

Tonight's Novice topic is:

# How do you classify planetary nebulae?

A very brief intro to the Vorontsov-Velyaminov  
system



Compiled by Jim Wessel  
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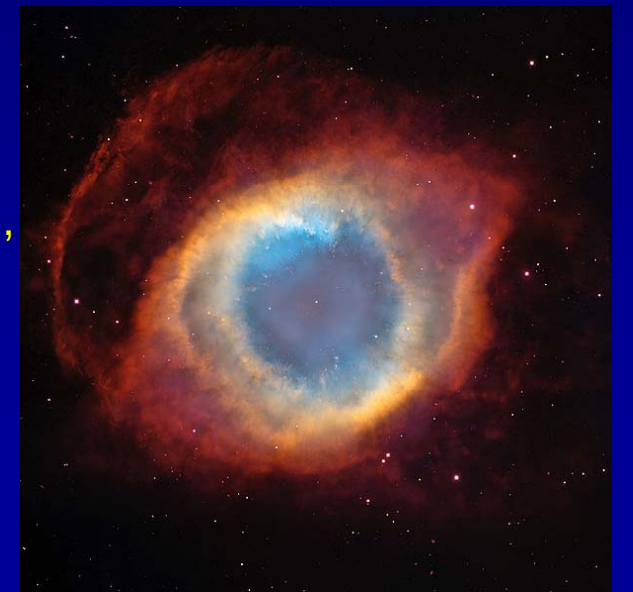
## V-V PNe classification system novice talk

- First – What is a Planetary Nebula?
- Some facts...
- Why are they important?
- How many are there in the Milky Way?



Clockwise from top: Cat's Eye Nebula (NGC 6543), Helix Nebula (NGC 7293), Eskimo Nebula (NGC 2392)

Photo credits are all NASA and various collaborators



## Boris Aleksandrovich Vorontsov-Velyaminov

- February 14, 1904 – January 27, 1994.
- Soviet/Russian astrophysicist.
- Independently discovered the absorption of light by interstellar dust (Robert J. Trumpler also found this).
- Created a catalogue of what are now known as Vorontsov-Velyaminov galaxies (the *Atlas of Interacting Galaxies*), as well as a larger and more general catalogue of galaxies (the *Morphological Catalogue of Galaxies*).
- He also studied and classified Planetary Nebulae. His system is the most commonly used means of identifying Planetary Nebulae today.



# Vorontsov-Velyaminov Planetary Nebula Classification System

**I: Stellar image** (like a star);

**II: Regular disk** (or a smooth disk):

**a:** has a shinier core (where the disk is brighter towards the center)

**b:** Uniform brightness

**c:** Presence of an annular structure (e.g. ring)

**III: Irregular disc:** (shape is not entirely circular)

**a:** Irregular brightness (varying light and dark areas)

**b:** Presence of an annular structure (may have rings or portions of them)

**IV: Annular structure** (main structure or shape is a ring)

**V: Irregular form** between a planetary nebula and diffuse nebula;

**VI: Abnormal form** without a regular structure (shaped like an 'S' or an '8', etc).

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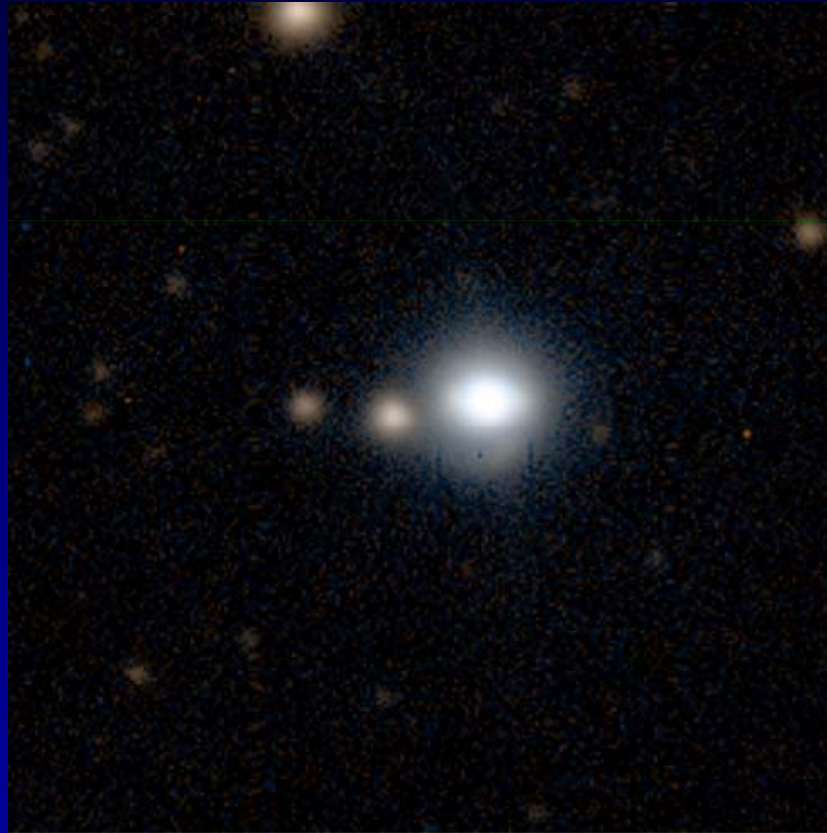
## **I: Stellar image (like a star)**



Cn 1-1, Digital Sky Survey Image

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## II: Regular disk (or a smooth disk)



Hb 7 G003.9-14.9 18 55 37.95 -32 15 47.1, R:G:B=log(Ha+[NII]), both, log[OIII]  
ref: Schwarz, H.E., Corradi, R.L.M., Melnick, J 1992 A&A Suppl, 96, 23  
image files courtesy R Corradi. N is NOT up. See ref for orientation.



**II: Regular disk (or a smooth disk):**

**a:** has a shinier core (where the disk is brighter towards the center)



NGC 6578 – Hubble Space Telescope Image

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**II: Regular disk (or a smooth disk):**  
**b: uniform brightness.**



NGC 3918 - Hubble Space Telescope image, processed by Al Kelly



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**II: Regular disk (or a smooth disk):**

c: Presence of an annular structure (e.g. ring)



Abell 39 – AURA, NOAO image

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### **III: Irregular disk (shape is not entirely circular)**



NGC 7008 – NOAO image

### III: Irregular disk

a: Irregular brightness (varying light and dark areas)



NGC 7027 – Hubble Space Telescope Image

### III: Irregular disk

**b:** Presence of an annular structure (may have rings or portions of them)



NGC 7139 – NOAO image

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## **IV: Annular structure** (main structure or shape is a ring)



IC 418 – Hubble Space Telescope Image

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**V: Irregular form:** between a planetary nebula and diffuse nebula



NGC 5189 – Gemini Telescope Image



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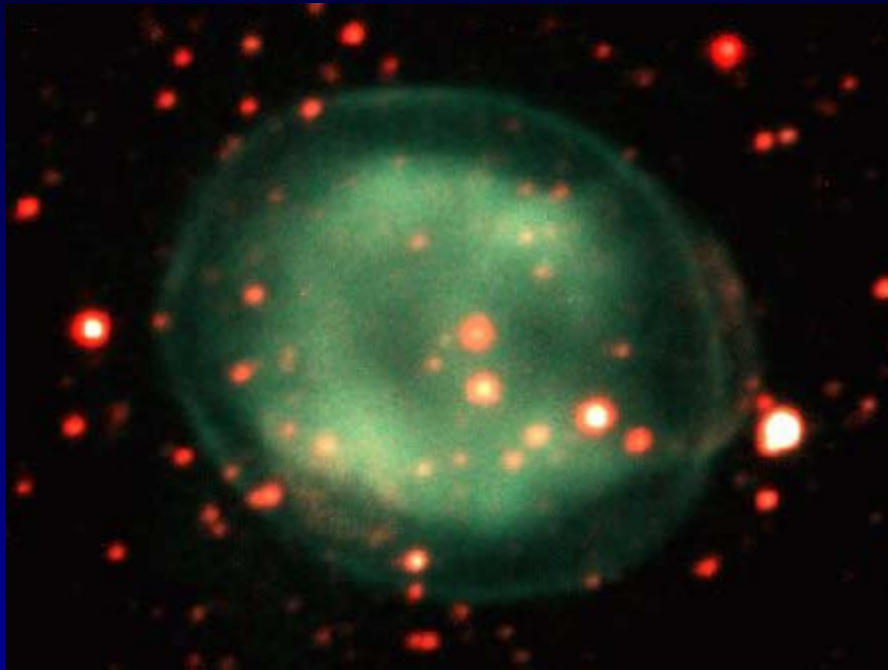
**VI: Abnormal form** without a regular structure (shaped like an 'S' or an '8', etc).



NGC 6302 – Hubble Space Telescope

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## Combinations of classifications:



IC 1295 - Type IIIb(II)



NGC 6804 - Type IV(II)

Sources used for this presentation were:

Wikipedia, [www.deepskyobserving.com](http://www.deepskyobserving.com),  
[www.blackskies.org](http://www.blackskies.org), [www.hubblesite.org](http://www.hubblesite.org), the  
Digital Sky Survey, the Gemini Telescope, and  
the National Optical Astronomy Observatory