

# The Centaurs and their crossing angle.

by D.H.Van den Berghe

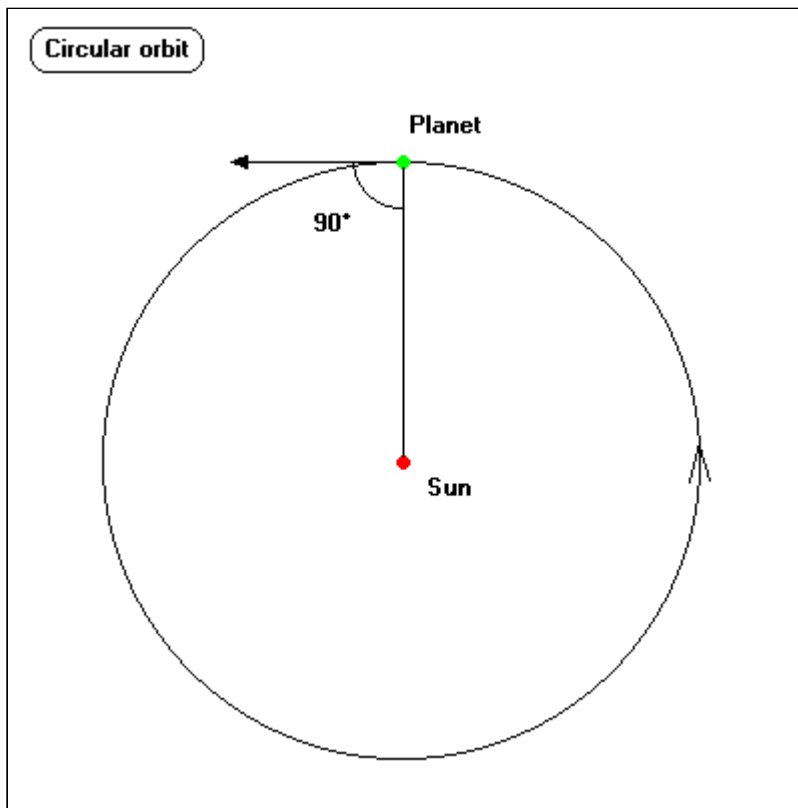
The main property of the centaurs is their orbit crossing behaviour.

In an effort to quantify this orbit crossing, I have proposed to consider the "heliodistance" and the "crossing angle" for this purpose.

Juan Revilla, author of the [Riyal software](#), has made space in his program for these two values, so that we can start studying them.

## What is the crossing angle?

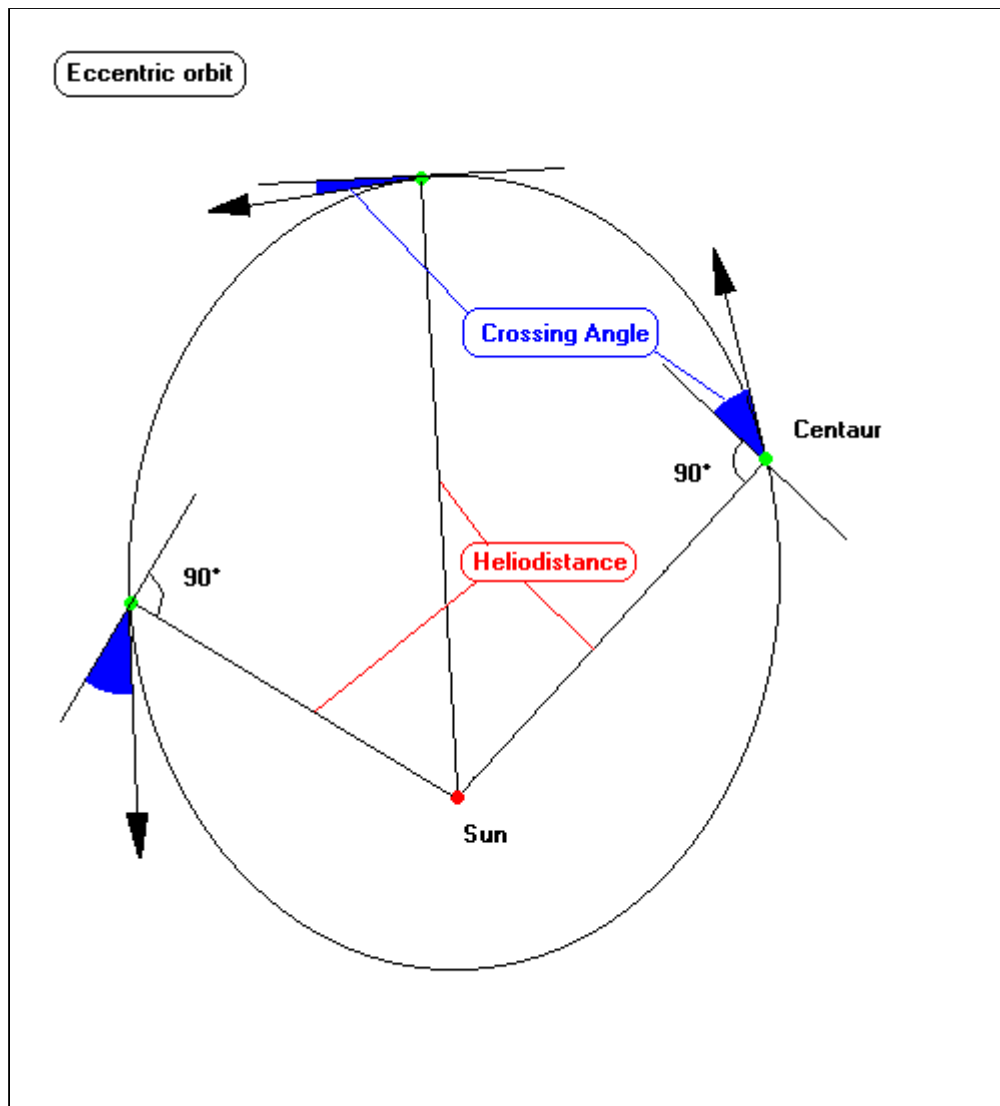
Most planets (except Mercury and Pluto) move in almost circular orbits around the Sun. This means that their distance to the Sun remains more or less constant, and that they do not cross in or out, they always move in a  $90^\circ$  (+/-) angle with the radius.



With the newly discovered centaurs, which move in highly eccentric orbits, this is not the case.

Their distance to the Sun and "crossing angle" is subject to constant fluctuations.

In the next picture we can clearly see the changing heliodistance and the concept of the "crossing angle".



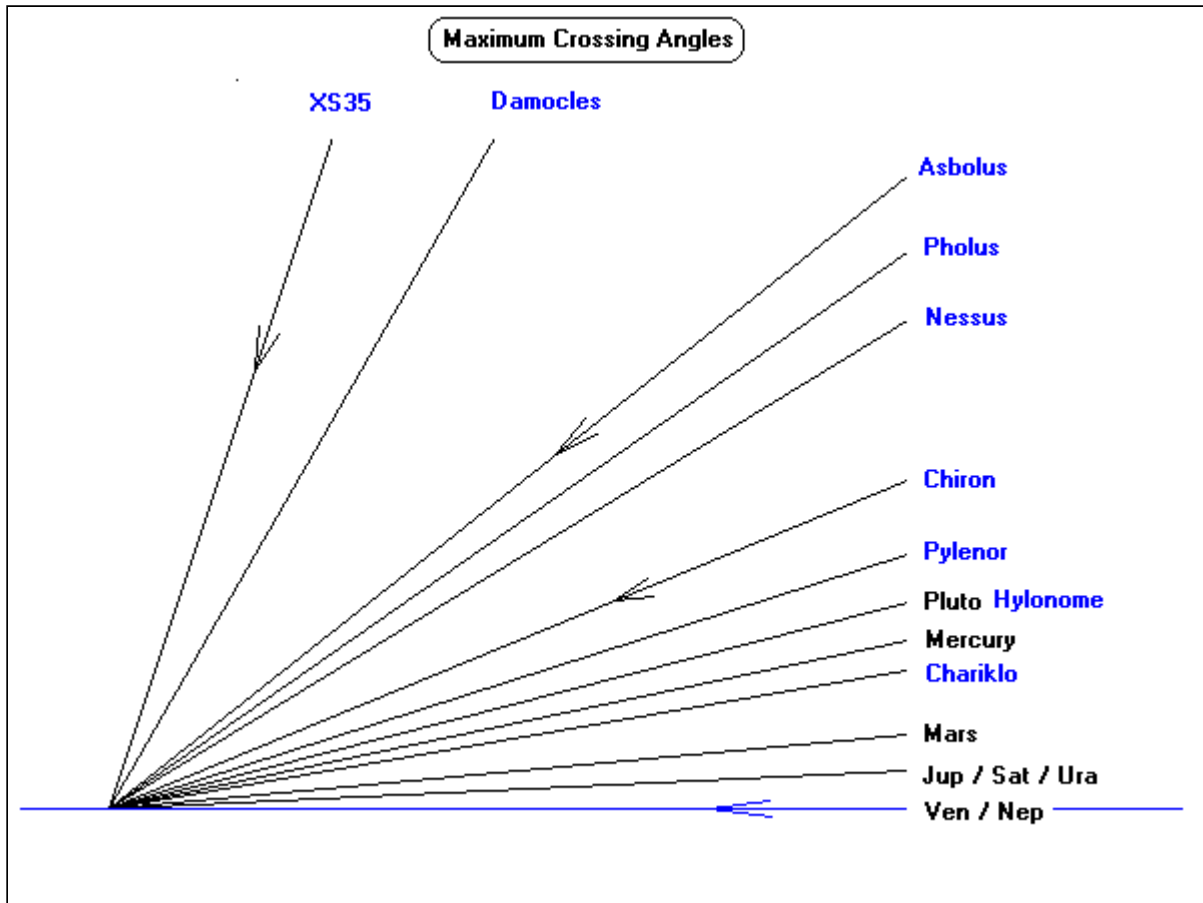
The crossing angle reaches its maximum value near the quadrature of the ellipse, and becomes zero in the perihelion and aphelion.

The crossing angle has a positive value when the body is moving out and a negative value on the way in.

Here are some max values for the crossing angles:

Body	Max Crossing Angle
Chiron	22°20'
Pholus	34°50'
Nessus	31°20'
Asbolus	38°20'
Chariklo	9°50'
Hylonome	14°20'

<b>Pylenor</b>	17°40'
<b>Damocles</b>	60°03'
<b>XS35</b>	71°20'
<b>Mercury</b>	11°52'
<b>Venus</b>	0°23'
<b>Mars</b>	5°22'
<b>Jupiter</b>	2°45'
<b>Saturn</b>	3°05'
<b>Uranus</b>	2°40'
<b>Neptune</b>	0°38'
<b>Pluto</b>	14°30'



**What is the meaning of the crossing angle?**

The orbit crossing behaviour of the centaurs has been understood as a form of aggression, wounding us...

This crossing angle may be useful to quantify the wounding potential of a centaur.

Although the traditional planets have very small crossing angles we should not neglect it. Even with Neptune, with a max crossing angle of  $0^{\circ}38'$ , it seems to have an important meaning. See: [Neptune's crossing angle](#)

A lot of further research has to be done in this area.

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