designed for generating spirals, that uses the MetaPost function "fullcircle". It can be used also as a circle.

ARC.

The arc of circle, which is translated into a MetaPost limited "full circle", is built drawing a first line that marks the origin,

radius and slope respect the start of the arc. Marking another point, this point and the origin of the first line are joined creating the second line that limits the arc. This one can be modified or adjusted in the simplest way, just by moving any of the three basic points, as is done with LINE or any other object.

POLYGON.

The polygon is a classical element, very useful and easy to create and modify. Once it's been drawn the first side, the rest is done automatically clicking with the mouse wherever we want to place a vortex. The number of sides has been limited to 64, never reached in practice.

Metapost deals with it like a closed cycle of straight paths. It's fully modifiable in 2-D and 3-D as we'll see.

CUBIC CURVE

This object is only found at METAGRAF, Its management resembles polygon, but, when we click the mouse in the second point after creating the first line, the cubic line appears, it's a Bezier's. Its control points are the middle points between extremities. If a curve line that is not limited to one element is wished, new points can be added as is done with polygons. The curve is adjusting itself every two clicks, so that it is tangent in the middle point of the sides of the circumscribing polygon. Metapost handles it the same way Java does on the screen, applying Bezier curves with the same control points, marked with the mouse clicks.

ARROWS.

Arrows are extremely important in any technical drawing. So, all their capabilities have been exploited. They have a special panel. It appears when we press the specific button and we can choose between 5 arrow sizes, each one with 5 different angles with the sides of the arrow, and there are five different shape of arrows to choose from. Moreover you can soften the point or leave it pointed and the the arrow can be filled or just drawn the contour. Straight, double or reverse ... no detail has been forgotten.

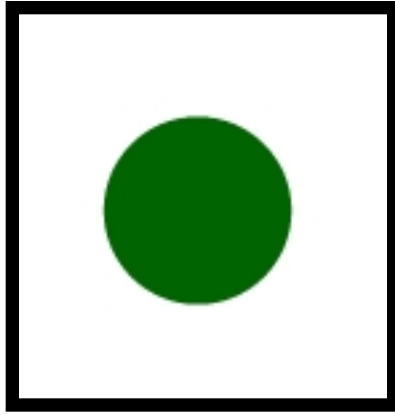
TEXT.

Finally, we end this description with the most important of all. It's the link with typesetting systems like TeX/LaTeX, PDFTeX,... It's possible to use raw PostScript and use the fonts available in the system. METAGRAF has a nice and original management of texts. You can change shape, shearing, placings,... in such a way that is unknown till today. This issue will be dealt later

IMAGES

A new and totally original way to include any image in standard JPEG or GIF mode is now possible with METAGRAF. And, what is more, the image can be manipulated in color, brightness, special effects... etc. This is a kind of "small revolution" for MetaPost, unable up to now to use these possibilities. MG is bringing new life to MP overcoming old frontiers of this one.

[INDEX](#)



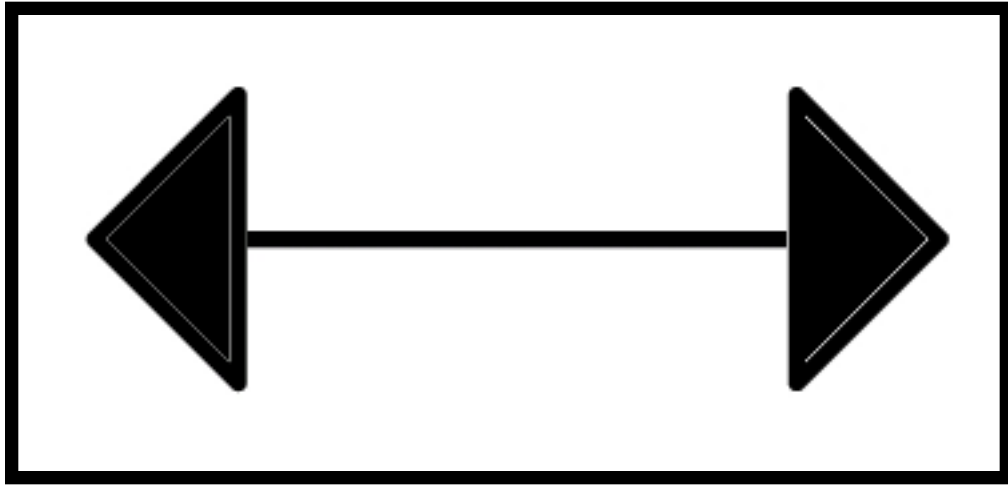
[RETURN.](#)



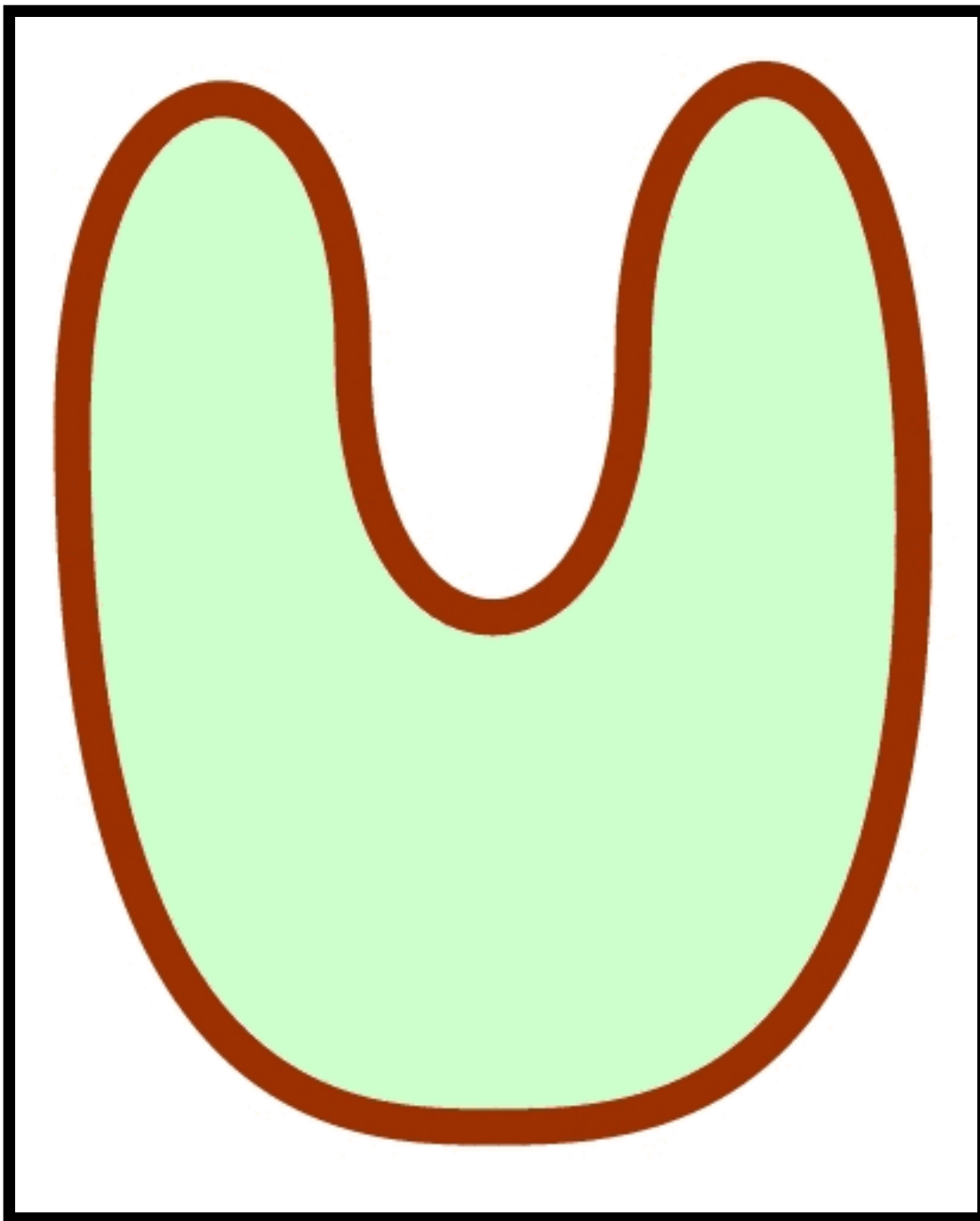
[RETURN.](#)

$$y = \int_0^{\infty} \sqrt{\frac{2x}{x^2+1}} dx$$

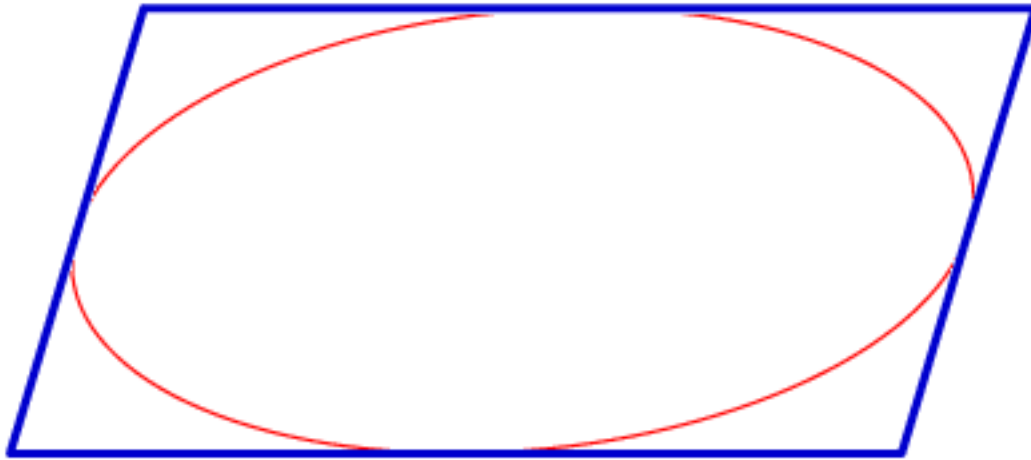
[RETURN.](#)



RETURN.



RETURN.



RETURN.

DESCRIPTION OF OPERATIONS

[INDEX](#)

POSSIBLE OPERATIONS

In this section, we'll present the operations related with objects, once these have been created. Some operations can't be applied to certain objects. So some objects have more operations than others. Even, some operations are specific of a unique kind of object. First, we'll present the operations available for the user. Afterwards, we'll present an abstract of the operations available for each object. But, previous to that, we must state a not so obvious thing: an object, usually, needs to be selected before any operation can be performed on it. To select an object, after pressing the right button of the mouse, that is, in "neuter" state, the mouse is clicked once over the created object. That makes the color of the object to turn red. Moreover, in most cases, if it is filled with color, after selecting it, it turns transparent. Later on, we'll explain in a greater extent the selection of objects, which is important indeed. The ongoing discussion is about selected objects.

COPY or CLONE.- Every object can be cloned as many times as you like just clicking a button. This copy is made retaining all the attributes of the object in the moment of cloning and can be done in the same way with groups.

GROUPING AND UNGROUPING- We can group either objects or groups, even we can group a single object, a very interesting feature sometimes. A group of objects acts like a single object, that can undergo new transformations. This opens many possibilities, because a very same transformation applied to two equal objects doesn't produce always the same result. For example, if we have two circles, side by side, we select them and we apply the "Perpendicular to screen (that is, Z axis) Rotation" transformation, we'll see no change, because rotation takes as center of rotation the center of the object (the center of each circle). But if we group them before the transformation, if the rotation angle is 90, the circles will change its position, because the rotation center of the compound "two-circles-grouped" object is the center of the group.

LINE THICKNESS CHANGE- The line-thickness-change-operation is done by pressing the button "+" (increasing thickness) or the button "-" (decreasing thickness). Buttons are by side. A small window let us know which is the actual value of the selected line. There's no other options than increase and decrease. The increasing/decreasing is done by steps of 50 %. It can't be lower than 0.1 pt (METAGRAF ignores further decreasing).

OBJECTS MOVEMENT.- Pressing over the objects and dragging. It's as easy as that, no further explanations. Groups behave the same way. Besides with affine transformations (specially in 3-D) it's possible to move objects too. Finally with the rules (if present) it is possible to move horizontally or vertically all the objects in the canvas, selected or not. This is useful, for example, when we deal with a real big drawing, then we can scroll and continue drawing. It's like the "scrolling function" but without moving the screen, only the drawings, like a transparent paper.

SHAPE TRANSFORMATION-All selected objects that have "marked" points in the corners and borders can be modified at any time, just clicking and dragging these points. This is very useful in certain objects. It's a "must" for adjusting curves.

TYPE LINE CHANGE- Sometimes we may wish dotted lines or special lines. Pressing the button, a window will appear where we'll be able to choose among six different types of lines.

FILLING AND COLOR CHANGE-Pressing the corresponding buttons the color dialog panel is displayed. This buttons can be the "fill" one, a circle filled in red, or the "contour" one, a palette of colors. Finally, a third button empties the filling

of a colour. Such button is necessary because there's not a transparent colour. Alpha channels are troublesome (and not only in METAGRAF)..

AFINE TRANSFORMATIONS.-There's a whole series of transformations of this kind. All afine transformations allowed by MetaPost and some other that are interesting for 3-D work. They sum up 14, available for the user and the functioning is almost the same always. Most objects can be used with them. These are the available afine transformations that appears when the selecting button is pressed:

- **X ROTATION.**
- **Y ROTATION.**
- **Z ROTATION**
- **ANY-PREDEFINED-AXIS ROTATION**
- **X SHEAR**
- **Y SHERA**
- **Z SHEAR**
- **GENERAL SCALING**
- **X SCALING**
- **Y SCALING**
- **Z SCALING**
- **X TRANSLATION**
- **Y TRANSLATION**
- **Z TRANSLATION**

The origin (0,0) is at upmost-leftmost corner of the canvas. The X axis goes from left to right, horizontally. The Y axis goes from top canvas to the bottom. The Z axis goes from origin towards the wall behind the monitor /CRT screen, that is, in the opposite direction of user. It's a right-turning (dextrogirum) axis.

(The text processing operations will be dealt in its own section, not here).

All transformations (with the exception of the rotation around a special axis) use the center of the object as its center, that is , that center behaves like the origin of coordinates. It's like the origin would move into the center of the object and the transformation is done in the axis, and then the axis return back to their corner. (in fact METAGRAF does that internally). Only the PREVIOUSLY-DEFINED-AXIS ROTATION doesn't take such center as has been said.

[INDEX](#)

CONTROLS DESCRIPTION

INDEX

LISTING OF AVAILABLE NON-SPECIFIC-USE CONTROLS.

In this section we will describe one by one the widespread use controls of MG, such as close and opening of files, saving,...

The six icons in the lower leftmost part are used for this sort of non-specific controls. So from top to down, left to right we have:



1- Open portfolio, that represents, as usual, the opening of files. Clicking this button we can see the file chooser, with the existing files on the "files" directory, but that can be used to choose any other directory or file. The file must end in .bmg to retrieve a graphic from disk. If the file is opened, it will be "pasted" in the screen. but If the CTRL-key is pressed before, when clicking this button and opening a file, this one will replace everything on screen. (Some buttons in the "file-chooser" haven't been bound to a function, they're in the top-right side).

2- Below the open portfolio, there's a button with the icon resembling two sheets. This is the button to paste postscript files translated to *.mg files. It is at an alfa stage but in the tests made, everything has gone straightforward. The translation of *.ps files to *.mg files can be done through the use of the "ps2mg" program included in directory "metagraf*" of the distribution. (Later on, the way of doing will be explained.)



3- The last button at the left is the "clear_all" button. If we click it, and then we click at any place of the working panel, everything is deleted, everything visible and also invisible. Once done, the right button must be clicked to continue working. (Besides, it's important to say, that some internal counters of METAGRAF are not reset, which is specially useful, as we'll see afterwards.)



4- At the right, the first of the three last buttons resembles a diskette; this is the button for saving files. Whenever you press this button, a "chooser" appears where the name of the file to save *WITHOUT EXTENSION* must be written. A couple of files with extension ".mp" and ".bmg" will be created in the directory chosen. .



5- The next button is the "cut&paste" button, used for inserting pictures or images after having clicked the "Place" green button of the image-panel. (See the file "Introduction.html").



6- Finally, a small honour to Java language when we use his mascot to say goodbye. This is the classic "exit" button.



We've finished the review of buttons of general use. There're more buttons, these other buttons have some specific functions. (Really, it's difficult to determine what is useful for all the people or just for part of the people.)

OTHER BUTTONS, NOT SO GENERALLY USEFUL



7- This button is in the top of the toolbox at the left, it's used for running "gv" (Linux) or "gsvie32" (Windows), for seeing the "real" result of the work. At the same time, a couple of new files, with extension ".mp" and ".bmg" are created in directory "files" as it is explained in "Introduction.html".



8- At the left of the previous button it's the button used for including special fonts, that is , PostScript fonts.

Clicking it, a font dialog pops up for the usual choosing. Afterwards, these fonts can undergo afins

transformations, like the ones used with standard LaTeX/TeX texts, including math formulae.



9- Button for raw MetaPost. It's used with the editor. METAGRAF is at the same time: a graphic editor and a text

editor. At any time, it is possible to mix a drawing with a text written in raw MetaPost. Using the editor to write a

MetaPost text and clicking the button labelled "MP", and then clicking anywhere in the working panel, the text

will be included in the resulting file. This Metapost included in the drawing behaves as a special MG object. It is not seen

but "it is there...".

[INDEX](#)

OBJECTS BUTTONS

[INDEX](#)

AVAILABLE BUTTONS:

In the next lines we will look at the available buttons for creating objects and we will speak about the way of using them. Nevertheless, before, we have to say a couple of words in relation with two buttons that appear at the top part of the principal button-box, at left. From left to right and from top to bottom we find what follows:



1- The "thick vertical arrow" is *the button* for transforms. If we want to manipulate an image through affine transformations, we have to use it. If it is clicked, the "Select Transform" window will appear. This button is in close relation with the principal Slider, in such a way that before clicking on it and depending on the transformation chosen, it is necessary to move the Slider to the place needed. Once the button is clicked, the Slider is locked.



2- The second button is just a "making-life-easier" button. If clicked, all the objects on the screen are grouped and then selected. As this is something that usually is done many times, with this button the whole operation is done quicker and simpler. Suppose that we want to "rotate" an image. There is no specific rotation-button in MG but we can do as follows:

- We click this "second" button.
- Then, move the Slider to the value chosen for the angle of rotation. No limitations.
- Then, click the "thick_Arrow" button, select the kind of rotation and accept (click O.K.) The whole drawing will be rotated (Not TEXT. BEWARE!!).

The next four buttons have been already explained or correspond to 3-D functions, so lets continue with the one after those. .



3- The first one in this series is the "Text" button, easily identifiable through the big "T" on its face. Although "text" will be explained with big detail later on, in another chapter, we will say already a couple of words. To put some text in a draw the process is as follows: First, something must be written in the upper Text Field. Anything according with TeX/LaTeX rules -if some PostScript font is not chosen- anything can be written, including "\$math_symbols\$". Once finished the "T" button must be clicked and with the mouse pointer a line must be drawn in the screen. The written text will appear over the line, left justified, as soon as the right button is clicked. Nevertheless, in the final MP figure, the text will be "center_justified" and the horizontal and vertical center will be the origin of the line just drawn. As will be seen, the line can have any direction, not necessarily horizontal.



4- The next button is the "oblique_arrow" button, and this is a "real" arrow button. Its function is to place arrow-heads of many different kinds over the end of open lines or curves. Once clicked, the "arrow_panel" will be visible. This is a quite simple window as it is, in some way, self-explaining. So, at left we find six "radio" buttons related with the shape of the arrowhead. In second place, there are also five small buttons to choose the size of the arrowhead, and in third place there are six other buttons to choose the angle of the arrow. On the upper part we can choose between a typical MetaPost arrow -the round one- or a totally acute one (Beware! the length of the total arrow increases slightly, breaking the extremely precise joints usually found in MP. We will find a solution someday.). At right-top there is a "big" button to "unfill" arrows and the other small buttons to choose from a single arrowhead at the last point drawn of a line, or a double arrow at both limits. Downward, it is possible to change the point where the arrowhead has been "placed", and place it over the beginning of the line. As can be seen, quite a lot of possibilities.

Once the kind of arrow choosen, the line where we want it placed must be selected (so, in red). Then it is enough to **CLICK A SECOND TIME THE SAME BUTTON** (sometimes a third time is also needed) that has launched the arrow-panel and the line will have an arrow in one or both extremes (it will be seen in the canvas, just a small blue point at the point where the arrow is placed). Some interesting points must be mentioned: the placement of arrows will be done on all the objects selected when we click. This is very convenient when we want to put arrows on many lines; we do not need to place one arrow a time. On the contrary, we select all the lines which we want to have an arrow and place it at the same time on all those lines, just clicking once. Another important issue is that if we make a mistake and place the wrong arrow, it is extremely simple to correct it. The only thing to do is to click the radiobuttons needed on the arrow-panel and place once more the arrows on the line/s. The first arrows will be deleted and the new ones will appear in due places. Finally, we can delete any arrow on any line: to do it, we must click the big upper-left button on the arrow-panel, the one with the title "Clear". This is the same as selecting the arrow: "no-arrow". So, placing it will erease any arrow over the line. We must not forget to click once more the "Clear" or the "Unfill" button to let the fonction of the panel in the original state. On METAGRAF's screen, the arrows will appear as a single blue point where we have placed them.



5- This button must be clicked to create a rectangle-object that, if transformed, can be converted to any kind of parallelogram, although modifying its "attributes". When "NOT" transformed, we are in front of the typical rectangle found in so many programs that has its sides parallels to horizontal and vertical axis. Just with the pointer of the mouse it is possible to change its dimensions, size...and so on. It is very simple to use and convenient for many applications. That's the reason why I have maintained it. But, sometimes, this simple rectangle is "too simple". If working in 3-D -but also in 2-D- if we want to rotate our objects or just to look at them from another point of view, the "simple-rectangle" is useless as it has no permission to change its axis-parallel behavior. The solution (versatility once more) is to do an affine transformation. Once transformed, our simple rectangle changes to a sophisticated one. Now it can be rotated through any one of the three Cartesian axis or change its dimensions and/or orientation...anything, BUT....everything must be done through affine transformations, so we will see how our four points in the corners (before, presents), disappear and we can only translate it in the usual way. I repeat, any other modification to its size and/or shape must be done with affine transformations. Quite sophisticated our rectangle object!



6- The oval or ellipse object is just the "sister" of the rectangle and has the same attributes. The same change from Dr.Jekyll to Mr.Hyde if we transform it and the same capabilities to satisfy all our pretensions.



7- The right line is probably (with the sole exception of the point) the simplest object to manipulate. Just by clicking on this button, and then clicking and dragging over the screen a line is created. Once done, to modify it is as simple as has been its creation. To translate it, it is enough to click on any part of the rectangle limited by its extreme points; and to change its orientation and/or length is just a matter of selecting one of the extreme points with the special mouse cursor and move it in any direction. This object accept any kind of transformation without changing its "peculiarities". Moreover, it is the base of the written text, as we have said before, and the positioning of this last is based on the line. The only characteristic that doesn't matter for the text, is the length of the line.

If the button is clicked after pressing the CTRL-key, the object choosen is the poly-line. It behaves like a polygone but is not necessarily closed.



8- We have spoken already about the standard circle of METAGRAF. It is an extremely versatile object that maintains all its initial properties submitted to any kind of direct or affine changes, as well in 2-D as in 3-D. As we know, the big advantage of Bezier curves is that submitted to affine transformations, the image has the same control points as those produced by the same transform over the initial ones. Just to mention it, we have to say that there is only a very small drawback in this object. And this "point-faible" is that it does not accept to be too small. For those cases, we have another object as will be seen.



9- This other version of Circle has two special reasons to be included in MG. The first one is to serve as the basis for the creation of the all-new object "spiral" from which we will speak later on. The second is to represent the simplest way of drawing circles according with MetaPost command "full circle", so with no limitations in small sizes and extremely simple to use as it is controlled like a right line. The price is the big limitations in relation with transforms, although a few are allowed to be used with the spiral.



10- In close relation with the button at its side it has been included the one represented here for the creation of spirals. This is a new object extremely versatile and simple to use. A must for this kind of figure. It is possible to draw spirals that go clockwise or anticlockwise, with the number of spires desired. It is also possible to select the final point in any position or angle. The spirals can be included inside a circle or an ellipse with the axis parallels to coordinates axis or rotated any angle. And, finally, this curve can serve also as the base of a written text in the same way as any other curve in METAGRAF.



11- This button corresponds to the general Bezier curve, open or close. It has been explained before and we will say more afterward, so we will not extend our comments as the users of METAGRAF know very well this nice approach to one of the strongest points of MetaPost. Nevertheless it must be said that this object maintains all its capabilities in 2-D and 3-D transformations.



12- The polygon is the typical object already known in other design applications and MG uses it in a standard way. In this BETA version, its ease of use has been increased from 2-D to 3-D, in such a way that the retouching of its shape through the corner points has been maintained in any situation. Everything related with this object can be applied to the Poly-Line one.



13- The simplest object is the point. Although simple it is useful in certain situation as will be explained later on in relation of positioning of final images. Also, changing the pen thickness it is possible to draw nice totally filled small circles absolutely perfect as we have shown in a chapter before.



14- The object ARC has suffered a certain modification to simplify its use. This new version is just what we were looking for. Simple and very intuitive with no limitations if the user tries it he will be convinced of its simplicity and incredible capability regarding edition of the figure, placements of arrows and so on. The interesting point is that the arc is always drawn from the second point to the third in an anticlockwise direction. Knowing that, any arc can be drawn quickly and easily and if arrows are wanted, the direction is known.

We finish here this chapter in which all the MG-standard object-buttons has been explained and its relationship with the available functions clarified..

[INDEX](#)

THE SLIDERS

INDEX

USING THE SLIDERS

In what follows it will be explained in detail the way of working with the Sliders and specially with the principal one. This one is the biggest, over the drawing-panel with four small buttons at its right.

As has been said before, this slider is connected with the "transformation-button", the one with the thick, short, vertical arrow. The way of using the slider is very similar for all the transformations with some exceptions to make the work easier and simpler. So, lets see how the slider must be used with every transformation, and according with the order that appears in the "transformation-panel" as it is launched.

ROTATIONS

The first four transformations available are related with rotations. For those, the use of the slider is very simple as it is graduated by default in degrees, from 0 to 180. Nevertheless, this values can be extended without limitations. For doing that, it is necessary to use the four small buttons at right, so now the function of this four buttons will be explained:

From top to bottom we find these four buttons:

- First, the one with the icon "plus-minus" over it. Each time this button is clicked, the effective value selected changes from positive to negative, as can be seen in the small window at right under the name "SCALE". To come back to the original value of the slider, it is enough to move it or, simpler, to click on it. As long as this is not done, the negative value (for instance) will be maintained.
- The second button represents a multiplication by 2, so the double of the value chosen manually. Once more, this new value will be shown in the window "SCALE" and it can be deactivated in the same way as before.
- The next button represents a multiplication by 10 and the last one, a division by 10.
- Any combination of these buttons is allowed and the result at any moment represented in the window mentioned. At any moment, everything can be deactivated as explained.

With what has been said it seems that no doubt must remain about Rotations values. Lets continue with other transformations:

SHEAR.

For this kind of transformation, the value introduced with the slider is the "percentage" of shear in the direction chosen related with the perpendicular one. So, if the value "X_Shear" is selected and the slider is placed over the number 30, the transformation will be a shear in the X-direction of a 30% of the value of the Y coordinate (referred to the center of the object or group of objects) at every point. Now, it is needed to clarify that, unless in special situations, all the affine transformations are done considering the geometrical center of the object or group of objects as the origin of coordinates (which is the only reasonable way of doing it).

The "Y_Shear" as can be thought, is exactly the same idea, changing their coordinates. The "Z_Shear" has no meaning in 2-D.

We can see the result of a "X_Shear" of a value equal to 30% now. [Here](#), is the object before shearing it, and [here](#) is the

object after the transformation.

We can see that in the upper part of the image (negatives "Y-coordinates") the "X-coordinate" has been moved a 30% of its Y-Coors. value to the left. The same, but opposite, at the bottom part. SHEAR is a fine transformation and very interesting for matters related with text.

CHANGE OF SCALE

Without any doubt, this is the most used transformation. It is extremely versatile as it serves for many purposes. It is of continuous use with "special" text but also when we want to make some use of a "zoom" function or when our drawing is small and difficult. In this last case, the best solution is to work at a bigger scale and, when finished, to reduce the image. For all those reasons, it is the transformation chosen by default when the "transform-panel" appears. The Zoom-button, lately implemented, just uses this capability to zooming objects. (Nevertheless something must be said related with zooming. In its present state, zooming is NOT a strong point in METAGRAF, and it must be used with care. A big problem is that the lines that support text will not be changed in position, so zooming drawings with text can have not very nice results. BEWARE!).

The big Slider works in the same way as with SHEAR, so in percentage. If the slider-button is placed over the number 100 and then the transformation is done, nothing changes. As the biggest number in the scale is 180, it is usual to make use of the buttons at right (most of all in 3-d). Those buttons works in a cumulative way. So if an increase of four times is wanted, after placing the ruler over the number 100 the button "x2" must be clicked twice. Over the small window SCALE can be seen the real value; in this case 400.

It is possible to use the change of the scale only in one direction, for instead the X or Y (the Z direction has no meaning in 2-D). In that case, the object or group of objects will be distorted in the direction choose my the corresponding percentage.

TRANSLATION.

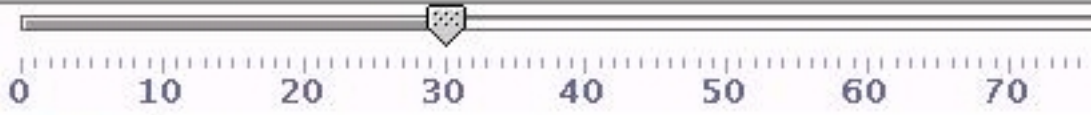
This is not a very useful transform in normal use. It is a lot simpler to move the objects directly selecting them and dragging the mouse. The work of the slider is the simplest as the objects are moved by default the same amount in unities as it is written on the scale. On another cases, as working in 3-D it can be useful when moving in directions perpendicular to the screen, but we will speak about that later on. One thing must be said about "unities". The METAGRAF unity is the pixel, and working with a resolution of 1024x768, it means that one pixel is 0.25 mm.

We will finish this short chapter with a reference to the other smaller sliders, vertical and horizontal (not present in the 800x600-screen version).. Those, also in 2-D have a limited utility, being a kind of "scrollbars". To understand the way they must be used, it can be imagined that when we are drawing a figure, between the screen and the pointer of the mouse there is a thin transparent layer. When we move the slider, what we are moving is this "transparent layer" with the drawing over it. This is useful when it is wanted to make a drawing bigger that the screen. In those cases, for instead if we want to draw a complete A4 sheet, we need to move the first part of the drawing to be able to fill the total page. It is important to know that, although not visible to the eyes, everything drawn in the "positive" part of the screen will be saved in its totality, so we have to increase the size of our drawing to the bottom part and, eventually, to the right. The unities written in the scales of the screen represents "real" cm's. of paper. A DIN-A4 sheet has approximately, 21x29 cm's., so we have the whole width always visible but in the vertical dimension we have only a little bit more than one half, working at 1024x768. .

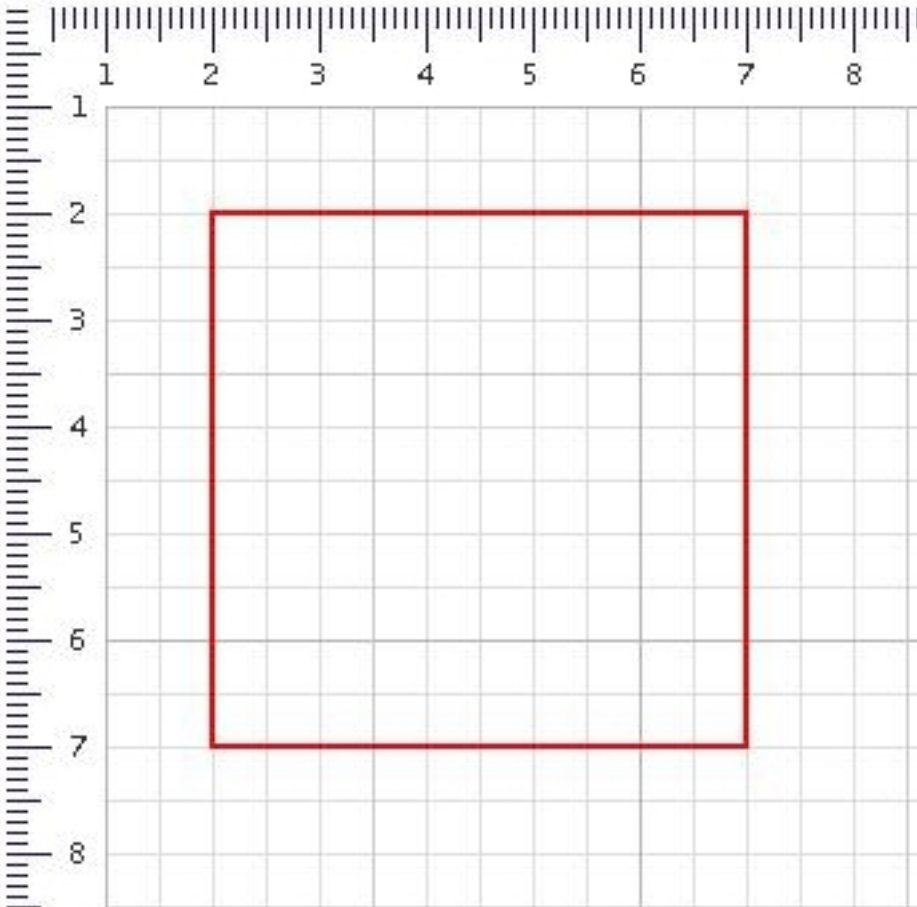
[INDEX](#)

METAGRAF-3D

XY XZ ZY



SET
RESET



↑	□○ ↺⊙
SP	AX
MP	GV
T	↗
□	○
/	⊙
○	⊙
∞	⬠
·	∩

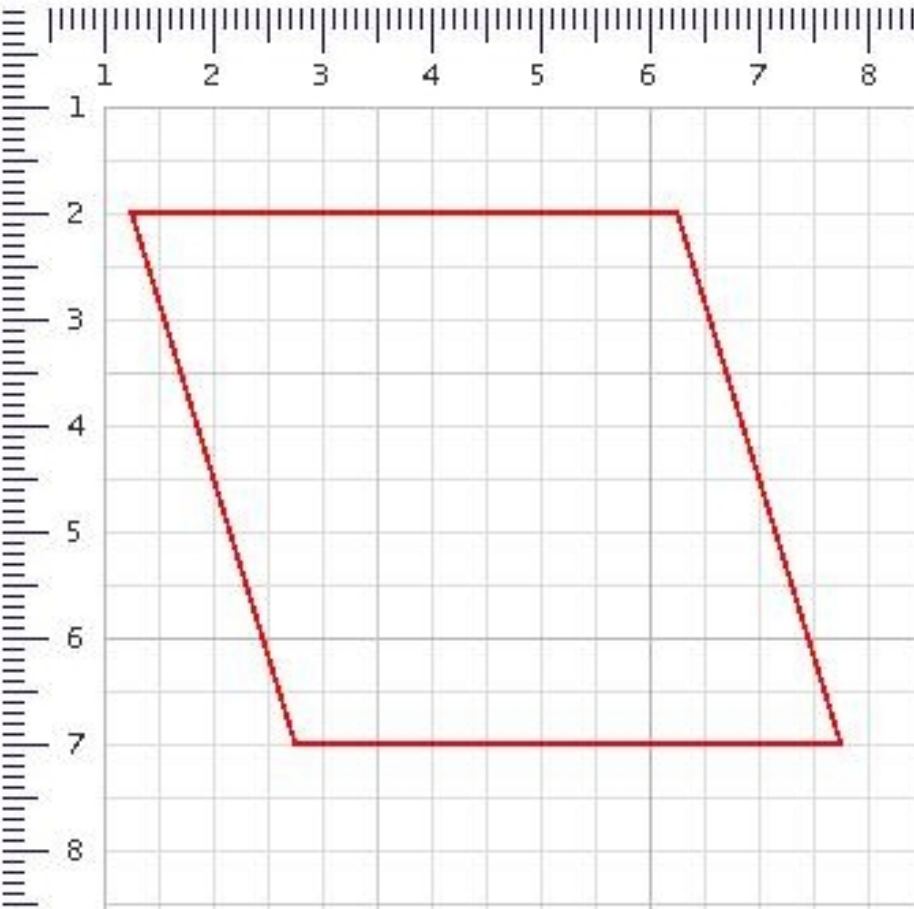
[RETURN](#)

METAGRAF - 3 D

XY XZ ZY



SET
RESET



↑	⊞
SP	AX
MP	GV
T	↗
□	○
/	⊙
○	⊙
∞	⬠
·	∩

[RETURN](#)

THE EDITOR

[INDEX](#)

WORKING WITH THE EDITOR

MG's Editor has a couple of functions clearly determined. One of those is the modification of the final metapost file obtained with MG by hand, and saving it with the name choosen.

The other "function" of the editor correspond to the capability of introducing direct MP code in any draw, what is useful not only to write complicated macros outside the scope of Metagraf, but also to introduce a part of a picture already done in the past. It is enough to copy and paste (both instructions work o.k., and also Ctrl C and Ctrl V) the file to the editor and then put it in the drawing with the use of the "MP" button. The advantage of this way of doing is the fact that this part of the image does interact as a single quick object and so, it does not affect the speed of MG screen.

To launch the editor's panel, the button at right with the tittle "EDIT" must be clicked. Immediatly, the panel editor will appear with a quite reduced size. This size can be modified at will, being the default small to permit to let it in some part of METAGRAF's screen without disturbing. The editor has only three options to make it as simple as possible. The first one is CLEAR and serves to let the screen blank after something has been written in the quickest way. The other two, OPEN and SAVE correspond to the usual ones. Any text file can be opened in the editor, modified and saved with the same or different name. Particularly this is useful when, at the end of a drawing it is desirable to change a small detail, and easy to do it by hand. Care must be taken if we modify in some way a file with the editor, then continue working in the usual way and finally the file is saved. This last file will not have the modifications done already. For that reason it is convenient to wait until the end or to paste the whole modified figure as a metapost file in the screen, but this need a good knowledge of METAGRAF.

For the reasons just mentioned, it is very convenient to delete all files in "files" directory begining with "graf_..." (this is done automatically from version 1.1.1) when a session is finished. The file with the bigger number after "graf_." is the last saved file.

Related with the pure application of texts, in next chapters we will come back to the editor or the TextField but then it will be about its use as a pure "base" for texts.

[INDEX](#)

"mpost" and then viewed with "gv". This can be used with any drawing without LaTeX/TeX text. So any figure without text can be viewed in this way. Not so if we include some simple text or math text or if we use the capability to write curved text. In all those situations, we must read in the small window below "gv-tex" to be able to launch "gv". The file will be processed through "mpost" and then "latex" and after "dvips". For the user is little difference. The only one is that when processing just with MPOST the drawing will be placed in the same position as it was in the screen. Processing with "latex" will put the figure in the upper left corner. If we do not want this, the simple solution is to place two points objects in the upper corners and make their thickness small. Doing that, the figure will appear in the same place in both cases.

- "TxPth" button. This button is used when writing curved text or text over a line and we will explain its way of working in the chapters related with text.
- "TxPar" button. We can say the same as in the case before. This button will launch a small screen to choose all the parameters related with writing text on the path.
- Next button is the one with the title "CurvEq". This is a new button in distribution 1.1.2 and is used to draw lines which mathematical formulae are written on the Text Field. Below are two small text fields where the minimum and maximum value of the variable used in the formula (always a big "X") must be written.
- The three final buttons are "Attach", "Un-Gr" and "Image". They are well explained in the file Introduction.html

With that we will finish what we have call help and control on screen and also the first group of chapters.

[INDEX](#)

OBJECT CREATION

[INDEX](#)

OBJECTS CREATION

Standard objects in METAGRAF are created according with a sequence of steps that almost always begins clicking the corresponding button for the object and then clicking and dragging the mouse on the screen. This is so for all geometric objects (exception: the Point object). Now we will see some peculiarities that must be known in relation with every object.

RECTANGLE.- This object is a typical example. As we drag the pointer of the mouse IN ANY DIRECTION we can see the shape of the object as it is created. When we click the right mouse button we can see that the red color that had the object as it was created, changes to black. A black color means that the object "is there" and that it is not selected, We can also observe that the mouse cursor has changed from a little crosshair to a small hand one. This is the cursor for the RESET situation, so the first thing to do is to click the right mouse button. As soon as we do that, the cursor changes to its reset shape that lets us do any other activity.

The steps done for the rectangle are the usual ones for any other object in relation with the creation and the need to click the right mouse button, so we will not come back to this point. Once the object is created, it is possible that it has the dimensions and is located at the exact position that we wanted. Usually this is not so, so a small precision work must be done. To translate the object in any direction it is enough to select it (to click on its boundary or the inner part) and clicking and dragging the pointer mouse we will see that the original object moves at the same time and in the same direction. Alternatively, when one or more objects are selected, they can be translated with the arrowkeys on the keyboard. The selected object or its boundary must be always of red color. This system of translating objects is the same for all objects or groups of objects at any moment.

If we want to change its dimensions, we select it to have it of red color and small bullets on the corners. Then is the moment to select with precision one of this corners. Once this is accomplished, clicking and dragging the mouse pointer we will see that the object changes its dimensions. The rectangle object, and exactly the same the oval one (before any affine transformation) change their size maintaining its axis parallel to the coordinates axis.

One aspect to be mentioned is the fact that when we create an object with any grid on the screen, the coordinates of the object work in the so-called "snap-to-grid" mode. Depending on the grid used, this coordinates will be millimeters, double millimeters, and so on. All the corners of the object will be placed in intersection points of the grid.

This is so at the time of the creation, and if we translate the object with the mouse, it will be translated from the original intersection point of the grid to another intersection point. This can be very important if we want our final drawing with perfect joints. Nevertheless, it is very simple to change this behaviour as it changes according with the grid on the background. If we prefer continuous positioning the simplest thing is to choose the "white paper" as the background or the "pixel grid". When changing the grid, the object will remain in the same place as it was, although now it can be in a place where its corners are not situated on the intersection points of the new grid. Anyway, the possible movements will follow the new grid.

What we have explained lately is the "simple" way of working and will remain like that for all objects as long as we don't transform them. (From now on, when the word "transformation" is written it must be understood "affine transformation"). When we transform an object, its behaviour changes in some way. Technically, the transformation changes the original

coordinates of the points that define the object from "integers" to "double" or "float". Apart from that, in some cases the effect of the transformations is deeper as in the case of the rectangle and the oval. For this two objects, when we transform any one of them it is changed into a totally different object defined in a totally different way. So, once one of those objects is transformed, if we select it we will not see anymore the points in the corners and we can not modify its shape with the mouse. We can do everything with it but in a different way and always trough transformations, with the sole exception of translations movements that can be done as always.

It can be convenient to say some words about the "right line". It is a very simple object but some properties must be mentioned. It is created as usual. Once done, for selecting it, it is convenient to know that it is enough to click in any part of the rectangle with sides parallel to the coordinate axis and which diagonal is our line. This seems very simple, but sometimes it can be a little bit tricky, most of all with vertical and horizontal lines. We know that another way of selecting an object is just by clicking and dragging the mouse pointer in such a way as to include our object in the red rectangle produced by this movement. Another one would be to click in the "one-up/one-down arrow button" that selects consecutively all the objects (the same is obtained pressing the "q" key). Also, if little movement is required, the best way to proceed is to select the line and move it with the key arrows on the keyboard. Each click moves the object one pixel in the direction of the arrow. If a finger is maintained over the key, the movement is not too slow. Finally, we will say that by selecting one of the extremos of the line, this one can be modified in length and position regarding rotation, and that this object is an exception to the general rule in the sense that it does not change its behaviour when transformed. (A point must be mentioned. If an object is translated using the arrow-keys, and there is a mesh as background of the drawing panel, the object can be put in an "out-of-the-grid" state. Then, selecting one of its corners, for example, will be impossible. So care is recommended. The solution always is to change to the "white-paper" background.

BEZIER-CIRCLE.- This is the usual and recommended circle to use when no very small sizes are required. It has also the advantage of little change in behaviour after transformation, so, for example, the size can be increased or decreased with the mouse. When we create it in the same way as always (clicking and dragging) the red circle appears with a point in the center (just for reference) and another one at the right extreme. This last one can be used lately to change the diameter of the circle clicking the mouse on it and dragging to the outside (increase the diameter) or to the inside (diminish the diameter). When transformed through rotation around x or y axis, the circle changes to an oval or ellipse, but the point will remain and the size can be modified at any moment, always in the same controlling way.

SPIRAL-CIRCLE.- This object has been implemented specifically for creating spirals, but it is also recommended when very small circles are needed and the approximation of Bezier curves is not very good. It is created in the standard way. At the time of creation we will see a red line where we drag the mouse that correspond to the radius and a black circle around it. If the extrem of the radius is changed in position but not in length, the circle will be the same, but not the spiral created if we do it. First of all it must be said that at present this object as a circle does NOT accept transformations. The spiral created with it, admits SOME transformations. In what follows we will go into spirals.

SPIRAL.- Once created the circle-support for the spiral in the way just explained, to create the spiral there are a few very simple steps to do it. First, the big slider must be placed in some value that will be the number of spires that the final object will have. To make it easier, the scale is divided by ten, so a value of 80 means 8 spires. Once the slider is in place the button with the spiral over it must be clicked. And that's all. Our spiral has been created. After clicking the right mouse button, as ALWAYS MUST BE DONE AFTER THE CREATION OF AN OBJECT, the original circle will change to a series of concentric circles, usually the same in number as spires created. This is just to remind us that this object is an spiral but the final draw is quite different, obviously. Now, some precissions about the spiral created: it begins always in the center of the circle and runs, by default, in clockwise fashion. It finish in the last point where we have draw the original radius of the circle. That is the reason why this radius can be changed in position without affecting the circle but changing the position of the spiral. If after placing the slider in place we click the corresponding "minus" button of the slider, so the value chosen appear in the small window "SCALE" as a negative number, the spiral created will go from the center to the extrem of the radius in an anticlockwise way. We will continue explaining other characteristics of this object in the chapter

