

The Professor Comet's Report ¹



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Welcome to the comet report which is a monthly article on the observations of comets by the amateur astronomy community and comet hunters from around the world! This article is dedicated to the latest reports of available comets for observations, current state of those comets, future predictions, & projections for observations in comet astronomy!

Late Autumn – December 2011

The Current Status of the Predominant Comets for Oct 2011!

Comets	Designation (IAU - MPC)	Orbital Status	Magnitude Visual	Trend	Observation (Range in Lat.)	Constellations (Night Sky Location)	Visibility Period
Garradd	2009 P1	C	6.5 - 7.0	Getting Brighter	90°N - 10°N	Eastern Region of Hercules <i>(Moving northward E of the Keystone!)</i>	Early Evening & Early Morning
Hill	2010 G2	C	9.7 - 10.5	Fading	90°N - 50°S	Moving SW thru the W region of Taurus towards Cetus	All Night
Gibbs	2011 A3	C	10.5	Steady	N/A	Poor Elongation!	N/A
Gehrels 2	78P	P	11	Steady	70°N - 50°S	Western Pisces (Undergoing retrograde motion in 'The Circlet')	Best Evening
Giacobini - Zinner	21P	P	12	Bright	90°N - 5°S	Moving eastwards thru the S region of Aquila	Early Evening
Arend - Rigaux	49P	P	12.5	Fading	75°N - 40°S	Southern Region of Leo (moving eastwards towards Coma Berenices)	Best Morning
McNaught	2011 Q2	C	~12.5	Bright	N/A	Moving NE thru northern region of Sagittarius (lost in the daytime glare!)	N/A
LINEAR	2011 M1	C	~12.5	Fading	35°N - 45°S	Southwards thru central Hydra and then the NW region of Centaurus	Early Morning
SWAN	2011 Q4	C	13	Fading	N/A	Moving N thru the southern region of Boötes approaching Arcturus (lost in the daytime glare!)	N/A
Schwassmann Wachmann 1	29P	P	~13	Varying Brightness	45°N - 30°S	Undergoing retrograde motion between Virgo and Corvus	Early Morning

<i>Ephemeris Term</i>	<i>Definition (plus additional comments)</i>
Date	Month and Year using the standard Gregorian calendar.
TT	Terrestrial Time (Day of the Month) as a substitute for the astronomical Julian date.
RA (2000)	Right Ascension based on the Epoch J2000 (longitudinal coordinate for the celestial sky) measured in hours, minutes, and seconds.
Dec (2000)	Declination based on the Epoch J2000 (latitudinal coordinate for the night sky) measured in degrees, arcminutes, and arcseconds.
Delta	The distance from Earth measured in AUs (1 AU = 1 Astronomical Unit = 92 955 807 mi = 149 597 871 km as the mean distance between the Earth and Sun).
R	The solar distance measured in AUs (the distance between the comet or comet - like body and the Sun)!
Elongation	Solar elongation which is the angle of separation between the observed object and the Sun as measured across the night sky as measured in degrees.
Phase	Phase angle between the Sun, the celestial object, and the observer on the surface of the Earth. Also known as the Sun - Object - Observer angle.
M1	M1: The visual magnitude of the celestial object as observed on the surface of the Earth at sea level. <i>(Note M1 values predicted by the Minor Planet Center can differ from actual visual reports obtain in the field!)</i>
M2	The nuclear magnitude of the Comet which is also the visual magnitude of the false nucleus. <i>(Rarely shown on a Comet's ephemeris data spreadsheet unless all values show a visual brightness value above 19th magnitude!)</i>
"/min	The progression or motion across the sky as measured in arcseconds per minute.
P.A.	Position angle while undergoing motion in the celestial sky. <i>(P.A. is the same method applied to binary stars with starts at N goes counterclockwise in an easterly direction!)</i>
Moon Phase	<i>A Numerical value for designating the phases of the Moon on a scale of (0.00 - 1.00): A New Moon = 0.00, Waxing or Waning Crescent = (0.01 - 0.49), Half Moon (1st or Last Quarter = 0.50), Waxing or Waning Gibbous = (0.50 - 0.99), & Full Moon = 1.00</i>
Foreshortening (% Fore.)	The appearance of the comet's tail due to the geometric orientation between the Earth and a Comet. <i>(100% means the comet's tail is parallel with the face of the Earth where as 0% means the tail is exactly perpendicular with respect to the face of the Earth!)</i>

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Degree of Condensation (DC)

All observations of comets are broken down into three factors: estimating magnitudes for light curves to predict future brightness, coma observations, and observations that concern with a comet's tail(s). For the coma or a comet's head there two characteristic features that are important for study: Degree of condensation (DC) and coma size measured in arcminutes. The classification system for determining the DC is based on a positive integer system from 0 to 9 as shown below.

DC value	Definition to numerical DC designation
0	<i>Diffuse coma of uniform brightness</i>
1	<i>Diffuse coma with slight brightening towards center</i>
2	<i>Diffuse coma with definite brightening towards center</i>
3	<i>Centre of coma much brighter than edges, though still diffuse</i>
4	<i>Diffuse condensation at centre of coma</i>
5	<i>Condensation appears as a diffuse spot at centre of coma – described as moderately condensed</i>
6	<i>Condensation appears as a bright diffuse spot at centre of coma</i>
7	<i>Condensation appears like a star that cannot be focused – described as strongly condensed</i>
8	<i>Coma virtually invisible</i>
9	<i>Stellar or disk like in appearance</i>

A Synopsis of the Predominant Comets for Autumn 2011!

Comet Garradd is still maintaining its presence as the only premiere comet for what is left of 2011! As the year is drawing to a close with the month of December now before us C/2009 P1 is starting to begin its northward trek thru the eastern region of Hercules on its' inevitable journey towards the constellation of Draco. 2009 P1 Garradd is still bright with the latest visual magnitude values ranging between 6.5 – 7.5 with the coma now appearing with a more circular shape plus a DC of 6 due to the high diffusion of the outer region of the comet's coma which now glows brightly in a greenish light as seen in the latest astroimages. The size of the coma averages between 6' – 9' across about 4% - 9% the size of an average full Moon! Observations of comet Garradd are possible using at least a 7x50 pair of binoculars or a small telescope. Garradd's Tail has been reported at angular lengths up to 1.1° across equivalent to two average full Moons laid end to end with the PA reported at values between 50° - 110° placing the orientation of the tail in a NE to SE direction with respect to the NCP (North Celestial Pole). However, the latest observations now show two distinct tails: one yellowish dust tail and a longer bluish, ion tail. The ion tail as shown in the Garradd image on the front page appears to have the 1.1° angular stretch while the shorter dust tail appears to be about ¼ of the breadth with respect to the more dominant ion tail as it appears to Earth viewers. The two tails are forming a chevron – like shape with the greenish – glowing, moderately diffusing coma at the vertex combined with the two tails forming angular separation close to 40°. Garradd will eventually be lost in the daytime glare as Hercules is now setting earlier day by day in the western skies just after and during dusk and disappear completely from view in the later half of the month. Hercules will reappear in the eastern evening skies before dawn around Mid-Jan 2012 before the comet reaches perigee with the Earth making it prime for observing through the Spring of the coming new year. In fact by the time the comet is expected to obtain maximum visual brightness during the month of Feb 2012, Hercules and Draco should be visible in the morning, eastern night skies up to 3 hours before the break of dawn. This should allow for some prime observing to occur on comet Garradd well into the month of March 2012!

A Synopsis of the Predominant Comets for Summer 2011!

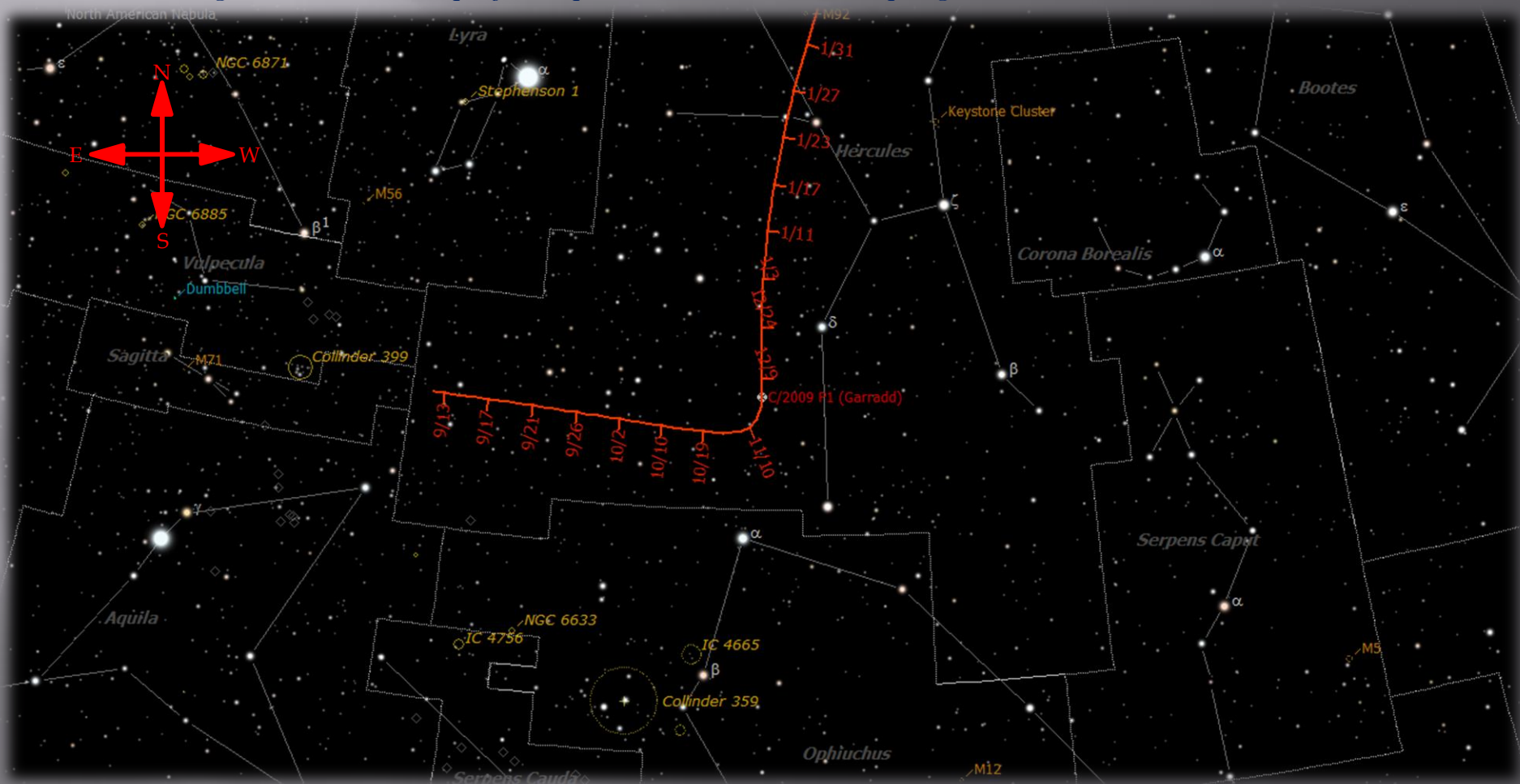
C/2009 P1 Garradd is now beginning its northward progression through the E region of Hercules for all of December and right up to its perigee with the Earth during most of the month of February. Garradd is increasing its northward progression from a rate of 18.6'/hr at a PA of 352.2° on Dec 1 to a speedy 105'/hr at a PA of 342.8° by end of January 2012! Expect the comet to then graze thru the eastern region of Hercules as it moves northward for most of Dec and all of Jan, but still lie distinctly to the east of the Keystone (the central asterism of Hercules) while maintaining a general PA of 0° between the dates of 10 – 22 December. Around this time and overlapping with the dates of 20 – 27 December, Garradd will reach perihelion with a distance of 1.551 AU (231.8 million km or 144.1 million mi) from the Sun. Therefore the comet will only get as close to the Sun roughly equal to the average distance the planet Mars is from our mother star! Further data analysis of the orbital elements of comet Garradd places its' perigee with the Earth at 1.266 AU (117.6 million mi or 189.2 million km) on the nights of 4 – 6 March 2012 when it is predicted by the IAU minor planet center to reach a maximum predicted brightness at a visual magnitude of 7.1. Continued gathering of photometry data and comparison with the light curve of C/2009 P1 from the previous months of 2011 still predicts that the comet brightening well into the Spring 2012. The original prediction of the comet reaching maximum visual brightness during the period of 11 – 24 February 2012 is still set, but with only a small change in the magnitude values with the expectation of the comet getting half a magnitude brighter for the coma than its' original magnitude value of 7.0. Garradd's eventual long term destination is to move thru the constellation of Draco travelling along west of the Dragon's tail around the time it is at perigee with the Earth and then head southward thru the W region of Ursa Major halfway between the bowl of 'the Big Dipper' and Muscida (the nose of the Bear)!

A Synopsis of the Predominant Comets for Summer 2011!

There is not much else remaining in terms of the presence of predominant comets for the late Autumn/Early winter 2011 and going into the succeeding Spring season. Comet 45P/Honda made an impressive run thru the Autumn sky as it brightening up to a visual magnitude 8.0 after passing to within 0.060 AU of the Earth the night of 15 August and then peaked at 6.6 in late September. Since then the comet has rapidly faded to mid-13th magnitude making it more of a photographic comet rather than a target for visual telescopic observations except where there are exceptionally dark skies. Most of the remaining comets that are brighter than 13.5 are either in there fading periods with the occasional outburst (example of 29P/Schwassmann – Wachmann 1 at 10th magnitude the night of 24 Nov) or starting to brighten, but not many above 10th magnitude for the early half of 2012. So far the only comet of interest for visual observers currently is C/2010 G2 Hill which has been reported reaching a maximum visual brightness of magnitude 9.6 during late November. It is only now starting to undergoing the process of fading from observational view with a dimming down to 15 – 16 magnitude well into next Spring while it becomes observable only to those living in the southern hemisphere. However, expect the comet to still be very observable thru this remaining month of 2011 as it moves SW across the western region of the constellation of Taurus and pass by the Pleiades about a few full Moons distance to the SE and SSE of that open star cluster during the evenings of Dec 1 – 5, 2011. The coma currently has a DC of 3 giving a slight, diffuse region around the coma with the latest field reports giving it an angular diameter of 3' (1% the size of the avg. full Moon) and a very, faint tail about 0.2 degrees in length at a PA of 310°. At 310° the tail is pointing towards the NW with respect to the NCP (North Celestial Pole near the north star 'Polaris') and at a size of 0.2 deg or 12', it has a breath equivalent to 2/5th the diameter of an average full Moon.

C/2009 P1 Garradd

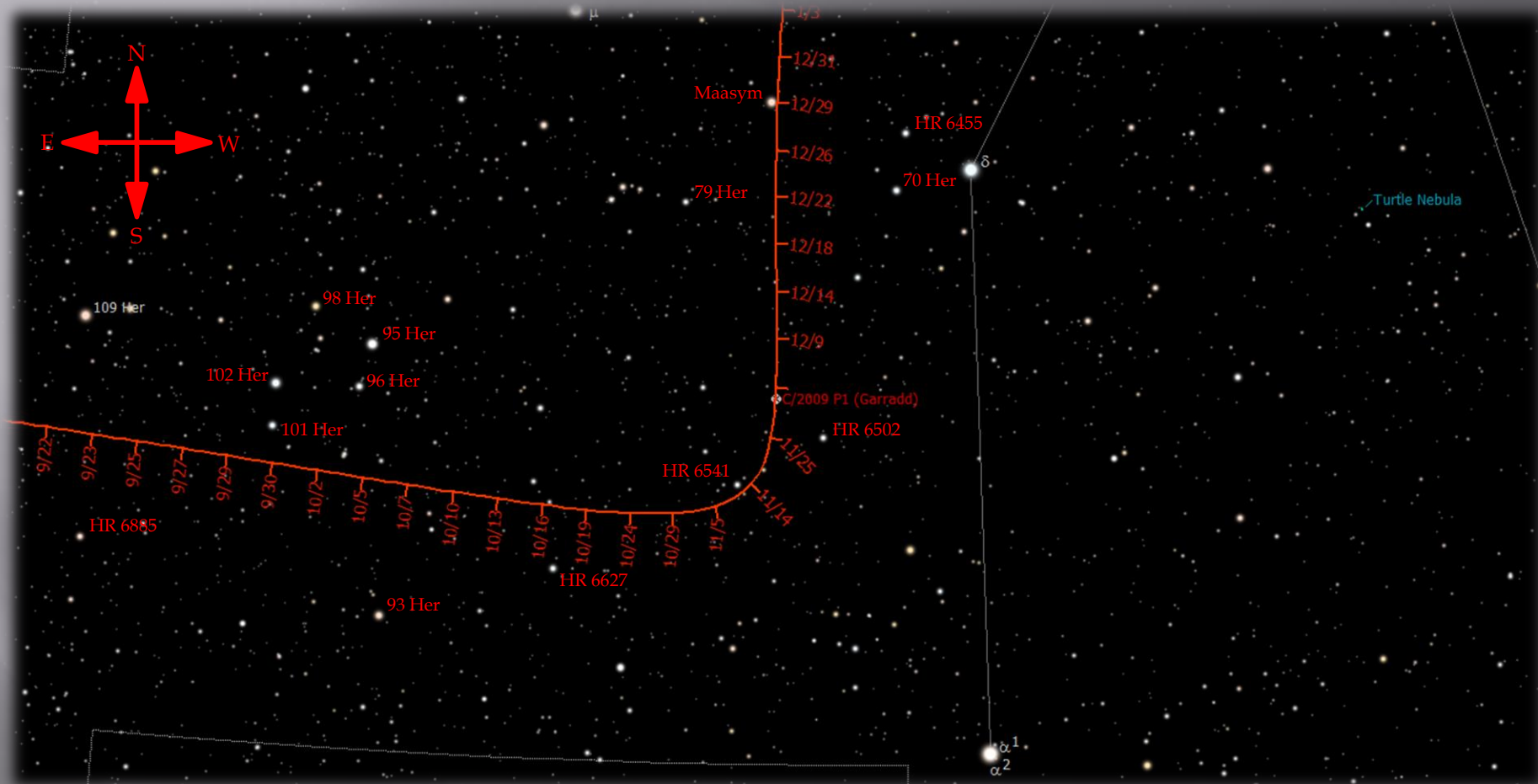
Figure 1: Garradd P1 projected path across the Summer/Spring Constellations thru Feb 1 2012!



Courtesy of SkyTools 3 Profession Ed, 2011.

C/2009 P1 Garradd

Figure 2: Close up of Garradd P1 projected path from 22 Sept 2011 - 5 Jan 2012!



Courtesy of SkyTools 3 Profession Ed, 2011.

Bright Stars in Hercules along the Autumnal/Winter path of Comet Garradd

Star	Common Designations	Vis. Mag	Classification	Stellar Attributes	R.A. (2000)	Dec (2000)	Distance (lys)
101 Her	HR 6794, HD 166230	5.10	A6 III	None	18h 8m 52.9s	+20°02'43"	320
98 Her	HR 6765, HD 165625	4.96	M3 IIIa	Suspected Variable	18h 6m 1.9s	+22°13'08"	620
96 Her	V820 Her, HR 6738, HD 164852	5.22	B3 IV	Variable (Spectroscopic Binary)	18h 2m 23.0s	+20°50'01"	1000
95 Her	HR 6729, HD 164668	4.96/5.18	A5 III/G8 III	Multiple Star System	18h 1m 30.0s	+21°35'44"	470
93 Her	HR 6713, HD 164349	4.67	K0 III	None	18h 0m 3.4s	+16°45'03"	660
79 Her	HR 6571, HD 160181	5.76	A2 Vn	Multiple Star System	17h 37m 31.1s	+24°18'36"	240
HR 6885	HD 169191, TYC 01572 - 2438 1	5.25	K3III	None	18h 22m 49.1s	+17°49'36"	440
HR 6627	HD 161833, TYC 01556 - 1341 1	5.61/5.72	F2 V/A1 V	Multiple Star System	17h 47m 8.1s	+17°41'49"	370
HR 6541	HD 159332, TYC 01546 - 0208 1	5.65	F6V	Variable	17h 33m 22.8s	+19°15'23"	120
HR 6502	HD 158148, TYC 01545 - 2527 1	5.52	B5 V	None	17h 26m 49.1s	+20°04'52"	470
70 Her	HR 6457, HD 157198, TYC 02078 - 1803 1	5.13	A2V	None	17h 20m 54.2s	+24°29'58"	460
HR 6455	HD 157087, HIP 84821, TYC 02078 - 1802 1	5.36	A3III	None	17h 20m 9.8s	+25°32'15"	500
Maasym	λ Her, HR 6526, HD 158899	4.41	K3.5 III	Suspected Variable	17h 30m 44.3s	+26°06'39"	370

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IAU MPC Ephemeris data for C/2009 P1 Garradd (December 2011):

Date	CDT/CST	R.A. (J2000)	Decl.	Delta	r	El.	Ph.	M1	% Fore.	Sky Motion	Moon Phase	Moon Mag.	
	h m s									"/min	P.A.	(0.00 - 1.00)	(Visual)
2011 12 01	180000	17 30 26.9	+20 44 29	2.113	1.580	45.1	26.2	7.6	56	0.31	353.2	0.44	-10.87
2011 12 02	180000	17 30 24.9	+20 51 55	2.112	1.577	45.0	26.2	7.6	56	0.32	354.0	0.53	-11.18
2011 12 03	180000	17 30 23.2	+20 59 38	2.110	1.575	45.0	26.2	7.6	56	0.33	354.8	0.63	-11.44
2011 12 04	180000	17 30 21.8	+21 07 36	2.108	1.572	44.9	26.3	7.6	56	0.34	355.4	0.72	-11.65
2011 12 05	180000	17 30 20.7	+21 15 51	2.105	1.570	44.9	26.3	7.6	56	0.35	356.0	0.80	-11.82
2011 12 06	180000	17 30 19.9	+21 24 22	2.103	1.568	44.9	26.3	7.6	56	0.36	356.5	0.87	-11.97
2011 12 07	180000	17 30 19.3	+21 33 11	2.100	1.566	45.0	26.4	7.6	56	0.37	356.9	0.93	-12.08
2011 12 08	180000	17 30 19.0	+21 42 16	2.096	1.564	45.0	26.5	7.5	55	0.39	357.3	0.97	-12.16
2011 12 09	180000	17 30 18.8	+21 51 39	2.093	1.562	45.1	26.5	7.5	55	0.40	357.6	0.99	-12.21
2011 12 10	180000	17 30 18.8	+22 01 19	2.089	1.561	45.2	26.6	7.5	55	0.41	357.9	1.00	-12.22
2011 12 11	180000	17 30 19.0	+22 11 18	2.084	1.559	45.4	26.7	7.5	55	0.42	358.1	0.99	-12.19
2011 12 12	180000	17 30 19.3	+22 21 35	2.080	1.558	45.5	26.8	7.5	55	0.44	358.3	0.95	-12.13
2011 12 13	180000	17 30 19.6	+22 32 11	2.075	1.557	45.7	26.9	7.5	55	0.45	358.4	0.90	-12.02
2011 12 14	180000	17 30 20.0	+22 43 06	2.070	1.555	45.9	27.0	7.5	54	0.46	358.5	0.83	-11.87
2011 12 15	180000	17 30 20.5	+22 54 21	2.064	1.554	46.2	27.2	7.5	54	0.48	358.6	0.74	-11.67
2011 12 16	180000	17 30 21.0	+23 05 56	2.059	1.553	46.4	27.3	7.5	54	0.49	358.6	0.64	-11.42
2011 12 17	180000	17 30 21.5	+23 17 52	2.052	1.553	46.7	27.5	7.5	54	0.50	358.6	0.53	-11.10
2011 12 18	180000	17 30 21.9	+23 30 08	2.046	1.552	47.0	27.6	7.5	54	0.52	358.6	0.42	-10.70
2011 12 19	180000	17 30 22.2	+23 42 46	2.039	1.551	47.3	27.8	7.5	53	0.53	358.5	0.31	-10.18
2011 12 20	180000	17 30 22.5	+23 55 47	2.033	1.551	47.7	28.0	7.4	53	0.55	358.5	0.21	-9.50
2011 12 21	180000	17 30 22.6	+24 09 09	2.025	1.551	48.0	28.1	7.4	53	0.57	358.3	0.12	-8.56
2011 12 22	180000	17 30 22.5	+24 22 55	2.018	1.551	48.4	28.3	7.4	52	0.58	358.2	0.05	-7.16
2011 12 23	180000	17 30 22.2	+24 37 05	2.010	1.551	48.8	28.5	7.4	52	0.60	358.0	0.01	-4.56
2011 12 24	180000	17 30 21.7	+24 51 39	2.002	1.551	49.2	28.7	7.4	52	0.62	357.9	0.00	-0.12
2011 12 25	180000	17 30 20.8	+25 06 37	1.994	1.551	49.7	28.9	7.4	52	0.63	357.7	0.01	-5.70
2011 12 26	180000	17 30 19.7	+25 22 01	1.985	1.551	50.2	29.1	7.4	51	0.65	357.4	0.05	-7.60
2011 12 27	180000	17 30 18.2	+25 37 51	1.976	1.552	50.6	29.3	7.4	51	0.67	357.2	0.11	-8.73
2011 12 28	180000	17 30 16.3	+25 54 07	1.967	1.552	51.1	29.6	7.4	51	0.69	356.9	0.18	-9.50
2011 12 29	180000	17 30 13.9	+26 10 50	1.958	1.553	51.7	29.8	7.4	50	0.71	356.7	0.27	-10.08
2011 12 30	180000	17 30 11.1	+26 28 02	1.948	1.554	52.2	30.0	7.4	50	0.73	356.4	0.36	-10.54
2011 12 31	180000	17 30 07.7	+26 45 42	1.938	1.555	52.8	30.2	7.4	50	0.75	356.1	0.45	-10.90

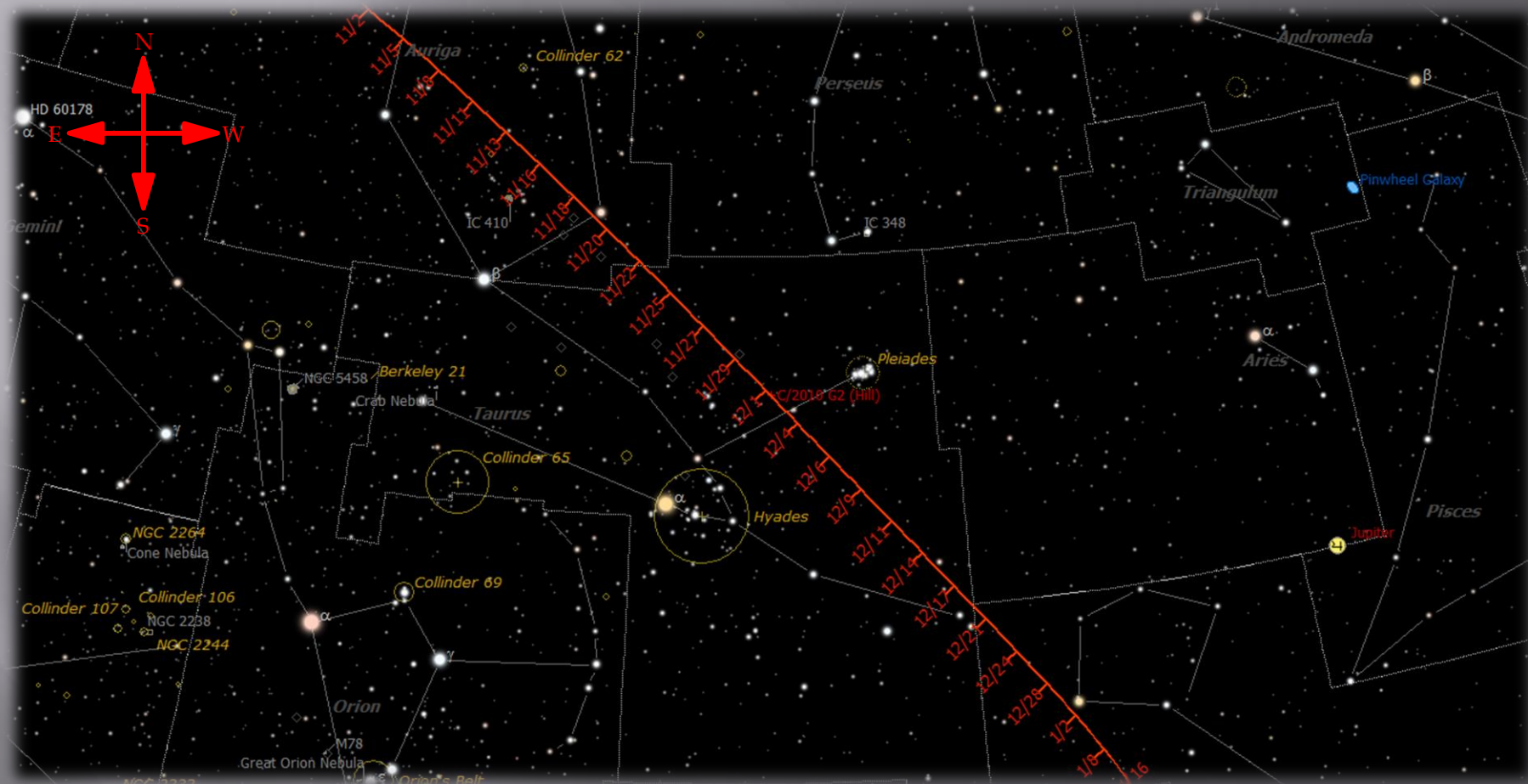
All ephemeris data is calculated based on the Geographical location of the George Observatory, SE Texas, United States.

29°22'30" N, 95°35'37" W

Late Autumn – December 2011

C/2010 G2 Hill

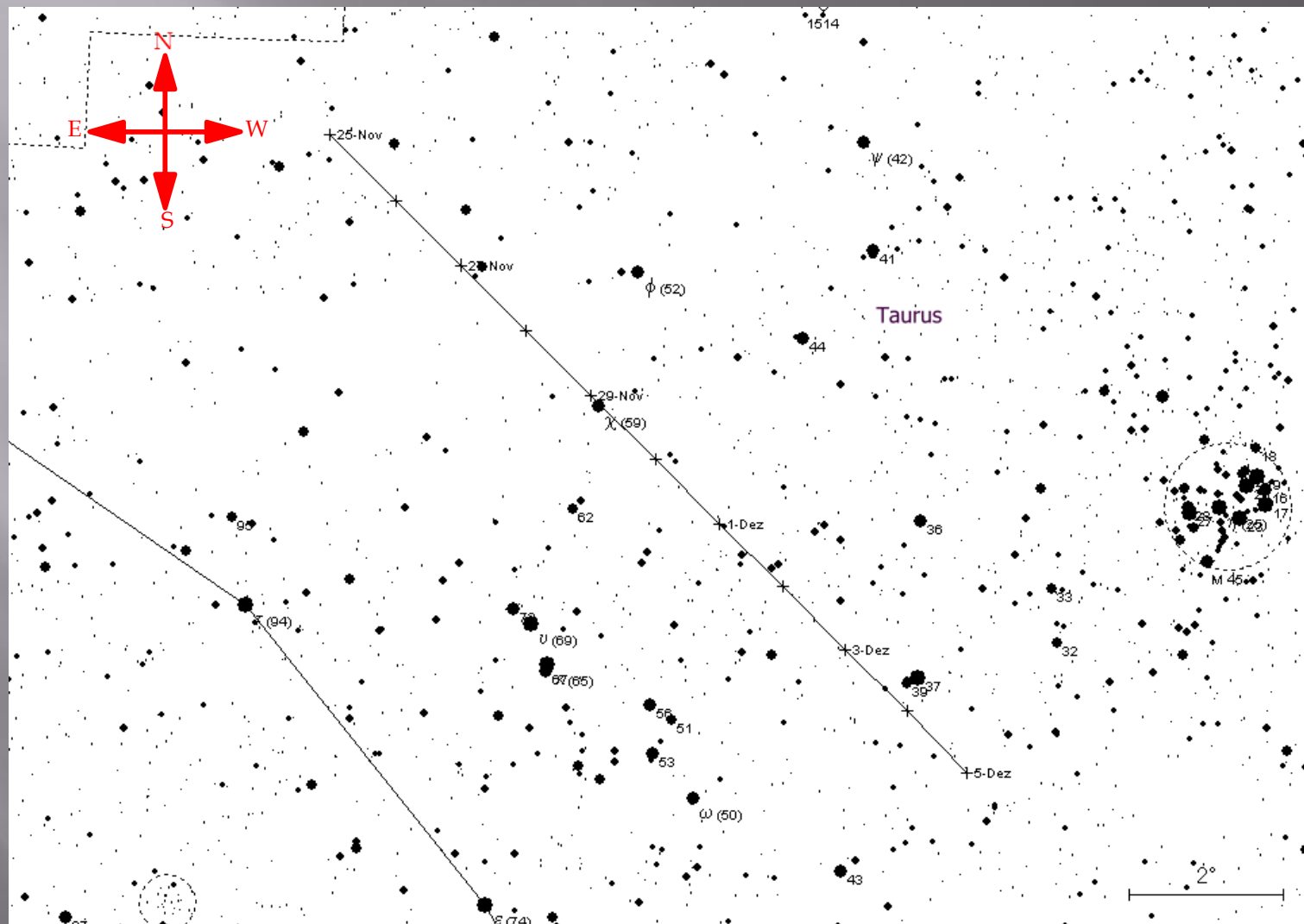
Figure 3: The projected path for comet Hill near the Winter Hexagon for Dec 2011!



Courtesy of SkyTools 3 Profession Ed, 2011.

C/2010 G2 Hill

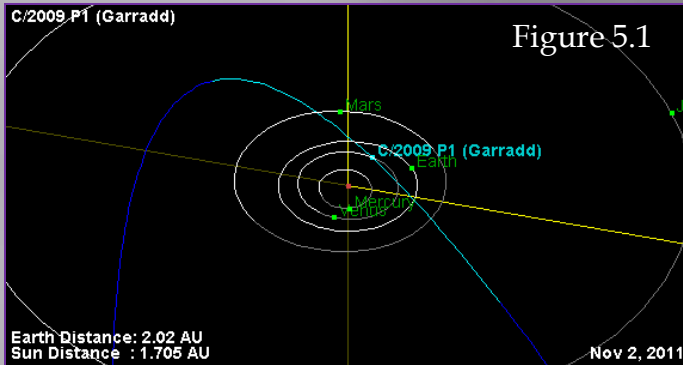
Figure 4: Comet Hill and it's close approach to the Pleiades on Dec 1 - 5, 2011!



Courtesy of Winnie's Comet Pages, 2011.

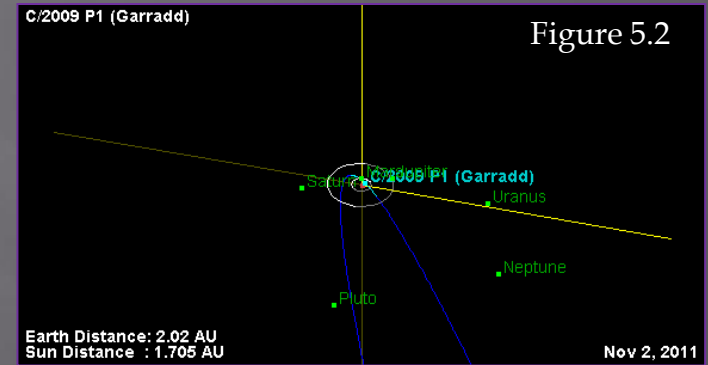
Late Autumn - December 2011

Overview of the Orbital Differences for Comets!



P – Periodic Comets

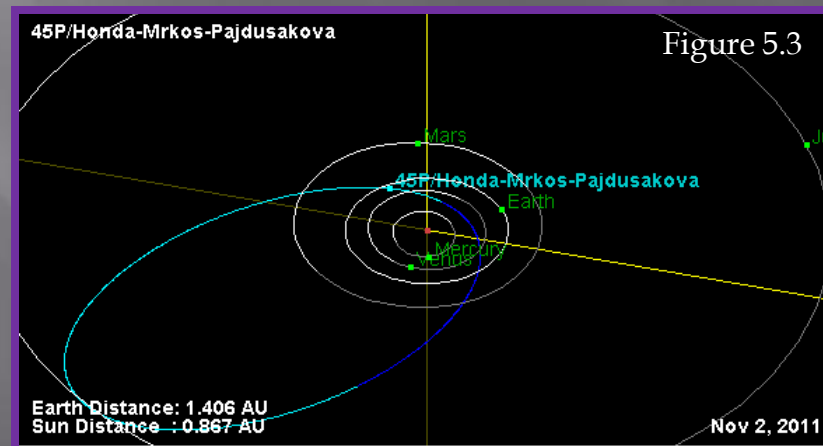
C – Non Periodic Comets



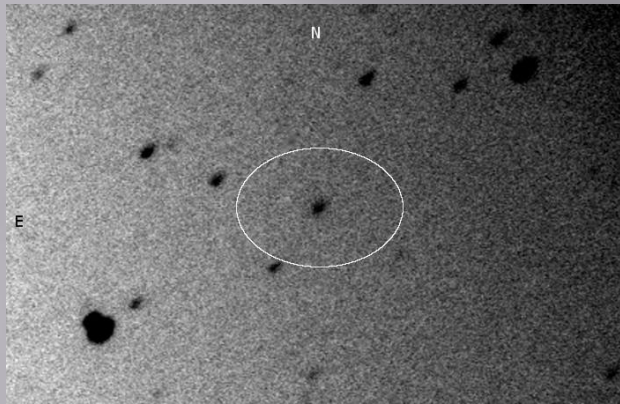
Comet Garradd is the perfect example of a non – periodic comet! The path is hyperbolic in nature. Comet 45P/Honda – Mrkos – Pajdusakova however is the perfect example of a periodic comet which is elliptical in nature.

Figures 5.1 & 5.2 are of Comet C/Garradd 2009 P1 and Figure 5.3 below is off 45P.

All images were obtained from the JPL Solar System Dynamics/Small Body Database Browser .
Courtesy of NASA/JPL/CalTech



Late Autumn
December 2011



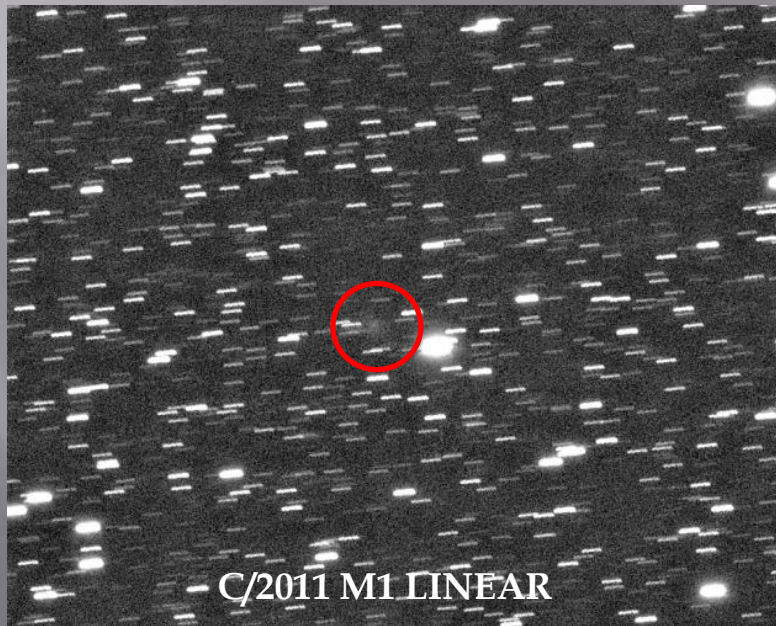
29P/Schwassmann - Wachmann 1



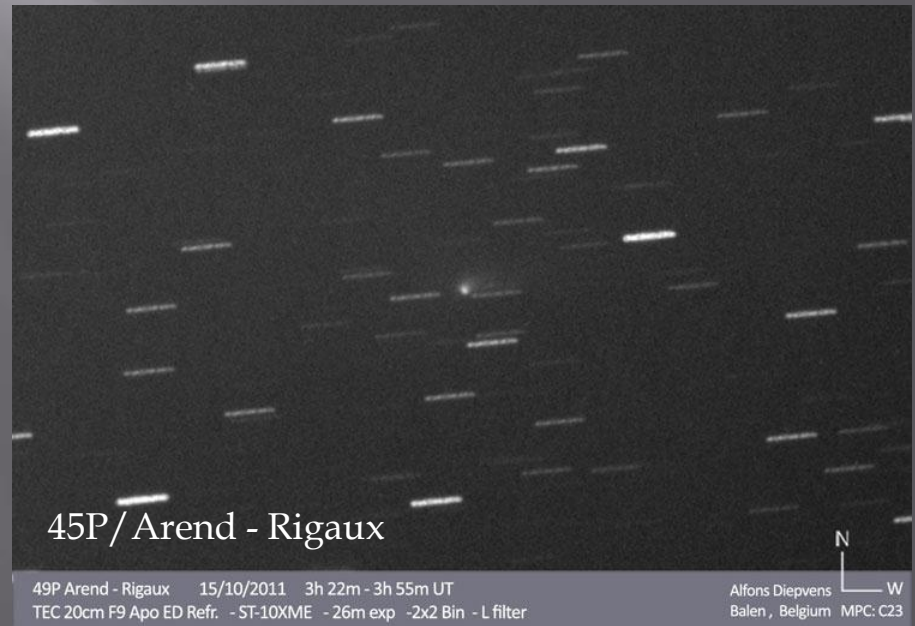
C/2010 G2 Hill



78P/Gehrels 2



C/2011 M1 LINEAR



45P/Arend - Rigaux

49P Arend - Rigaux 15/10/2011 3h 22m - 3h 55m UT
TEC 20cm F9 Apo ED Refr. -5T-10XME -26m exp -2x2 Bin - L filter

Alfons Diepvens
Balen, Belgium MPC: C23

