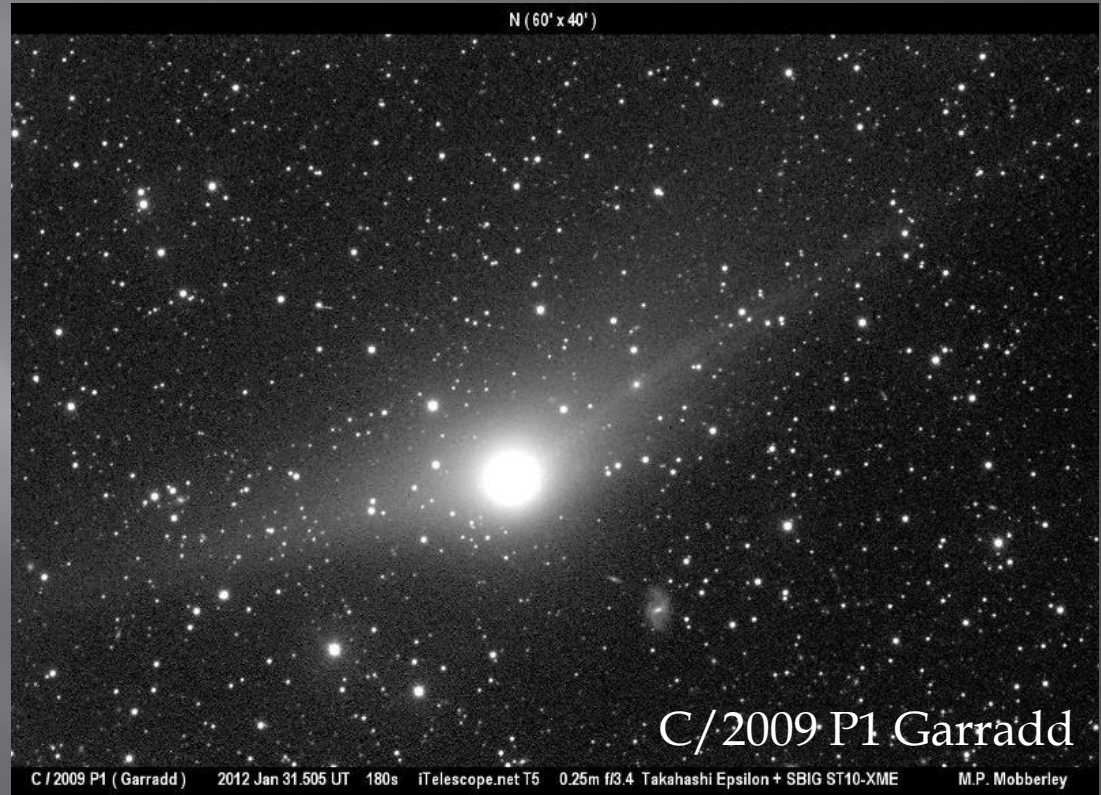


# The Professor Comet's Report

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*Mr. Justin J McCollum (BS, MS Physics)  
Lab Physics Coordinator  
Dept. of Physics  
Lamar University*



*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 Winter – February 2012

## *The Current Status of the Predominant Comets for Feb 2012!*

Comets	Designation (IAU - MPC)	Orbital Status	Magnitude Visual	Trend	Observation (Range in Lat.)	Constellations (Night Sky Location)	Visibility Period
Garradd	2009 P1	C	6.3* - 6.7	Steady	90°N - 10°S	Northeastern Region of Hercules <i>(Moving north, northwest &amp; currently NE of the Keystone!)</i>	Early Evening & Early Morning
Giacobini - Zinner	21P	P	8.1 - 8.8	Bright	50°N - 25°N	<b>Moving eastward across Aquarius and heading towards Pisces. Lost in the daytime glare!</b>	N/A
Hill	2010 G2	C	10 - 10.8	Fading	70°N - 55°S	Moving SW thru the E region of Cetus & then SE into the W region of Eridanus	All Evening
Gehrels 2	78P	P	11 - 12	Steady	75°N - 45°S	<b>Moving eastwards in the SE region of Pisces.</b>	Best Evening
Lovejoy	2011 W3	C	12	Fading	20°S - 55°S	<b>Heading north from N region of Caelum into the Eridanus/Lepus Region!</b>	All Night
SWAN	2011 Q4	C	13	Fading	80°N - 15°S	<b>Traveling NW across Canes Venatici and towards the bowl of 'The Big Dipper'</b>	Best Morning
Tuttle - Giacobini - Kresak	41P	P	13.5	Fading	50°N - 90°S	<b>Moving Eastwards from the NE region of Sagittarius and into the NW region of Capricornus! Lost in the daytime glare!</b>	N/A
McNaught	2009 F4	C	13.5	Steady	0°S - 90°S	Moving across the southern circumpolar constellation Hydrus.	Early Evening
Levy	255P/2011 Y1	P	13.5	Brightening	70°N - 55°S	Moving rapidly SE to ESE from Eridanus to Canis Minor before Feb 29!	Early to Mid Evening

\*Visual Magnitude determined from last known field observation report!

<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 19<sup>th</sup> 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 (1<sup>st</sup> or Last Quarter = 0.50), Waxing or Waning Gibbous = (0.50 - 0.99), &amp; 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.*

<i>DC value</i>	<i>Definition to numerical DC designation</i>
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 the New Year 2012!

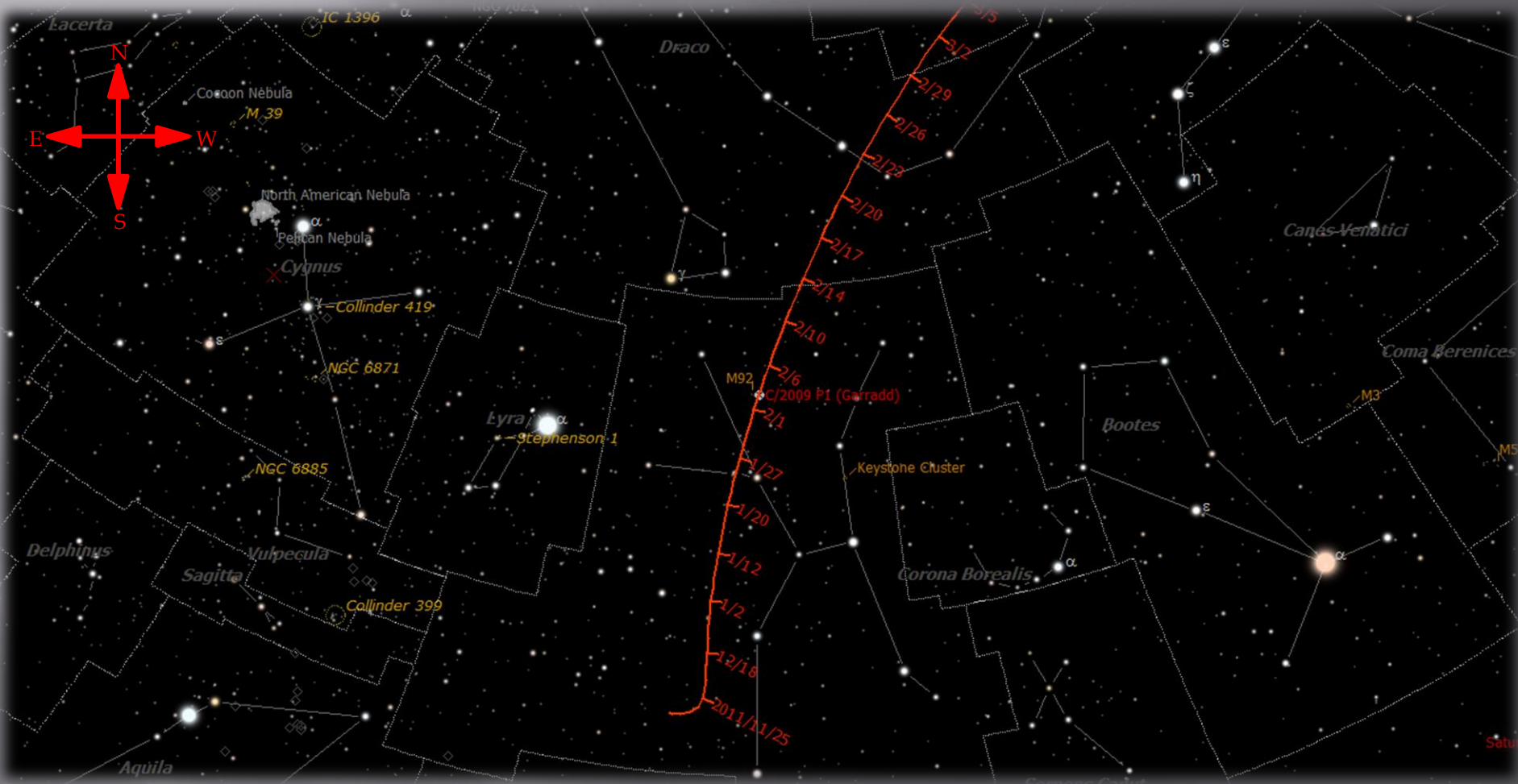
*Comet Garradd continues to reach a point of stability in its' brightness level with visual magnitude values ranging from 6.5 to 7.0, but more often seen at in the mid to lower 6<sup>th</sup> mag range. The latest confirmed sighting of Garradd took place last month on the Jan 30 with a visual report of Magnitude 6.3! Comet Garradd has turn to a more NNW direction across the northern region of Hercules and is destined to reach the southern region of Draco west of the Head by mid - month. Reports of Garradd for the first month of this years have been very scant with Hercules and Draco lost in the daytime glare during the early winter months, but expect the comet to be more visible as both constellations are now rising earlier in the morning night during this late winter. Last reports put the coma as a size range varying between 6 – 9 arcminutes giving it an angular surface area about 3.7% - 8.4% to that of an average full Moon. Garradd still maintains a fan – shaped tail with its orientation changed with respect to the orientation of our planet's orbit. The fan tail now shows itself protruding from both ends of the coma as the comet continues with its' inevitable periapsis with Earth during the first week of March. If one is interested in observing comet Garradd with small optical instruments a pair of 8x40 binoculars or a 4" – 8" reflector telescope should be sufficient. Garradd's tail from previous observation reports in the field have indicated a length up to 1.1 degrees at a PA of 50°. The ion tail appears as a nice, bluish color with the coma displaying itself in a bright greenish – hue due to the presence of C2 – based organics being ejected from imbedded reservoirs of volatiles located possibly in the cavities located at the polar and antipolar ends of the nucleus. The DC (Degree of Condensation) is averaging around 6 which means that the inner coma is appearing as brighter, hazy path with an outer coma fading and dissipating as it spreading outwards away from the CO – rich, nucleus. Note that when observing the comet there are two tails of different characteristics: dust and ion oriented in a north – south direction with the blue ion tail on the south end of the coma and the much fainter, dust tail protruding northwards from the top end of the coma!*

## A Synopsis of the Predominant Comets for the New Year 2012!

*The comet continues its' general north, northwest motion towards the northern circumpolar, night sky with an initial rate of 108 arcminutes (1.80°) per hour starting on Feb 1 2012 and will gradually increase to about 195.6 arcminutes (3.26°) per hour by 2 March. A perigee distance with the Earth at 1.266 AU or 117,611,400 mi (189,236,743 km) is predicted to occur during the evening of 4 – 5 March 2012. Upon this particular time period C/2009 P1 will have reached the southern region of Ursa Minor 'The Little Dipper' at a northern declination of 68.5° - 69° N and only several degrees from the stars Kocab ( $\beta$  UMi) and Pherkad ( $\gamma$  UMi) during the first week of March. New photometry readings still predict that this comet will exceed expectations in brightness with a possible visual magnitude of 6.0 making it a better opportunity for naked eye comet hunting for the early half of 2012. Comet Garradd will eventually reach a maximum northern declination of 70° 41' the evening of March 11 2012 while crossing the boundary between Ursa Minor and the western tail of Draco and then start a SW march back into towards the southern skies while moving thru Ursa Minor thru all of late March and mid April. During the rest of winter and well into the month of March expect comet Garradd to surpass a nightly progression of 2"/min starting Feb 5 to over 3"/min by Feb 24. The night of its closest approach to Earth the comet will swing by at 3.3"/min. It's maximum progression across the northern night sky will peak at 3.33"/min during the evenings of 7 – 9 March and then it will move further from the Earth and it continues its headlong movement out of the inner solar system into the icy regions beyond the outer planets!*

## C/2009 P1 Garradd

*Figure 1: Garradd P1 projected path across the Summer/Spring Constellations thru Early - March 2012!*

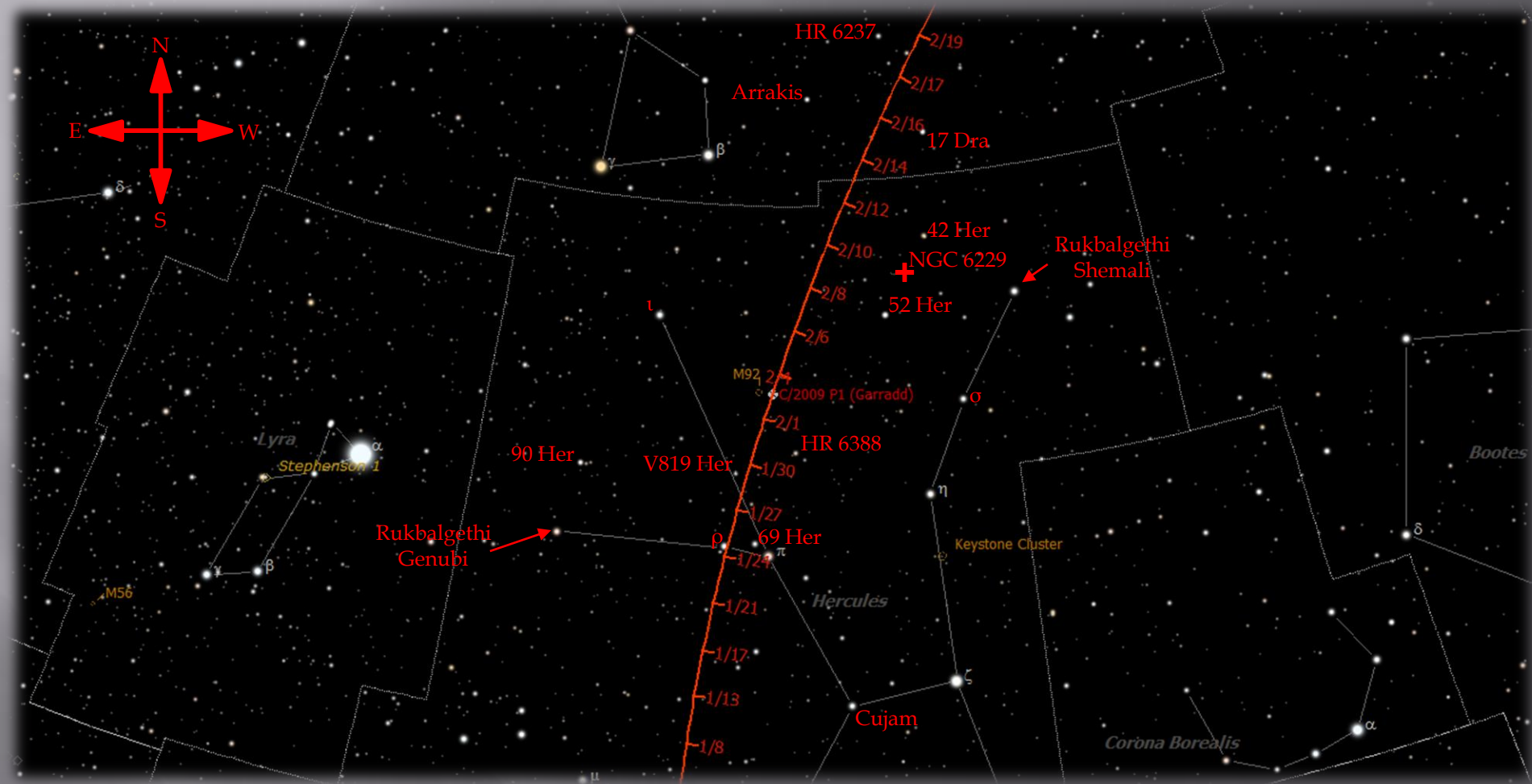


Courtesy of SkyTools 3 Profession Ed, 2012.

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## C/2009 P1 Garradd

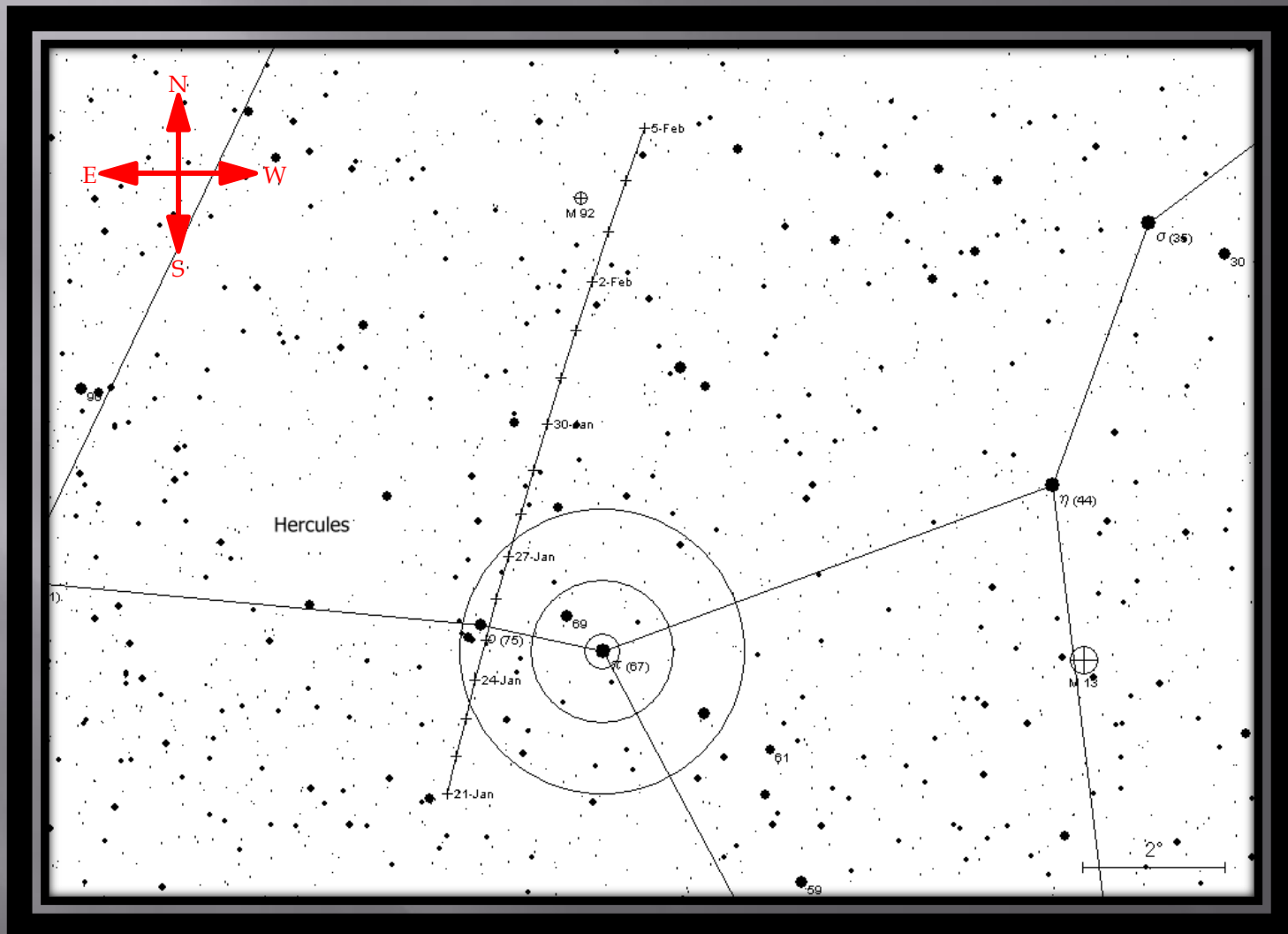
*Figure 2: Close up of Garradd's projected path from '8 Jan - 19 Feb' 2012!*



Courtesy of SkyTools 3 Profession Ed, 2012.

# C/2009 P1 Garradd

*Figure 3: Garradd's projected path in Hercules from '21 Jan - 5 Feb' 2012!*

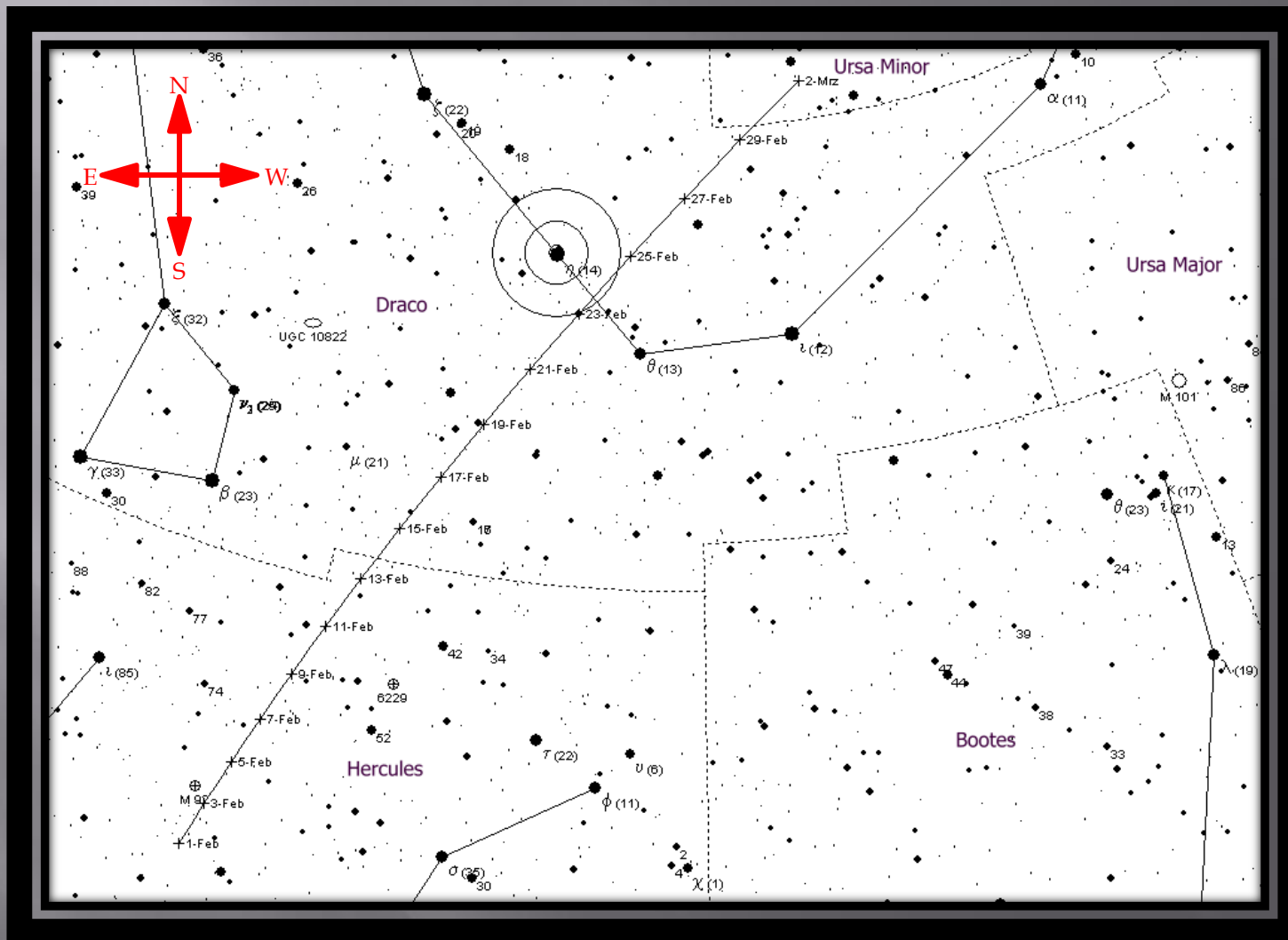


Courtesy of Winnie's Comet Pages, 2012.

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# C/2009 P1 Garradd

*Figure 4: Garradd's projected path into Draco from '1 Feb- 2 Mar' 2012!*



Courtesy of Winnie's Comet Pages, 2012.

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*Bright Stars in Hercules along the Winter path of Comet Garradd*

Star	Common Designations	Vis. Mag	Classification	Stellar Attributes	R.A. (2000)	Dec (2000)	Distance (lys)
Cujam	Epsilon (ε) Her, 58 Her, HR 6324, HD 153808	3.92	A0 V	None	17h 0m 17.3s	+30°55'35"	160
Pi (π) Her	67 Her, HR 6418, HD 156283	3.18	K3 II	Suspected Variable	17h 15m 2.8s	+36°48'33"	370
Rho (ρ) Her	75 Her, STF 2161, HR 6484, HD 157778	5.40	B9.5 III/A0 V/K0 V	Triple Star System	17h 23m 40.7s	+37°08'49"	401
69 Her	HR 6436, HD 156729, SAO 65921	4.66	A2V	Suspected Variable	17h 17m 40.3s	+37°17'30"	180
Rukbalgethi Genubi	Genu Sinistrum Ingeniculi, Theta (θ) Her, 91 Her, HD 163770	3.88	K1 II	Suspected Variable (+/- 0.05 Mag)	17h 56m 15.2s	+37° 15' 02"	670
V819 Her	HR 6469, HD 157482, SAO 46664	5.57	G0 V	Variable Type: Algol	17h 21m 43.6s	+39°58'28"	210
HR 6388	HD 155410, SAO 46524, TYC 03076 - 1566 1	5.07	K0 V	None	17h 9m 33.2s	+40° 46' 37"	280
90 Her	BU 130, HIP 87563, TYC 03093 - 1947 2	5.32	K3 III (Primary Star)	Stellar Binary	17h 53m 18.2s	+40° 00' 29"	363
52 Her	V637 Her, BU 627, HIP 82321, TYC 03500 - 2419 2	4.82	A2 V	Variable Type: Alpha 2 CVn	16h 49m14.3s	+45 59' 01"	175
Iota (ι) Her	Tain Bang Wu, 85 Her, HR 6588, HD 160762	3.75	B3 IV	Variable Type: Beta Cep	17h 39m 27.9s	+46° 00' 23"	500
42 Her	V906 Her, HR 6200 , HD 150450	4.86	M2.5 III	Suspected Variable	16h 38m 44.8s	+48° 55' 42"	380
17 Dra	HR 66186, HD 150118, SAO 30013	6.42	A2 V	None	16h 36m 14.1s	+52° 55' 27"	400

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IAU MPC Ephemeris data for C/2009 P1 Garradd (February 2012):

<b>Date</b>	<b>CDT/CST</b>	<b>R.A. (J2000)</b>	<b>Decl.</b>	<b>Delta</b>	<b>r</b>	<b>El.</b>	<b>Ph.</b>	<b>M1</b>	<b>% Fore.</b>	<b>Sky Motion</b>	<b>Moon Phase</b>	<b>Moon Mag.</b>	
	h m s									"/min	P.A.	(0.00 - 1.00)	(Visual)
2012 02 01	180000	17 16 29.9	+41 48 05	1.538	1.646	78.0	35.9	7.1	41	1.80	342.2	0.65	-11.50
2012 02 02	180000	17 15 18.6	+42 29 54	1.525	1.650	79.0	35.9	7.1	41	1.85	341.6	0.74	-11.74
2012 02 03	180000	17 14 02.1	+43 12 41	1.511	1.655	80.0	35.9	7.1	41	1.90	341.0	0.82	-11.93
2012 02 04	180000	17 12 39.8	+43 56 28	1.498	1.660	81.0	35.9	7.1	41	1.95	340.4	0.89	-12.10
2012 02 05	180000	17 11 11.5	+44 41 15	1.486	1.665	82.0	35.9	7.1	41	2.00	339.7	0.95	-12.22
2012 02 06	180000	17 09 36.5	+45 27 01	1.473	1.669	83.0	35.9	7.1	41	2.05	339.1	0.98	-12.30
2012 02 07	180000	17 07 54.4	+46 13 46	1.460	1.675	84.0	35.9	7.1	41	2.10	338.4	1.00	-12.34
2012 02 08	180000	17 06 04.7	+47 01 31	1.448	1.680	85.0	35.8	7.1	42	2.16	337.6	0.99	-12.31
2012 02 09	180000	17 04 06.7	+47 50 13	1.436	1.685	86.0	35.7	7.1	42	2.21	336.9	0.96	-12.23
2012 02 10	180000	17 01 59.7	+48 39 52	1.424	1.690	87.1	35.7	7.0	42	2.27	336.1	0.90	-12.10
2012 02 11	180000	16 59 43.0	+49 30 27	1.412	1.696	88.1	35.6	7.0	42	2.32	335.3	0.82	-11.90
2012 02 12	180000	16 57 15.7	+50 21 56	1.401	1.701	89.1	35.5	7.0	42	2.38	334.4	0.72	-11.66
2012 02 13	180000	16 54 37.0	+51 14 16	1.390	1.707	90.1	35.3	7.0	42	2.44	333.5	0.61	-11.35
2012 02 14	180000	16 51 45.9	+52 07 25	1.379	1.713	91.2	35.2	7.0	42	2.49	332.6	0.50	-10.98
2012 02 15	180000	16 48 41.1	+53 01 18	1.369	1.718	92.2	35.1	7.0	43	2.55	331.6	0.39	-10.52
2012 02 16	180000	16 45 21.6	+53 55 53	1.359	1.724	93.2	34.9	7.0	43	2.61	330.6	0.28	-9.96
2012 02 17	180000	16 41 45.9	+54 51 04	1.349	1.730	94.2	34.7	7.0	43	2.66	329.4	0.19	-9.26
2012 02 18	180000	16 37 52.6	+55 46 45	1.340	1.736	95.2	34.5	7.0	43	2.72	328.3	0.11	-8.35
2012 02 19	180000	16 33 40.1	+56 42 50	1.332	1.742	96.2	34.3	7.0	44	2.77	327.0	0.05	-7.06
2012 02 20	180000	16 29 06.5	+57 39 11	1.323	1.748	97.2	34.1	7.0	44	2.82	325.7	0.02	-4.98
2012 02 21	180000	16 24 09.9	+58 35 40	1.315	1.755	98.2	33.9	7.0	44	2.87	324.2	0.00	-1.76
2012 02 22	180000	16 18 48.2	+59 32 06	1.308	1.761	99.1	33.7	7.0	45	2.92	322.7	0.01	-4.83
2012 02 23	180000	16 12 59.1	+60 28 19	1.301	1.767	100.1	33.5	7.0	45	2.97	321.0	0.03	-6.87
2012 02 24	180000	16 06 40.1	+61 24 04	1.295	1.774	101.0	33.2	7.1	45	3.02	319.3	0.08	-8.10
2012 02 25	180000	15 59 48.7	+62 19 08	1.289	1.780	101.9	33.0	7.1	46	3.06	317.4	0.14	-8.96
2012 02 26	180000	15 52 22.0	+63 13 16	1.284	1.787	102.8	32.7	7.1	46	3.10	315.3	0.21	-9.62
2012 02 27	180000	15 44 17.3	+64 06 08	1.280	1.793	103.6	32.5	7.1	46	3.14	313.1	0.29	-10.15
2012 02 28	180000	15 35 31.8	+64 57 25	1.276	1.800	104.5	32.2	7.1	47	3.18	310.8	0.38	-10.59
2012 02 29	180000	15 26 03.0	+65 46 45	1.272	1.807	105.3	31.9	7.1	47	3.21	308.2	0.47	-10.97
2012 03 01	180000	15 15 48.3	+66 33 45	1.270	1.814	106.0	31.7	7.1	48	3.24	305.5	0.57	-11.29
2012 03 02	180000	15 04 46.1	+67 18 00	1.268	1.821	106.8	31.4	7.1	48	3.26	302.6	0.66	-11.58

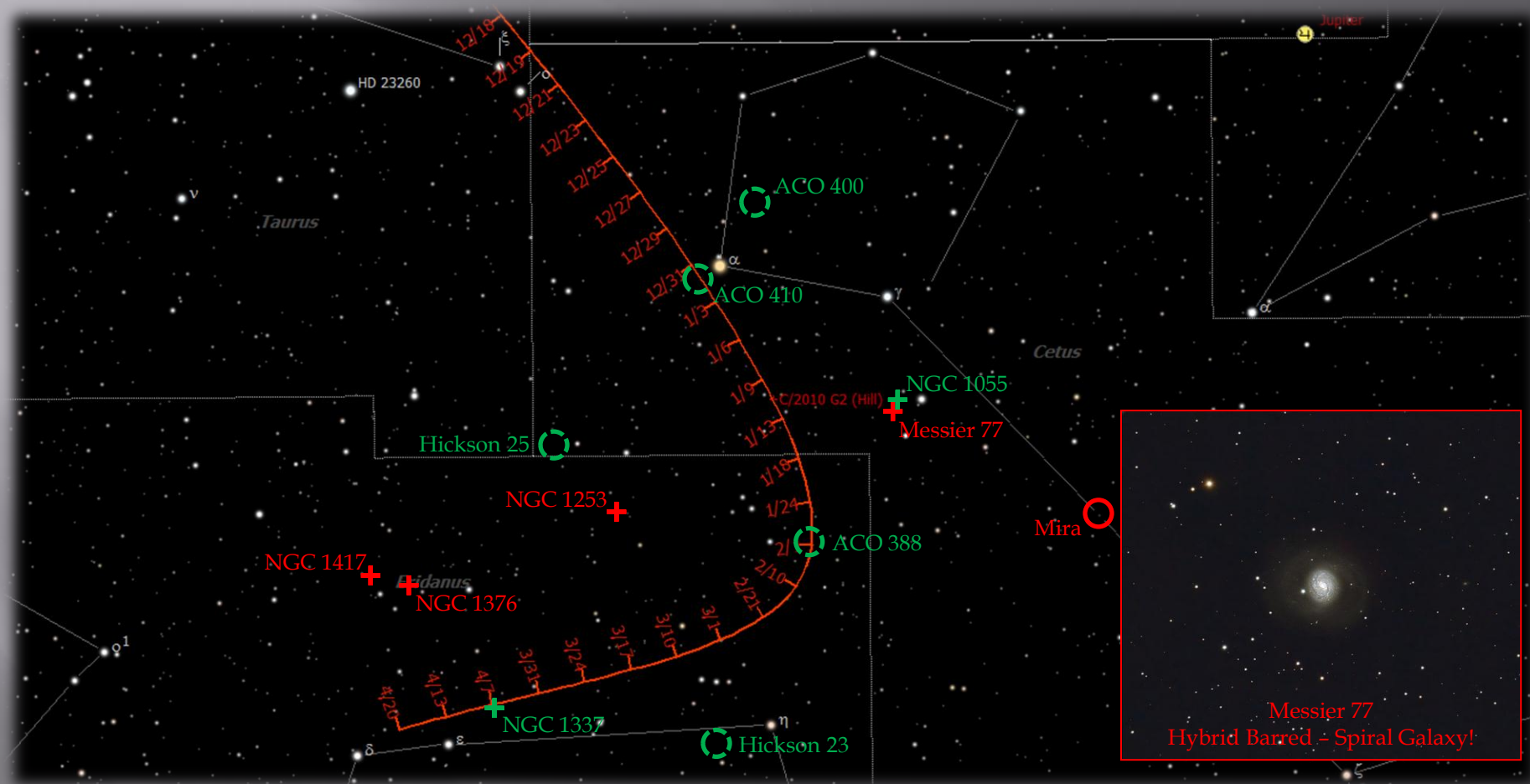
*All ephemeris data is calculated based on the Geographical location of the George Observatory, SE Texas, United States.*

*29°22'30" N, 95°35'37" W*

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## C/2010 G2 Hill

*Figure 5: The projected path for comet Hill through Cetus & Eridanus for Winter/Spring 2012!*



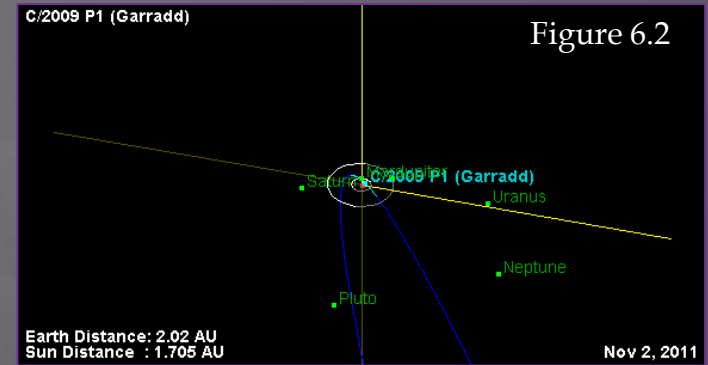
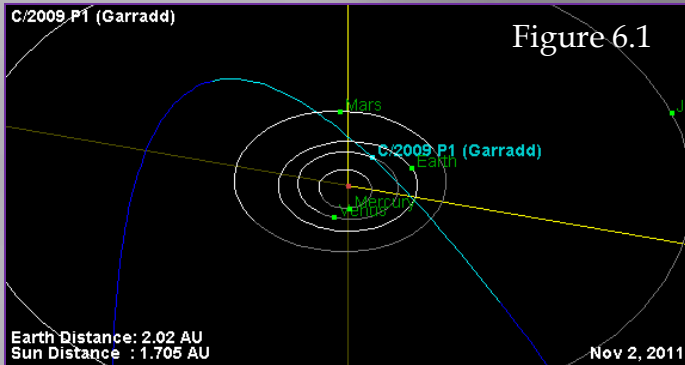
Courtesy of SkyTools 3 Profession Ed, 2012.

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## *Common DSOs near the Winter path of Comet C/2010 G2 Hill*

DSO	Common Designations	Vis. Mag	Classification (stellar or non - stellar)	DSO Attributes	R.A. (2000)	Dec (2000)	Distance (lys)
ABELL 400	ACO 400	13.9	Non - Stellar	Galaxy Cluster	2h 57m 36.0s	+06° 01' 00"	310 million
Hickson 25	HCG 25	12.9	Non - Stellar	Small Galaxy Group (7 Members)	3h 20m 43.7s	-01° 03' 07"	~300 million
Menkar	Alpha (α) Ceti, 92 Cet, HR 911, HD 18884	2.50	Stellar	M1.5 III Variable Type: LB	3h 2m 16.8s	+04° 05' 22"	220
Kaffaljidhma	Gamma (γ) Ceti, 86 Cet, HR 804, HD 16970	3.47	Stellar	A3 V Binary Star	2h 43m 17.9s	+03° 14' 07"	82
NGC 1055	MCG 0 - 7 - 81, UGC 2173, PGC 10208	11.40	Non - Stellar	Spiral Galaxy Hubble Type: SBb	2h 41m 45.2s	+00° 26' 32"	52 million
M 77	NGC 1068, Arp 37, MCG 0 - 7 - 83	9.70	Non - Stellar	Spiral Galaxy Hubble Type: Sb	2h 42m 40.8s	-00° 00' 48"	70 million
Mira	Omicron (ο) Ceti, 68 Cet, HR 681, HD 14386	6.05	Stellar	M5e - M9e Variable Type: Mira	2h 19m 20.8s	-02° 58' 42"	420
NGC 1253	Arp 279, MCG -1-9-18, PGC 12041	12.30	Non - Stellar	Barred - Spiral Galaxy	3h 14m 9.1s	-02° 49' 22"	75 million
NGC 1376	MCG -1-10-11, PGC 13352	12.90	Non - Stellar	Spiral Galaxy Hubble Type: Sc	3h 37m 5.9s	-05° 02' 34"	>180 million
Azha	Eta (η) Eri, 3 Eri, HR 874, HD 18322	3.87	Stellar	K1 III Suspected Variable	2h 56m 25.7s	-08° 53' 56"	130
Sadira	Epsilon (ε) Eri, 18 Eri, HR 1084, HD 22049	3.75	Stellar	K2 V Variable Type: BY Dra	3h 32m 55.0s	-09° 27' 30"	10
Rana	Delta (δ) Eri, 23 Eri, HR 1136, HD 23249	3.56	Stellar	K0 IV Variable Type: RS CVn	3h 43m 14.8s	-09° 45' 39"	29
NGC 1337	MCG -2-9-42, PGC 12916	12.40	Non - Stellar	Spiral Galaxy Hubble Type: SBc	3h 28m 5.8s	-08° 23' 18"	55 million

## Overview of the Orbital Differences for Comets!



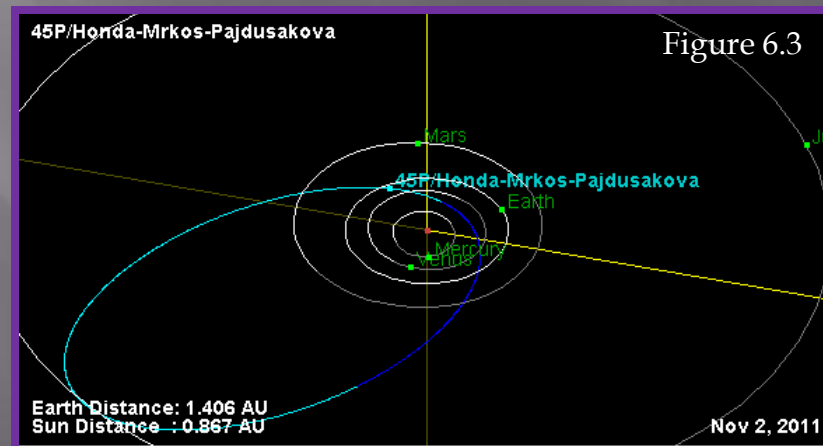
P - Periodic Comets

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 6.1 & 6.2 are of Comet C/Garradd 2009 P1 and Figure 6.3 below is off 45P.

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



Late Winter  
February 2012



**Comet Lovejoy  
(C/2011 W3)**

© Dan Burbank - NASA Astronaut  
Mission Commander, ISS Expedition 30  
Earth Orbit - ISS, 22 December 2011.



**C/2010 G2 Hill**



**78P/Gehrels 2**



**255P/Levy**



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