

During April and May, the 3rd largest constellation in the sky - Ursa Major - does a back flip over the north star high overhead. Ursa Major, or "The Great Bear," is most recognizable as "The Big Dipper," the familiar star pattern (asterism) that forms the bear's "hind quarters" and "tail." This month, we will explore why Ursa Major can be considered one of the most useful constellations in the sky.

### Exploring Ursa Major with the Unaided Eye:

*Finding directions:* Start by looking overhead and finding the familiar square-shaped bowl and bent handle that forms the big dipper. Draw a line through the front two stars of the bowl down towards the horizon. It will intersect with a lone and somewhat dim star about 35 degrees above the horizon (from Clemson). This is **Polaris**, or **The North Star**. (Many people are surprised that it is not as bright as they expected.) Facing Polaris now gives you the cardinal directions from your current position: straight ahead - *north*, behind you - *south*, to your right - *east*, and to your left - *west*.

*Finding stars:* Remember this phrase: "Follow the arc to Arcturus, then spike to Spica." Now, find the big dipper and follow its handle towards the eastern horizon until you reach a very bright star; this is **Arcturus**, the brightest star in the constellation **Bootes**. Now continue on the same path until you reach the next bright star: **Spica**, the brightest star in constellation **Virgo**.

*Ursa Major:* To see the whole bear, face north and find the big dipper overhead. The bowl of the dipper forms his upper back and hind quarters while the handle forms his tail. In "front" of the bowl is a dim square and triangle of stars which form his upper back and head respectively. Then, south of the body of the bear, you can easily see 3 pairs of stars which form his feet. The legs and lower torso are very dim stars in between.

### Exploring Ursa Major with a Telescope:

Needless to say, Ursa Major isn't a real bear; rather, like all constellations, it is a map of an area of the sky. Using the stars as points on map, we can explore the deep space objects visible in the Ursa Major (see map on back of newsletter). We'll start with the nearest object to Earth and move outward to the distant edges of the Virgo Supercluster!

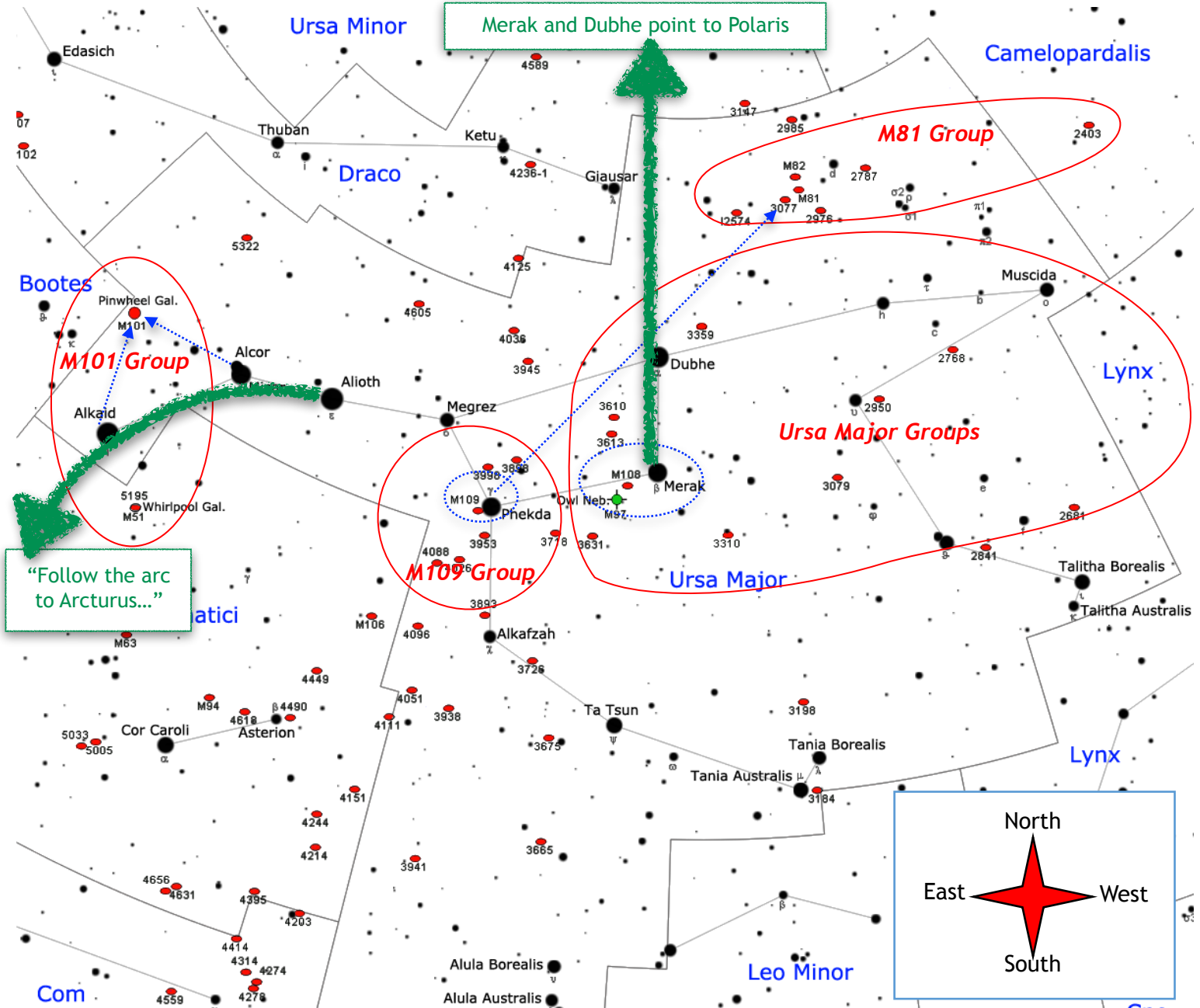
- **M97, "The Owl Nebula,"** is a 10th magnitude planetary nebula near the star **Merak** (beta-UMa) located above us on the galactic plane about 1200 lightyears from Earth. It appears as a bright round cloud containing 2 dim dark circles that give the appearance of "owl eyes."
- **M81 (Bode's Galaxy)** is a bright, large spiral galaxy that can be found south of the big dipper on a line formed by **Phekda** and **Dubhe** (see map). It is the largest of 34 galaxies in the M81 group, a cluster of galaxies near our own local group. M81 is 12 million light years from Earth
- **M82 (the Cigar Galaxy)** is an edge on starburst galaxy both visually and physically near M81. It is a member of the M81 group, 11.5 million lightyears away.
- **NGC 3077** is a small distorted elliptical galaxy also visually and physically near M81 and M82 and a member of their group. In fact, all 3 galaxies are interacting with each other and are connected with bands of hydrogen gas. It is 12.8 million light years away.
- **M101** is a large and beautiful, but very dim "grand design" spiral galaxy found at the "top of a equilateral triangle formed with **Alkaid** and **Alcor** (see map). Even at a large scope, it takes some time to see the spiral arms due. It is 21 million light years from earth and is a member of the M101 Galaxy Group (along with M51 nearby).
- **M109** is fairly bright barred spiral galaxy easily located in the sky near Phekda. It is 84 million light years away from Earth and is a member of the M109 group, a large group which contains over 50 galaxies.
- **M108** is a dim (vm 10) edge-on barred spiral galaxy that can be seen near M97. In fact, it is located over 80 MILLION light years from earth. It is one of the brighter members of the Ursa Major Galaxy Group in the Virgo Supercluster.

These are only a few of the dozens of wonderful galaxies visible in small and medium sized telescopes in and around Ursa Major. How many can you find?

### How many deep space objects can you find in Ursa Major?

To use this map:

Lie on the ground with your feet pointing south and your head pointing north. Ursa Major will be slightly north of straight up.



**Legend:**

- **Thick (green) lines:** unaided eye pointer stars (see text)
- **Dotted (blue) lines:** pointer stars for finding deep space objects with a telescope (see text)
- **Circles (red):** Galaxy Groups within the Virgo Supercluster (hand drawn by me – approximate fields):
  - M81 Group (M81, M82, NGC3077) - 10 million light years from Earth
  - M101 Group (M51, M101, etc.) – 20 million light years from Earth
  - M109 Group (M109, NGC3953, NGC4085, NGC4088, etc.) – 40 to 90 million light years from Earth
  - Ursa Major Group (M108, NGC3631, etc.) – 30 to 100 million light years from Earth