ASSA DEEP SKY BULLETIN:

OBSERVING THE ESKIMO (NGC 2392), SOUTHERN RING (NGC 3132), BLUE (NGC 3918) AND THE CORVUS (NGC 4361) PLANETARY NEBULAE

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A INTRODUCTION

Planetary nebulae, the glowing remnants of dying stars, offer breathtaking views and critical insights into the stellar evolution. This bulletin highlights prominent planetary nebulae visible from the southern hemisphere, including observational tips and scientific significance.The strategy for observing planetary nebulae is to search with low magnification and on finding your target to switch to higher magnification to observe finer details.

Two observing techniques will dramatically improve the detail you can see in planetary nebulae.

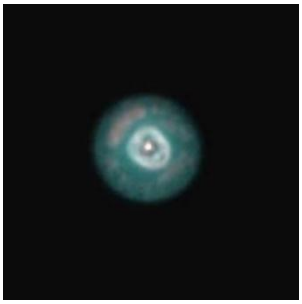
First, gently moving the telescope in right ascension or declination by small amounts as you use averted vision which make it easier to see minute details. This is because your eyes are greatly sensitive to motion.

Second, try using red-transmissive nebula filters like a UHC filter. This device transmits the nebula's light to your eye but blocks scattered terrrestrial lighting. Backyard telescopes and patient eyes also show that these objects vary considerably in structure, from rings to disks to complex shells.

The observer will find planetary nebulae to be some of the most varied, unusual forms in our galaxy. There are about 3500 planetary nebulae in the galaxy.

B THE PLANETARY NEBULAE (NGC 2392, 3132, 3918 AND 4361)

1 THE ESKIMO/CLOWN FACE NEBULA (NGC 2392)



1.1 OVERVIEW

Discovered by the German-English astronomer William Herschel in 1787. NGC 2392, commonly known as the Eskimo nebula, is a striking planetary nebula in the constellation Gemini.

Its distinctive appearance, resembling a face surrounded by a fur-lined hood, has made it a favourite among amateur and professional astronomers alike. This Deep Sky object offers a fascinating glimpse into the evolutionary stages of a sun-like star.

1.2 OBSERVATIONAL DATA

1.2.1 Designation: NGC 3292/Caldwell 39
1.2.2 Constellation: Gemini
1.2.3 Right ascension: 07h 29m 10.8s
1.2.4 Declination: +20°54’42”
1.2.5 Magnitude: 9.2
1.2.6 Apparent size: 47 arcseconds
1.2.7 Distance: 6500 light years

1.3 STRUCTURE AND COMPOSITION

NGC 2392 consists of two main shells of gas ejected by its dying central star. The inner shell is denser and forms a bright core, while the outer shell extends outward in a complex pattern. Spectral analysis reveals emission lines of ionized oxygen, hydrogen and nitrogen, giving the nebula its characteristic blue-green hue. The central white dwarf, with an estimated temperature of over 50000K, emits intense ultraviolet radiation, causing the surrounding gas to glow.

1.4 ASTROPHYSICAL SIGNIFICANCE

As a classic planetary nebula, NGC 2392 represents the fate of medium-sized stars, including our sun. The outer layers, shed during the red giant phase, will eventually disperse, leaving behind a slowly cooling white dwarf. Studying this nebula provides crucial insights into stellar evolution and the chemical enrichment of the interstellar medium.

1.5 OBSERVATION TIPS

NGC 2392 is best observed from November to March, when Gemini is high in the northern night sky. An UHC or O III filter can enhance contrast and bring out finer structural details.

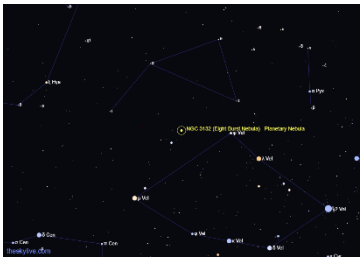
Even a small telescope (under 6 inch or 15 cm aperture) will show it as a small greenish ball with slightly fuzzy edges. An 8 inch (20cm) aperture will

begin to show that the disk is surrounded by another ring or shell, which becomes conspicious in a 16 inch (40 cm) and larger telescopes. This is the fur parka around the Eskimo's face. The central star, which is easy to see at 9th magnitude, is sometimes identified with the Eskimo's nose. Detail within the bright inner disk is complicated and made difficult to see by the presence or the central star.

1.6 CONCLUSION

The Eskimo nebula remains one of the most visually striking planetary nebular in the night sky. Its detailed structure and evolutionary significance make it an essential target for Deep Sky enthusiasts. Whether viewed through a small telescope or imaged with advanced astrophotography equipment NGC 2392 offers a stunning look into the cosmic future of our sun.

2 THE SOUTHERN RING/EIGHT-BURST NEBULA (NGC 3132)



2.1 OVERVIEW

Discovered by English astronomer John Herschel (son of William) when in Cape Town in 1835, the Southern Ring nebula, also known as the Eight-Burst nebula, is a striking planetary nebula located in the constellation Vela. This celestial wonder is a prime target for amateur and professional astronomers alike, offering a breathtaking display of delicate shell structures and vibrant colour contrasts.

2.2 OBSERVATION DATA

2.2.1 Designation: NGC 3132
2.2.2 Constellation: Vela
2.2.3 Right ascension: 10h 07.7 m
2.2.4 Declination: -40°26'
2.2.5 Magnitude: 9.87
2.2.6 Apparent size: 1.3 arcminutes
2.2.7 Distance: 2000 light years

2.3 STRUCTURE AND COMPOSITION

The central binary system includes a faint white dwarf and a brighter companion star, which together contribute to nebula's illumination. The nebula's assymetrical shape and overlapping shells suggest complex interactions with its surrounding interstellar medium. Infrared observations, notably from the James Webb Space Telescope (JWST), have revealed hidden dust structures and molecular outflows within the nebula.

2.4 ASTROPHYSICAL SIGNIFICANCE

NGC 3132 provides critical insights into the evolutionary stages of low – to intermediate – mass stars. The nebula's complex morphology and layered structures offer valuable data for understanding mass loss and stellar wind interactions in aging stars.

Observations from JWST and Hubble Space Telescope continue to refine models of planetary nebulae formation and evolution.

2.5 OBSERVATION TIPS

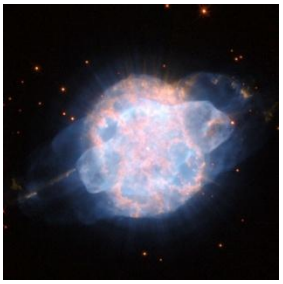
This is one of the best planetary nebulae for any telescope. NGC 3132 is best observed during late summer and early autumn. A small telescope (100-150 mm or 4-6 inches) will reveal its distinct ring shape, while larger telescopes (250 mm/10 inches or more) will showcase finer details, including its filamentary structure.

Using an O III filter will enhance visibility of the nebula's intricate features, bringing out more contrast between the outer shell and the background sky.

2.6 CONCLUSION

The Southern Ring nebula stands as one of the most visually captivating and scientifically significant planetry nebulae in the night sky. Whether observed visually or through advanced imaging techniques, it remains a fascinating target for both amateur stargazers and professional astronomers alike.

3 THE BLUE PLANETARY NEBULA (NGC 3918)



3.1 OVERVIEW

Discovered by English astronomer John Herschel in 1834, when in the Cape, NGC 3918, known as the blue planetary nebula, is one of the most spectacular planetary nebulae in the southern night sky. Its vivid blue-green hue and well-defined structure make it a fascinating target for all astronomers. Located in the constellation centaurus, it lies approximately 4900 light years from earth.

It is a very popular object for Deep Sky observers due to its striking resemblance to a distant planet.

3.2 OBSERVATION DATA

3.2.1 Designation: NGC 3918
3.2.2 Constellation: Centaurus
3.2.3 Right ascension: 11h 50.3m
3.2.4 Declination: -57°11’
3.2.5 Magnitude: 8.4
3.2.6 Size: 12”
3.2.7 Distance: 4900 light years

3.3 STRUCTURE AND COMPOSITION

The nebula consists of an inner bright region and a fainter, more diffuse outer shell, remnants of the dying star’s ejected outer layers. The central white dwarf, the core of the original progenitor star, is an extremely hot and dense remnant.

3.4 ASTROPHYSICAL SIGNIFICANCE

As a planetary nebula, NGC 3918 represents the final evolutionary phase of a low - to intermediate - mass star (1-8 solar masses). The expelled outer layers of gas are illuminated by the hot core, producing a characteristic glow seen in planetary nebulae. Spectroscopic studies reveal the presence of ionized oxygen, hydrogen and nitrogen, responsible for the Nebula’s blue-green appearance.

3.5 OBSERVATION TIPS

NGC 3918 is a prime target for small to medium sized (70-150 mm or 4-6 inches) telescopes. Even in a 6 inch (150 mm) telescope it appears as a bright, compact blue disk. Larger telescopes (8 inches/150 mm and above) reveal more details such as the nebula’s subtle shell structure and slightly

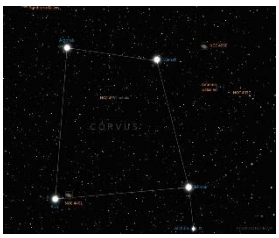
oval shape. High magnification helps distinguish its sharp edges from background stars.

The nebula also responds well to O III and UHC filters, which enhance its contrast against the sky and bring out the finer details.

3.6 CONCLUSION

NGC 3918 is a remarkable Deep Sky object that offers both aesthetic appeal and astro physical insight. Whether you are a casual stargazer or a dedicated observer the blue planetary nebula is a must-see for those exploring the southern celestial wonders.

4 THE GARDEN SPRINKLER PLANETARY NEBULA (NGC 4361)



4.1 OVERVIEW

NGC 4361 is a truly remarkable planetary nebula located in the constellation Corvus. Discovered by William Herschel in 1785, this nebula is an intriguing Deep Sky object, featuring a distinct appearance that also sets it apart from typical planetary nebulae. Its central star and diffuse outer envelope provide an extra-ordinary study in stellar evolution.

4.2 OBSERVATION DATA

4.2.1 Designation: NGC 4361
4.2.2 Type: Planetary nebula
4.2.3 Constellation: Corvus
4.2.4 Right ascension: 12h 24 m 5.8s
4.2.5 Declination: -18°47’6”
4.2.6 Magnitude: 10.3
4.2.7 Size: -50 arcseconds
4.2.8 Distance: 3500 light years

4.3 STRUCTURE AND COMPOSITION

NGC 4361 is unusual in that it has four lobes, or jets, of ejected material instead of the standard or usual two lobes or jets. Astronomers suspect there might be two dying stars inside the nebula, each producing a bipolar jet. The colour orange primarily shows heated gas. NGC 4361 is an extremely high excitation, low-density, very inhomo-geneous nebula. Indeed a nebula to crow about!

4.4 ASTROPHYSICAL SIGNIFICANCE

NGC 4361, like the above mentioned nebulae, also represents the late evolutionary stage of a sun-like star. The central white dwarf, having expelled its outer layers, now illuminates the expanding shell of ionized gas. Studies of this nebula also contribute to our understanding of stellar death processes, chemical enrichment and the dynamics of planetary nebulae evolution.

4.5 OBSERVATION TIPS

Through moderate-sized telescopes, NGC 4361 appears as a faint, circular nebula with a soft, diffuse glow. Larger apertures (8 inch/200 mm and above) reveal an intricate structure with faint outer lobes resembling the shape of a galaxy rather than a typical round or ring-like planetary nebula. The central star, a fading white dwarf, is visible at magnitude 13.3, providing an excellent target for high-power observations. It is best viewed in the autumn and winter when Corvus is high up in the night sky.

A medium to large telescope (8 inch/200 mm and larger) is recommended for resolving its structure.

O III and UHC filters will also enhance contrast and help reveal finer nebular details.

For astrophotographers long-exposure imaging can capture the extended faint filaments and highlight the unique structure.

4.6 CONCLUSION

NGC 4361 stands out among planetary nebulae due to its unusual shape and diffuse nature. It serves as an excellent target for dedicated observers and astrophotographers looking for a challenge beyond the more well-known planetary nebulae. Whether visually or through imaging, this deep-sky object offers an intruing glimpse into the final stages of stellar evolution.

C ASTROPHOTOGRAPHY TIPS

1 FILTERS

Narrowband filters like II-Alpha, O III and S II help bring out specific emission lines, highlighting the intricate structure of planetary nebulae.

2 Long exposures capture faint outer shells and subtle colour gradients.

3 Guiding and precise tracking are essential for high-resolution imaging of small, bright nebulae like NGC 3918.

D SCIENTIFIC INSIGHTS

Planetary nebulae are laboratories for studying:

1 STELLAR EVOLUTION

The transition from red giants to white dwarfs.

2 CHEMICAL ENRICHMENT

The recycling of elements like carbon, nitrogen and oxygen into the interstellar medium.

The cosmos is a gigantic recycling factory, from stardust to stardust.

3 NEBULAE DYNAMICS

The role of magnetic fields and binary stars in shaping asymmetric structures.

E CONCLUSION

Planetary nebulae offer unparalleled opportunities for both amateur astronomers and astrophotographers alike. Whether you're marveling at the intricate Southern Ring or uncovering the delightful colours of the Blue nebula, these celestial objects are a testament to the universe beauty and complexity.

I wish you all clear skies and happy observations!

Colin Steyn

ACKNOWLEDGEMENTS

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