DEEP-SKY CHALLENGE OBJECTS

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The beauty of the deep sky extends well past the best and brightest objects. The attraction of observing is not the sight of an object itself but our intellectual contact with what it *is*. A faint, stellar point in Virgo evokes wonder when you try to fathom the depths of this quasar billions of light-years away. The eclectic collection of objects below is designed to introduce some "fringe" catalogs while providing challenging targets for a wide range of apertures. Often more important than sheer aperture are factors such as the quality of sky, quality of the optics, use of an appropriate filter, and the observer's experience. Don't be afraid to tackle some of these with a smaller telescope.

Objects are listed in order of right ascension. Abbreviations are the same as in THE MESSIER CATALOGUE and THE FINEST NGC OBJECTS, with the addition of DN = dark nebula and Q = quasar. **Chart #** indicates the chart in which the object can be found in *Uranometria 2000.0 Deep Sky Atlas* (2nd Ed., 2001). The last column suggests the minimum aperture, in millimetres, needed to see that object. Most data are taken from *Sky Catalogue 2000.0, Vol. 2*. Some visual magnitudes are from other sources.

#	Object	Con	Type	RA (2000) h m	Dec ° ′	m_v	Size ′	Chart #	Minimum Aperture mm
1	**NGC 7822**	Cep	E/RN	0 03.6	+68 37	—	60 × 30	8	300
	large, faint emission nebula; rated "eeF"; also look for E/R nebula Ced 214 (associated w/ star cluster Berkeley 59) 1° S								
2	**IC 59**	Cas	E/RN	0 56.7	+61 04	—	10 × 5	18	200–250
	faint emission/reflection nebula paired with IC 63 very close to γ Cas.; requires clean optics; rated as "pF"								
3	**NGC 609**	Cas	OC	1 37.2	+64 33	11.0	3.0	17	250–300
	faint patch at low power; high power needed to resolve this rich cluster (also look for Trumpler 1 cluster 3° S)								
4	**IC 1795**	Cas	EN	2 24.7	+61 54	—	27 × 13	29	200
	brightest part of a complex of nebulosity that includes IC 1805 and IC 1848; use a nebular filter								
5	**Maffei I**	Cas	G-E3	2 36.3	+59 39	≈14	5 × 3	29	300
	heavily reddened galaxy; very faint; requires large aperture and black skies; nearby Maffei II for extremists								
6	**NGC 1049**	For	GC	2 39.7	–34 29	11.0	0.6	175	250–300
	Class V globular in dwarf "Fornax System" Local Group galaxy 630 000 ly away; galaxy itself invisible?								
7	**Abell 426**	Per	G cl.	3 19.8	+41 31	12–16	≈30	43, A4	200–400
	Perseus galaxy cluster 300 million ly away; mag. 11.6 NGC 1275 Perseus A at center; see close-up chart A4								
8	**NGC 1432/35**	Tau	RN	3 46.1	+23 47	—	30 × 30	78, A12	100–150
	Pleiades nebulosity (also includes IC 349); brightest around Merope; requires transparent skies and clean optics								
9	**IC 342**	Cam	G-SBc	3 46.8	+68 06	≈12	17 × 17	16	200–300
	large and diffuse face-on spiral; member of UMa–Cam cloud (Kemble's Cascade of stars also on this chart)								
10	**NGC 1499**	Per	EN	4 00.7	+36 37	—	145 × 40	60	80–125 RFT
	California Nebula; very large and faint; use a wide-field telescope or big binoculars plus Hβ filter								
11	**IC 405**	Aur	E/RN	5 16.2	+34 16	—	30 × 19	59	200
	Flaming Star Nebula associated with runaway star AE Aurigae; see Burnham's Handbook p. 285 (also look for IC 410)								
12	**HH 1**	Ori	E	5 36.3	–06 45	≈14.5	8″	136	250
	Herbig–Haro 1; best with no filter at 250× or more; bipolar jets from forming star; not plotted; 2.5′ SW NGC 1999								
13	**IC 434 / B 33**	Ori	E/DN	5 40.9	–2 28	—	60 × 10	116	100–150 in dark sky!
	B 33 is the Horsehead Nebula, a dark nebula superimposed on a very faint emission nebula IC 434; use Hβ filter								
14	**Sh 2-276**	Ori	EN	5 48.0	+1 —	—	600 × 30!	116	100–150 RFT
	Barnard's Loop; SNR or interstellar bubble? difficult to detect due to size; use filter and sweep with wide field								
15	**Abell 12**	Ori	PN	6 02.4	+9 39	≈13	37″	96	250–300
	plotted in *Uranometria* as PK 198.6–6.3; on NW edge of μ Orionis; OIII filter required								
16	**IC 443**	Gem	SNR	6 16.9	+22 47	—	50 × 40	76	250–300
	faint supernova remnant very close to η Gem.; use filter (also look for NGC 2174 and Sh 2–247 on this chart)								
17	**J 900**	Gem	PN	6 25.9	+17 47	12.2	8″	76	200
	Jonckheere 900; bright starlike planetary; plotted as PK 194.2+2.5 in *Uranometria*; use OIII filter & high power								
18	**IC 2177**	Mon	E/RN	7 05.1	–10 42	—	120 × 40	135	200–300
	Seagull Nebula; large, faint; contains bright patches Gum 1 (–10°28′), NGC 2327 (–11°18′) & Ced 90 (–12°20′)								

DEEP-SKY CHALLENGE OBJECTS (continued)

#	Object	Con	Type	RA (2000) h m	Dec ° ′	m_v	Size ′	Chart #	Minimum Aperture mm
19	**PK 205 +14.2**	Gem	PN	7 29.0	+13 15	≈13	≈700″	95	200–250
	Medusa Nebula or Abell 21; impressive in large aperture w/ OIII filter								
20	**PK 164 +31.1**	Lyn	PN	7 57.8	+53 25	≈14	400″	26	250
	Jones–Emberson 1; faint with two small components; use OIII filter; sometimes confused with nearby NGC 2474–75								
21	**Leo I**	Leo	G-E3	10 08.4	+12 18	9.8	10.7×8.3	93	300
	dwarf elliptical; satellite of Milky Way; very low surface brightness; 0.3° N of Regulus! requires clean optics								
22	**Abell 1367**	Leo	G cl.	11 44.0	+19 57	13–16	≈60	72, A11	300–400
	cluster of some 30 or more galaxies within a 1° field near 93 Leonis; Copeland's Septet nearby								
23	**NGC 3172**	UMi	G-Sb	11 50.2	+89 07	13.6	0.7×0.7	1	250
	"Polarissima Borealis"—closest galaxy to the north celestial pole; small, faint, and otherwise unremarkable								
24	**NGC 4236**	Dra	G-SBb	12 16.7	+69 28	9.6	18.6×6.9	13	200–250
	very large, dim barred spiral; a diffuse glow (NGC 4395 on Chart #54 a similar large diffuse face-on)								
25	**Mrk 205**	Dra	Q	12 21.6	+75 18	14.5	stellar	5	300
	Markarian 205; a faint star on SW edge of NGC 4319; center of redshift controversy								
26	**3C 273**	Vir	Q	12 29.1	+2 03	12–13	stellar	111	250–300
	at 2–3 billon ly away, one of the most distant objects visible in amateur telescopes; magnitude variable								
27	**NGC 4676**	Com	G cl.	12 46.2	+30 44	14.lp	2×1	53	250
	"The Mice" or VV 224—two classic interacting galaxies; very faint double nature detectable at high power								
28	**Abell 1656**	Com	G cl.	13 00.1	+27 58	12–16	≈60	71, A8	250–300
	Coma Berenices galaxy cluster; very rich; 400 million ly away; brightest member NGC 4889; see close-up chart A8								
29	**NGC 5053**	Com	GC	13 16.4	+17 42	9.8	10.5	71	100–200
	faint and very loose globular 1° SE of M53; requires large aperture to resolve; difficult in hazy skies; class XI								
30	**NGC 5897**	Lib	GC	15 17.4	−21 01	8.6	12.6	148	150–200
	large and loose; easily hidden in hazy skies at higher latitude; brightest stars mag. 13.3, main branch mag. 16.3								
31	**Abell 2065**	CrB	G cl.	15 22.7	+27 43	≈16	≈30	69	500 in superb sky!
	Corona Borealis galaxy cluster; perhaps the most difficult object for amateur telescopes; 1.5 billion ly away								
32	**NGC 6027**	Ser	G cl.	15 59.2	+20 45	≈15	2×1	69	400
	Seyfert's Sextet (6027 A–F); compact group of 6 small and very faint galaxies; see Burnham's Handbook p. 1793								
33	**B 72**	Oph	DN	17 23.5	−23 38	—	30	146	80–125 RFT
	Barnard's dark S-Nebula or "The Snake"; opacity of 6/6; 1.5° NNE of θ Ophiuchi; area rich in dark nebulae								
34	**NGC 6791**	Lyr	OC	19 20.7	+37 51	9.5	16	48	200–250
	large, faint but very rich open cluster with 300 stars; a faint smear in smaller instruments; Type II 3 r								
35	**PK 64 +5.l**	Cyg	PN	19 34.8	+30 31	9.6	8″	48	200
	Campbell's Hydrogen Star; very bright but very starlike; also cataloged as star BD +30°3639								
36	**M 1-92**	Cyg	RN	19 36.3	+29 33	11.0	12″×6″	48	250–300
	Minkowski 1-92 or Footprint Nebula; bright, starlike reflection nebula; double at high mag; associated star invisible								
37	**NGC 6822**	Sgr	G-I	19 44.9	−14 48	≈11	l0.2×9.5	125	100–150
	Barnard's Galaxy; member of the Local Group; large but very low surface brightness; requires transparent skies								
38	**Palomar 11**	Aql	GC	19 45.2	−8 00	9.8	3.2	125	200–300
	brightest of 15 heavily reddened GCs found on Sky Survey; magnitude is misleading; 11 Terzan GCs more challenging								
39	**IC 4997**	Sge	PN	20 20.2	+16 45	10.9	2″	84	200
	bright but starlike planetary; the challenge is to see the disk! blink the field with and without a nebular filter								
40	**IC 1318**	Cyg	EN	20 26.2	+40 30	—	large	32, A2	80–150 RFT
	complex of nebulosity around γ Cygni; multitude of patches in rich starfield; use a very wide field plus filter								
41	**PK 80 –6.1**	Cyg	PN?	21 02.3	+36 42	13.5	16″	47	250
	the "Egg Nebula"; a very small proto-planetary nebula; can owners of large telescopes detect polarization?								
42	**IC 1396**	Cep	EN	21 39.1	+57 30	—	170×140	19	100–125 RFT
	extremely large and diffuse area of emission nebulosity; use nebular filter and very wide-field optics in dark sky								
43	**IC 5146**	Cyg	E/RN	21 53.5	+47 16	—	12×12	31	200–250
	Cocoon Nebula; faint and diffuse; use Hβ filter; at the end of the long filamentary dark nebula Barnard 168								
44	**NGC 7317–20**	Peg	G cl.	22 36.1	+33 57	13–14	≈1 ea.	46	250–300
	Stephan's Quintet; 0.5° SSW of NGC 7331; easy to pick out 3 or 4 (also look for "companions" to 7331)								
45	**Jones 1**	Peg	PN	23 35.9	+30 28	12.1	332"	45	250–300
	plotted as PK 104.2 –29.6 in *Uranometria*; large dim glow; OIII filter required								