= Alpha Andromedae =

Alpha Andromedae ( Alpha And , ? And , ? Andromedae ) , which has the traditional names Alpheratz ( or Alpherat from the Arabic word ????? ) and Sirrah ( or Sirah ) , is the brightest star in the constellation of Andromeda . Located immediately northeast of the constellation of Pegasus , it is the northeastern star of the Great Square of Pegasus . Ptolemy considered Alpha Andromedae to be shared by Pegasus , and Bayer assigned it a designation in both constellations : Alpha Andromedae ( ? And ) and Delta Pegasi ( ? Peg ) . When the modern constellation boundaries were fixed in 1930 , the latter designation dropped from use .

It is located 97 light @-@ years from Earth . Although it appears to the naked eye as a single star , with overall apparent visual magnitude + 2 @.@ 06 , it is actually a binary system composed of two stars in close orbit . The chemical composition of the brighter of the two stars is unusual as it is a mercury @-@ manganese star whose atmosphere contains abnormally high levels of mercury , manganese , and other elements , including gallium and xenon . It is the brightest mercury @-@ manganese star known .

= = System = =

The radial velocity of a star away from or towards the observer can be determined by measuring the red shift or blue shift of its spectrum . The American astronomer Vesto Slipher made a series of such measurements from 1902 to 1904 and discovered that the radial velocity of ? Andromedae varied periodically . He concluded that it was in orbit in a spectroscopic binary star system with a period of about 100 days . A preliminary orbit was published by Hans Ludendorff in 1907 , and a more precise orbit was later published by Robert Horace Baker .

The fainter star in the system was first resolved interferometrically by Xiaopei Pan and his coworkers during 1988 and 1989 , using the Mark III Stellar Interferometer at the Mount Wilson Observatory , California , United States . This work was published in 1992 . Because of the difference in luminosity between the two stars , its spectral lines were not observed until the early 1990s , in observations made by Jocelyn Tomkin , Xiaopei Pan , and James K. McCarthy between 1991 and 1994 and published in 1995 .

The two stars are now known to orbit each other with a period of 96 @.@ 7 days . The larger , brighter star , called the primary , has a spectral type of B8IVpMnHg , a mass of approximately 3 @.@ 6 solar masses , a surface temperature of about 13 @,@ 800 K , and , measured over all wavelengths , a luminosity of about 200 times the Sun 's . Its smaller , fainter companion , the secondary , has a mass of approximately 1 @.@ 8 solar masses and a surface temperature of about 8 @,@ 500 K , and , again measured over all wavelengths , a luminosity of about 10 times the Sun 's . It is an early @-@ type A star whose spectral type has been estimated as A3V .

= = = Chemical peculiarities = = =

In 1906 , Norman Lockyer and F. E. Baxandall reported that ? Andromedae had a number of unusual lines in its spectrum . In 1914 , Baxandall pointed out that most of the unusual lines came from manganese , and that similar lines were present in the spectrum of ? Leporis . In 1931 , W. W. Morgan identified 12 additional stars with lines from manganese appearing in their spectra . Many of these stars were subsequently identified as part of the group of mercury @-@ manganese stars , a class of chemically peculiar stars which have an excess of elements such as mercury , manganese , phosphorus , and gallium in their atmospheres . , § 3 @.@ 4 . In the case of ? Andromedae , the brighter primary star is a mercury @-@ manganese star which , as well as the elements already mentioned , has excess xenon .

In 1970 , Georges Michaud suggested that such chemically peculiar stars arose from radiative diffusion . According to this theory , in stars with unusually calm atmospheres , some elements sink under the force of gravity , while others are pushed to the surface by radiation pressure . , § 4 . This theory has successfully explained many observed chemical peculiarities , including those of mercury

@-@ manganese stars . , § 4 .

= = = Variability of primary = = =

? Andromedae has been reported to be slightly variable , but observations from 1990 to 1994 found its brightness to be constant to within less than 0 @.@ 01 magnitude . However , Adelman and his co @-@ workers have discovered , in observations made between 1993 and 1999 and published in 2002 , that the mercury line in its spectrum at 398 @.@ 4 nm varies as the primary rotates . This is because the distribution of mercury in its atmosphere is not uniform . Applying Doppler imaging to the observations allowed Adelman et al. to find that it was concentrated in clouds near the equator . Subsequent Doppler imaging studies , published in 2007 , showed that these clouds drift slowly over the star 's surface .

= = Etymology and cultural significance = =

The names Alpheratz and Sirrah both derive from the Arabic name , ??? ????? surrat al @-@ faras " the navel of the mare " . ( ??? alone is surrah . ) The word horse reflects the star 's historical placement in Pegasus . Another term for this star used by medieval astronomers writing in Arabic was ??? ?????? ???????? r?s al @-@ mar 'a al @-@ musalsala " the head of the woman in chains " , the chained woman here being Andromeda . Other Arabic names include al @-@ kaff al @-@ kha??b and kaff al @-@ na??r .

In the Hindu lunar zodiac , this star , together with the other stars in the Great Square of Pegasus ( ? , ? , and ? Pegasi ) , makes up the nakshatras of P?rva Bh?drapad? and Uttara Bh?drapad? .

In Chinese , ?? ( Bì Sù ) , meaning wall , refers to an asterism consisting of ? Andromedae and ? Pegasi . Consequently , ? Andromedae itself is known as ??? ( Bì Sù èr , English : the second star of the wall . )

It is also known as one of the " Three Guides " that mark the prime meridian of the heavens , the other two being Beta Cassiopeiae and Gamma Pegasi . It was believed to bless those born under its influence with honour and riches .

= = Observation = =

The location of ? Andromedae in the sky is shown on the left . It can be seen by the naked eye and is theoretically visible at all latitudes north of 60 ° S. During evening from August to October , it will be high in the sky as seen from the northern midlatitudes .

= = Optical companion = =

The binary system described above has an optical visual companion , discovered by William Herschel on July 21 , 1781 . Designated as ADS 94 B in the Aitken Double Star Catalogue , it is a G @-@ type star with an apparent visual magnitude of approximately 10 @.@ 8 . Although by coincidence it appears near to the other two stars in the sky , it is not close to them in space .