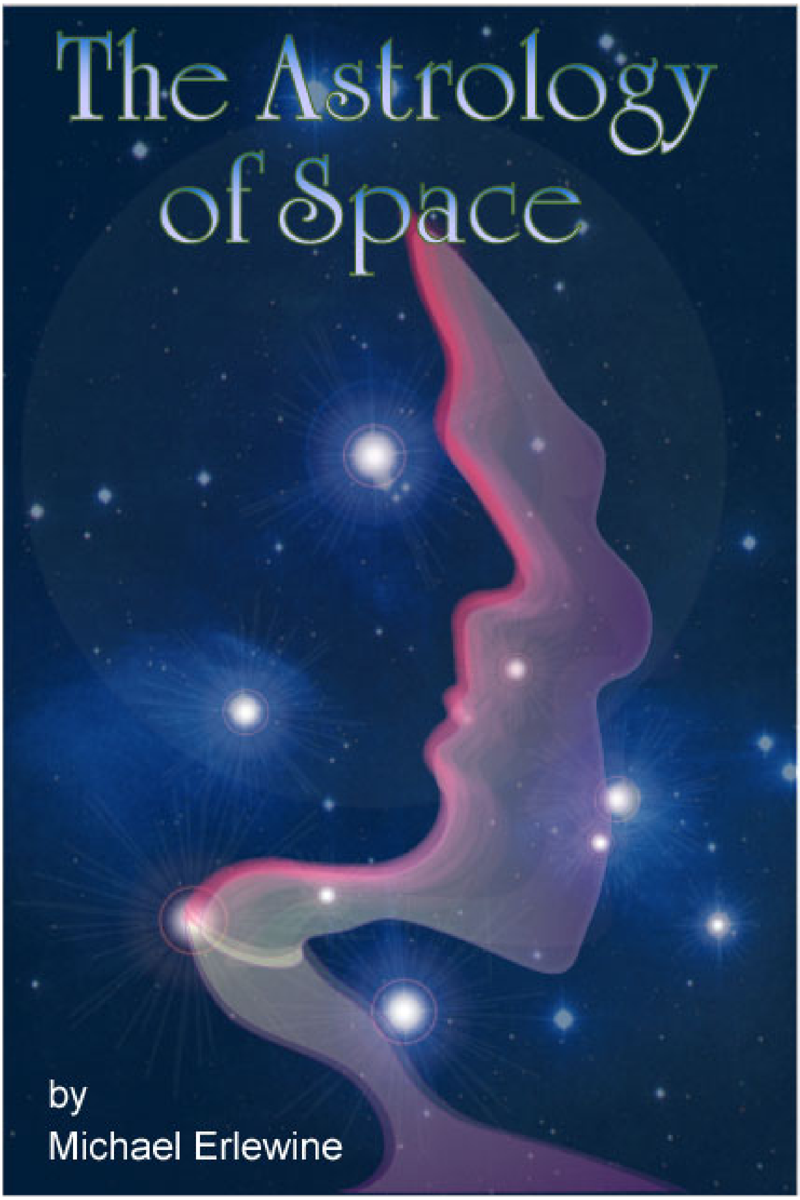
The Astrology
of Space
by
Michael Erlewine

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This book is dedicated to

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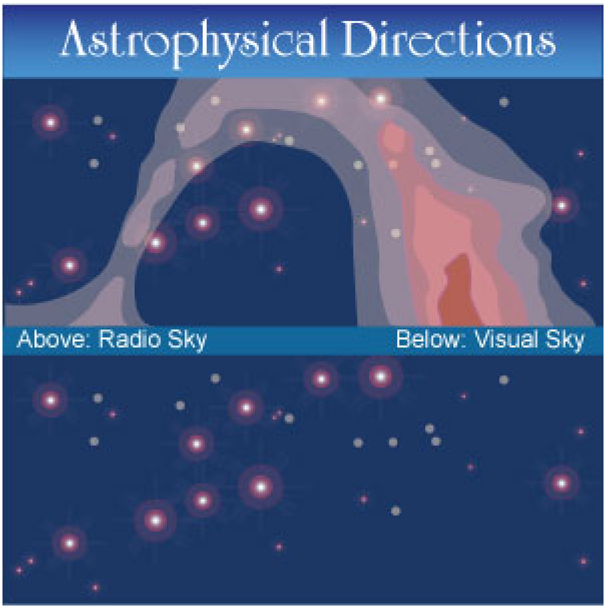


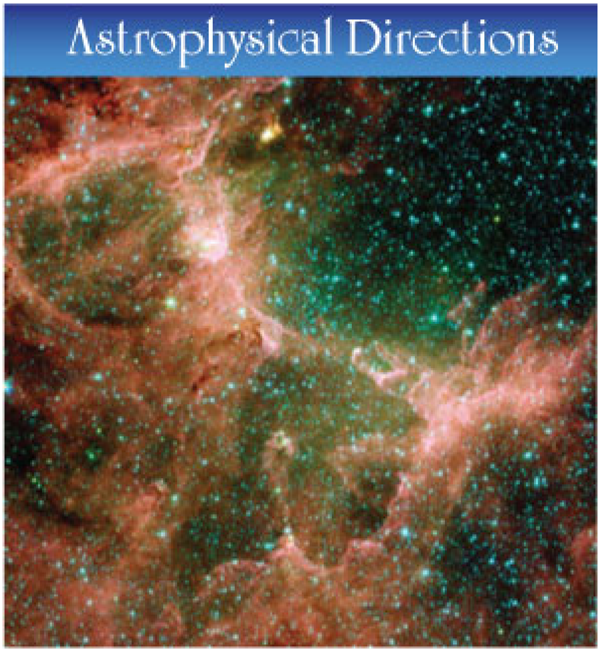
Chapter 1: Introduction

The sky above us has not changed much in millions of years, but how we see that sky and how much of it we see has changed forever in our lifetimes. A revolution in astronomy has taken place, as astronomers and physicists ventured beyond the visual spectrum and began to see the actual shape and form of the universe. The pinpoint stars that we have been staring at for centuries are literally just the tip of the iceberg, like the eyes in the human body. The shape of the body of the universe itself has now been partially revealed and it is beautiful indeed.

Astrologers have always followed astronomical research (such as the discovery of Uranus, Neptune, Pluto, etc.) with open ears and with a mind to interpret what this or that astronomical discovery might mean astrologically. We now have astrological interpretations for the outer planets, the asteroids, and so on. But this has not been as true for the landmark discoveries of deep space objects like pulsars, quasars, radio and X-Ray sources, black holes and the like. What do they mean?

Perhaps it is because so much was discovered in a such a relatively short time that astrologers have just not had time to catch up. Some 35 years have passed since I did the research for some of the material in this book, which was first published in 1976 under the title “Astrophysical Directions.” Nothing of similar scope astrologically has appeared since that time. Aside from the interest of a few astrologers in one or two of the deep-space concepts, there has been almost no mention of this material. No echo has returned.

With that in mind, I feel it is important to once again make these astronomical discoveries available to astrologers in an easy-to-use and illustrated format. In addition, all of the more important fixed stars and deep space objects like black holes, quasars, etc. are included here along with their familiar zodiac positions, rather than the equatorial coordinates used by astronomers. That way, as you read about a particular celestial object, you can look that point up in your own natal chart.



Astrophysics for Astrologers

To begin, I would like to share a few experiences and thoughts concerning the structure in space beyond our solar system and how it might be of value astrologically for learning more about who you are and what on Earth you might be here for.

I first became interested in deep-space astrology through exploring heliocentric astrology, the astrology of our entire solar system. Early on, I was amazed at the difference between my standard geocentric natal chart and some of the other astrological coordinate systems such as the heliocentric and Local Space charts. At that time my interest in the space beyond and surrounding our solar system was minimal. I was put off by the billions of stellar objects out there and, on a more basic level, by the ideas of coldness and blackness I had been programmed to associate with outer space. I sure didn’t want to go out there.

Distant space somehow represented the epitome of "otherness"' and "foreign" to me. I was embarrassed (in terms of astrological usage) by all of the books I had read on the fixed stars, with the possible exception of L. E. Johndro's book, “*The Stars*.” How was I to determine the significance of these billions of stars and use them in my practice, when I had enough difficulty just using the nine planets?

And then the unexpected happened. I had a dream, a very special dream. It was not an ordinary dream, but one of those dreams that are more real than waking consciousness and that take months to understand and absorb. It was placed deep in my consciousness. In fact, it was a kind of vision.

In my dream the astrologer L. E. Johndro appeared to me and his eyes were filled with light. There were rays or stalks of light coming out of his eyes. This strange being said but one word, "LOOK!," and with his arm, he turned and pointed up to the night sky. I looked up and out there.

As I opened my eyes, the sky was filled with brilliant points of light. The stars and all of this starry material were clustered together to form the great glowing arch of the Milky Way or galactic plane. It was wondrous beyond description and in that instant my heart went out from me and filled this bright hall of space. Never again have I had the feeling of being here on Earth, warm and trembling before the cold and black of space. I became the space and light and reversed my polarity or changed my attitude. I understood in that instant that I was a living representative of this mother galaxy, its child. I was the being from outer space I had always wondered about. Furthermore, I had always been so!

From that night forward, I began to venture beyond the zodiac in an inquiry as to the nature and structure of this universe. Here, in brief form, is what I found:

Most important is the fact that *we* are an integral part of the cosmos, not some lonely outpost. In fact, each of us is a node or information aggregate and the universe is in intimate contact with itself only through us – through our eyes. We are part of the cosmic information conduit, the eyes of the universe. The cosmos sees through our eyes, itself.

The manifold nature of distant cosmic events happening out there in space is represented through our very self and lives down here on Earth. It lives through us. There is not only a correlation between these seeming remote cosmic events and our person, but an identity as well. Information coming from the Galactic Center (and elsewhere), carried by electromagnetic and gravitational radiation from every last star and cosmic plane and event, passes through us at all times. We are in some way a node or information complex embedded in the matrix or web of manifestation. We look at ourself!

While all that may sound pretty heady, the overpowering idea that occurred when I made some acquaintance with the universe and its structure is that there is no difference between out there and in here. We are already out there! We ARE in deep space and have been there from eternity until now.

Our world, our self and relationships are a perfect reflection of what IS and what is happening out there. Not an analogy, but an identity. Black holes, supernovae, quasars, and the like are not just remote cosmic events, but this identical story is represented, reflected, lived, and acted out each day in our lives by those of us living here on Earth.

It seems that information circulates through the universe and our identity or sense of our self is this very process of circulation. What we call "identity" or knowing our self is not only a personal experience, but a relationship, in fact, a circulation, and a process of communion or communication – identification! Not only is there a connection between our life and that of our galaxy and universe, but WE ARE that connection.

A study of the structure of the universe, at any level (large or small) is a study of our self, and the guidelines of cosmic structure help to illustrate the specific structure of our self. In summary, the idea that I am unfolding here is: astrology is not only a symbolic system of psychological discussion. The symbol is also, in fact, real. If we say it is an analogy, then the analogy is complete down to the limits of any specific example we might chose.

We are all time and space travelers. There are no better words that I know of than these of Emerson:

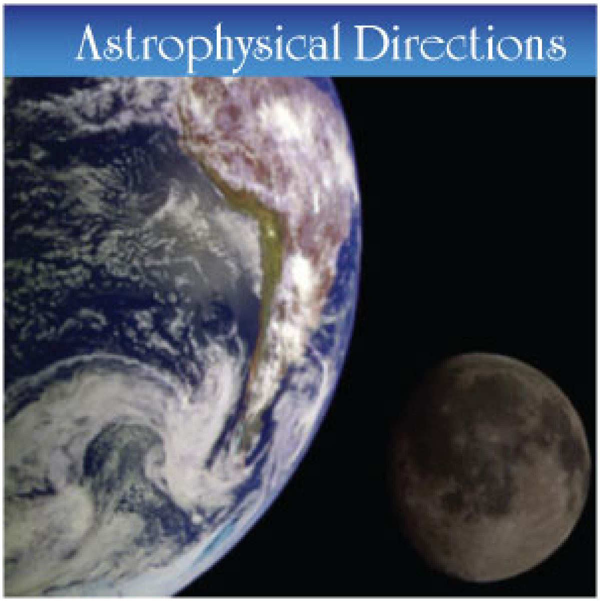
> "All inquiry into antiquity is the desire to do away with this wild, savage, and preposterous There or Then, and introduce in its place, the Here and the Now. Belzoni (an archeologist) digs and measures in the mummy-pits and pyramids of Thebes until he can see the end of the difference between the monstrous work and himself. When he has satisfied himself, in general and in detail, that it was made by such a

> person as he, so armed and so motivated, and to ends to which he, himself, should also have worked, the problem is solved; his thought lives along the whole line of temples and sphinxes and catacombs, passes through them all with satisfaction, and they live again to the mind, or are NOW." -- Emerson, Essay on History.

A process of self-discovery awaits those who would inquire into the nature and structure of this universe. We may read and study the history and record of astrology through all of the books we have. We may return again and again to our favorite passages to make sure of what we have found there. But, sooner or later, each of us must turn away from the book and just LIVE our life. That is why we study astrology in the first place. As my dharma teacher once said to me: “Michael, someday *you* must become the book!”

We each must become the book and only that lives which we have known for ourselves to have life, which we have personally lived. As Shakespeare said in one of his early sonnets: "You *are* no more yourself than you now here live." The philosopher Hegel said the same thing in another way: "We go behind the curtain of the Self to see what is there, but *mainly* for there to be something to be seen."

There is great value in a reading of the ancient wisdom and documents. What the ancients saw or discovered about themselves, that truth, is still true today. All of the laws of the universe still exist to be known today. We are always free to leave off at reading about our life and cast off into an inquiry, our inquiry, and to live that life we read about. We can learn to know or experience what we are talking or reading about. And now let’s get more back to Earth.



Astrophysics for Astrologers

What It All Means – With the rise of space travel and new more powerful telescopes, man has himself stepped out into space. He has gone beyond himself in a fresh inquiry into the nature of his existence. What does this mean for astrologers?

As astrologers, we have a habit of associating or reflecting outward celestial events with a simultaneous change within ourselves. The array of recent astrophysical events and discoveries over the last 40 years may tax even *our* imagination. In fact, man's understanding of the nature of his universe (and thus himself) has changed in recent years beyond any memory of change that history can offer as guidance. We are in new territory here.

The Astrology of Space

This astrologer can remember when cosmic food for thought was still kind of rare and the use of the astrological imagination had to be encouraged! However, the deluge of fascinating astrophysical information in the last few decades has had the effect of curbing our imagination and even limiting our inquiry to the simple available facts. At least at this time in history, the facts are more inspiring than any flight of the imagination or as it has been repeatedly said: the facts are indeed "stranger than fiction."

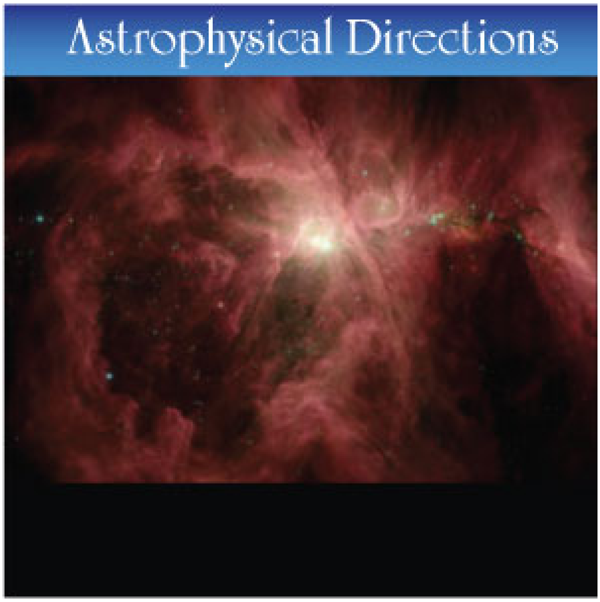
In recent years, astrologers have turned from an age-old, very-active state of receiving astronomical information (essentially passive in nature) to a bold, active inquiry into the nature of outer space, and thus into ourselves and our "god" or awareness. It is happening out there in space through astrophysical discovery; it is happening down here within ourselves, through depth psychology, the spread of many spiritual "new age" disciplines, and what-have-you.

An astrological approach to the discoveries of modern astrophysics is actually quite simple. In fact, it can be reduced simply to a study of the life and death struggle of stars and the various kinds of light they produce. In fact it would seem that we can gaze on life and death of stars more candidly than we dare to examine our own!

With this in mind, let us examine here some of these facts and the ideas or interpretations they seem to generate or suggest. None of this interpretive speculation is intended to be dogmatic. It is simply a first attempt to arrange or order some of this new material and get at least some sense of what it means for the astrology of the future and the present time. In fact, I will not offer too much by way of interpretation.

The Astrology of Space

The facts speak for themselves. Let them guide your imagination and interpretation.

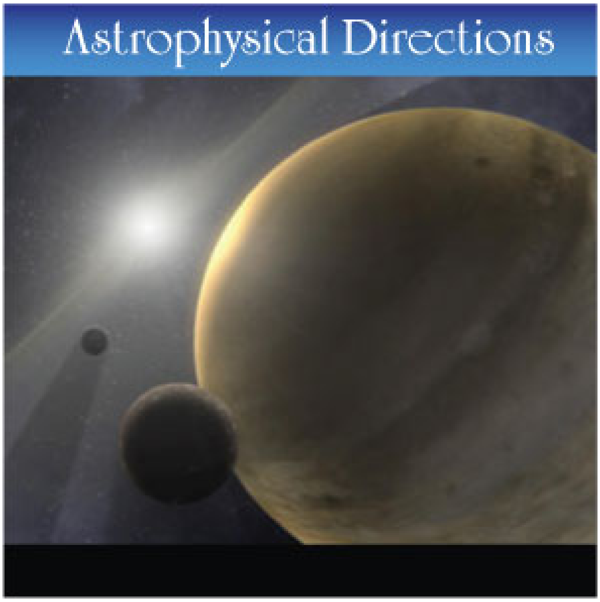


Interpreting Deep Space Points

With the advent of deep-space astrology, a question that comes up often is: how do we interpret all of these many new objects, like black holes, pulsars, quasars, and the like?

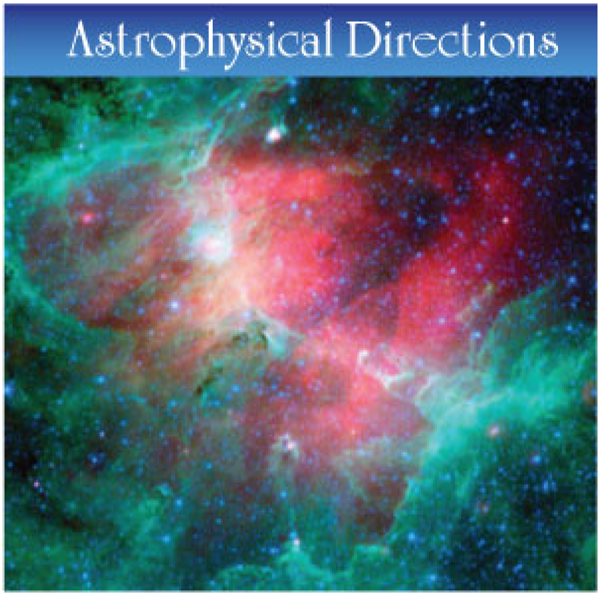
Putting these new objects aside for a moment, we might ask: how have astrologers dealt with all of the myriad of stellar points that we have known about for many hundreds (or thousands) of years, points like the named stars, novae, globular clusters, and so on?

The simple truth is that as astrologers we have pretty much ignored all celestial objects beyond our solar system. There are some few books on the fixed stars, I agree, but for the most part these are little more than an attempt to carry forward ancient (Arabic, Greek, Chinese, etc.) notations on a relatively few number of stars.



For example, we might read that the red-giant star Antares pertains to eyesight, and so forth. All together, these (at least the ones that are commonly used in Western astrology) amount to only a handful of stars, no more than would fit in a very small book, if not a pamphlet. My point is that we not only need to find interpretations for some of the exotic new deep-space objects, but all of the well-known stars and other visual stellar objects that have been around for thousands of years also beg for clarity.

In fact, any attempt to notate (and interpret) these long-known visual objects in a linear fashion (one-by-one) is probably doomed to failure. Another way to put this might be that over the centuries we have already done a linear count, and the sum total of what we have to say interpretively about the various visual stars and objects would not even fill a small booklet. That in itself says a lot. Perhaps it is time to take another approach.



The approach I suggest is nothing new for astronomers, but it might just be what we astrologers are looking for. In fact, it is exactly that approach that astronomers have used for hundreds of years: group individual objects of a similar nature together. Instead of trying to find what is unique about a particular object (i.e. Antares affects eyesight, etc.), look instead for what stellar objects share in common, and go from there.

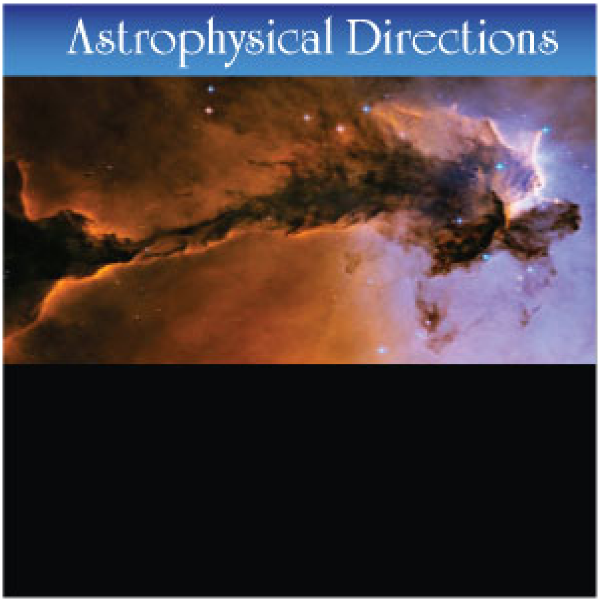
For example, all novae are exploding stars. All novae share this attribute and we can speculate how that might relate to a natal chart, and so on. If we come up with an interpretation for exploding stars, then that would also work for all known and yet-to-be-discovered novae. You get the idea: *to what group does the star belong?*

As astrologers, we can agree that what is happening out there, whether with the planets or objects much farther away, is also being acted out now, down here on Earth. Another way of phrasing this concept is that we are in the middle of all that; we live in the solar system, which lives in the Local System, which lives in the Galaxy, and so forth. We are in there now, and have always been there.

"As above, so below," is the key phrase here. What is writ large across the heavens is acted out (albeit small) here on Earth. This is what most astrology is all about. If we can't agree on this, I suggest you read no farther.

If you are still with me, then, not only the planets, aspects, and houses have meaning in our lives, but all of the many myriads of stellar objects also have meaning in our lives. By finding what group an object belongs to will tell us something about how to go about interpreting that object. The only real difference between the old set of visual astronomical objects and the newer astrophysical or deep-space objects is that many of the new objects don't appear to our eyes. They do not shine in the visual spectrum, but rather they shine in some other part of the electromagnetic spectrum, be it through radio emissions on the low end (beneath the visual portion of the spectrum) or X-ray emissions on the high end (above the visual spectrum). But shine they do.

What we have then is a multitude of stellar objects all shining, but shining throughout the entire electromagnetic spectrum, all the way from dim radio emissions on the low end, through infrared, visual, and on to X-ray and Gamma-ray emissions on the high end. It is this complete set of objects that we seek to examine for meaning in our astrological charts, the ones that figure prominently in our nativity.



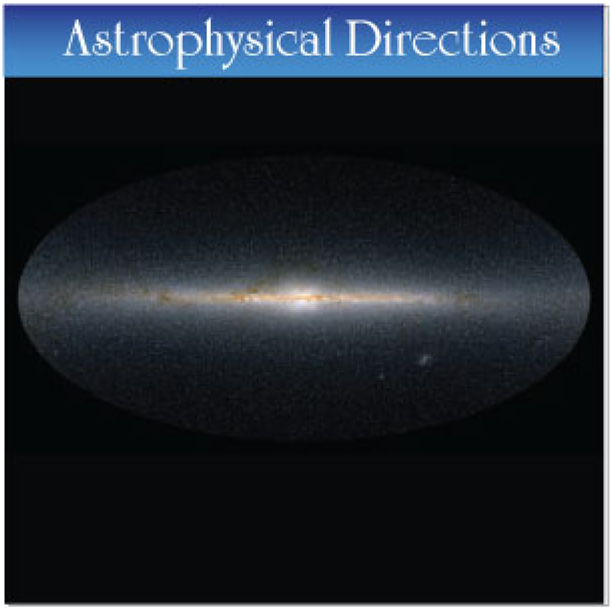
Putting aside the visual stars and objects for the moment, what is so different about these new deep-space objects? As mentioned above, perhaps the main difference is that they have been literally unseen until now. They were always there, but we were not aware of them because they shine at frequencies which our eyes cannot see. There are objects that shine below the visual part of the spectrum, like infrared stars and the like, and even lower yet are the radio and infrared objects that just kind of sit out there and dimly glow.

Then there are objects that are faster and shine at higher frequencies than the visual spectrum, objects like X-ray sources and Gamma-ray emissions. It is this factor that I feel we should look to for our interpretations. I can only tell you my experience with these deep-space points over the last 30 years or so.

Emissions below the visual spectrum (what we can see with our eyes) seem to measure the general shape of the cosmos, the basic form of the surrounding universe. These low emissions (radio and infrared) paint a picture of the general cosmic structure in which the visual stars that we have known for so long are embedded or fixed. As for how to interpret this structure, I find that it is similar to what we would call psychic or subconscious areas of our mind and life, areas beneath our visual conscious mind.

Whole areas of the sky, such as the Galactic Center (26-degrees of Sagittarius) have very much more structure, shape, and emissions than do other areas, such as the area opposite the Galaxy Center (26-degrees of Gemini). But even the anti-center of the galaxy has a lot of material, because our Sun is not all the way to the edge of our galaxy. The direction that has about the least material is zero degrees of Aries. That direction is relatively *very* empty.

It is in the subconscious that we learn to feel our way around and individuals with psychic talent and skills make it much easier for us to do this. When some of these major radio stars figure prominently in the natal chart, this is a sure sign of some sort of synergy with reaching into the subconscious – psychic ability. Light shining beneath the visual spectrum is more like feeling the structure of our life, much like the proverbial blind man feeling an elephant's leg. We learn to feel our way around in areas where we can't see.



At the other end of the visual spectrum (above the visual spectrum) are fast, high-energy sources shining at ultraviolet and X-ray frequencies. This is a very different kind of light, not evoking the shape of the universe, but just the reverse. This high-energy emission cuts right through the radio (and the visual!) pictures, exposing only the very essential point sources of energy. Some high-energy emissions look right through matter itself, just like X-rays do in the dentist chair.

If you have high-energy point sources like black holes, quasars, and X-ray sources prominently configured in your chart, then you have the ability to see right to the heart of things, cutting through any obscurations or shadows and getting right down to it. This X-ray vision is a perfect complement to the more feeling psychic talents, so you can take your pick.

As for practical uses for these two parts of the spectrum, when life gets too cold and theoretical, get together with someone with strong radio (psychic) points in their chart. They will help to ground you and help you feel more like yourself again. They are great for dinner parties and having a good time.

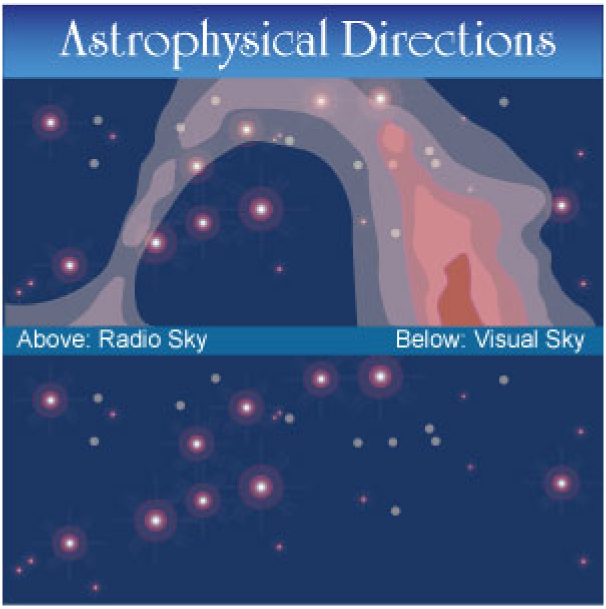
On the other hand, when life gets too much and you have more on your plate than you can handle, get close to someone with high-energy points (X-ray, etc.) in their chart. They will make it easier for you to cut through the crap and see clearly what is important and what needs to be done.

I hope these general interpretive comments are helpful in approaching these new deep-space objects. I have only given you a very brief overview. It can be fascinating to read about each kind of object, noting their specific qualities, especially if they figure in your natal chart. For example: black holes are super high-energy sources with incredible power at the high end of the electromagnetic spectrum. Their life story is incredible to read about. Have one conjunct your natal sun or other key part of your chart? I would read with great care everything I could about such objects.

I have not forgotten the visual objects that we have observed for centuries, such as the fixed stars. By this point, you should pretty much know what I am going to say. These visual points point are no different as regards interpretation. In fact, they have been around for hundreds of years in full sight – visually. We all have seen them for centuries. They are right out there in the open. Treat them the same as you would any deep-space point. By that I mean, instead of trying to come up with personal idiosyncrasies for each fixed star, find out what group they belong in and think about what that might mean.

For example, is it a young bright blue star or is it an old dying red star? That much is easy to figure out, just by looking at the spectral type (which we have included). And read about the life progression of stars, because all deep-space astrology is nothing more nor less than the life and death story of stars. Every last object is a star in some part of their life span, much as we are in ours. What more of a hint do you need?

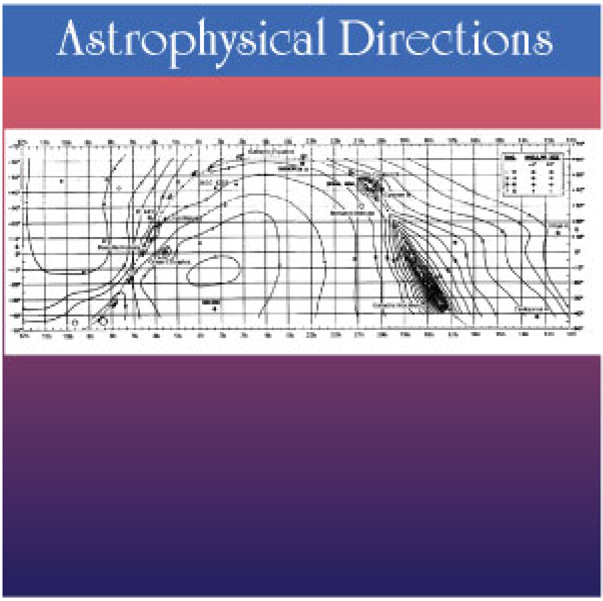
If you will approach all stellar objects in this way, you can learn a lot about them. If they configure strongly in your natal chart, you can read about the whole class of objects and learn something about yourself.



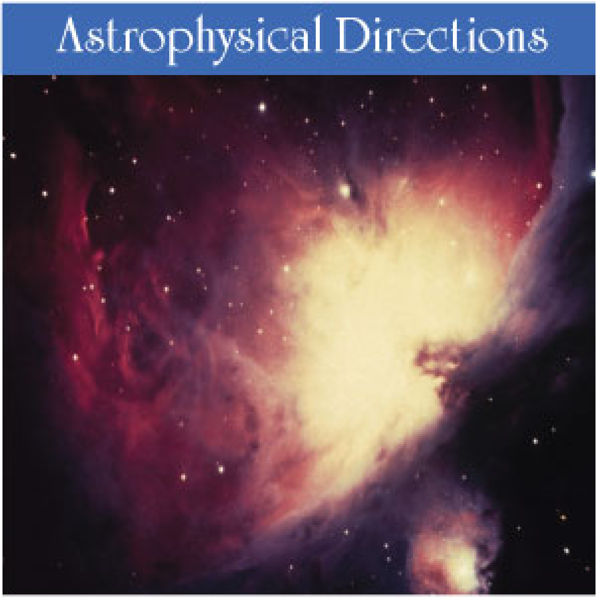
Part II: The Radio Sky

The above (upper part) picture represents a panoramic view of how the entire sky would appear if our eyes were sensitive to radio waves rather than to light. The lower diagram is the same 360degrees of sky as it might appear visually to our eyes. If we could walk out at night and see in radio frequencies, such a sight would go a long ways toward persuading astrologers as to the existence of preferential directions in space. Some areas of the sky have more things happening in them than do others.

While "bright' discrete radio sources (like our visual stars) do stand out, the overpowering sense received from such a view is of the overall shape or body of our Milky Way galaxy. At radio frequencies, there is no mistaking the galactic plane and the very heart and center of the galaxy. It abounds with light. Even at visual frequencies, we can renew our sense of cosmic direction almost any night of the year by just walking outside and looking.



Why we cannot see at visual frequencies the great mass of light of the galactic center (GC) is very simple. At visual wavelengths, great clouds of relatively near dust intervene and block our view of the GC and of much of the galactic plane. In general, these dark clouds prevent us from seeing more than a few kilo parsecs in any direction along the galactic plane. If we could see our galaxy from the vantage point of a neighboring galaxy, such as Andromeda, the center would appear filled with light.



Radio and infrared waves are able to bend around the particles of dust and reach us. Only in recent years has it been possible to really "see" the actual center and structure of our galaxy, through non-visual windows in the electromagnetic spectrum. The radio maps of the heavens shown on these pages bring out the basic shape, body, and "aura" of our galaxy. Our dependence upon the physical eye and optical frequencies results in an idea of the heavens as filled with an infinite number of points of light or stars, but otherwise relatively empty of shape and form. It is similar to the human form, if we were only able to see the eyes of a person, but not their shape. The fixed stars are "set" in space staring at us, but most of us do not have much sense or feel for the fabric or matrix (the body) in which these stars are set. This shape becomes clear in radio maps and it is obvious that the great galaxy is the mother (matrix) and home of the countless stars embedded within it. Radio maps reveal that whole areas of the sky are filled with more light than others and that this light is graded, with a concentration toward the galactic plane and, of course, there is the brilliant galactic nucleus or center.

Until about 40 years ago, our knowledge of the cosmos outside the sphere of the Earth came almost entirely only from the light we could collect with large mirrors and lenses via telescopes. In fact "light" meant to us the eye and only the visual part of the electromagnetic spectrum. The atmosphere surrounding the Earth is largely opaque (blocks) to most parts of the electromagnetic spectrum, although there are several transparent regions through which we may receive light and thus "look" out into deep space.

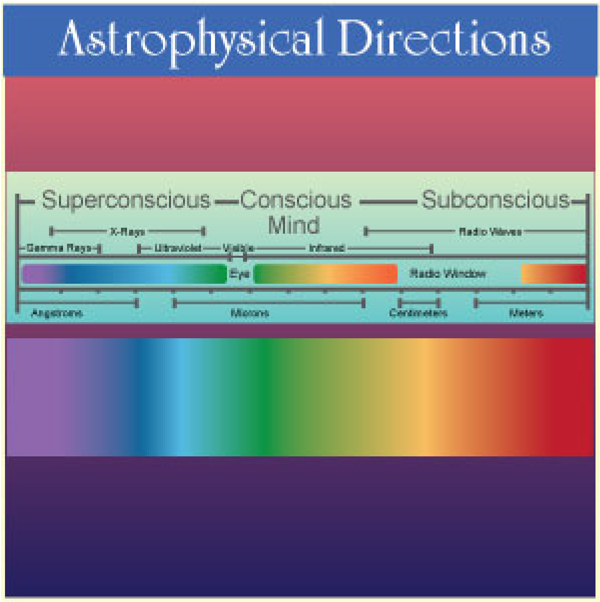
These have been termed "windows," and the two most important windows are the optical and radio bands of the light spectrum. If we compare these two windows to the sound spectrum, the radio window represents a ten-octave span, while the optical (visual) window represents a little *less than* a single octave! There are several other bands of relative transparency in the Infrared range through which appear an almost entirely different set of stars and constellations. In fact, the range of energy between the extremes of the electromagnetic spectrum is so great that very different techniques have evolved for their study.

The Earth's Aura

The atmosphere of the Earth serves to shield the Earth from much of the radiation reaching it from outer space, with the exception (as mentioned) of the two windows in the visual and radio frequencies. In recent years research has removed the entire concept of windows, bypassing the atmosphere, through the means of balloons, rockets, and other space vehicles. Beyond our immediate atmosphere, the entire range of the "light" spectrum is wide open to our reception.

In our lifetimes, we have experienced not only a fantastic increase in the receptivity of light, but we have made active outreach beyond the atmosphere and the Earth itself. We have stepped away from ourselves into the space beyond and into ideas outside our imagination but a few short years ago.

How are these different kinds of light generated? The answer to this question is the key to understanding how modern astrologers can interpret astrophysics.



The Kinds of Celestial Light

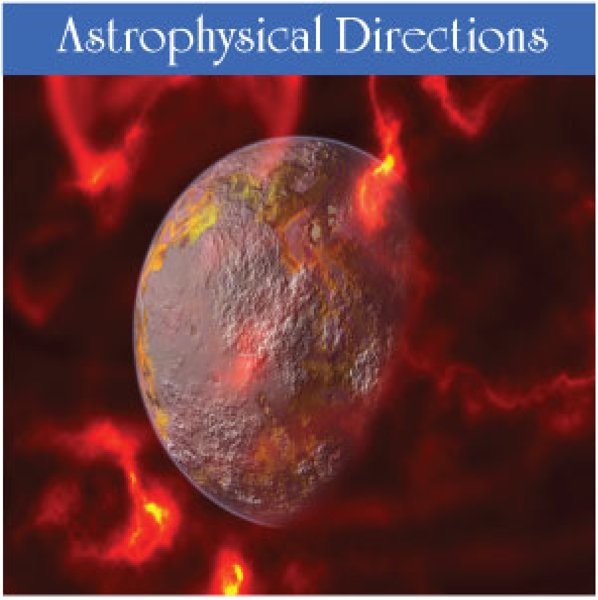
A key concept is to understand here is that there is light beneath (slower than) visual light and also light above (faster) than the eye can see.

Light beneath the visual, slower light, is that of radio waves and infrared. Radio waves, the longest waves, are generated by oscillating electric currents. The short wave radio waves or microwaves have a wavelength similar to that of sound through air.

Infrared radiation (a hot stove for instance) is produced by rearrangements of the outer electrons in atoms. As mentioned earlier, the human eye is sensitive to a very narrow range of wavelengths corresponding in musical terminology to slightly less than a single octave and this is to be compared to the enormous frequency range to which the human ear is sensitive.

On the other (higher) side of the visual, there is light that is faster or higher than we can see. Ultra-violet light immediately joins the visual spectrum, at the high end. X-rays, higher yet, have wavelengths of the approximate size of atoms and originate in the rearrangement of the innermost electrons in atoms.

The Gamma rays are the electromagnetic waves of highest frequency (and therefore the shortest wavelength) and they originate in the rearrangement of the particles within the atomic nucleus itself. How does our universe appear at these different frequencies?



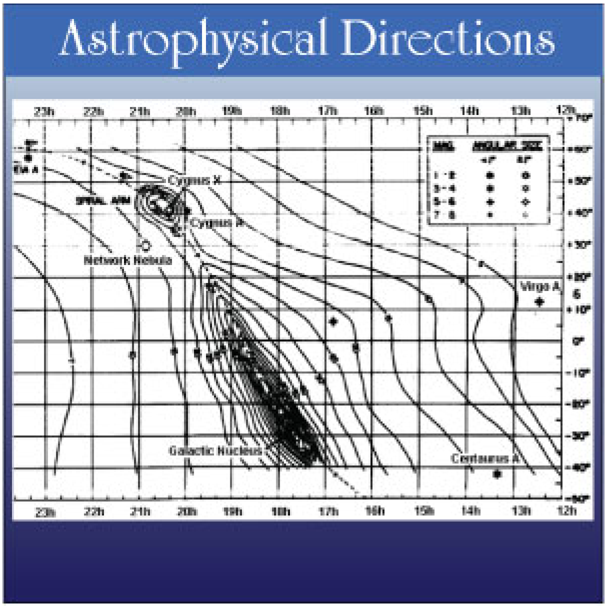
The Types of Light

Starting with the longer radio waves of several meters, the reading or picture we get is of a universe alive with a radiant haze or constant glow of radiation in all directions. As we move to receivers of higher radio frequencies, certain forms begin to emerge out of the general fog. The haze appears to be brighter or thicker in the direction of the galactic plane and particularly around the galactic nucleus, which is alive with light. The plane of our galaxy is a glowing arch reaching across the heavens. As we further increase the frequency, we penetrate or see more sharply through the radiant fog and real discrete features begin to appear. Extended sources of radiation and at still higher frequencies, point sources or "radio stars" show up, shining at these frequencies more brightly than any other objects in the heavens, yet they have never been seen with the human eye. At yet still higher frequencies, we reach the visual level of radiation, where point sources are the main objects resolved -- the stars. At the yet higher frequencies of the x-ray and gamma ray wavelengths, the energy is so intense that it "looks" or passes right through most materials.

Until recently, our knowledge of the physical universe is a result largely of what we have been able to see in the visible or conscious-mind window. Thanks to the astrophysical discoveries of the 20th Century, we have augmented our visual information, both below the visual (radio frequencies) and above it (X-Ray frequencies).

The rational or conscious mind (visual eye) is no longer required to exclusively carry the burden of leadership in our life, as it has in the past. In other words: our dependence upon the organ of sight and its ideas is to some extent breaking down, and the load it carried is being redistributed among other senses, in addition to the eye. It has been enhanced.

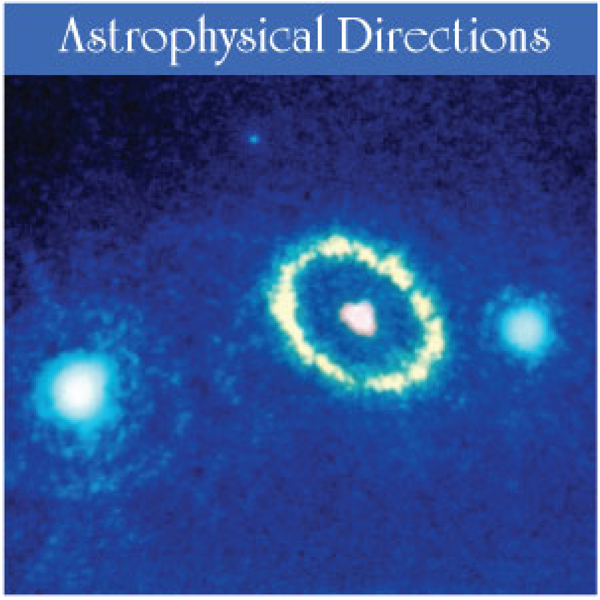
The conscious mind has a long history of discrimination and a particular way of looking at the world. In summary, we are discovering that we can "see" through other senses as well and the future looks brighter as we learn to tolerate and use these new ways of seeing. The results of all of these different portions of the light spectrum do form a unified whole, although we should expect to find astrological specialists working in areas outside of the visual spectrum of the eye or rational mind.



Radio Frequencies

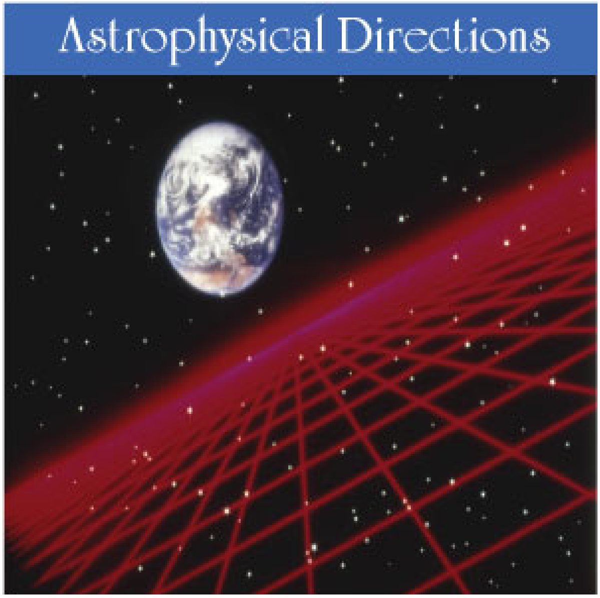
The universe at radio frequencies, with textures and forms never seen with the eye, is literally a map of our subconscious and the psychic realm. We can expect to find radio astrologers measuring and discovering individuals who personify or represent some of the great radio sources. In other words, by noting and monitoring the astrological positions of great radio and infrared sources, we should be able to better pinpoint and track individuals who personify these sources -- psychics and psychic healers. We can now begin to chart the psychic potential in ourselves. And keep in mind that the entire region around late Sagittarius and early to middle Capricorn is filled with radiant energy. This is the area surrounding the very heart center of the galaxy, the galactic nucleus itself. If that area of your chart is very active, this in itself is a very strong indicator.

At yet higher frequencies, we reach the visual level of radiation, where bright point sources or stars are the main objects resolved. Beyond the visual window are the ultra-high frequencies of the x-ray and gamma ray wavelengths. These waves shine right through much of what we would call matter and indicate the sites of cataclysmic events and massive outpourings of energy beyond our comprehension.



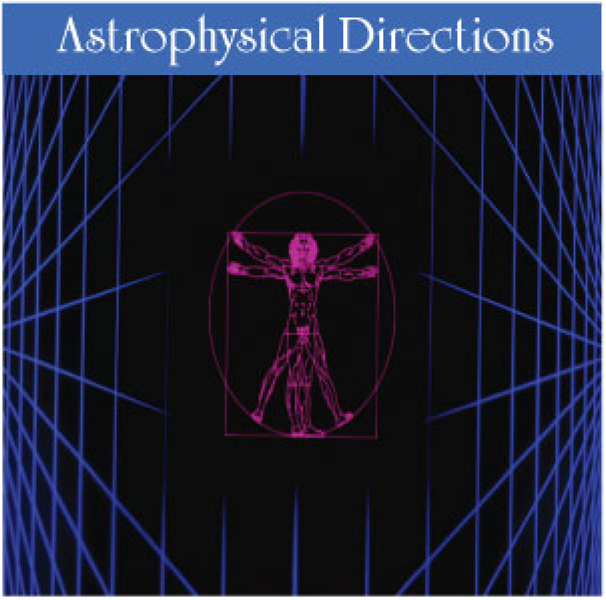
Higher Frequencies

As mentioned, on the other end of the visible spectrum, the higher frequency X-rays and gamma rays, we find a measurement of what we can only call the super conscious, where we do not find so much broad strokes and texture, as powerful point sources clearly seeing right through the form and structure so visible at radio frequencies. We can expect to see X-ray astrologers whose chief interest is not form, but light as never before measured. We should be able to chart and measure X-ray sources and those who have the gift of clairvoyance or clear seeing -- seeing right to the heart of the matter.



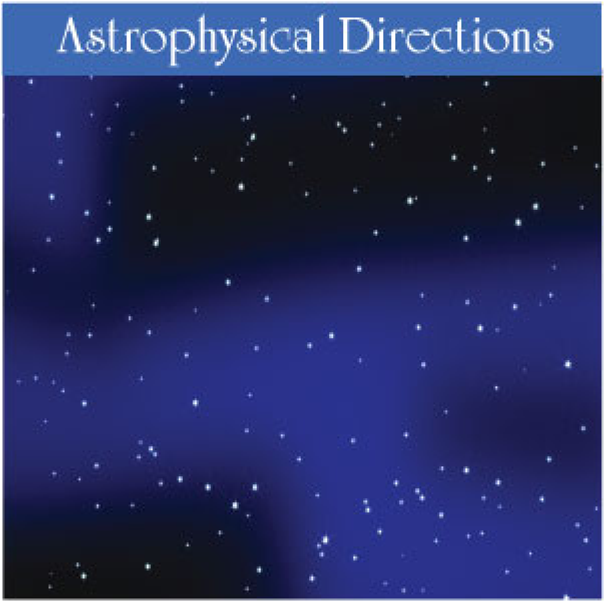
Above all, these new techniques will mean a discovery and appreciation of a variety of types of genius besides the familiar fixed stars that have captivated our attention for so long. We will be able to find and know radio and x-ray light and genius, alongside of the familiar visual stars and astrology.

Perhaps we will learn to go to those among us who can feel at radio frequencies, the psychics and "sensors," and learn better how to "feel" and explore the feeling and texture of our life. When we have trouble appreciating or feeling our lives, we can learn to do this through those with very strong radio sources in their charts. They will help to put us in touch with ourselves once again.

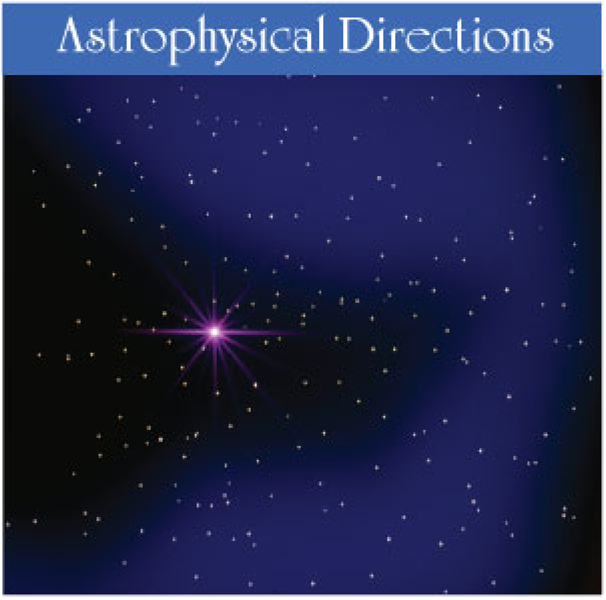


On the other hand, we will go to the X-ray genius when we hurt or "feel" too much, and benefit from their vision that sees through our feeling and clears us up. Persons with prominent X-ray stars or black holes in their chart will have the gift to cut through our fog and resolve our problems, clearing them up – instant cauterization. We will seek them out when we are lost in our confusions.

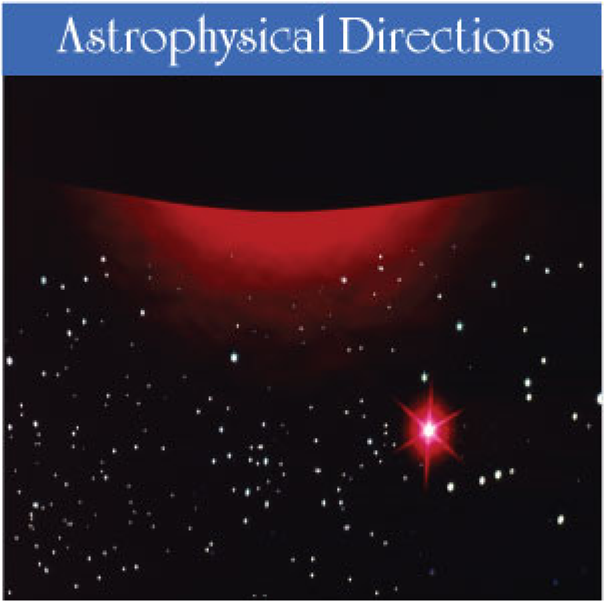
Again: the vision that occurs to me is a new appreciation and tolerance for all of the different kinds of light and their human representatives. The psychic or radio genius can accurately see or feel and tell us truths about ourselves that we personally may have never known how to feel for ourselves, and the X-ray or reflective genius cuts through our feelings and mirrors our self to us, that we may accept this self as it is.



An initial fear of this author when first I considered all of the very many new radio and x-ray points was that I would not be able to make sense of so many points and would somehow spread myself too thin. In fact, this never happened. In fact the opposite is true. Understanding how all objects can be grouped brought relief and made dealing with all these objects much more manageable.

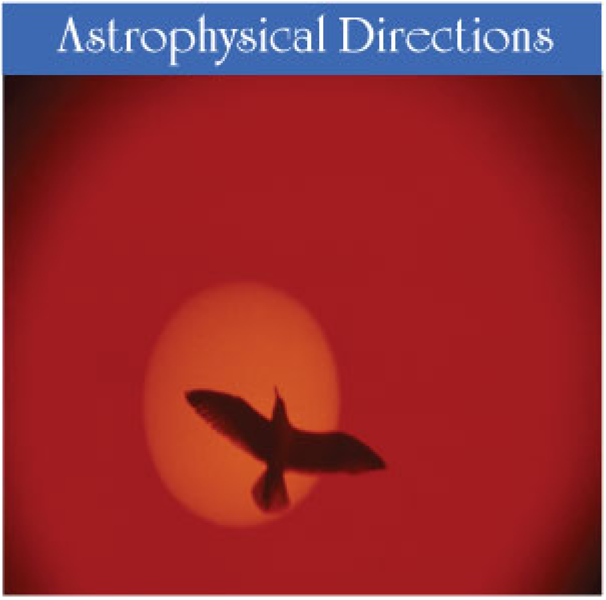


My investigations show that each of us will be drawn to study those kinds of points that we in fact are and act out in life. I was drawn inexorably to just those points that figure most clearly in my horoscope, and discovered in these remote cosmic events my innermost feeling and self. I greatly feared being "lost out there in the stars" and my faith in life has increased very much as I experience a great return from my inquiry and a coming to better know my self. I have no longer any sense of there being any "Other" out there but, no, just my self, and my life out there as in here. No other: One.



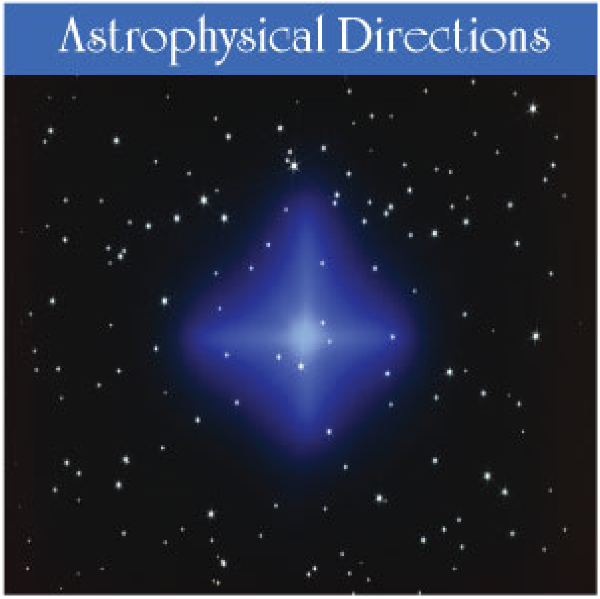
Part III: Astrophysical Directions

In this section, I would like to introduce you to several of the more advanced considerations and techniques involving cosmic structure. I would also like to share with you some of my own questions that have occurred over the years. Let me make it clear that it has often been very difficult for me to come to feel I understand much of the information presented here. This is due (in the beginning) to an almost complete ignorance on my part of astronomy and mathematics, as well as a deep feeling of insecurity about technical issues in general, and this required me to go over and over simple facts until I felt that I understood what they signified. This learning experience has been, for me, a personal odyssey of immense value and also high adventure.

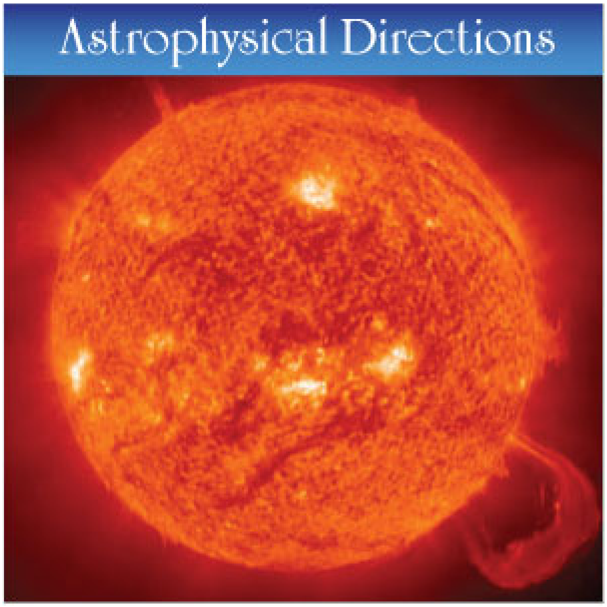


As for the astronomy, do not expect to absorb what astrologers have made a point of avoiding for centuries in a few days. Take your time and develop a feel for this material. Don't worry about "what it all means" for the present. The outer space surrounding our birth is filled with countless stars and objects. These objects, whose sheer numbers may "boggle" the mind can all be ordered according to the fabric or system to which they belong or are members. An understanding of the basic matrix or fabric in which they objects are nested or embedded will bypass the need to try to interpret them one-by-one in an attempt to somehow count and interpret all the stars.

Astrologers have lost much of the grasp they once had on the astronomy and mathematics of their field. In past centuries, as any history book will demonstrate, astrologers were both astronomers and mathematicians. They held a very responsible place in society, a position that was respected, and one that provided a reasonable living.

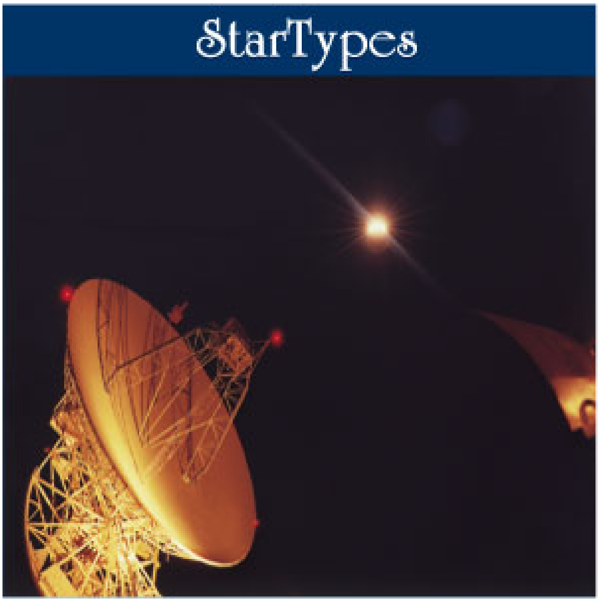


Astrology in our times is generally held in low esteem, and the individuals practicing it are made to feel shame for charging money for their skills. In my mind, there may well be a direct connection between the state of our art and the loss of the more physical or "scientific" part of our art, the astronomy and math. I have spent many years investigating the heliocentric system of event expression, by itself, and in relation to our traditional geocentric concepts. This has involved not only the doing of many tens of thousands of charts, but also a great many individual readings in which both geo and helio charts were consulted. What follows is not pure speculation, but has emerged to my attention through many years of study. Let me recount to you, in brief, how I got into investigating the larger life of our solar system – heliocentric.



In the beginning, I was propelled in this direction by an increasing dissatisfaction with the results of existing astrological techniques and by the thrill of the unknown. After I got over the "newness" of helio charts and the extreme discomfort of not having familiar landmarks such as the Moon, the houses, and chart angles to guide me, it dawned on me that the helio planetary patterns (in particular what I have come to call whole-chart configurations, where several major aspects combine to form a whole gestalt or 360° picture) represented our zodiac in a purity or at a level of significance not before encountered by me.

After several years of this work, during which much of my geocentric astrological activity was suspended, I attempted to return to Earth (so to speak) and to begin to combine the helio with the traditional geocentric techniques. I then encountered a singular and life-changing problem. It became quite clear to me that the zodiac or ecliptic, whether expressed through helio or geocentric planetary positions, was heliocentric or Sun centered in essence, a much less "mundane" plane of reference than I could remember it. Let me restate this:

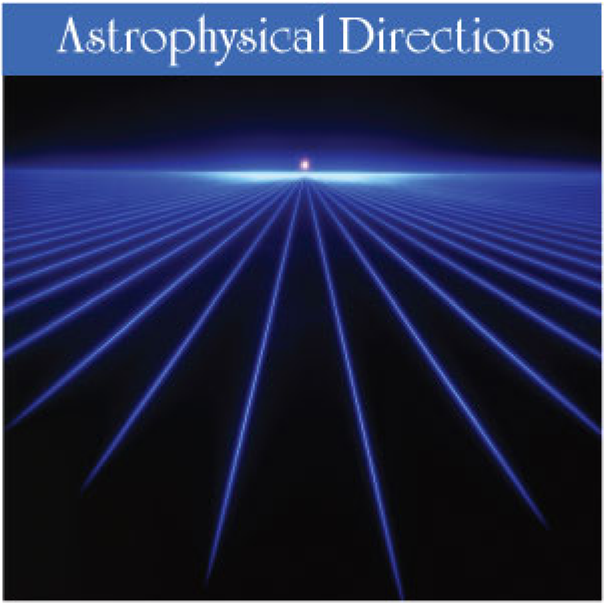


When first venturing into helio research, I had assumed that I was moving from the very practical and specific methods of geocentric astrology to a more "spiritual," generic, and higher level or order of information (heliocentric). This was, in fact, the case.

An unexpected side result, however, was my growing awareness that our traditional geocentric sphere (all of our zodiac concerns) was also of a very high or spiritual (psychological, if you prefer) nature and much less the "nitty gritty," down-to-Earth exact affair that I assumed and/or remembered. A different and stark understanding of myself and my fellow astrologers began to occur, one in which I could see that I was much less practical and much more of a dreamer than I could ever before have admitted.

As a part of this experience I began to see that astrologers (as a group) had let lapse or somehow lost almost all their means to specify or communicate their vision to the general public. In particular, they no longer understood the equatorial and horizon systems of coordinates and planes, even though without them, a standard astrological chart could not be constructed. Modern astrologers have little idea what these auxiliary coordinate systems are, much less how they might be interpreted. This is particularly true for the helio chart.

Well, everything began to "flip-flop" in this learning experience, which by that point for me was a waking vision. As an astrologer, I had a built-in thirst and love for such powerful or sensitive zodiac points as the Ascendant the MC, Vertex, and the house cusps. In fact, like many astrologers, I longed to find and extract even more such meaningful points from my well-worn zodiac.



The Sacred Zodiac

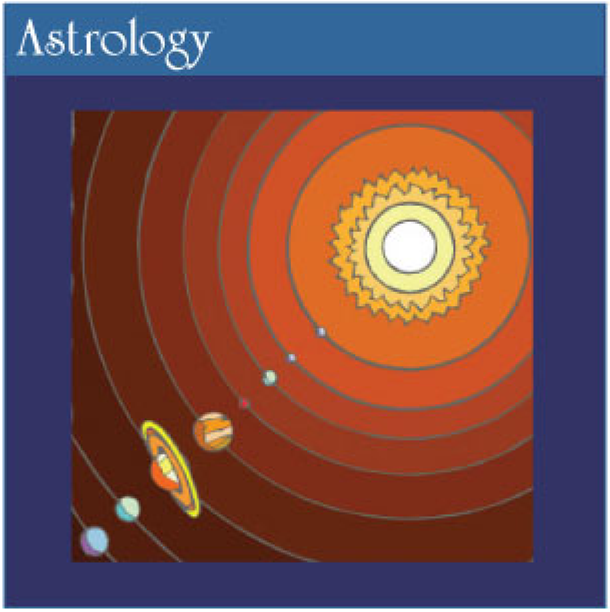
Until that time, it had never occurred to me that the "specificity" or "individuality" of these sensitive points were provided by the horizon and equatorial planes, as much as by the zodiac. In other words, it is the plane of the horizon that marks out the specific degree of my Ascendant from the other 360 possible degrees. I had unconsciously given all credit for this ability or "power" to the zodiac alone and none to the horizon. In truth, I hardly even knew what the horizon was, other than (perhaps) as a diagram in an astronomy book.

I began to see that astrologers have let lapse their conscious use and awareness of these other coordinate planes, although all three systems must be used to calculate every last natal chart! I found that I had been trying to induce and extract all meaning from the familiar zodiac alone, which is similar to trying to climb up out of the middle of a deep lake when we feel the need for dry land. And I was not alone in this.

Astrologers have for some centuries now lost the ability to deliver the kind of very specific information that is available through mastery and conscious use of the equator and horizon system of coordinates. Instead, they have clung to the vestiges of such specificity as found in the Ascendant, house cusps, etc. The public's demand for such specifics has been satisfied (in our times) more by the "psychic" or intuitive gifts of modern astrologers, than by the use of any comprehensive astrological technique.

If astrologers live in "specific" poverty, it is because they refuse to master the means to get the attention of this very result-oriented world and this means is available to them through the reacquisition of the lost branches of their art/science: astronomy and mathematics. If astrologers do have a holistic and "spiritual" message to deliver to these times, they will have to get public attention, not through their intuition alone, but also through dependable and predictable results. We must deliver. This book is intended to re-introduce astrologers to their own astronomical heritage.

Chapter 2: The Solar System



Solar System

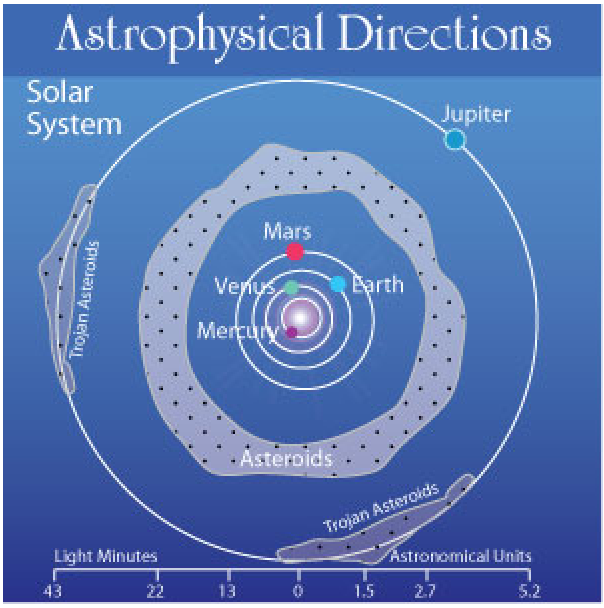
The Earth is a planet or secondary circling the Sun or primary at a mean distance of about 93 million miles. The mean Earth-Sun distance is taken as one astronomical unit (AU). The plane of the Earth's orbit around the Sun in the course of one year is called the plane of the ecliptic or zodiac. The ecliptic is the circle on the Celestial Sphere (at an infinite distance) at the intersection of the Celestial Sphere and the plane of the Earth's orbit. The Earth's axis of rotation is not perpendicular to the plane of the ecliptic, but is inclined about 23.5 degrees to the perpendicular. The North Pole of the Earth does not point in the direction of the ecliptic North Pole.

There are at least nine planets, including the Earth, revolving around the Sun. The closest to the Sun is

Mercury (at a mean distance of about .4 AU) and the most distant is Pluto (at a mean distance of 39.4 AU). The planes of the orbits for all the planets are quite close to the plane of the ecliptic, except that of Pluto, which is inclined some 17 degrees.

Six of the nine planets have satellites. In addition, there are thousands of small bodies revolving around the Sun between the orbits of Mars and Jupiter, the asteroids or minor planets. The system, including the Sun, its planets, and asteroids, is referred to as the solar system. In addition to these main members of the solar system, there is a significant amount of gas, dust, and small solids (including meteors and comets), which may be collectively referred to as inter-planetary matter.

The main purpose of this section is to provide reference information useful in connection with sections. The following pages contain tables of pertinent information concerning the planets, their satellites, the asteroids, comets, and meteors. There are many good texts available describing the nature of our solar system in great detail and it is assumed that the reader either has some familiarity with our system or can obtain this at the local library. Here we are interested in the significant points and directions in space rather than an examination of the many different qualities of the members of our solar system.



The Planets of Our Solar System

Included is a diagram of our solar system out to and including Saturn. The outer or transcendental planets Uranus, Neptune, and Pluto are much too far out to fit on this paper. The other planets (pictured here) show the relative size and distance of the various orbits. Note the large asteroid belt between the orbits of Mars and Jupiter and the two groups of asteroids (Trojans) positioned roughly sixty degrees ahead and behind the giant planet Jupiter (see Asteroids for details).

The Sun

The Sun is a variable star that is unlike any we know. It revolves east to west (in the direction of the signs of the Zodiac -- counterclockwise. The equator of the Sun is another fundamental reference plane to which we could refer all planetary motion. The inclination of the solar equator to the ecliptic is 7°15' and the longitude of the ascending node to the ecliptic of 1950 is 75°04'. Some interesting data about our Sun:

Period of synodic rotation $26.75 + 5.7^2$ sin in φ d.

Period of sidereal rotation (φ = 17°)= 25.38 days

Corresponding synodic period = 27.275 days

Sun's angular velocity (φ = 17°)= $2.865 \mathrm{x} 10^{-6}$ rad s^{-1}

Sun's radius = 864934.6 miles

Sun's mass = 1.989(2)x 10^{33}g

Mean distance from Earth= $92.9558 \mathrm{x} 10^6$ miles

Mean equatorial horizontal parallax= 8.79418

The Sun Data

SS-99 North Pole of Sun
15°Pi03'58 +82°44'60

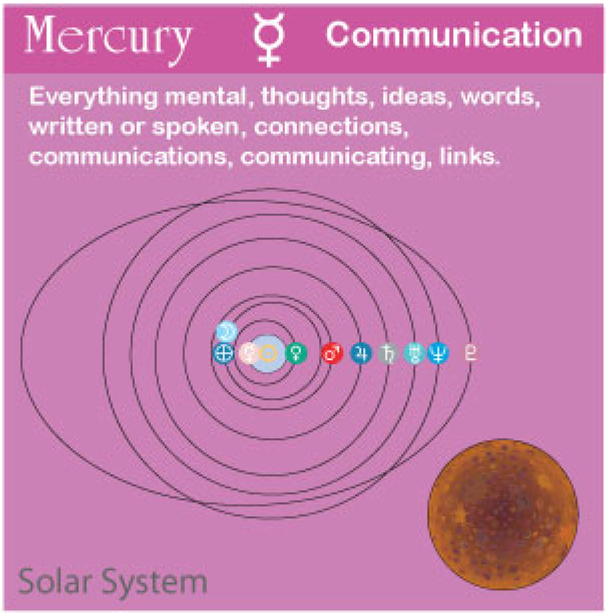
SS-100 South Pole of Sun
05°Vi20'26 -81°51'32

SS-101 Ascending North Node Sun Equator to ecliptic
15°Ge03'60 + 0°00'00

SS-102 Descending South Node Sun Equator to ecliptic
14°Sa55'53 + 1°12'39

SS-103 Ascending North Node Sun Equator to equator
14°Ar45'45 - 6°18'22

SS-104 Descending South Node Sun Equator to equator
14°Li45'45 + 6°18'22



The Moon

Here is some basic data about the Moon:

Mean distance from Earth= 384401 km

Extreme range 356400406700 km Mean horizontal paralax 3422.60”

Eccentricity of orbit = 0.0549

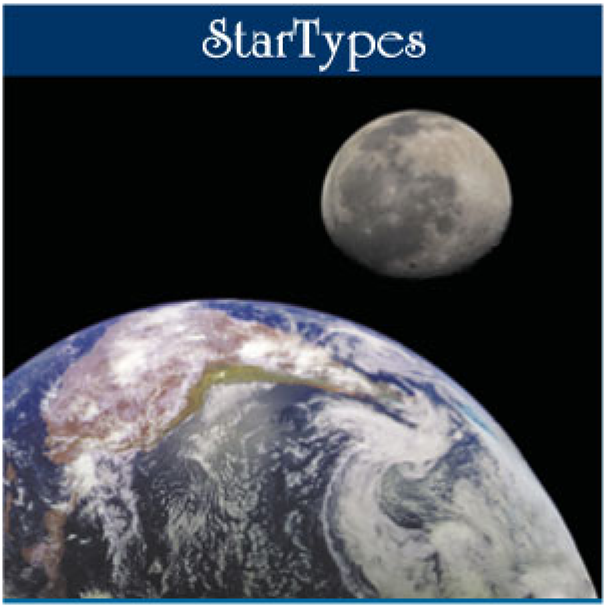
Inclination of orbit to ecliptic = 5°08'43”

Sidereal period (fixed stars)= 27.321661 ep. days

Synodical month (New Moon to New Moon) = 29.5305882 ep. days

Anomalistic month perigee to perigee) = 27.5545505 days

Tropical month (equinox to equinox) = 27.321582 days



Mother Moon

Nodical month (node to node) = 27.212220 days

Period of Moon's node (nutation, retrograde) = 18.61 tropical years

Period of rotation of Moon's perigee (direct) = 8.85 years

Moon's sidereal mean daily motion = 13°.176358

Mean Transit interval = 24h 50.47m

Main periodic terms in the Moon's motion:

Principal elliptic term in longitude 22639" sin g

Principal elliptic term in latitude 18461" sin u

Evection = 4586"sin (2D-g)

Variation = 2370"sin 2D

Annual inequality = -669"sin g'

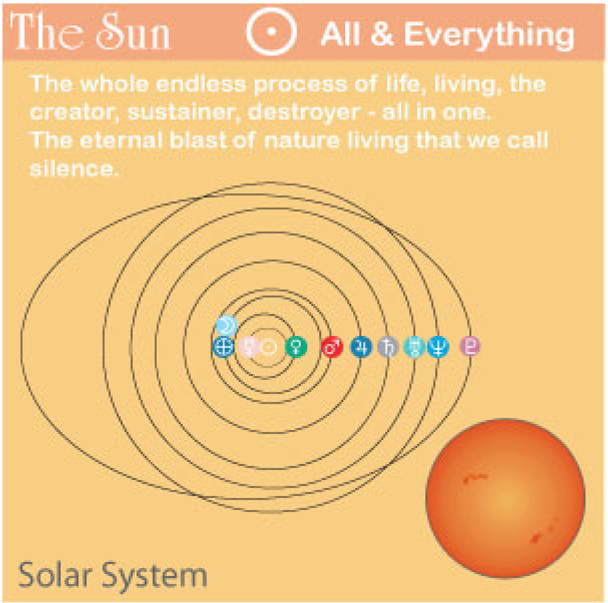
Parallactic inequality = -125"sin D
Where g = Moon's mean anomaly,
g'= Sun's mean anomaly,
D = Moon's age,
u= distance of mean Moon from ascending node.

Inclination of lunar equator to ecliptic = 1°32.5'

Inclination of lunar equator to orbit = 6°41'

Mean Moon radius= 1738.2 km

Moon mass = 1/81.301 mass of Earth



Mercury

SS-01 North Pole of Mercury Orbit
17°Aq44'21 +82°59'47

SS-02 South Pole of Mercury Orb
14°Le03'33 -82°21'12

SS-03 Asc North Node Mercury to ecliptic
17°Ta44'19 + 0°00'00

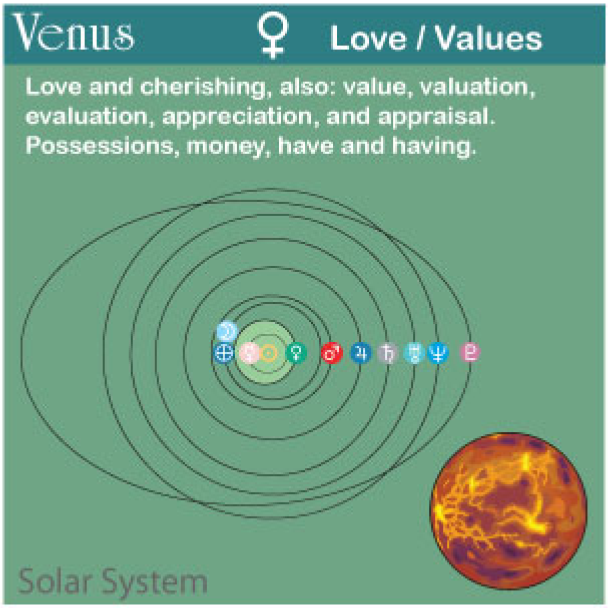
SS-04 Descending South Node Mercury to ecliptic
17°Sc40'06 + 0°14'28

SS-05 Ascending North Node Mercury to equator
09°Ar59'14 - 4°18'05

SS-06 Descending South North Mercury to equator
09°Li59'14 + 4°18'05

SS-07 Perihelion Mercury
16°Ge40'40 + 3°24'07

SS-08 Aphelion Mercury
16°Sa38'40 - 3°04'37



Venus

SS-09 North Pole of Venus
16°Pi13'45 +86°36'21

SS-10 South Pole of Venus
01°Vi23'47 -86°05'27

SS-11 Ascending North Node Venus to ecliptic
29°Ta50'57 + 2°40'20

SS-12 Descending South Node Venus to ecliptic
16°Sa04'45 + 1°27'34

SS-13 Ascending North Node Venus to equator
07°Ar19'48 - 3°10'01

SS-14 Descending South Node Venus to equator
07°Li19'48 + 3°10'01

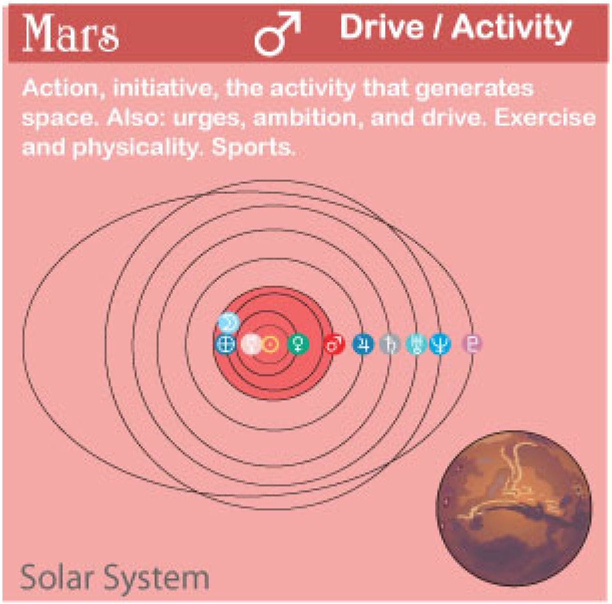
SS-15 Perihelion Venus
10°Le52'03 + 2°46'09

SS-16 Aphelion Venus
10°Aq57'49 - 2°26'10

Earth

SS-17 Perihelion Earth
12°Cn04'50 + 0°00'00

SS-18 Aphelion Earth
12°Cp14'33 + 1°47'10



Mars

SS-19 North Pole of Mars
19°Aq10'09 +88°09'00

SS-20 South Pole of Mars
08°Le09'31 -87°40'53

SS-21 Ascending North Node Mars to ecliptic
19°Ta10'19 - 0°00'00

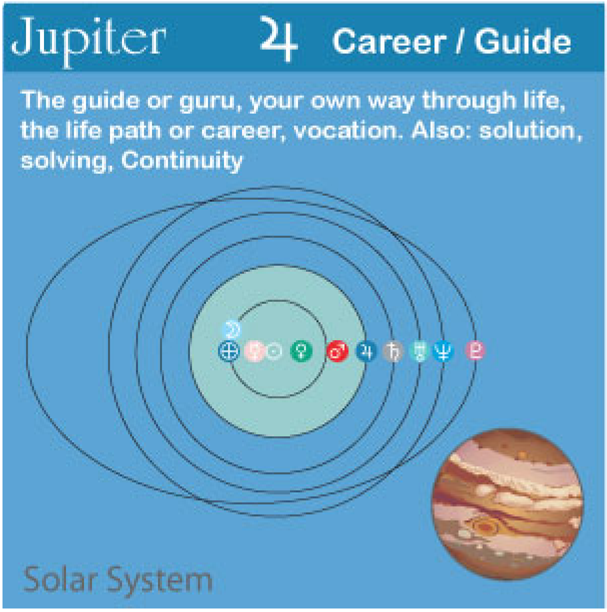
SS-22 Descending South Node Mars to ecliptic
18°Sc53'15 + 1°00'14

SS-23 Asc North Node Mars to equator
03°Ar04'34 - 1°19'59

SS-24 Descending South Node Mars to equator
03°Li04'34 + 1°19'59

SS-25 Perihelion Mars
05°Pi20'53 - 1°15'01

SS-26 Aphelion Mars
05°Vi08'19 + 1°46'43



Jupiter

SS-27 North Pole of Jupiter
09°Ar56'37 +88°41'39

SS-28 South Pole of Jupiter
17°Le09'29 -88°08'24

SS-29 Ascending North Node Jupiter to ecliptic
09°Cn56'36 - 0°00'00

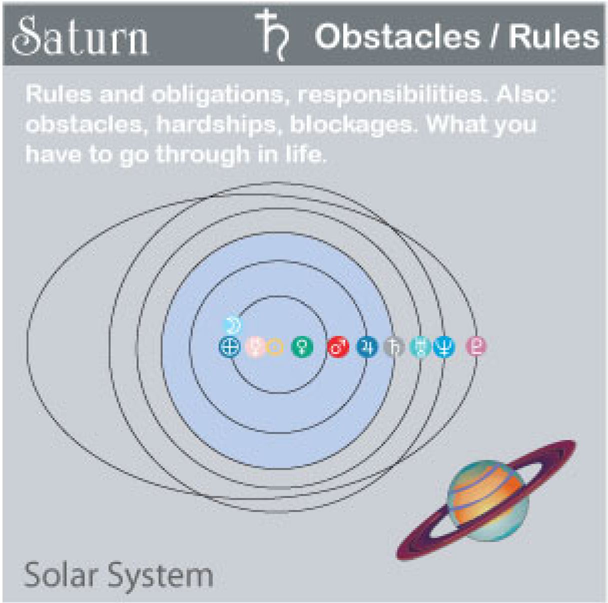
SS-30 Descending South Node Jupiter to ecliptic
09°Cp57'15 + 0°08'45

SS-31 Ascending North Node Jupiter to equator
02°Ar59'27 - 1°17'47

SS-32 Descending South Node Jupiter to equator
02°Li59'27 + 1°17'47

SS-33 Perihelion Jupiter
13°Ar31'01 - 1°18'12

SS-34 Aphelion Jupiter
13°Li24'44 + 1°33'08



Saturn

SS-35 North Pole of Saturn
23°Ar13'19 +87°30'35

SS-36 South Pole of Saturn
03°Li12'25 -87°37'34

SS-37 Asc North Node Saturn to ecliptic
23°Cn13'12 + 0°00'00

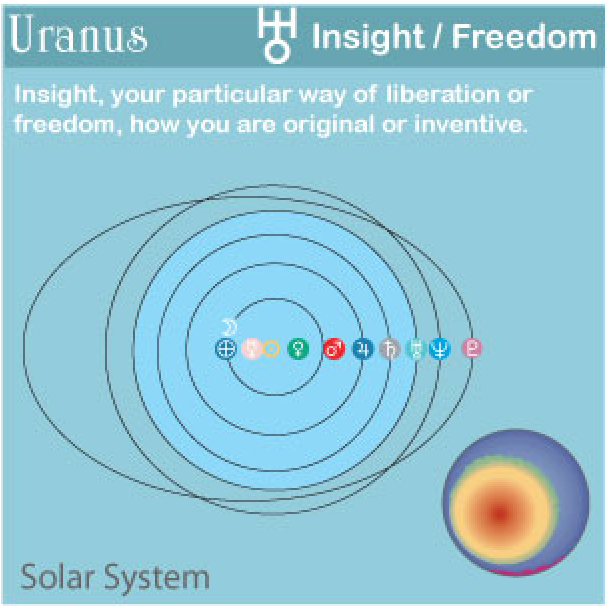
SS-38 Descending South Node Saturn to ecliptic
23°Cp22'15 + 0°52'58

SS-39 Ascending North Node Saturn to equator
05°Ar28'52 - 2°22'19

SS-40 Descending South Node Saturn to equator
05°Li28'52 + 2°22'19

SS-41 Perihelion Saturn
02°Cn04'07 - 0°53'57

SS-42 Aphelion Saturn
02°Cp05'07 + 1°57'37



Uranus

SS-43 North Pole of Uranus
13°Pi44'59 +89°13'38

SS-44 South Pole of Uranus
11°Le11'30 -88°50'38

SS-45 Ascending North Node Uranus to ecliptic
13°Ge44'43 - 0°00'00

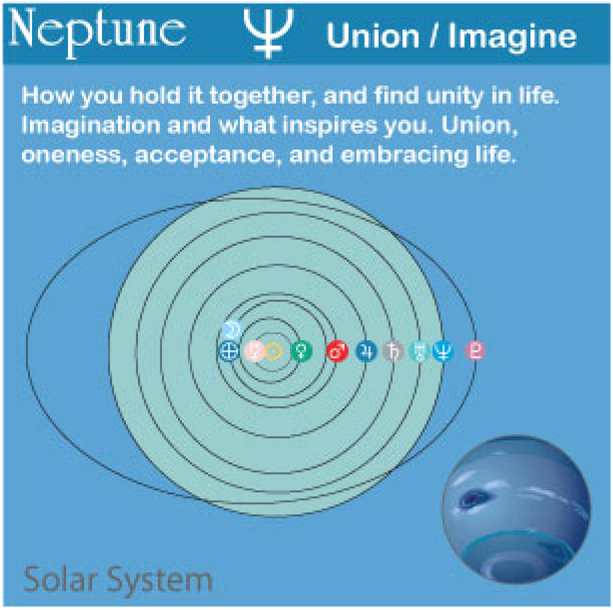
SS-46 Descending South Node Uranus to ecliptic
13°Sa38'07 + 0°54'20

SS-47 Ascending North Node Uranus to equator
01°Ar41'44 - 0°44'07

SS-48 Descending South Node Uranus to equator
01°Li41'44 + 0°44'07

SS-49 Perihelion Uranus
19°Vi50'54 + 0°46'07

SS-50 Aphelion Uranus
20°Pi25'14 + 0°34'14



Neptune

SS-51 North Pole of Neptune
11°Ta13'43 +88°13'31

SS-52 South Pole of Neptune
21°Vi54'56 -88°34'25

SS-53 Ascending North Node Neptune to ecliptic
11°Le13'47 - 0°00'00

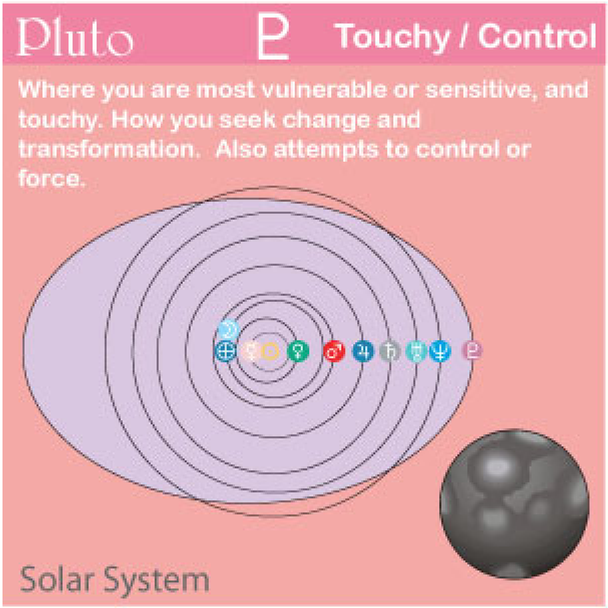
SS-54 Descending South Node Neptune to ecliptic
11°Aq27'21 + 0°47'30

SS-55 Ascending North Node Neptune to equator
03°Ar13'38 - 1°23'55

SS-56 Descending South North Neptune to equator
03°Li13'38 + 1°23'55

SS-57 Perihelion Neptune
14°Ta11'10 - 0°46'19

SS-58 Aphelion Neptune
13°Sc58'16 + 1°27'56



Pluto

SS-59 North Pole of Pluto
20°Ar25'60 +72°49'48

SS-60 South Pole of Pluto
16°Li53'13 -72°24'05

SS-61 Ascending North Node Pluto to ecliptic
20°Cn26'01 - 0°00'00

SS-62 Descending South Node Pluto to ecliptic
20°Cp42'02 + 1°45'44

SS-63 Ascending North Node Pluto to equator 11°Ta37'32
-16°04'14

SS-64 Descending South Node Pluto to equator
11°Sc37'32 +16°04'14

SS-65 Perihelion Pluto
14°Sc49'42 +16°16'16

SS-66 Aphelion Pluto
15°Ta00'15 -15°41'43

Invariable Plane of the Solar System

The Invariable Plane of our solar system passes through the center of gravity of the solar system and is independent of the mutual perturbations of the planets. It is called "invariable" because it remains unaltered, regardless of any and all motions within the planetary system. It is a plane through the center of mass, perpendicular to the orbital angular-momentum factor. This factor is made up of the angular momentum arising from orbital revolutions and from axial rotations.

As one planet decreases its eccentricity and inclination (over very long time periods), one or more orbits must at the same time be increasing their eccentricities and inclinations, whereby the total amount of eccentricity and inclination remains constant. Jupiter and Saturn largely determine the invariable plane, since they are the largest and heaviest of the planets. There has been some thought given to using the invariable plane as a fundamental reference plane on which to study planetary configurations. The center of mass of the solar system moves, with respect to the inertial system of reference, in a straight line with constant speed through space in a 250-million-year orbit or circle around the galactic center. The northern node of the invariable plane to the ecliptic is 107°03'46.99" in longitude (1950.0) with an inclination of 1°34'50" to the ecliptic plane. Thanks to Charles A. Jayne, Jr. for his research on this subject.

Invariable Plane

SS-105 North Pole of Invariable Plane
17°Ar03'41 +88°25'10

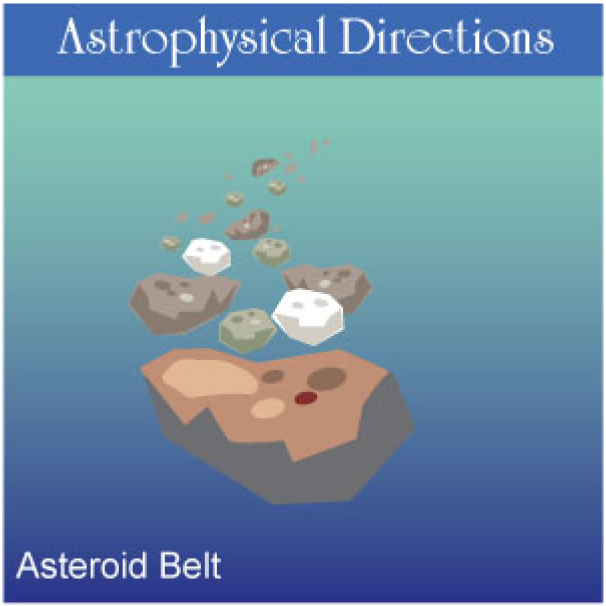
SS-106 South Pole of Invariable Plane
17°Le52'17 -87°48'04

SS-107 Ascending North Node Invariable Plane to ecliptic = 17°Cn03'47 - 0°00'00

SS-108 Descending South Node Invariable Plane to ecliptic = 17°Cp09'11 + 0°42'26

SS-109 Ascending North Node Invariable Plane to equator =03°Ar32'48 - 1°32'13

SS-110 Descending South Node Invariable Plane to equator =03°Li32'48 + 1°32'13

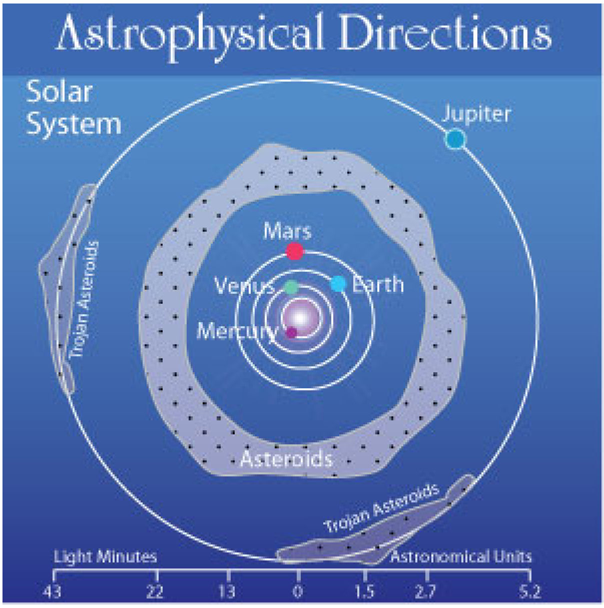


The Asteroids

The Asteroids (Greek, asteroids, "starlike"), also known as the minor planets or planetoids, constitute a group of bodies ranging from about 470 miles to a mile or two in diameter that revolve about the Sun in orbits that occur, in general, between those of Mars and Jupiter. It has long been known that the distance between Mars and Jupiter is proportionally larger than for any other two planets and Kepler even suggested that a planet might be found in this region of the solar system. The first asteroid was sighted in this region in 1801 (Ceres) and by 1807 three others were known (Pallas, Juno and Vesta). As of 1972 there were 1779 minor planets with determined orbits and an estimated 50,000 asteroids probably exist.

The great majority of the asteroids move in orbits within a range of 2.1 to 3.5 astronomical units from the Sun and the orbital periods vary, in general, between 3.3 and 6 years, with a weighted average of 1.5 years. The orbits are somewhat more eccentric than those of the principal planets and the orbital planes are also more highly inclined to the plane of the ecliptic. The asteroids are more or less evenly spread between Mars and Jupiter, with some exceptions. None has a period close to one-half, two-fifths or one-third of the orbital period of Jupiter and these spaces in the asteroid belt are termed the Kirkwood gaps.

It was first thought that these gaps were produced by perturbations caused by the giant planet Jupiter, but today it is felt that the disturbing actions of many asteroids on each other, in resonance, force them out of period. There is no precise information concerning the true mass or structure of any asteroid. Many astronomers believe that most are the broken fragments of two (or many) small planets that, formed between Mars and Jupiter, subsequently underwent violent collisions.



The Trojan Asteroids

One of the most interesting sub-groups of asteroids are the Trojans. In 1772, the French mathematician and astronomer Lagrange considered the hypothetical case of a body of relatively small mass (such as an asteroid) revolving around the Sun in the same orbit as a heavy planet. He showed that if the Sun, the planet, and the asteroid were located at the corners of an equilateral triangle, the position of the asteroid with respect to the planet would remain essentially unchanged.

Such an asteroid was actually discovered in 1906 and subsequently a group of 15 or so turned up – the Trojan asteroids. The Trojans fall into two groups: one group of five asteroids precedes Jupiter in its orbit by 60 degrees of arc and the other ten follow it by that same angle. Today over 1,000 Trojans have been discovered and for some unknown reason there are at least twice many Trojans at the Lagrangian point ahead of Jupiter as there are behind it. Spectral studies show that, as a group, the Trojans are the darkest of all asteroids. They may be composed of debris left over after the formation of Jupiter or they may be accretions of interplanetary matter gravitationally attracted toward the giant planet.

A number of asteroids with highly inclined orbits also exist (one reaching within Mercury's orbit). Some of these cross the orbit of the Earth and some exhibit rotation. Asteroids are the subject of much attention at this time in astronomy.

Ceres

SS-67 North Pole of Ceres
20°Pi48'31 +79°24'11

SS-68 South Pole of Ceres
13°Vi11'20 -78°24'15

SS-69 Ascending North Node Ceres to ecliptic
21°Ge43'33 - 0°03'37

SS-70 Descending South Node Ceres to ecliptic
21°Sa42'36 + 0°18'51

SS-71 Ascending North Node Ceres to equator
21°Ar43'30 - 9°07'12

SS-72 Descending South Node Ceres to equator
21°Li43'20 + 9°07'08

SS-73 Perihelion Ceres
01°Vi53'15 +10°02'10

SS-74 Aphelion Ceres
02°Pi00'08 - 9°45'21

Pallas

SS-75 North Pole of Pallas
13°Ge00'16 +57°40'25

SS-76 South Pole of Pallas
22°Sa56'26 -54°52'36

SS-77 Ascending North Node Pallas to ecliptic
23°Vi04'11 - 0°00'00

SS-78 Descending South Node Pallas to ecliptic
23°Pi39'51 + 1°22'51

SS-79 Ascending North Node Pallas to equator
11°Vi53'38 - 7°40'34

SS-80 Descending South Node Pallas to equator
11°Pi53'38 + 7°40'34

SS-81 Perihelion Pallas
02°Le49'00 -26°19'16

SS-82 Aphelion Pallas
03°Aq14'09 +27°59'10

Juno

SS-83 North Pole of Juno
20°Ge42'37 +76°58'59

SS-84 South Pole of Juno
20°Sa03'56 -77°22'06

SS-85 Ascending North Node Juno to ecliptic
20°Vi42'37 - 0°00'00

SS-86 Descending South Node Juno to ecliptic
21°Pi14'51 + 1°15'18

SS-87 Ascending North Node Juno to equator
10°Ar17'27 - 4°25'49

SS-88 Descending South Node Juno to equator
10°Li17'27 + 4°25'49

SS-89 Perihelion Juno
26°Ta05'09 -11°52'06

SS-90 Aphelion Juno
25°Sc45'04 +13°17'05

Vesta

SS-91 North Pole of Vesta
13°Ar47'33 +82°51'38

SS-92 South Pole of Vesta
10°Li00'10 -82°49'14

SS-93 Ascending North Node Vesta to ecliptic
13°Cn47'32 - 0°00'00

SS-94 Descending South Node Vesta to ecliptic
13°Cp56'33 + 1°27'17

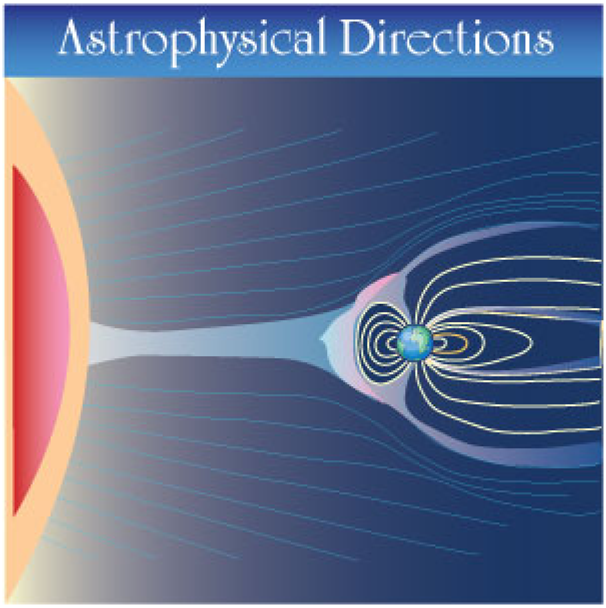
SS-95 Asc North Node Vesta to equator 16°Ar45'51 - 7°07'48

SS-96 Des South Node Vesta to equator 16°Li45'51 + 7°07'48

SS-97 Perihelion Vesta
13°Sa13'58 + 5°15'17

SS-98 Aphelion Vesta
13°Ge25'51 - 3°37'22

Chapter 3: Beyond the Solar System



The Solar Wind

A high wind of hydrogen blows all night and day through our solar system. It emanates from the Sun and rushes past the Earth at some 400 km per second and out into interstellar space. Like a broom, it sweeps gases that have evaporated from planets and meteoritic dust. The solar wind is responsible for the outer portions of the Van Allen radiation belts, for the aurora in the Earth's atmosphere, and for terrestrial magnetic storms, perhaps even the general weather patterns.

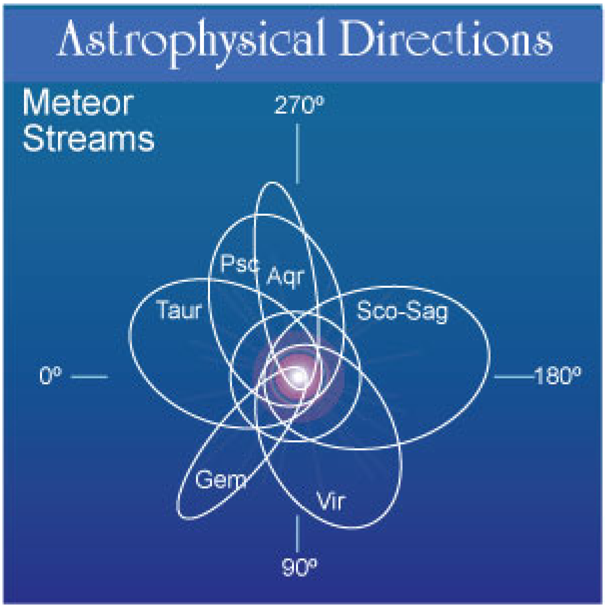
In recent year, the phenomenon of the solar wind has become of more interest to researchers. This solar wind blows far out into the solar system and beyond. The Earth's magnetic fields serve to shield us from direct contact with the solar wind's charged particles. The Earth's magnetic field is rounded toward the sun, and stretches out in a long tail away from the sun, just like a comet. The solar wind rushes around and past the Earth and on out into space.

A most important function of the solar wind, which acts like an aura out as far as Saturn (during the years of high solar activity, the sunspot cycle) is to push back cosmic ray particles coming from outside our solar system. The intensity of cosmic rays reaching the Earth is cut in half during the years of highest solar activity.

One way of looking at this phenomenon is that the Earth and the inner planets are wrapped in a cloak or aura of solar particles for several years and are thus shielded from information trying to reach us from deep space. As the Sunspot cycle ebbs and the aura withdraws, the cosmic rays once again penetrate in greater numbers into the inner solar system and to the Earth. There were sunspot minimums in 1964 and 1976.

It is important to note that the Moon passes through the different sections of the Earth’s magnetic sphere in its monthly orbit. At New Moon it is always in the upstream portion of the magnetosphere, facing the sun and downstream in the Earth's tail at Full Moon. At First Quarter, the Moon is to the dusk side of Earth and at Fourth Quarter, the Moon is in the dawn side of the magnetosphere.

The interrelationship of the solar wind and the Earth's magnetosphere is receiving considerable attention in recent years. It has been suggested that the passage of the Moon through the Earth’s magnetic shield may serve to trigger various weather and magnetic activity. The interrelationship of indicators like the geomagnetic index, solar flux and other measures of solar activity with the Moon is just now in the process of being researched and understood.



Meteors

Meteor or "shooting star" is a bright streak (meteor trail) across the night sky resulting from the heat generated when a particle or piece of matter traveling at a high velocity in space enters the Earth's atmosphere. The particle itself is called a meteor, but it is preferable to designate it as a meteoroid. A meteoroid then produces a meteor when it encounters and interacts with Earth's atmosphere. A very bright meteor is called a fireball, and a large fireball (particularly one accompanied by sparks and explosive noise) is called a bolide. While most meteoroids will disintegrate into small particles and dust upon entering our atmosphere, some of the very largest will make impact with the surface of the Earth creating large craters. A list of some of the most famous meteor craters follows this article.

There are two main types of meteors: sporadic and recurrent meteors (showers). Sporadic meteors may be seen on almost any night of the year at a rate of 5 to 7 per hour and show no preferred direction in the sky. The greatest frequency of sporadic meteors occurs after, rather than before, midnight. Between midnight and dawn an observer is facing the same direction as the Earth is moving in its orbit and he can see all of the meteors formed by the meteoroids traveling toward him (from the left), no matter what their velocity). On the other hand, between dusk and midnight, the only meteors that are visible are those produced by meteoroids coming toward him (from the right) with sufficient velocity to overtake the Earth.

The other type of meteor that occurs is the meteor shower. Meteor showers occur at relatively fixed times of year and seem to originate from a fixed point in the heavens known as a radiant. Meteor showers take their names from the constellation or star near where their radiant position is located and most occur each year with great regularity. The display of the Leonid shower on November 12, 1833 was so striking that meteors were described as "falling like snowflakes from the sky" and no section of the heavens was not filled with thousands of meteors. These permanent showers occur as the Earth sweeps through the concentrations of dust and debris in space. This debris is moving in orbit about the Sun. After A few days, the Earth moves through and beyond the particular debris. Orbits of a general sort are known for the principal showers and some of the major showers are presented in the diagram above. Most meteor shows occur regularly each year, some every few years, and in several cases a shower has been completely lost or has vanished.

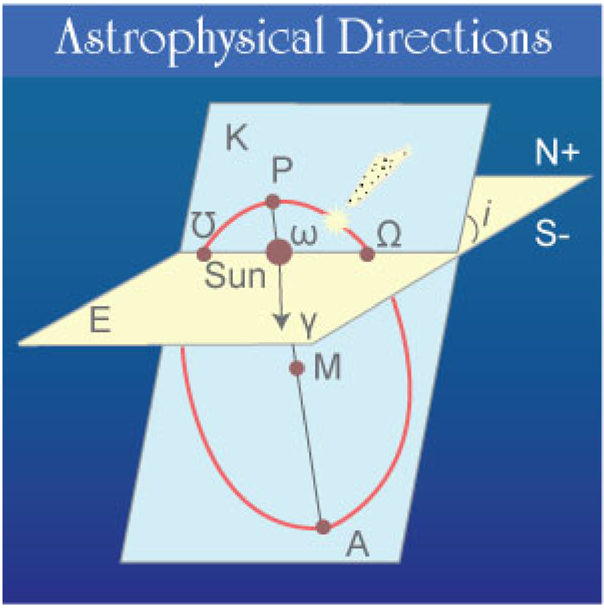
Radio-echo technique has greatly expanded our understanding of meteor showers by allowing us to very accurately record these events. In at least three major cases, this technique has discovered new radiant points occurring only through the daylight hours (daytime showers).

Meteors Table

ME 1	22°Li05'32	+62°20'32	Quadrantids Jan 1/4
ME 2	01°Li09'30	+ 4°51'46	Virginids Mar 5/21
ME 3	14°Le08'46	+42°20'59	Whipple II Mar 13/Apr 21
ME 4	00°Cp00'00	+56°26'45	Lyrids Apr 20/23
ME 5	07°Pi46'53	+ 9°18'48	eta Aquarids May 2/6
ME 6	18°Ta15'31	+ 5°58'21	Daytime Arietids May 29/Jun 18
ME 7	04°Ge22'44	+ 2°00'39	Daytime Perseids Jun 1/16
ME 8	26°Ge12'26	- 4°23'35	beta Taruids-Day Jun 24/Jul 6
ME 9	04°Pi14'39	- 7°34'41	S. delta Aquarids Jul 21/Aug 15
ME 10	08°Pi43'16	+ 3°33'34	N. delta Aquarids Jul 14/Aug 19
ME 11	04°Pi28'05	- 4°26'06	S. iota Aquarids Jul 16/Aug 25
ME 12	01°Pi15'44	+ 6°26'32	N. iota Aquarids Jul 16/Aug 15
ME 13	08°Aq47'06	+ 8°20'57	alpha Caricornids Jul 17/Aug 21
ME 14	01°Ge49'17	+38°46'56	Pereids Jul 29/Aug 17
ME 15	19°Aq33'00	+76°09'30	Kappa Cygnids Aug 19/22
ME 16	14°Sa00'36	+77°06'45	Draconids Oct 10
ME 17	03°Cn52'38	- 7°23'31	Orionids Oct 18/26
ME 18	22°Ta13'47	- 4°28'41	S. Taurids Sep 15/Dec 15
ME 19	24°Ta53'25	+ 2°04'02	N. Taurids Oct 17/Dec 02
ME 20	00°Ta30'42	+16°28'53	Andromedids Nov 7
ME 21	26°Le10'58	+ 9°48'58	Leonids Nov 14/20
ME 22	19°Cn40'09	+10°06'42	Geminids Dec 7/15
ME 23	27°Ge11'49	- 2°24'60	chi Orionids Dec 9/14
ME 24	13°Cn19'26	-14°50'47	Monocerotids Dec 13/15
ME 25	25°Cn51'35	+69°01'59	Ursids Dec 17/25

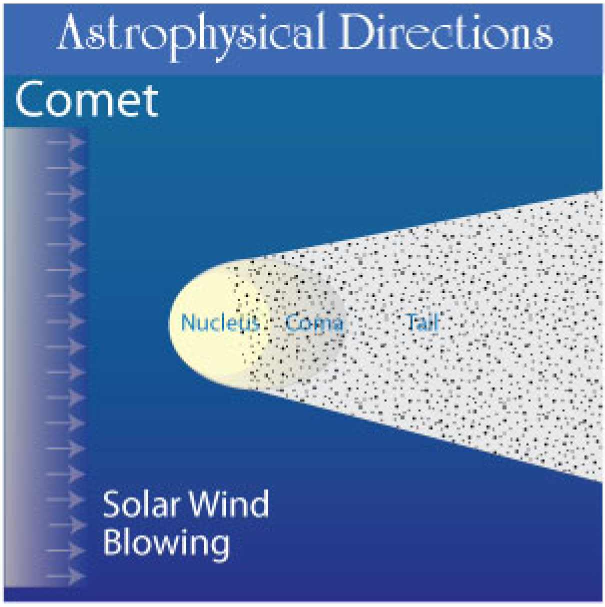
Famous Meteorite Craters

No	Geographic		location	Year	#	Diam.
01	35N02	111W01	Barringer, Arizona, USA	1891	1	1240
02	6ON55	l6lE57	Tunguska, Siberia, USSR	1908	10+	52
03	3lN48	102W30	Odessa, USA	1921	2	170
04	27S45	117E05	Dalgaranga, Australia	1923	1	70
05	58N24	022E40	Osel, Kaalijarv, Estonia	1927	7	100
06	28S40	06IW40	Campo del Cielo, Argent.		many	75
07	24S34	133El0	Honbury, Australia	1931	13	150
08	2lN30	050E28	Wabar, Arabia	1932	2	100
09	37N35	099Wl0	Haviland, Kansas, USA	1933	1	14
10	22S37	135El2	Boxhole, Australia	1937	1	175
11	19Sl8	127E46	Wolf Creek, Australia	1947	1	820
12	43N32	003E08	Herault, France	1960	6	230
13	6IN17	073W40	Chubb, New Quebec, Canada	1950	1	3400
14	20N17	012W42	Aouelloul. Mauritania	1950	1	300
15	46N04	078W29	Brent Ontario, Canada	1951	1	3200
16	38N05	076EI6	Murgab, Tadzhik, SSR	1952	2	80
17	56N24	103W00	Deep Bay, Sask, Canada	1956	1	13000
18	48N53	0l0E37	Reiskessel, Bavaria	1904	1	24000
19	56Nl0	074W20	Clearwater lakes, Quebec	1954	2	26000



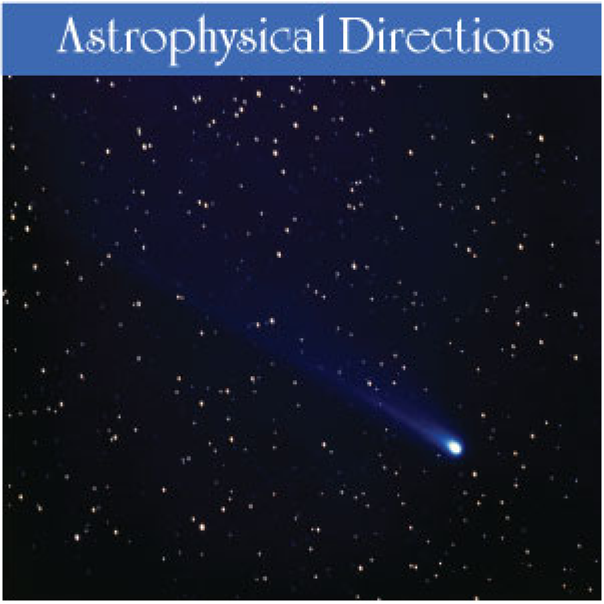
Comets

It is believed that Comets are massive chunks of loosely packed ices – frozen gases. In addition to ordinary water, these include carbon dioxide (dry ice), methane, cyanogen, and ammonia. Comets move in highly elliptical orbits (in most cases) and spend the majority of their time in the frigid regions at the very edge of our solar system. Once every 10,000 years or so, they come close to the Sun, rapidly cross the inner portion of their orbit, and then speed back out again to the depths of space. During this fleeting visit to the solar neighborhood, the comet encounters sunlight, which melts and evaporates some of the ices. The solar wind particles (ever flowing out from the Sun) catch this comet material and blow it out into a long luminous tail that may stretch millions of miles, always in a direction away from the Sun.



The Head of the Comet

It is believed that practically all comets belong to the solar system and no clear-cut evidence for a visitor from external space has been yet found. Upwards of 800 passages (more than 500 individual comets) have been observed with sufficient accuracy to provide reliable orbital data. Some 300 move in nearly parabolic or in hyperbolic orbits, while about 200 move in elliptic orbits of measurable period.



Spectacular Comets

Bright and spectacular comets are rare, one appearing on the average of every ten years or so. According to one theory, "new comets" come close to the Sun for the first time when the gravitational action of passing stars perturbs their original orbits. The lifetimes of comets appear to be quite short, once their perihelion distance from the Sun is reduced to 1 A.U. or so. They begin to disintegrate and disappear. Each return of the comet results in a loss of mass until, in some cases, the comet may break into pieces and disintegrate.

Very bright comets were seen during the 19th century in 1811, 1835, 1843, 1861, and 1882 and this century in 1910, 1957, 1962, and 1965. Comet designation represents the order of their discovery in a given year (1910a, 1910b, and so on) as temporary identification, along with the name of the discoverer or discoverers (not more than three names). Later, a permanent designation is decided upon that includes the year, followed by a Roman numeral in the order of perihelion passage. Periodic comets often bear the names of their discoverers or occasionally of the individual who computes the orbit. The famous Halley's comet received its name because of Halley's important prediction of its return in 1759.

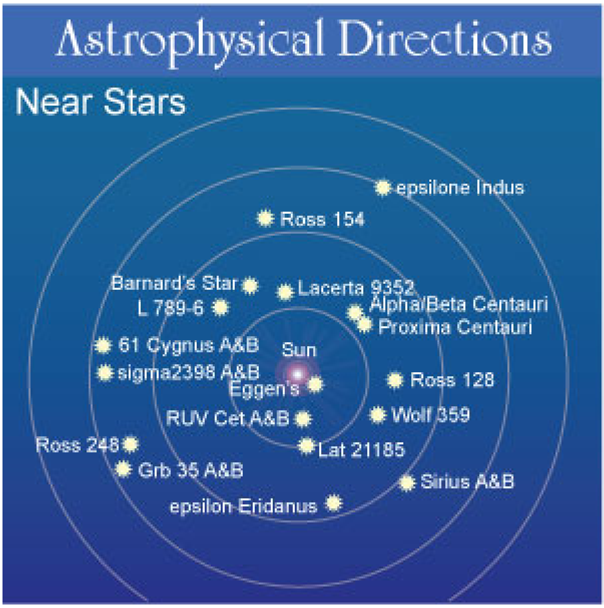
The head of a comet often appears as a stellar nucleus surrounded by a fuzzy coma, which may extend for more than 100,000 kilometers. Most comets appear or become visible somewhere between the orbits of Jupiter and Mars, become brilliant and spectacular in the approach to the Sun, and show a rapid decrease in brightness as they recede from the Sun. During their departure, few are observed beyond 3 A.U.. Comets have long been a sign or believed to be an indication of powerful events soon to occur on Earth.

Table of Comets

No	Name		p	N	Time	
01	1960i	Encke	3.3002	46	1961	Feb
02	196lg	Gri gg-Skj el I erup	4.9081	10	1961	Dec
03	1954III	Honda-Mrkos-Pajdusakova	5.215	2	1959	Apr
04	1961b	Tempel 2	5.259	13	1962	May
05	1927I	Neujmin 2	5.4296	2	1927	Jan
06	1879I	Brorsen	5.4630	5	1879	Mar
07	1962b	Tuttle-Gaicobini-Kresak	5.4887	4	1962	Apr
08	19081I	Tempel-Swift	5.6807	4	1908	Oct
09	1894IV	de Vico-Swift	5.8551	3	1894	Oct
10	1879III	Tempel 1	5.9822	3	1879	May
11	1951VI	Pons-Winnecke	6.296	15	1964	Mar
12	1958I	Kopff	6.318	8	1964	May
13	1959b	Giacobini-Zinner	6.4161	7	1959	Oct
14	1961a	Forbes	6.424	4	1961	Jul
15	1958V	Wolf-Harrington	6.5115	3	1958	Aug
16	1960j	Schwassmann-Wachmann 2	6.5324	6	1961	Sep
17	1852III	Biela	6.6208	6	1852	Sep
18	1960rn	Wirtanen	6.6693	3	1961	Apr
19	19501I	d'Arrest	6.673	10	1963	Oct
20	1961h	Perrine-Mrkos	6.7097	4	1962	Feb
21	1960IX	Reinmuth 2	6.7114	3	1960	Nov
22	1960VI	Brooks 2	6.7199	10	1960	Jun
23	1960VII	Harrington	6.8024	2	1960	Jun
24	1957VII	Arend-Rigaux	6.8129	2	1964	Jun
25	1906III	Holmes	6.8577	3	1906	Mar
26	1956V	Johnson	6.861	3	1963	Jun
27	1960VIII	Finlay	6.8957	7	1960	Sep
28	1960V	Borelly	7.0207	7	1960	Jun
29	1950V	Daniel	7.094	4	1964	Apr
30	1962a	Harrington-Abell	7.24	2	1962	Mar
31	196le	Faye	7.38	15	1962	May
32	1962f	Whipple	7.462	5	1963	Apr
33	1962e	Ashbrook-Jackson	7.5078	3	1956	Apr
34	1958II	Reinmuth 1	7.6522	4	1958	Mar
35	1959V	Arend	7.7922	2	1959	Sep
36	19581V	Otema	7.8804	3	1958	Jun
37	1960III	Schaumasse	8.1792	6	1960	Apr
38	1959II	Wolf 1	8.4296	10	1959	Mar
39	1960f	Comas-Sola	8.5857	5	1961	Apr
40	19601V	Vaisala 1	10.4566	3	1960	May
41	1951V	Neujmin 3	10.57	2	1961	Dec
42	1938a	Gale	10.810	2	1960	Jan
43	1939X	Tuttle	13.6059	8	1939	Nov
44	19571V	Schwassmann-Wachmann 1	16.1004	3	1957	May
45	1948XIII	Neujmin 1	17.9711	3	1948	Dec
46	1956VI	Crommelin	27.8726	6	1956	Oct
47	1866I	Tempel-Tuttle	33.1758	2	1866	Jan
48	19421X	Stephan-Oterma	38.9611	2	1942	Dec
49	1913VI	Westphal	61.7303	2	1913	Nov
50	1956IV	Olbers	65.5692	3	1956	Jun
51	1919III	Brorsen-Metcalf	69.0597	2	1919	Oct
52	1954VII	Pons-Brook	70.8567	3	1954	May

53	19101I	Halley	76.0289	29	1910	Apr
54	1939VI	Herschel-Rigollet	156.044	2	1939	Aug
55	190711	Grigg-Mellish	164.317	2	1907	Mar

Chapter 4: Local Star System

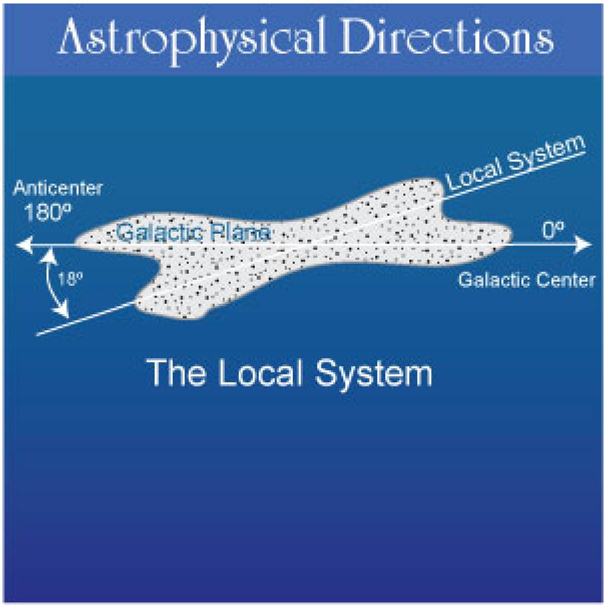


The Nearest Stars

The 26 nearest stars to our Sun are mapped in the accompanying diagram. The stars are mapped using New Galactic Longitude and Latitude and the numbers within the circles indicate the distance of the star above or below the galactic plane (through the Sun) in light years.

Near Stars Table

Zodiac	Latitude	Object
23°Ar55'34	+37°56'14	Grb 34 A, Grb 34 B
08°Ar00'41	-35°21'54	Eggen's star in Sculptor
15°Ar08'27	-25°46'46	UV Cet A, UV Cet B
17°Ta52'23	-26°30'51	epsilon Eridanus
13°Cn13'11	-38°18'17	Sirius A, Sirius B
25°Cn06'00	-16°00'49	Procyon A, Procyon B
12°Vi00'37	+ 0°17'50	Wolf 359
01°Vi24'09	+27°27'26	Lal 21185
26°Vi11'27	- 0°27'07	Ross 128
27°Sc54'21	-43°54'30	Proxima Centaurus
28°Sc08'44	-41°25'41	alpha/beta Centaurus
28°Sa42'12	+27°50'26	Barnard's star
09°Aq07'24	+81°32'38	sigma 2398 A, sigma 2398 B
10°Cp48'23	+ 0°53'32	Ross 154
06°Pi09'37	+51°52'55	61 Cygnus A, 61 Cygnus B
08°Aq53'04	-41°21'25	epsilon Indus
05°Pi09'16	- 5°08'22	L 789-6
02°Pi00'41	-27°13'05	Lacerta 9352
16°Ar50'07	+41°27'46	Ross 248



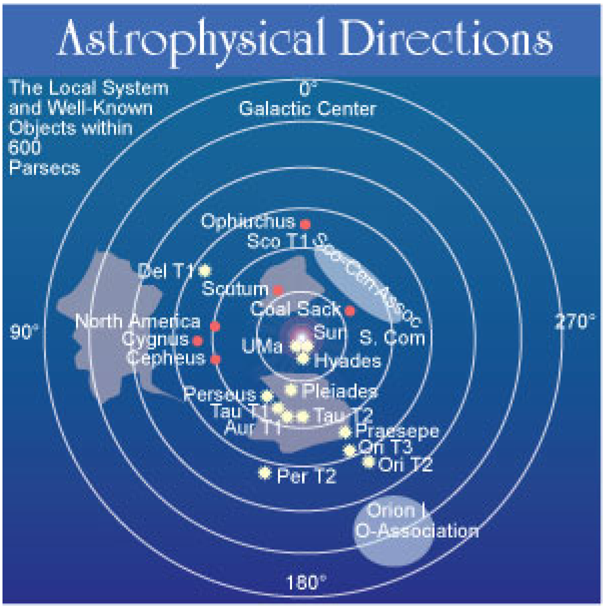
The Local System (Gould's Belt)

Our Sun is embedded in the leading edge of a belt of gas and dust, which is partially condensed into stars, inclined at 180 to the galactic plane, and apparently linked to the lower edge of the Orion spiral arm. This Local System, as it is called, may be moving with the lower edge of the Orion arm and projects from the later, like a tongue, toward and slightly above the direction of galactic center. It is estimated that the majority of all matter in the vicinity of the Sun must be concentrated in the local system, including all of the common constituents of spiral arms, namely: dust, gas, and young stars. In other words, the Sun is embedded in a local system or structure of very recent origin, and it was even suggested that this system might be a tiny galaxy (itself with spiral structure) set within the main galaxy. The idea of a local system and its acceptance as a fact has gained and lost favor several times among astronomers. It is now considered a well-established fact.

It was first noticed by Herschel in 1887 that many of the brightest stars in the southern sky occur in a band inclined some 18° to the plane of the Milky Way. In other words, the near and bright stars in the sky concentrate along a great circle which is not coincident with the galactic equator, but tilted or inclined to it – a flattened local structure. Around 1880, this phenomenon was reexamined by American Astronomer B. A. Gould, who guessed that the Sun was located in a small cluster whose structure seemed to be evident in the naked-eye (near) stars. Gould's Belt, as it came to be known, contained the "B" stars brighter than 5.25 magnitude, whereas stars of "B" spectral class fainter than 7.25 magnitude were confined to the plane of the galaxy. It was then discovered that diffuse nebulae were also distributed in two distinct belts, one coinciding with the plane of the galaxy, the other matching Gould's Belt. At first, all objects whose plane of symmetry deviated greatly from the galactic equator were considered part of Gould's belt. Today this belt (now called the local system) is considered to be defined as a group of 100 million stars flanked by the Scorpio-Centaurs association on one end and the Pleiades cluster at the other.

This local system is made up of the luminous O-B5 stars within 400 parsecs of the Sun, the "A" stars in the Henry Draper Catalogue, neutral hydrogen, the O-associations: Scorpio-Centaurus, II Perseus, and I Orion, and the two largest dust complexes within 500 parsecs of the Sun. These two dust complexes, the great concentration of dust in the Taurus-Orion-Auriga region below the galactic equator and the Ophiuchus-

Sagittarius-Scorpio dust clouds above the equator, were shown to be connected along the line of the equator of the local system. This connection (made by the astronomer Hubble) helped to make clear the shape of the local system which is now defined as follows:



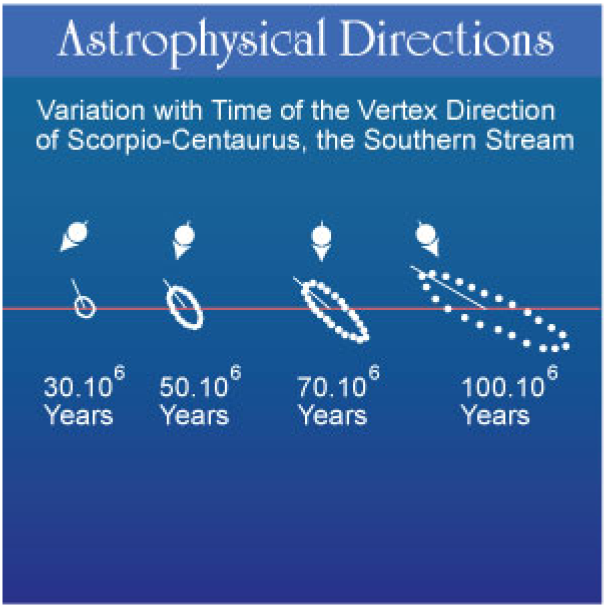
The Plane of the Local System

The Local System is a thin sheet of young objects 500-700 parsecs long and several hundred parsecs wide with a thickness of 70 parsecs. This elongated system is parallel to the direction 160°-340° (New Galactic Longitude), inclined at about 18° to the galactic plane, with the Sun located near the leading edge of the system about 100 parsecs from the centroid of the system. The system, in other words, is an elongated form that points roughly in the direction of the galactic center. The axis aligned toward the center of the galaxy makes sense, because differential galactic rotation (the spinning wheel) would destroy any object whose axis might be along the direction of a spiral arm. However, an axis toward the center might persist for 100 million years before being dispersed.

There has been controversy as to whether the local system is independent of the spiral arm or part of that arm. If the local spiral arm were for some reason twisted out of plane by 18°, the main features of the local system would be accounted for. The local system has also been detected at the 21 cm line of neutral hydrogen.

- Extent of the Local System = 700 parsecs
- Thickness = 70 parsecs
- North pole of system: lII= 202°, bII= 72°
- Sun's distance from center @ 100 parsecs
- Sun's distance from local plane @12 parsecs North of plane
- Direction of centroid of Local System: lii = 270°0 bii -3°
- Expansion life of system = 40xl06 years
- Mass of system = 2x105
- Mass of the Sun Absolute magnitude of system: Mv = -13

The centroid of the Local System is located in the middle of the constellation Vela. It intersects the ecliptic at 165°24' (15-degrees Virgo) of Longitude and a latitude of -62°30' .



Via Combusta -- The Southern Stream

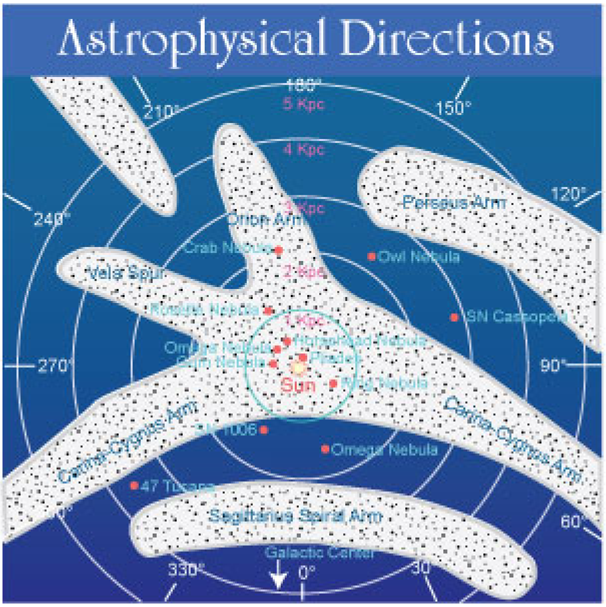
The largest of the near moving clusters and the chief contributor in the Southern Hemisphere to the Local System is the Scorpio-Centaurus association of stars. Charles Jayne points out that this immense loose cluster (stretching from later Libra through late Sagittarius in the Zodiac) must be the origin of the fabled Via Combusta. The entire sign of Scorpio is influenced by the presence of this vast cloud of stars.

The Scorpio-Centaurus association is also called The Southern Stream and a stream it is, stretching from New Galactic longitude 243° through 360° and latitude +30° and -30°. The centroid is at galactic coordinates 12 = 330°, b2 = +15° and the main body of the cluster stretches from galactic longitudes 314° to 347°.

The 1950.0 position for the centroid of Sco-Cen is:

Zodiac	Latitude	Object
26°SC 05'50"	-21°36'60"	Sco-Cen

The shape of the cluster is elongated considerably, with the distance between the extreme points in the direction of elongation being about three times its transverse section. The angle between the direction of elongation and the radius vector through the Sun is 52°. It is estimated that between 0.4xl0-8 and 1.5xl0-8 years ago, the cluster (which up to that time may have been spherical) was liable to a disturbing force. This force gave it a velocity between 9 and 19 km/sec relative to an imaginary star moving in a circle around the galactic center and coinciding with the center of the cluster at the time of disturbance. The present shape and motion of the cluster are explained by the evolution since this disturbance. The present mean motion of the cluster is found to indicate an initial velocity of 19 km/sec in the direction forming an angle of 87° with the direction of circular motion, that is approximately in the direction outward from the galactic center. The position of the cluster was at that time at the distance 2200 parsecs from the present position of the Sun in the direction of about 59° New Galactic Longitude (Vulpecula-Sagitta direction).

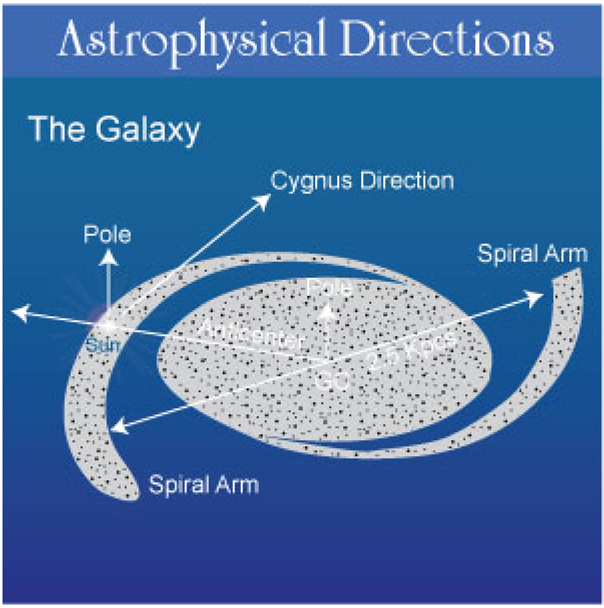


Chapter 5: The Milky Way Galaxy

Our Local Spiral Arm Region

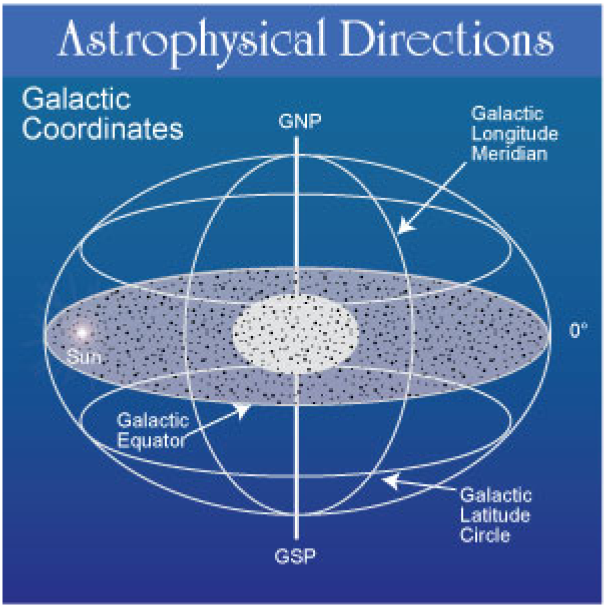
The diagram on this page represents the general structure of the local portion of the spiral arm in which our Sun is embedded. Even the very nearest stars (and they are few) are at a great distance. It takes light over four years to reach us from our closest stellar neighbors. It is difficult to get a feel for such vast distance. For instance, the 6000 or so naked-eye stars are all very, very near to us in terms of cosmic distance. In fact, almost all of the objects in this catalog (with the exception of the external galaxies and quasars, etc.) are quite near. They are not far from where we are in terms of the size of our mother galaxy. In other words, we cannot see too far out across our galaxy.

If you will refer to this map once in a while, as you get to know some of the different kinds of celestial objects, it will come home to you that most of the famous objects that astronomers refer to (that illustrate the many astronomical books) are more or less our neighbors. Objects like the Pleiades, the Crab Nebula, and the Orion Nebula are on the one hand so distant that it is difficult to imagine and on the other, so close (in terms of any comprehensive cosmic distance scale), that one gets the idea that we know only about our nearest neighbors, and no one else. Although we have developed a receptive or passive knowledge of time and space, we have just begun to become active and reach out or travel through space. The Hubble telescope is changing all of this.



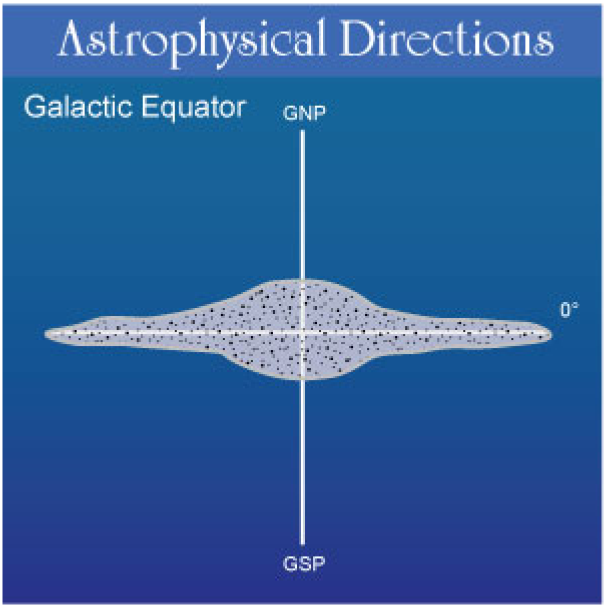
Our Galaxy

Our Sun and the Local System of stars are part of a much larger disc-shaped collection of many billions of stars, gas, and dust that are bound together by mutual gravitational attraction to a vast flattened system that turns like a great pinwheel in space. A simplified sketch of our galaxy is presented above. There is a dense bright central region or nucleus and spiral arms extend from the nucleus outward into space to form a flat disk. These arms become increasingly thin until they are imperceptible. Our Earth and the solar system are embedded within the great disk that is our galaxy, and from our vantage point within this disk (and toward the edge of the great wheel), the plane of the galaxy appears as a great glowing arch in the night sky – the Milky Way. All stars that we can see with the naked eye and almost all stellar material that is visible to our telescopes is concentrated within this galactic disk or plane, as it is called. The immense mass of stars and light has been known to man since time began through many names: River of Heaven, River of Light, Silver Street, Winter Street, Shining Wheel and The Ashen Path.



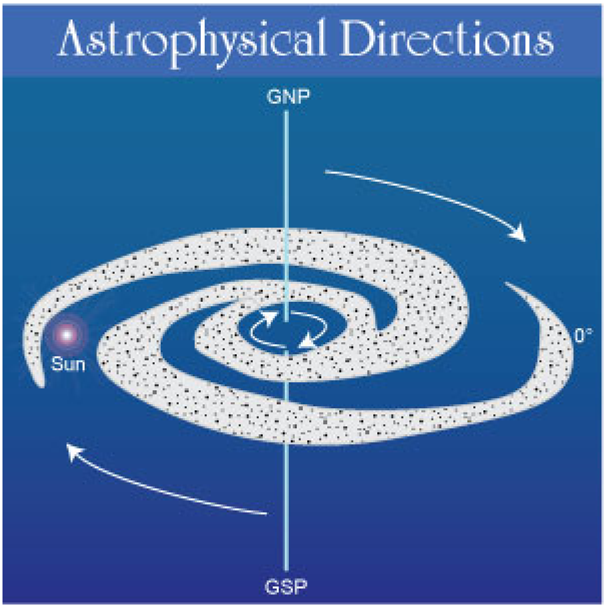
The Galactic Sphere

The diagrams in this section illustrate the general features of the Galaxy. Our Sun is located very much toward the edge or rim of the galactic disk, rather than toward the center. Keep in mind that we are embedded deep within the plane of the galaxy and that there are countless stars above and below us as well as toward the center and rim of the galactic disk. However, by far the greatest concentration of light and stellar matter appears to us in the direction of the Galactic Center and Anti-Center, as we look through or along the actual plane of the galaxy. If we look (from the Earth) in the direction of the North or South Pole of the Galaxy, we are not peering through the countless stars concentrated in the disk, but rather through a relatively thin sheet of stars between us and the intergalactic void beyond.



The Galactic disk

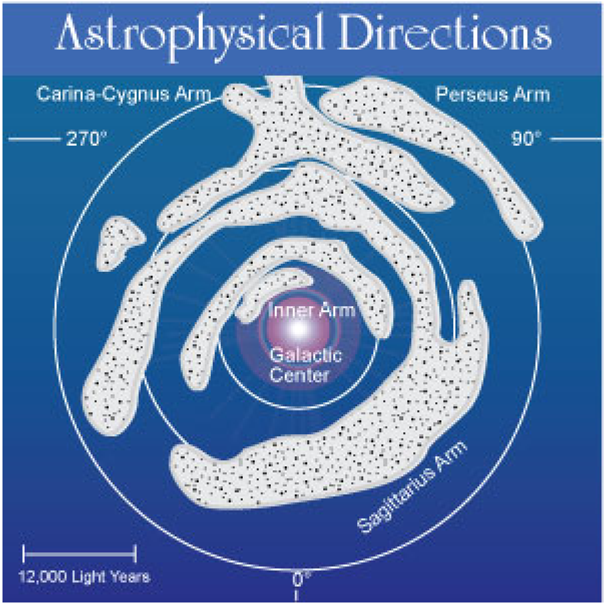
Because we are situated so far out on the galactic disc, there is also a great difference in what we see when we look toward the Center as opposed to the Anti-Center of our galaxy. There is much less material between us and the rim or edge of the galactic plane than there is toward the galactic center. When we gaze toward the galactic center (GC), we receive the combined light from all the stars between us and that center as well as the light stemming from the stars in the galactic disc beyond the center. In fact, as we look into the GC, we receive light (at once) that has been traveling to reach us for very different periods of time.



The Location of Our Sun

Keep in mind that although it takes some nine minutes for light to reach us from the Sun, it takes a period of around four years for us to receive light from even the nearest of stars. When we consider what we see as we gaze toward the GC, it becomes difficult to comprehend. We are looking at starlight that may have been traveling to reach us for 50-70,000 years! In other words we are looking at stars as they were a long, long time ago. We are looking into the past at the universe then. Who knows if these stars even exist now and, if so, what kind of light they give off today. We will not know for another 50,000 years of so. The stars in the anti-center direction are not so distant from us and we have a more up-to-date idea of how the galaxy is when we look in this direction.

Chapter Six: The Galaxy

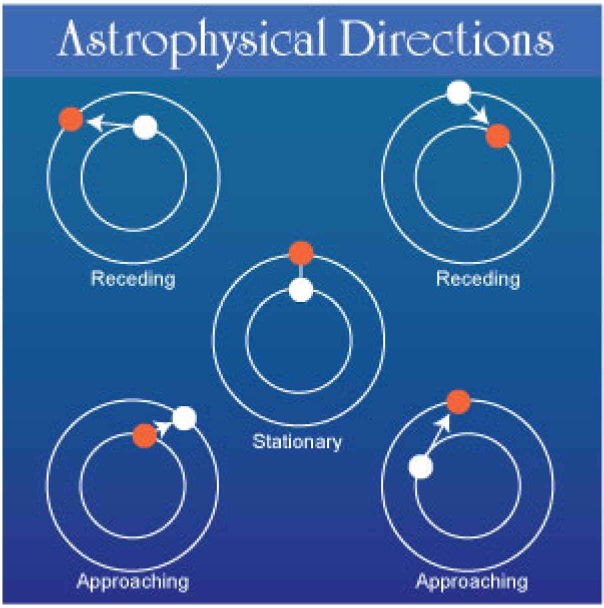


Spiral Arms

Many distant galaxies appear to us through telescopes to have a lovely vortical or spiral structure. For over a century, astronomers have assumed that our Milky Way is also a spiral galaxy, although this has been difficult to prove. We are embedded within our galactic plane and surrounded in all directions by an apparently chaotic distribution of stars, clusters, nebulae, and dust clouds. It has been only since the 1950's that we have understood what the spiral arm structure of our galaxy looks like.

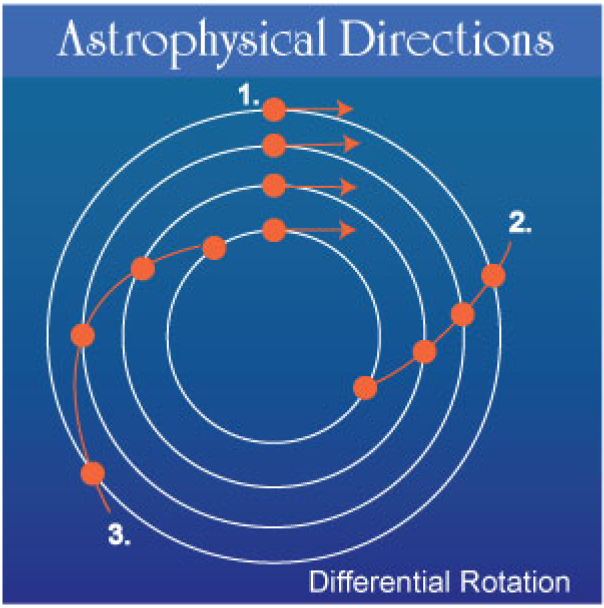
At this point in time astronomers have distinguished three major spiral arms this side of the galactic center. The Sun seems to be about 1,000 light years from the central part of a spiral arm that includes the Orion Nebula, the Coal Sack, and the North American nebula – the Carina-Cygnus arm. An outer spiral arm (including the double star cluster in Perseus) passes about 6,000 light years beyond us (the Perseus arm) and an inner arm (Sagittarius arm) has been discovered between the Galactic Center and us. Much of this research has been made possible through radio astronomy and in particular studies of the 21-cm line of emission in interstellar hydrogen. A rough idea as to the probable spiral arm structure as astronomers see it today is given in the diagram above. Keep in mind that this structure is rotating toward the right (clockwise), so that the tilt of the arms to the radius vector from the center indicates that the spiral arms are trailing in the rotation as in a vortex. The spiral arms that exist today were probably formed not too long ago and in cosmic time may be rather short-lived.

The spiral arms are gaseous envelopes filled with stars and dust held together by gravitational and magnetic forces. These arms will cohere until the gas and dust has condensed into individual stars and these stars are dispersed throughout the galactic plane. In fact the whole sequence, if we could speed up the time process, would appear as a spinning pinwheel shedding sparks or stars as it whirls. The new-formed stars stay embedded within the spiral arm where they were born until galactic rotation forces them to migrate and be scattered through space, dissolving the spiral arms. New arms are continually being formed.



Differential Rotation

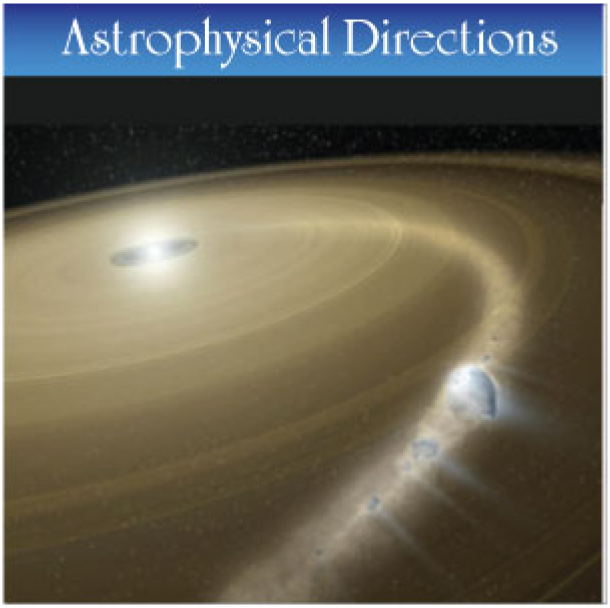
Our entire galaxy rotates about its center. The spiral arms revolve in a clockwise direction as seen from the north galactic pole and the velocity of revolution of stars about the center of the galaxy will decrease with increasing distance from the center. This is also true for the planetary orbits in the solar system; the far-out planets take longer to circle the Sun than do the inner planets. This is called differential rotation.

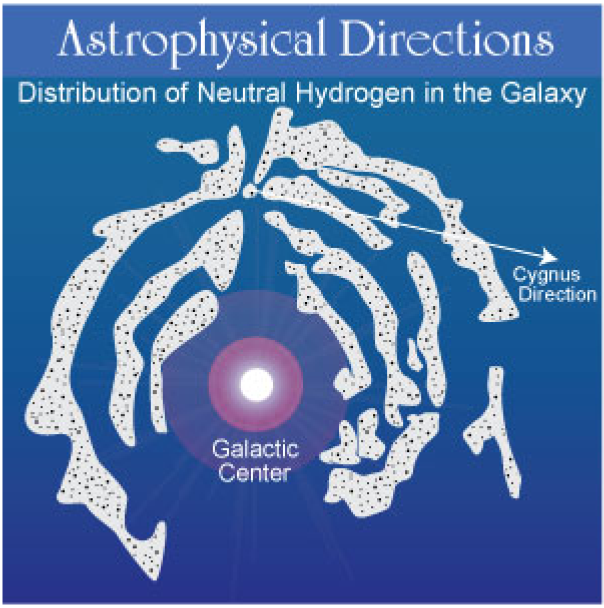


How Differential Rotation Works

The above diagram will help to illustrate differential rotation. Stars or gas clouds that were lined up at one time (points 1) are spread out by the time they have gone 1/4 of the way (points 2) or about 3/4 of the way (points 3) around the galaxy. The small diagrams show the net velocity that stars or gas clouds at different distances from the GC would have with respect to our Sun. Objects within the Sun's orbit around the GC are orbiting faster than does the Sun and objects farther out than the Sun's orbit are orbiting more slowly than does the Sun. Our Sun complete one revolution about the GC in some 200 million years. The Sun was last on this side of the Milky Way center (with respect to the universe of external galaxies) at about the time that small dinosaurs were beginning to develop on the Earth's surface. It has moved through an angle of about 120° of its orbit since the last great dinosaurs vanished.

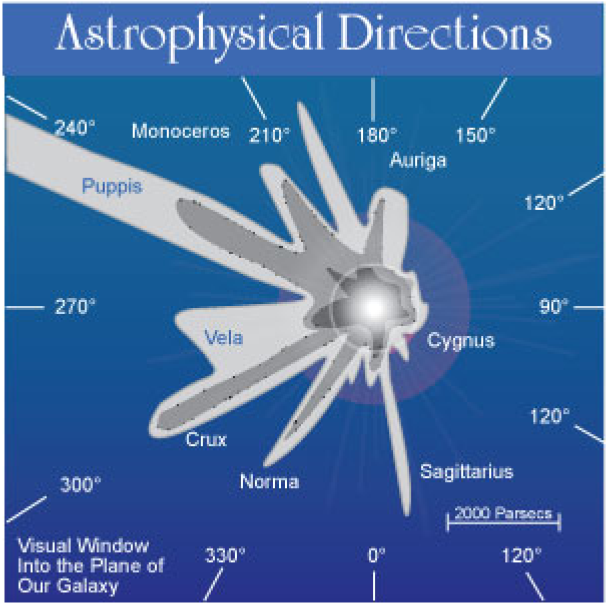
Altogether, our Earth and Sun have completed only about 20 to 25 revolutions around the GC since their formation some 5 billion years ago.





Interstellar Dust

Interstellar space is not empty, but filled with fine particles of dust (grains, smoke) and gas often mixed in clouds. These small grains of matter – clouds of smoke or dust – have absorbing efficiency and like cigarette smoke, diffuse or scatter starlight. Few single clouds absorb more than three magnitudes, but the accumulation in depth of many individual clouds in the vast cloud complexes of the "Great Rift" in the Milky Way can produce, in places, almost total obscuration. The Coal Sack dark nebula in the south Milky Way results from a dark cloud some 40 light years across absorbing somewhat more than one magnitude. It is located at a distance of some 500 light years from our Sun. Almost all of the gas and dust is concentrated in the equatorial plane of the galaxy and our observing situation in the Milky Way (in optical wavelengths) is similar to that of an edge-on external galaxy.



Windows to the Galaxy

The galactic center is totally obscured in the visual part of the spectrum by the dense dust clouds. Except for a few "windows" (see below), this dust prevents us from seeing more than a few thousand parsecs in any direction in the galactic plane. The dust tends to clump in clouds associated with the spiral arms (see section on Spiral Arms). The most famous window through which we can look to greater distances than average is in the direction of the globular cluster NGC 6522. The most transparent or homogeneous window in the galactic equator is toward Puppis, between galactic longitudes 240°-250° (245° optimum view).

Dust particles are not the only form of obscuring matter in interstellar space. Many kinds of gas pervade the space between the stars. The most abundant gas, Hydrogen, was discovered in the 1950s, when its emission at a radio wavelength of 21 centimeters was detected. Using radio astronomy, the first detailed map of the spiral-arm structure of our galaxy was produced. (see above diagram) The gas is concentrated in the spiral-arms.

Dark Nebulae

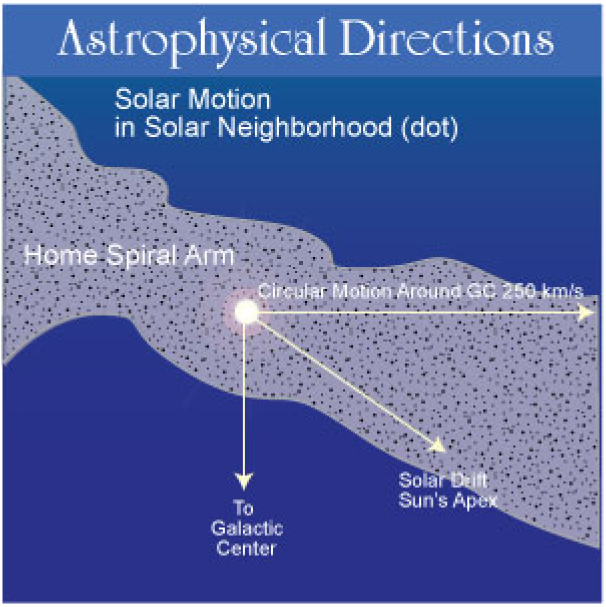
If there are no stars in or near the nebulosity, the nebula will obscure or block all light beyond or behind itself. The result are dark patches or "holes" in the sky. The most celebrated dark nebula is the Coal Sack in the Southern Cross.

Dark Clouds and Interstellar Dust

Until the 20th century, astronomers assumed that the immense distance between stars was empty, in effect a perfect vacuum. Numerous dark patches were thought to be some sort of "holes in space" where there were no stars. A few of these dark areas are visible to the naked eye, in particular the "Coal Sack" near the Southern Cross and the "Great Rift" in the Milky Way. The Great Rift splits the luminous background from Cygnus to Sagittarius through a succession of large overlapping dark clouds in the equatorial plane of the galaxy. It has been discovered that these "holes in the stars" are in fact obscuring clouds of small grains of matter, dust. Like cigarette smoke, this dust diffuses the light coming from behind them. There is no essential difference between a bright nebula and a dark one; it all depends on whether there are any suitable stars to provide illumination.

Dark Nebulae Table

##	Zodiac	Latitude	Object
DN	12°Ar12'18	+62°07'58	Cepheus
DN	07°Ge25'08	+ 6°01'47	Taurus
DN	18°Ge4 1'44	-28°03'23	Orion
DN	22°Ge22'16	-25°22'19	Orion
DN	08°Cn05'37	-13°13'25	S Monoceros
DN	17°Li28'05	-11°32'58	Coal sack
DN	18°Li35'58	-59°08'27	eta Carina
DN	05°Sa33'20	- 2°02'39	rho Ophiuchus
DN	21°Sa25'32	- 2°20'03	theta Ophiuchus
DN	10°Cp29'06	+18°05'05	Scutum
DN	20°Aq58'22	+47°31'49	52 Cygnus
DN	07°Pi00'45	+59°04'19	North America
DN	20°Pi43'58	+63°56'25	Cygnus



Solar Apex

The great disk of the galactic plane spins in space through time and carries with it all objects, including our Sun. Differential rotation causes objects that are located at different distances from the center of the galaxy to rotate at different speeds. In general, different groups of objects of a similar kind tend to move together through space. For instance, the Local System of stars that includes our Sun is moving in the general direction of the star Vega in the constellation Lyra. This apparent direction is termed the Solar Apex or Apex of the Sun's Way. The position given in astronomy books for the solar apex depends upon what group of stars we use to measure our Sun's motion. This can lead to a lot of confusion as to which of several values is significant for our use.

Solar motion is often explained as the deviation of the Sun's motion from a circular motion around the GC.

This definition may help to clarify some of the confusion surrounding the use of the solar apex in astrological work. The standard solar motion (listed below) is the Sun's drift with respect to the stars, which form the majority in the general catalogue of radial velocities and proper motions (A to G main-sequence stars, giants and super giants) and not the right-angle motion of the Sun and other galactic objects around the galactic center. The solar apex value depends upon what group of background stars we use to measure our Sun's motion and the more distant the objects (such as globular clusters), the more this apex approaches a simple right-angle to the GC. In fact, if we remove the effect of solar motion, the Sun and nearby stars are found to be moving at right angles to the GC.

Astronomers do this to arrive at a value called the local standard of rest. The local standard of rest is arrived at by removing what is termed the basic solar motion, and this motion is defined as the most frequently occurring velocities in the solar neighborhood, the "average" of local stars as measured from their geometric centers, rather than their centers of mass. Centers of mass for individual stars are not known. Therefore, the apex of the Sun's way (by definition) cannot be derived from the more distant stars, but should be determined using relatively near stars since it is a measure of the Sun's drift with respect to the centroid of motion of the local group of stars. It is similar to the slow drift to the side that often occurs to powerboats as they plow through the water. Astrologers will be interested both in the solar apex and in the right-angled motion of our Sun about the GC.

The most quoted value for the solar motion (Apex of the Sun's Way) is about 1 degree of the sign Capricorn.

Star Streaming

In the early 1900's, it was discovered, from proper motion studies of the brighter stars, that the stars, in general, are moving in two preferred directions toward the apparent vertices. These points are situated in Lepus, at R.A 90° and declination, -15°, and in Pavo at R.A. 285°, declination -64°.

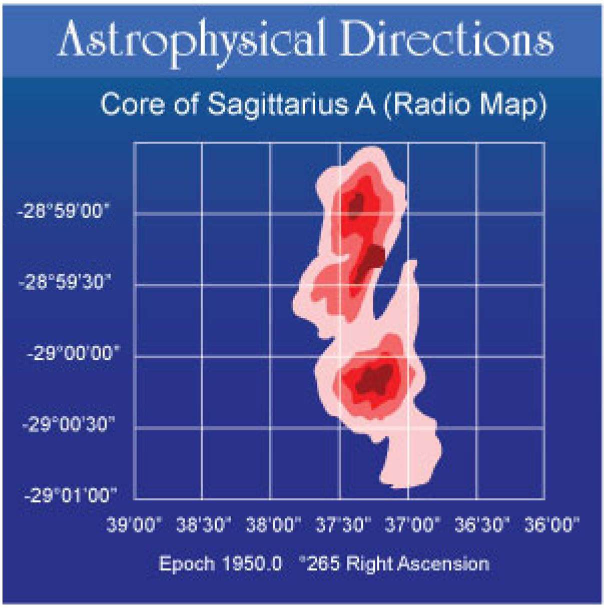
About 60% of the stars belong to Stream I, moving toward the Lepus vertex, and 40% belong to Stream II, moving toward the Pavo vertex at a velocity about half that of Stream I. Not all stars share in the streaming, however; type A stars are very prone to do so, and type F and later classes in the spectral sequence show the same tendency, though less strongly. Most type stars are not members of either stream, but seem to be practically stationary. They are moving with the Sun. (see Local System).

If the apparent streaming is corrected for solar motion, the streams are found to be moving toward diametrically opposite points in the plane of the galaxy -- the true vertices at R.A. 95°, Declination +12° in Orion , and R.A. 275°, declination -12° in Scutum. Star streaming has been explained as the result of small deviations from circular orbits.

Type of Solar Motion Table

Type of Solar Motion	Long.	Lat.
The Standard Solar Motion	270 14 38	+53 23 18
The Basic Solar Motion	267 47 09	+49 03 02
Solar Apex (most quoted value)	271 27 14	+53 26 27
Solar Motion (to RR Lyrae stars)	333 57 58	+70 33 49
Solar Motion (to Globular cl.)	354 04 15	+63 06 37

Circular motion around the GC
-346 39 08|+59 34 30 Emission Nebulae



The Galactic Center (GC)

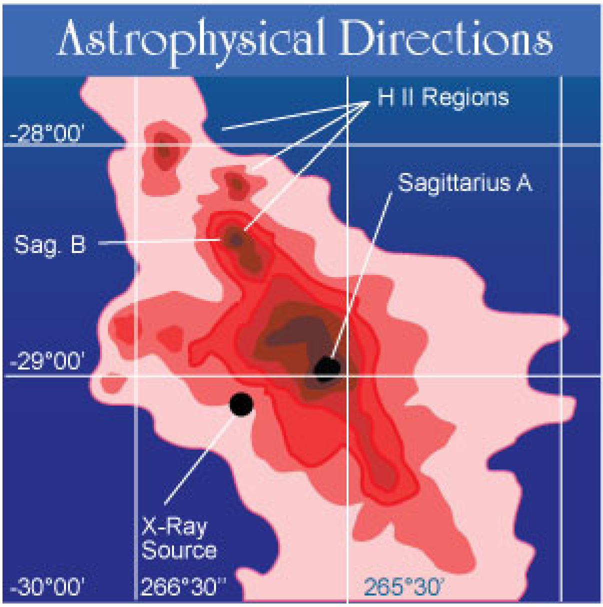
Astrologers have become more aware of the existence and position of the Galactic Center (GC) or nucleus in recent years thanks to the work of men like Theodor Landscheidt. Landscheidt points out in his seminal book "*Cosmic Cybernetics"* that there is an increasing tendency among astrophysicists toward consideration of our entire galaxy as a whole or living organism, capable of self-communication. The galactic nucleus may communicate "information" through electromagnetic and gravitational radiation and other yet-undiscovered means.

It is estimated that the core of our galaxy has a million stars per cubic parsec, a million times greater star density than in the solar neighborhood. If we lived on a planet circling a star near the galactic nucleus, we could see a million stars as bright as Sirius, and the sky each night would be as bright as 200 full Moons!

However, our planet would be ripped out of its orbit every few hundred million years by close encounters with passing stars.

Vast clouds of obscuring dust prevent us from having a very spectacular view each night of the GC, which is ablaze with light. Most of our information concerning the GC has been obtained through the non-optical regions of the electromagnetic spectrum, such as the radio, infrared, and x-ray "windows." While light cannot penetrate the dust clouds, the radio and infrared waves, in effect, flow around the dust particles and on to reach us. The very energetic gamma and x-rays pass right through the intervening dust particles!

There appears to be an energetic flow of matter out from the core, and astronomers have located a ring of expanding particles at about 300 parsecs from the GC that is moving at 100 km/s. Two expanding arms of hydrogen (on either side of GC) at about 3000 parsecs have been found, one moving toward us at a velocity of 50km/s and the other away from us at about 135 km/s. There is some speculation that the nucleus of our galaxy may periodically explode (see Seyfert Galaxies) or that mass may spontaneously appear in the nucleus through some process that is beyond our comprehension at this point in time.



The Galactic Nucleus

Most radiation from the GC originated in an extended region about 20 across (above diagram). There are several "hot spot " or discrete emission sources located in the nuclear region. The GC appears somewhat different when viewed through the radio spectrum than it does through the x-ray or infrared windows. There is a powerful discrete x-ray source and at least three discrete infrared sources that each radiate a little less than a million times more in the infrared than our Sun does at all wavelengths.

The GC has four ways of emission at radio frequencies:

1. Emission over a broad continuum of wavelengths by energetic electrons held in orbit by a magnetic field (synchrotron radiation);

2. 21-cm hydrogen emission (hydrogen atoms whose electrons flip over from a higher to a lower energy state);
3. Similar molecular lines of emission;
4. Both line and continuum emission from H II regions.

The most powerful source of synchrotron radiation and the traditional value given for the position of the GC is Sagittarius A which is a source about 12 parsecs in diameter of continuum emission generated by highly energetic electrons spiraling in a magnetic field. Embedded within Sag A and very near the actual center of the galaxy are several small, bright knots of thermal radio emission about a parsec or less in size (see above). The general region of the galactic nucleus is located at about the 26th degree of Sagittarius in zodiac longitude and -5 degrees of zodiac latitude. Every astrologer should be aware of this position.

Both Theodor Landscheidt and Charles Harvey have written about the GC, which is located at about 26 degrees of the zodiac sign Sagittarius. It is a power point when it occurs highly placed in a natal chart, a point often associated with strong, macho like energy. It is sometimes related to the Christian and Judaic religions and said to represent their aggressive and positive energy and outreach.

A nebula containing a very hot star can be excited to self luminosity, resulting in what is termed an emission nebula. A nebulous region which is excited to luminosity in this way is also called an H-II region since hydrogen (H) is the most abundant element.

Emission nebulae are huge masses of gas that absorb ultraviolet radiation from nearby hot stars and reradiate it as bright-line emission. The most famous example of an emission nebula is Messier Object 42 (M.42), the great nebula in Orion. Another is the Eta Carinae Nebula in the southern sky. The larger emission nebulae are most often associated with the very hot "O" and "BO" stars and may contain dense groups of these most luminous stars. The hot central stars in the emission nebulae often appear to have cleared away the dust from their immediate surrounding, creating a hole or dust-free bubble inside an otherwise dusty region of space (see the section on Solar Wind).

Chapter 7: Star Lives

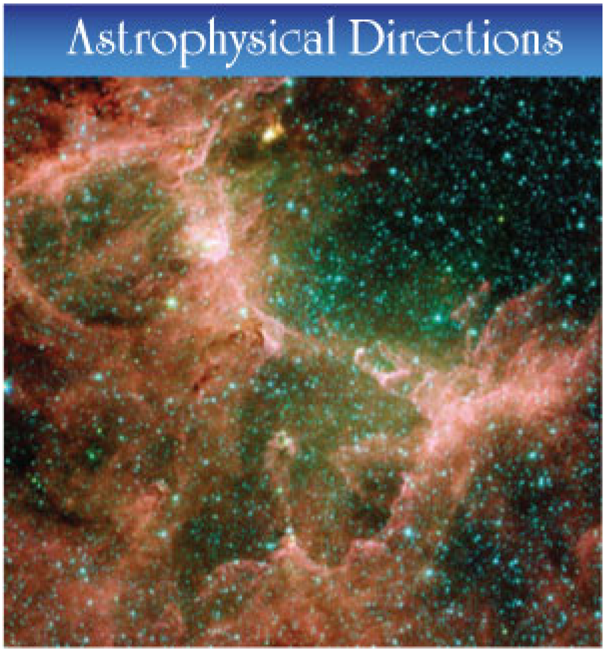
Over the centuries, astrologers have taken note of a handful of fixed stars and a few other celestial objects. In the 20th Century, the advent of more and more powerful telescopes made it clear that there are literally billions of objects out there, each with some kind of significance. There is no way each of these objects could be individually studied and their influences (or lack thereof) noted.

In fact, many astrologers find the recent advances in astronomy and astrophysics over the last 40 years complex and difficult to understand. And yet it could be important for us to grasp the significance of what is being discovered out there in deep space. In this article, we will attempt to provide astrologers with a key to unlocking the mysteries of modern astrophysical inquiry.

I have been repeatedly asked to explain what all this deep-space astrology (stars, black holes, etc.) means. My answer is that it is far easier for you to learn to read and interpret the results of scientific astronomers than to look for someone to explain the endless series of newly discovered stellar objects to you, one by one. It should be enough to be told that everything out there has to do with the life and death of stars, just as down here we are concerned with our own life and death. That note plus the age-old maxim "As Above, So Below," should do it for you. Learn to read science in terms of your own self and life. It is not hard and it opens up the world of scientific writing to you, from that moment forward. You don't need an interpreter. You are the interpreter.

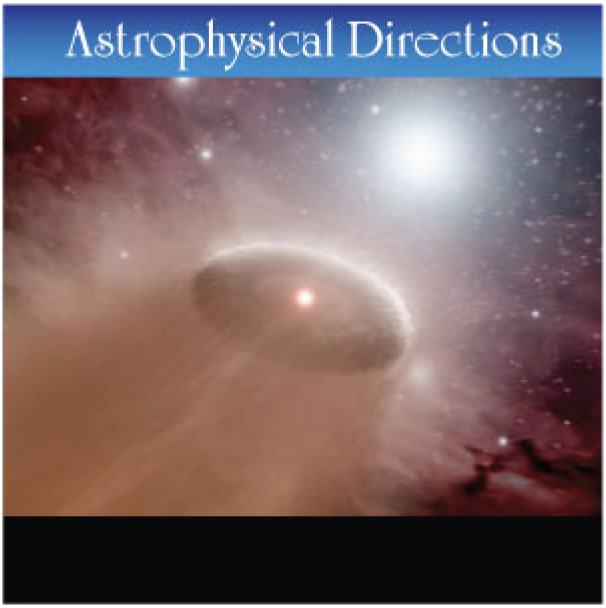
Any investigation of our universe becomes the story of the stars. Aside from dust and gas, space contains stars. Even such exotic objects as pulsars, neutron stars and black holes are but the end stages in the lives of stars. Almost all of the information assembled through various branches of astronomical observation, be it visual, infrared, ultraviolet, x-ray or Gamma-ray may best be examined in terms of the following question: What stage in the life history of a star do they describe? Therefore, a grasp of the basic stages in the life history of a star provides the essential framework for astrophysical inquiry.

It is difficult, perhaps impossible, to consider the various stages of a star's life and the sequence of these stages, without being struck by the resemblance to our own life story. Here is our own life story acted out on a grand scale before our very eyes.



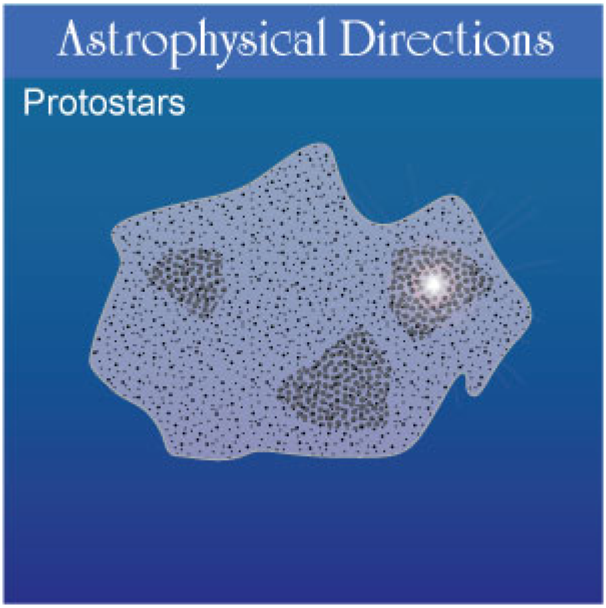
The Birthplace of Stars

It is now considered fact that the birthplace of stars is the womb of vast nebular clouds of dust and gas distributed throughout space. In these relatively cool and dark clouds, proto-stars (new stars) form through a process of gravitational condensation or contraction. It is imagined that perhaps some outside force, maybe in the form of gravitational energy from a passing stellar object, causes a dust cloud to begin the contraction process. These huge clouds are known to be of various densities. They contain spots where the gas and dust is somewhat denser than in the surrounding regions of the cloud. These denser areas attract still more material toward themselves until a huge amount of matter, many times the size of our solar system, is formed. The contraction process becomes critical – nothing within the protostar can stand up to the crushing weight of gas and dust that continues to accumulate. A crisis is reached.



A Star is Born

Through a friction-like process, the ever-increasing pressure and density inside the proto-star causes the temperature to rise in the star's center or core until a thermonuclear reaction is initiated at 10 million degrees. Such a reaction releases enormous radiant energy that pulses out from within and holds back or stops the contraction process. A star is born!



Protostars

From this point forward, the life story of a particular star is dependent upon the mass of the original protostar. The collapse of the protostar takes a relatively short portion of the star's life, and once the thermonuclear ignition takes place, the star's surface temperature rises rapidly, and then levels off, and the star settles down to about ten billion years of being a star in the common sense of the word. It is important, at this point, to examine the struggle going on within the stellar interior.

Stellar Equilibrium

Once born, the star must live and die, much like us. The death of stars is inevitable and the life process is often conceived as one of thwarting or putting off of this inescapable death and thus prolonging life. The most fascinating aspect of a star's life is the intense struggle between the forces of gravity and contraction on one hand (so called outer forces) and the internal forces of radiation pressure on the other. As long as there is radiation coming from within, the forces of gravitational contraction are resisted or balanced, and stellar life as we observe it continues. The star shines. In fact, the entire life of the star can be conceived of in terms of a continuous conversion process. The diagram above shows how these two archetypical forces form the stellar shell, which is well below the actual surface of the star itself. The thickness of this shell as well as its position near to or far from the inner stellar core suffers continual change and adjustment throughout the life of the star.

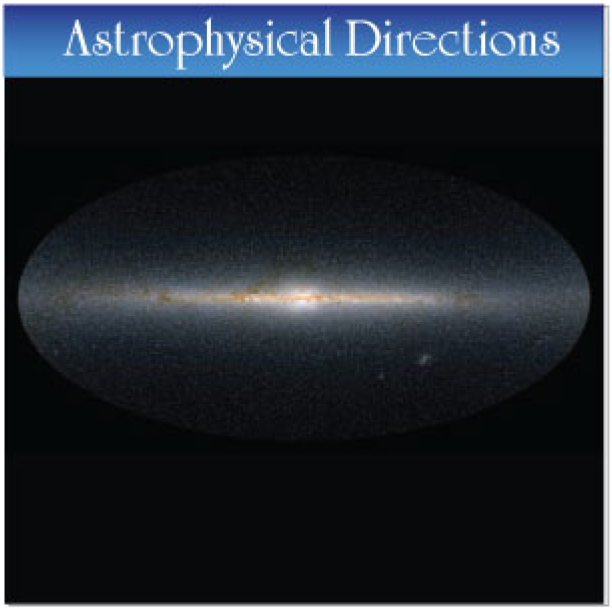
The Stellar Prime of Life

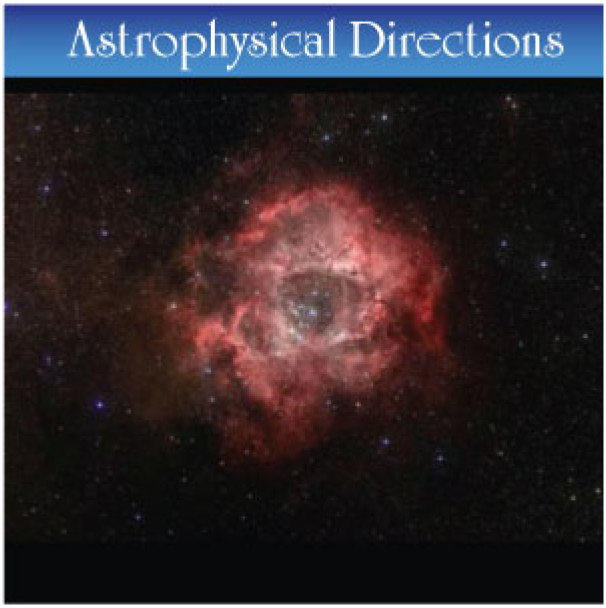
The incredible weight of the many layers of gas first initiates and then continues to contain and maintain the radiant process – a cosmic crucible. This pressure and the inevitable collapse that must occur is forestalled and put off by an incredible series of adjustments and changes going on within the core of the star. First of all, hydrogen burning (initiated at the birth of the star) continues for around ten billion years. This constitutes a healthy chunk of the stellar lifetime. Our sun is about halfway through this stage at present, and we can expect the sun to continue as it is today for another five billion years or so. The exhaustion of hydrogen signals the onset of drastic changes in the life of the star and brings on the next stage of that life.

A Red Giant

The radiant pressure of burning Hydrogen within was all that held back the initial contraction of the protostar, and when this is gone, the star's core continues to contract. It then has no material strong enough to stop this contraction and the core again shrinks, causing increased pressure, density and temperature. When the temperature at the center of the star reaches l00 million degrees, the nuclei of helium atoms (products of the Hydrogen burning stage) are violently fused together to form carbon. The fusion of this helium burning at the stellar core again produces a furious outpouring of radiant energy, and this energy release inside the star's core (as the star contracts) pushes the surface far out into space in all directions. The sudden expansion creates an enormous star with a diameter of a quarter of a billion miles and a low surface temperature between 3,000-4,000 degrees – a red giant.

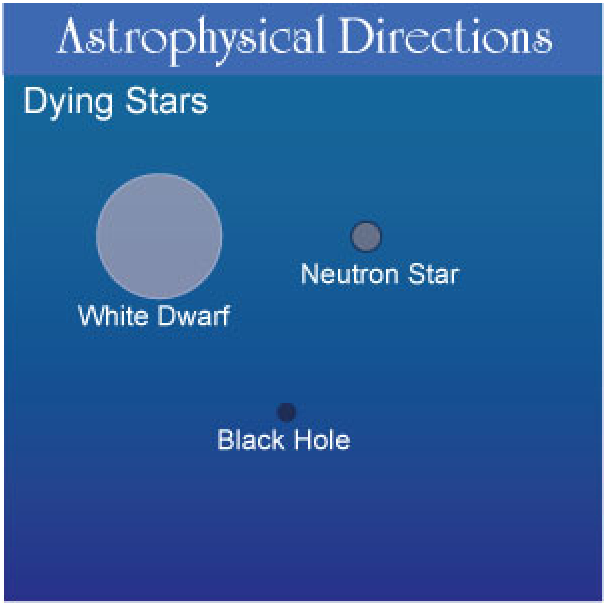
In about five billion years, the core of our sun will collapse while its surface expands. This expansion will swallow the Earth and our planet will vanish in a puff of smoke. The above diagram shows a red giant. The red stars like Antares and Arcturus are examples of this stage and this kind of star.





A Supernova

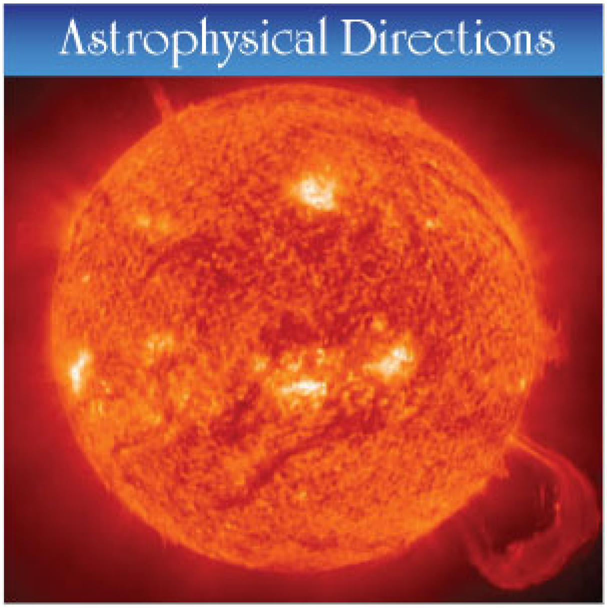
This helium burning stage (red giant) continues for several hundred million years before exhaustion. With the helium gone, the contraction process again resumes and still greater temperatures, densities, and pressures result. At this point, the size or mass of the star begins to dictate the final course of the life. For very massive stars, the ignition of such thermonuclear reactions as carbon, oxygen, and silicon fusion may take place, creating all of the heavier elements. These later stages in stellar evolution produce stars that are very unstable. These stars can vary or pulsate in size and luminosity. In certain cases this can lead to a total stellar detonation, a supernova.

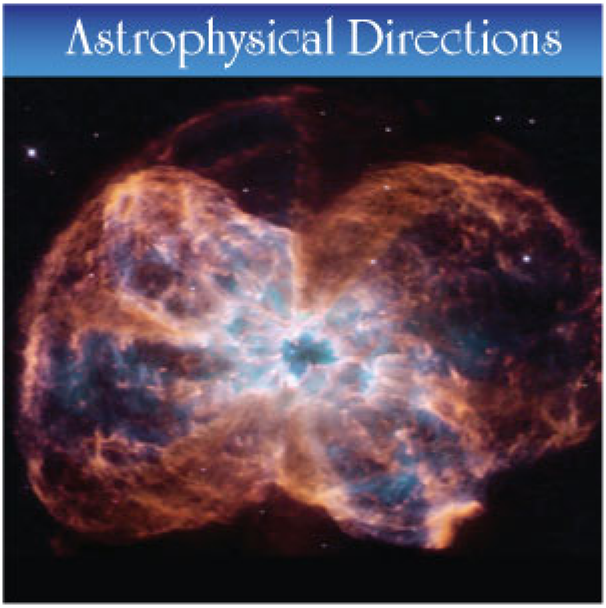


The End of Life for Stars

A star may end its life in one of several ways. When all the possible nuclear fuels have been exhausted, all conversions or adjustments made, the inexorable force of gravity (the grave) asserts itself and the remaining stellar material becomes a white dwarf. As the star continues to contract, having no internal radiation pressure left, the pressures and densities reach such strength that the very atoms are torn to pieces and the result is a sea of electrons in which are scattered atomic nuclei. This mass of electrons is squeezed until there is no possible room for contraction. The resulting white dwarf begins the long process of cooling off.

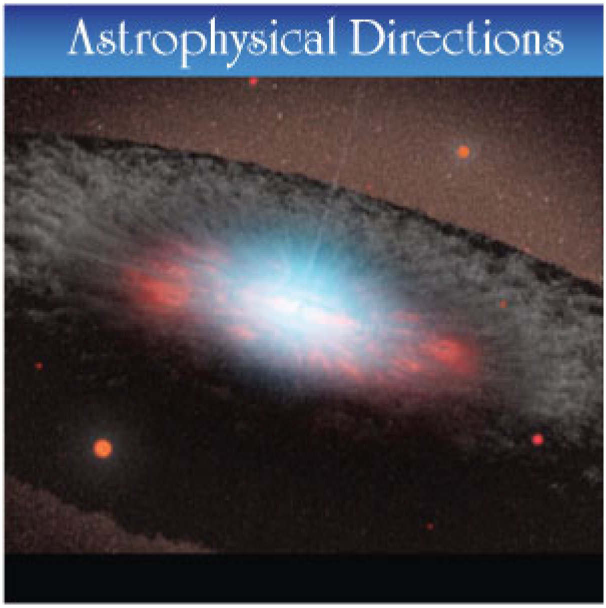
Becoming a white dwarf is only possible for stars with a mass of less than 1.25 solar masses. If the dying star has a mass that is greater than this limit, the electron pressure cannot withstand the gravitational pressure and the contraction continues. This critical limit of l.25 solar masses is termed the Chandrasekhar Limit after the famous Indian scientist by that name.





A Neutron Star

To avoid this further contraction, it is believed that many stars unload or blow off enough excess mass to get within the Chandrasekhar Limit. The nova is an example of an attempt of this kind. In recent years it has become clear that not all stars are successful in discarding their excess mass, and for them a very different state results than what we find in the white dwarf. We have seen that the electron pressure is not strong enough to halt the contraction process and the star gets smaller and tighter. The pressure and density increase until the electrons are squeezed into the nuclei of the atoms out of which the star is made. At this point the negatively charged electrons combine with the positively charged protons and the resulting neutron force is strong enough to again halt the contraction process and we have another type of stellar corpse: a neutron star.

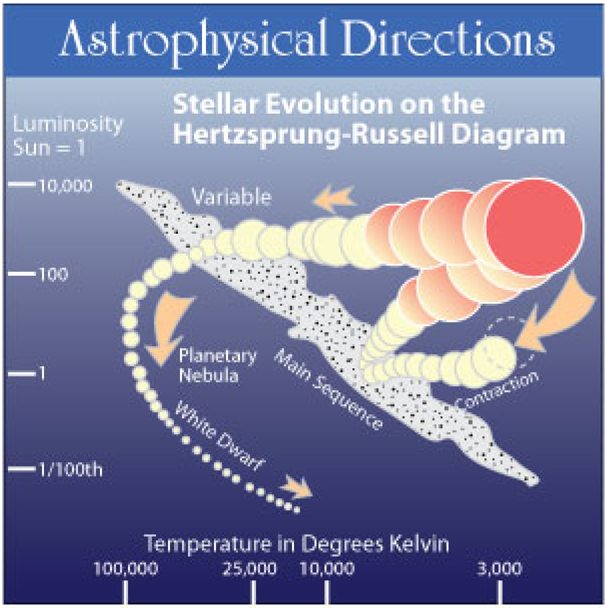


The Black Hole

We have one further kind of "dead" star. There is a limit to the size of star that can become a neutron star. Beyond a limit in mass of 2.25 solar masses, the degenerate neutron pressure cannot withstand the forces of gravity. If the dying star is not able to eject enough matter through a nova or supernova explosion and the remaining stellar core contains more than three solar masses, it cannot become a white dwarf or a neutron star. In this case there are no forces strong enough to hold up the star and the stellar core continues to shrink infinitely! The gravitational field surrounding the star gets so strong that space-time begins to warp and when the star has collapsed to only a few miles in diameter, space-time folds in upon itself and the star vanishes from the physical universe. What remains is termed a black hole.

It should be clear at this point that all of the many kinds of stars and objects in space could be ordered in terms of the evolutionary stage they represent in the life of the star. Just as each of us face what has been called the "personal equation" in our lives, so each star's life is made possible by the opposing internal and external forces. In the end, it appears, the forces of gravity dominate the internal process of adjustment and conversion that is taking place, just as in our own lives the aging of our personal bodies is a fact. And yet fresh stars are forming and being born, even now. The process of life or self is somehow larger than the physical ends to the personal life of a star or a man and our larger life is a whole or continuum and continuing process that we are just beginning to appreciate. Some of the ideas that are emerging in regard to the black hole phenomenon are most profound and perhaps are the closest indicators we have of how the eternal process of our life, in fact, functions.

In conclusion, a very useful way to approach the fixed stars, as we pointed out above, is to determine what stage in stellar evolution a particular star may be. Is the star a young, energetic newly formed star in the blue part of the spectrum or an old dying (red colored) star? Are we talking about a white dwarf or a super dense neutron star? I have found this approach to the endless millions of stars to much more helpful than ascribing particular characteristics to existing stars and objects, most of which are too new to have any history in astrology anyway. As mentioned earlier, learn to read the writings of science from a personal or astrological perspective. It is very instructive.



Hertzsprung-Russell Diagram

The Hertzsprung-Russell diagram is said to be the most important in all astronomy. It is a graph obtained by plotting the luminosities versus the temperatures of stars. As shown in the diagram, the luminosities are measured along the vertical axis and the surface temperature or spectral type along the horizontal axis. Every star for which the luminosity and temperature are known can be represented in this graph. Notice that the stars are not scattered in a random fashion over the diagram, but are grouped in three main regions.

This tells us that there is a precise relationship between the temperature and luminosity of stars. Most stars are located along the main sequence that runs diagonally from the hot & bright stars in the upper left to the cool & dim stars in the lower right. Our sun is near the middle of the main sequence.

There is a second major grouping of stars in the upper right-hand corner of the diagram. These stars, which are bright and cool are called red giants. Betelgeuse, Antares, and Aldebaran are red giants. A third group of stars, white-dwarfs, can be found in the lower left-hand corner, These stars are cool and dim.

The various life stages of a star plotted on the Hertzsprung-Russell diagram is shown above. The reason almost all stars can be found only in one of the three major groups indicated above is that these represent the life stages of longest duration: main sequence or hydrogen burning, red giant or helium burning, and cooling-off white-dwarf stage. The transition between these stages is relatively rapid and we have fewer examples available of stars in these transitions, although all stars must pass through them.

It would be similar to plotting the human lifeline. Those times when we are in the greatest change tend to be of short duration, but they are crucial.

In attempting to understand and interpret stars in natal astrology, it can be a great help to refer the star to this diagram. Is it a young, brought, hot star or an old, dim, cool star? Where in the stellar life sequence does a particular star fit?

Using Stars with your Natal Chart

All of the stars and stellar objects documented in this book include their position in the familiar astrological zodiac, by degrees, minutes, and seconds. I have included short lists of the most well-known examples for each type of object, as well as much larger lists that combine all the obects into one long running list, starting at zero-degrees of the sign Aries and running through the end of the sign Pisces.

Since both the short and long lists are sorted in zodiac order, you can browse any list to see where your natal planet positions (and other sensitive points) match with the positions of various stellar objects.

For example, my natal Sun position is 25 degrees of the zodiac sign Cancer and 48 minutes, 25°Cn48'. Looking at the extended list of objects at the back of this book, I find this section.

```
## Zodiac     Latitude  Object
NS 25°Cn07'53 -16°11'17/Procyon A, Procyon B
WD 25°Cn11'41 -16°06'05/Procyon B
OC 25°Cn13'10 -44°56'06 NGC 2362
     Very young cluster
     Loose & poor, tau Canis Major
G  25°Cn30'52 +52°18'41/Holmberg I = DDO
     63 = A0936+71
Q  25°Cn50'08 -20°09'11/0736+01
ME 25°Cn51'25 +69°01'51/Ursids
```

I see that my Sun is conjunct quasar “0736+01,” the near star “Procyon A, and the white dwarf “Procyon B, as we as open galactic cluster “NGC 2362,” which is a a bright cluster of very young stars.

Let’s use the closest match with is Quasar “0736+1,” which lists:

```
## Zodiac     Latitude   Name
Q  25°Cn50’08 -20°09’11/0736+01
|
```

= Abbreviation of object: “Q” stands for “Quasar”

I can see by the abbreviation that I am looking at a quasar, a very high-energy cosmic event located at great distance in the universe. Doing a quick “Google" search on the web for “0736+01” turns up the comment that this is an optically violent variable quasar.

In fact, once you have located which celestial objects relate to your natal chart, it is great fun to compile notes on what each of these objects is all about. Since all of the thousands of objects in this book are organized by the group they belong to, once you understand something about the group, then you automatically know about each member of that group. This can be of particular use when it comes to the fixed stars, since they are so many of them. I have included about 750 fixed stars here. For example, this fixed star entry:

FS 29°Ta06'37 + 3°14'20|2.96|B7ne
    ALCYONE / eta Taurus
    The Pleiades

This is the named star “Alcyone,” the central star in the star group “The Pleiades,” said to be the most photographed stellar object. It is conjunct the planet Uranus in my natal chart. This listing breaks down as follows:

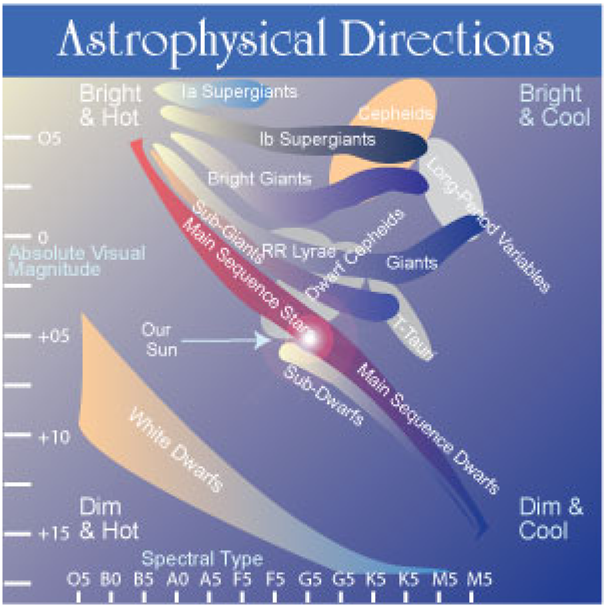
FS = Fixed Star
29°Ta06'37 = Zodiac longitude position
+ 3°14'20 = Zodiac latitude position
2.96 = Magnitude brightness

B7ne = Spectral Type
ALCYONE = Name of Star
eta Taurus = Flamsteed Number
The Pleiades = Star Group

We can see by its Spectral Type that it is a “B” star, which means it is a young and newly born star, and thus is burning very brightly. By doing a Google search for “Alcyone Pleiades,” I come up with 42,700 references, enough to keep me busy for a long time.

So I might hazard an interpretation that my way of breaking through or having insight (Uranus) will be powerful, deep (quasar), and very energetic, with perhaps a youthful innocence (spectral type B star). Use your own imagination. You get the idea.

That is how to make use of the catalog portion of this book. It is really very easy.



Hertzsprung-Russell Diagram II

The Time Table for Our Sun in Years

```
10  Billion Standard Life
100 Million Hydrogen Exhaustion
10  Million First Red Giant
10  Million Helium Burning
100 Million Second red Giant
20,000 Collapse
5 Billion   White Dwarf
```

Chapter 8: The Kinds of Stars

Double Stars

Not all stars stand alone as solitary beacons in space. A surprising number of stars are double, made up of two separate components, which may be either perfect twins or decidedly unequal in size and luminosity. Double stars, whose components are intrinsically associated and are in motion round a common center of gravity, are known as binaries. Optical doubles, in which the appearance is due to a chance alignment with one star almost behind the other, are much less common.

For a long time astronomers thought all double stars were results of such chance alignment. The first discovery of a double star with a telescope occurred in 1650, although both Arabs and North American Indians have used the double stars Mizar and Alcor as a test of keen eyesight for centuries.

The optical doubles are often divided into two types: equal doubles and unequal doubles. In the equal doubles, both components are of similar magnitude (example: Gamma Aries), while in the unequal doubles, the magnitudes as well as the colors of the two stars will differ. (example: Beta Cygni). Again: optical doubles result when two stars appear close to one another through chance alignment rather than gravitational interdependence. One star may be at a much greater distance from the Earth than the other.

Double Stars: Equal Doubles

Two stars of equal magnitude that are very close together.

Double Stars: Unequal Doubles

Two stars very close together, but of unequal magnitude.

Double Stars: Multiple Stars

A series of stars of unequal magnitude that are very close together in our line of sight.

Double Stars: Triple Stars

Three stars of varying magnitude that are very close together.

Rapid Binary

One star in very tight orbit around a larger star.

Physical Doubles or Binaries

Around 1767 it was recognized that most close pairs are not all optical (chance alignment), but in fact many double stars are physically associated with one another. These we called Physical Doubles or Binary Stars. One of the diagrams above shows an unequal binary system in orbit around a common center of gravity. Perhaps the most famous binary system is that of Sirius found in 1834. The bright star Sirius displayed a "weaving" sort of proper motion through space and it was deduced that this perturbed motion was caused by the presence of an invisible companion. The companion was discovered in 1862 and is only one ten-thousandth of the luminosity of its primary (Sirius) and is now known to be a dense star called a white-dwarf. Most binary systems can only be resolved into two distinct components through the use of a large telescope and a device called a filar micrometer.

Visual Binaries

##	Zodiac	Latitude	Object
VB	10°Ar26'21	+24°13'56	85 Pegasus
VB	14°Ar41'12	-25°17'24	L 726-8
VB	14°Ar41'45	+59°02'38	Kru 60
VB	01°Ta54'29	+50°24'43	eta Cassiopeia
VB	29°Ta12'49	-27°19'53	○ Eridanus B,C
VB	06°Cn35'07	-24°18'40	Ross 614 A,B
VB	12°Cn37'38	-38°14'59	Sirius
VB	24°Cn23'06	-15°58'49	Procyon
VB	02°Sc06'05	+34°00'50	epsilon Bootes
VB	27°Sc35'11	-41°29'22	αCentaurus A,B
VB	00°Sa21'36	+52°51'31	zeta Hercules
VB	05°Sa54'03	+67°38'02	Fu 46
VB	00°Cp00'00	+25°26'53	70 Ophiuchus

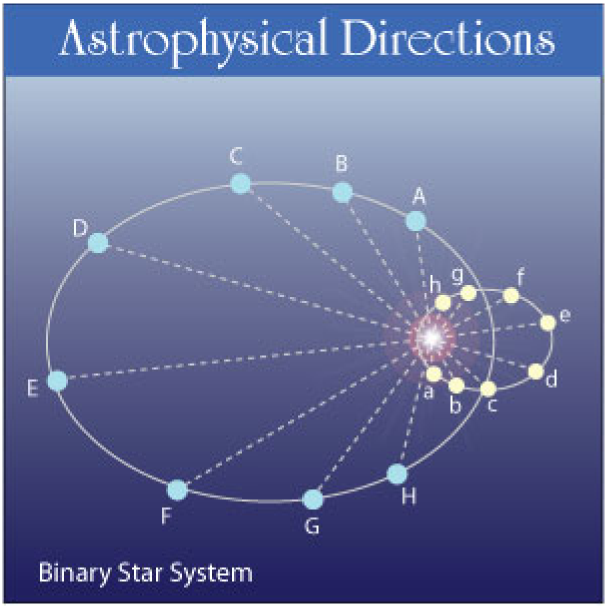
Spectroscopic Binary Stars

Spectroscopic binary stars are double stars that appear single in even the largest of telescopes, but whose double-ness becomes apparent from periodic changes in their spectra. The brighter component of the double star Mizar (Zeta Ursa Major) was the first star to be recognized as a spectroscopic binary. Some spectroscopic binaries have orbits oriented to our perspective such that they pass in front of one another or eclipse each other. These are termed eclipsing binaries. Algol or Beta Persei, which undergoes eclipse every few days, was the first known eclipsing binary. Astrometric Binaries are a group of double stars in which the presence of the unseen companion is determined by its gravitational action on the motion of the visible primary, much like Neptune was discovered through the perturbations of Uranus. Both Sirius and Procyon are examples of astrometric binary systems.

Spectroscopic Binaries

##	Zodiac	Latitude	Name
SB	10°Ta50'20	+20°03'59	4 β Triangulum
SB	21°Ta20'08	-53°26'52	41 nu Eridanus
SB	28°Ta51'58	+34°51'37	gamma Perseus
SB	29°Ta37'26	+11°43'14	omicron Perseus
SB	21°Ge32'48	-27°43'42	i Orion
SB	28°Ge27'49	+20°33'45	beta Aurigao
SB	23°Le00'37	- 4°04'23	omicron Leo
SB	14°Vi50'43	+56°03'16	ζ-2 Ursa Major
SB	03°Li08'35	+ 2°10'46	eta Virgo
SB	04°Li39'37	-49°52'42	p Vela
SB	21°Li50'60	- 0°31'16	alpha Virgo
SB	12°Sc44'19	-31°33'07	zeta Centaurus
SB	18°Sc22'21	+45°47'00	T Cor. Borealis

##	Zodiac	Latitude	Name
SB	01°Sa34'33	+ 2°32'09	beta Scorpio
SB	06°Sa47'22	+53°09'58	ε Hercules
SB	14°Sa31'05	-13°48'16	μ (one) Scorpio
SB	17°Cp24'52	+56°15'17	Beta Lyra
SB	02°Aq38'04	+ 4°57'19	beta Capricorn
SB	03°Aq37'27	+19°20'44	theta Aquila
SB	21°Aq44'19	+20°02'07	alpha Equuleus
SB	26°Aq35'22	+63°41'60	31 ○-1 Cygnus
SB	27°Aq49'16	+63°58'09	32 ○-2 Cygnus
SB	12°Pi56'58	-53°46'21	zeta Phoenix



Binary System

The two components revolve around the center of gravity of the system. The intersecting lines represent the center of gravity of an unequal system. The more massive component has the smaller orbit (a,b.c ... h), while the less massive component has the larger orbit (A,B,C ... H). If these were equal components, the center of gravity would be midway between the stars.

Eclipsing Binaries

##	Zodiac	Latitude	Name
EB	28°Ar13'27	+54°32'57	AR Cassiopeia
EB	25°Ta17'48	+21°54'22	β Pers., ALGOL
EB	28°Ta36'06	+59°52'38	YZ Cassiopeia
EB	29°Ta57'35	- 7°50'44	lamda Taurus
EB	05°Ge43'19	+49°59'36	RZ Cassiopeia
EB	11°Ge20'16	+63°10'28	U Cecheus
EB	20°Ge29'56	+10°40'20	AR Auriga
EB	22°Ge03'38	-23°59'55	VV Orion
EB	06°Cn14'35	+ 9°00'36	WW Auriga
EB	22°Le59'18	+34°15'47	TX Ursa Major
EB	23°Le53'50	-66°16'04	V Puppis
EB	02°Sc07'55	+76°24'06	CM Draconis
	(dwarf eclipsing binary)		
EB	11°Sc56'05	+43°38'32	α Cor. Borealis
EB	14°Sc22'07	+ 8°58'09	delta Libra
EB	13°Sa02'56	+56°40'12	u Hercules
EB	17°Sa21'15	+24°26'40	U Ophiuchus
EB	20°Sa20'13	-10°30'34	RS Sagittarius
EB	26°Cp58'48	+ 7°19'37	V 505 Sag.
EB	28°Pi11'08	+52°01'14	AR Lacerta

Variable Stars

The term "Variable Star" originally referred to those stars that vary in their brightness. All stars vary in one way or another. There are about 20,000 recognized variable stars listed in the well-known *Catalogue of Variable Stars* . The major types of variable stars are listed below.

Individual variable stars within each constellation are named by letters and numbers that indicate their order of discovery. The first variable found within any constellation has the letter R assigned to it (example: R Coronae Borealis). Subsequently discovered variables take the letters S, T … to Z; then RR, RS, RT …. SS, ST, and so on through ZZ.

After ZZ, variable stars are named starting from the beginning of the alphabet with AA, AB, AC … through AZ, then BB, BC through BZ, and son on through QZ.

The preceding will take care of 344 stars in each of the constellations. If there are still more variables, they receive numbers from 335 on, preceded by the letter "V" and followed by the constellation. An example would be V 335 Cygni, being the 335th variable star discovered in the constellation Cygnus.

Pulsating Variables

C Classical Cepheids, No. 696
I (L) Irregular Variables, No. 1687
M Mira Ceti , No. 4600
SR Semi-regular Variables , No. 4423
RR RR Lyrae Variables , No. 4423
RV RV Tauri Stars , No. 100
C Cephei Stars, No. 14 UV
SC Scuti Stars, No. 12
CV CVn Stars, No. 28

Explosive Variables

N Novae 203
Ne Nova-lie Variables
SN Supernovae No. 7
RCB R Cr Borealis Stars, No. 31
RW (I) RW Aur, T Tauri Stars, No. 1005
UG U Geminorum Stars, No. 210
UV Ceti (flare) Stars, No. 100
Z Z Camelopardalis Stars, No. 19

Eclipsing variables of all kinds total 4018.

Variable Star Naming

Individual variable stars within each constellation are named by letters and numbers that indicate their order of discovery. The first variable found within any constellation has the letter R assigned to it (example: R Coronae Borealis). Subsequently discovered variables take the letters S, T ... to Z; then RR, RS, RT ... SS, ST, and so on through ZZ.

After ZZ, variable stars are named starting from the beginning of the alphabet with AA, AB, AC ... through AZ, then BB, BC through BZ, and so on through QZ.

The preceding will take care of 344 stars in each of the constellations. If there are still more variables, they receive numbers from 335 on, preceded by the letter "V" and followed by the constellation. An example would be V 335 Cygni, being the 335th variable star discovered in the constellation Cygnus.

The Two Types of Intrinsic Variables:

Extrinsic Variables

Extrinsic are not “true” variable stars. Their variations are not caused by something happening within them, but by the intervention of some external action or by changes in aspect, as when an ellipsoidal star revolves or rotates. The eclipsing variables are extrinsics that change brightness when two stars eclipse one another, total or partially, and sometimes stars appear to have variance due to obscuring matter drifting in front of them. These often show physical interaction with interstellar matter.

Intrinsic Variables

These are the true variable stars, for something within them is happening to cause the variation in their appearance. The rest of this article will describe some of the basic attributes of the various major types of intrinsic variable stars. Some intrinsic variables have a more or less regular rhythm or period and are termed Periodic Variables, while others are only periodic in a rough fashion and ire termed Semi-regular or Cyclic Variables.

These semi-regular variables may be seen to dissolve, in a step-by-step manner, into those stars whose variations show no obvious pattern, the Irregular Variables. The most spectacular of all the variables are the Novae, Supernovae, and other Cataclysmic or Exploding Variables.

Periodic Variables

The periodic variables are giant and super-giant stars with periodic variations ranging from an hour or so to three years in length. In spectral class, the stars range from A to M and N . Those with the longest period have spectra of the latest type and those with the shortest periods tend to be A (or B) stars. Those of longest period are called Long-Period Variables and are red-giant stars. Stars with periods between a day and fifty days or more, the Cepheid Variables, are super-giant stars with spectral types near F or G at maximum. Stars with periods less than a day, called the RR Lyrae Variables, have spectral types between A and F, and absolute magnitudes near zero. Between the long-period variables and the RR Lyrae stars occurs a less well-defined series of periodic variables, with giant or super-giant luminosities and spectral types between F And K.

The Cepheid Variables

The Cepheid Variables, so named because the naked-eye star delta Cephei is a typical example and first discovered, are all giants or super-giant stars. The pole star Alpha Ursa Minor is a Cepheid variable. The Cepheids are pulsating stars with periods ranging from a few days to several months and spectral types from F or G (at maximum light). All are reddest at minimum light, but never of spectrum later than K. The Cepheid variables are most important because they are bright enough to be observed in other galaxies besides our own, such as Andromeda. Since we know that the longer the period of a Cepheid, the more luminous it is, these variables have served as the "standard candles" with which to explore external galaxies such as the Magellanic Clouds. Over 600 Cepheids have been discovered in other galaxies, as well as our own and this group of pulsating stars are often called Classical Cepheids. Cepheids are associated with dust filled regions of space.

The RR Lyrae Stars

RR Lyrae stars were first known as Cluster-type Variables, since they were discovered (in large numbers) in the high velocity globular clusters. RR Lyrae stars have absolute magnitudes near zero and spectral types near class A5. These stars are pulsating stars of very short period (usually less than one day) and only a slight dependence exists between period and luminosity, unlike the Cepheids. RR Lyrae stars (named after the star RR Lyrae, one of the brightest in this group) are very numerous in our galaxy, but are too faint to be seen in any but the nearest of the external galaxies. Some have been observed in the dwarf system in Sculptor and the Magellanic Clouds. RR Lyrae stars posses a high velocity motion that associates them with objects in the nucleus of our galaxy and other dust-free regions of space. As mentioned, they were first discovered in large numbers in globular clusters, which are very old and relatively free of interstellar dust.

W. Virginis and RV Tauri Stars

W Virginis and RV Tauri stars have periods of more than a day to over a hundred days. This group spans the range between the RR Lyrae stars and the long-period variables. These stars all occur in globular clusters (as do the RR Lyrae stars) and are often called Type II Cepheids. They have a spectral class of F to 6, but display strong bright lines of hydrogen. The group of shortest period is called the RV Tauri stars, after a typical specimen, while those having periods between ten and thirty days are W Virginis stars. Whereas all the classical Cepheids are found in the galactic plane (within the layer of dust and gas), the type II Cepheids occur at large distances from the plane of the galaxy and form a more nearly spherical system, like that filled by the globular clusters.

Long-Period Variables

The Long-period variables, as their name suggests, have periods that range from ninety days up to six or seven hundred. They have spectra of Classes M, S, R, and N, -- the coolest stars -- and large light ranges (from between three to six magnitudes). They are very common in our galaxy, which contain 100,000 such stars. Perhaps the most famous of the long-period variables is Mira Ceti, "the Wonderful," which has been known for centuries. These stars are rare or never found in globular clusters.

Semi-Regular Variables

The semi-regular red variables form a group that grades into the long period variables. They have similar periods and spectra, but their ranges of brightness and their spectral class are much smaller. These stars may be considered cyclic rather than periodic. The lengths of individual cycles and the forms of individual light variations are much more irregular than for the long-period variables, which in turn are less regular than the Cepheids. The semi-regular red variables may be on the verge of becoming long-period variables. This group contains a number of super-giant M stars, such as Betelgeuse and Antares, with absolute visual magnitudes near 4 and a large enough angular diameter to be measured with the interferometer.

Irregular Variables

Still other variables may be termed Irregular, for they suffer brightness changes in abrupt and unpredictable fashion. These stars may by continue at a constant brightness or, after small fluctuations for years or months, drop suddenly in brightness by six magnitudes in days or weeks, and return to maximum brightness over a period of years. The most famous irregular variable is R Coronae Borealis.

Flare Stars

Flare stars are main-sequence stars that abruptly brighten by several magnitudes for a very sort time, then quickly revert to their usual brightness. These flare-ups are erratic, with no detectable periodicity. There is also a large increase in the ultraviolet (UV) in many cases. Typical flare stars such as AD Leonis and YX Canoris exhibit small microflares as often as several times each night, while larger spectacular flares are observed with frequencies of once a week to once a month.

Many astronomers believe that the flare phenomenon represents a localized release of energy within the star atmosphere, similar to flares on the Sun. From this point of view, the Sun is a flare star, but the brightness of a flare star so small compared with the Sun's total brightness, that the solar luminosity is not appreciably increase during a flare. One of the Sun's nearest neighbors, Proxima Centauri, is a flare star.

Flare Star Table

##	Zodiac	Latitude	Name
FL	00°Ar52'53	+20°40'43	EQ Pegasus B
FL	05°Ar35'37	+47°02'11	EV Lacerta
FL	12°Ar30'31	-23°51'57	UV Ceti
FL	15°Ar45'31	+59°12'15	DO Cepheus
FL	26°Cn47'48	-17°36'24	YZ Canis Minor
FL	27°Le57'11	+34°18'32	WX Ursa Major
FL	28°Le48'19	+ 8°56'13	AD Leo
FL	27°Sc50'31	-43°53'32	α Centaurus C
FL	22°Pi00'52	+ 0°57'33	Jun 7, 1976, (unusual flare)

Magnetic Stars

The existence of strong magnetic fields in certain variable stars has been known since 1946, but the observation of the longitudinal Zeeman-effect in the spectra of such stars. The magnetic field strength often shows strong fluctuations of an irregular type and often also a reversal of polarity.

Magnetic Stars Table

##	Zodiac	Latitude	Name
MS	16°Ar10'40	+56°14'26	215 441
MS	27°Ar03'58	- 1°47'03	10 783
MS	13°Ge51'60	+ 7°06'22	32 633
MS	17°Ge56'04	+10°51'40	32 633
MS	13°Cn33'43	-23°18'06	50 169
MS	18°Cn06'49	+38°44'54	53
MS	29°Cn08'35	+21°11'13	71 866
MS	07°Sc43'34	- 4°06'03	125 248
MS	06°Pi19'35	+69°01'24	192 678

Novae: Exploding Stars

The Explosive or Cataclysmic Variable, in which the star undergoes some sort of explosion, has fascinated mankind for centuries. An otherwise apparently normal looking star will suddenly brighten, reach a maximum, and then fade away in a more gradual manner. In general, the cataclysmic variable stars are divided into three groups on the basis of the intensity of the explosion or outburst: Dwarf Novae, Novae and Recurrent Novae, and the Supernovae.

The normal novae are brighter still than either the dwarf or the recurrent novae, and more common. More than 100 novae have been observed in our galaxy in the last one hundred years. It is estimated that about 25 novae brighter than 9th magnitude occur in our galaxy each year; although all are not visible due to either their intrinsic faintness or daytime skies.

Novae are designated by constellation and year of appearance. Novae Aquilae 1918 was the brightest seen this century. Most novae have an average range of 13 magnitudes or, in other words, an increase in brightness by a factor of 160,000 within a period of several days. The absolute visual or photographic luminosity at maximum can range as high as a million times that of the Sun. Novae may decline rapidly from peak luminosity or fade much more slowly. The novae that show rapid decline are several magnitudes brighter than those which decline more gradually.

As mentioned, it is believed that the nova explosion is confined to a relatively thin layer of the star's envelope, which expands and makes the star appear to swell. After this bubble has been blown off, the star appears little altered in either brightness or color. The bubble or expanding envelope becomes transparent as the expanding shell evolves into a nebula. The total amount of stellar material lost is small, perhaps one thousandth of the star's mass or less.

Dwarf Novae, Novae, and Recurrent Novae

The brightness or luminosity of an ordinary nova may increase by a factor of 100,000 (12.5 magnitudes) within only a day or two. This sudden brightening of the star into a nova results from a sudden swelling of the photosphere – an explosion. Although both the temperature and radius of the star undergo change through the nova process, the rapid expansion of the star's radius is by far the more important of the two. The temperature even grows cooler as the star nears maximum.

Examination of the spectra (see Spectral Types) of novae bears out the idea that an explosion is taking place. Bright lines appear and become progressively more prominent. This is an indication that matter has left the surface of the star and surrounded it with kind of an extensive chromosphere. As the nova process continues, spectral analysis gives evidence of decreasing density. Bright lines, characteristic of most diffuse nebulae, appear and it is therefore understood that the envelope of the star is expanding into the surrounding space. A portion of the star is ejected.

Dwarf Novae

There are different kinds of novae. The Dwarf Novae (also called SS Cygni or U Geminorum stars) are repeating variable novae with a range up to six magnitudes. These dwarf novae repeat their outbursts at quasi-periodic intervals of a few weeks or months and are faint at minimum and around zero magnitude at maximum.

Recurrent Novae

The Recurrent Novae, much larger than the dwarf novae (they range in light between 8 and 10 magnitudes, undergo outbursts at irregular intervals of several decades. The fact that a star can undergo the nova process more than once is thought provoking. As violent as the nova process may appear, it seems to be but a passing incident in the life of the star, which returns to very much the same condition that existed before the outburst. As we shall see later in the text, this is not true for the supernovae. The variable star T Coronae Borealis is a classic recurrent nova with outbursts in 1866 and in 1946.

Novae

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Table of Novae

##	Zodiac	Latitude	Name
N	10°Ar37'33	+58°55'28	Nova 1936 Lacerta CP
N	10°Ar59'32	+54°43'44	Nova 1910 Lacerta No. 1
N	15°Ar22'58	+54°30'30	Nova 1950 Lacerta
N	26°Ar36'08	+32°27'52	885 Andromeda (S)
N	11°Ta40'24	+53°30'54	Nova Cassiopeia (8) 1572
N	20°Ta34'50	+41°08'29	Nova 1887 Persei No. 1 (V)
N	00°Ge52'15	+24°16'31	Nova 1901 Persei No. 2 (GK)
N	19°Ge28'48	- 6°55'36	Nova 1927 (XX Tau)
	Rapid development		
N	23°Ge12'51	+ 6°56'08	Nova 1891 Auriga (T)
N	08°Cn54'41	+ 7°07'07	Nova 1903 Gemini No. 1
N	10°Cn59'22	+ 9°58'08	Nova 1912 Gemini No. 2
N	11°Cn13'48	-23°20'51	Nova 1939(8T)
	Monoceros rapid early development		
N	23°Cn39'37	-26°48'29	Nova 1918 (GI) Monoceros
	Rapid early development		
N	12°Le41'47	-83°53'33	Nova 1925 Pictoris (RR)
N	13°Le18'28	-44°32'47	Nova 1902 DY Puppis
N	01°Vi01'16	-45°54'18	Novae 1890, 1902, 1920, 1941
	T Pyxis		
N	23°Vi57'10	+59°38'47	Nova 1970G NGC 5457
N	20°Li34'04	-58°28'43	Nova eta Carina
N	26°Li42'17	-57°35'20	Nova 1895 Carina (RS)
N	02°Sc29'20	-17°24'02	1968 NGC 5236

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N  03°Sc44'04 -18°43'23|Nova 1895 Centaurus No. 2
N  19°Sc16'29 +45°33'29|Nova 1866 Coronae (T) also 1946
N  19°Sc19'37 +33°34'20|Nova 1948 (CT) Serpens
         Rapid early development
N  29°Sc04'52 +27°08'59|Nova 1866 Scorpio (U) 1906, 1936
N  02°Sa12'41 -29°39'18|Nova 1893 Norma (R)
N  02°Sa16'10 -46°58'50|Nova 1926 X Circinus.
         Slow development
N  05°Sa29'54 - 0°18'05|Nova 1860 Scorpio (T)
N  13°Sa20'03 -62°19'51|Nova 1953 RR Chamaeleon
N  14°Sa14'42 +11°20'26|Nova 1848, Ophiuchus No. 2
N  14°Sa59'20 - 6°20'20|Nova 1917 Ophiuchus No.5
N  15°Sa18'41 -28°49'53|Nova 1910 Ara
N  21°Sa35'52 -11°47'41|Nova 1944 V 696 Scorpio
N  26°Sa44'23 +17°32'16|Nova 1898, 1933, 1958 RS Ophiuchus
N  27°Sa35'59 -10°43'32|Nova 1950 V 720 Scorpio
N  28°Sa24'21 - 2°47'12|Nova 1936 V 732 Sagittarius
         Rapid early development
N  29°Sa06'30 -12°28'49|Nova 1954 V 1275 Sagittarius
N  29°Sa17'53 - 5°45'14|Nova 1937 V 787 Sagittarius
N  29°Sa18'14 - 2°46'43|Nova 1910 Sagittarius No. 2
N  01°Cp09'56 - 9°55'57|Nova 1936 Sagittarius
N  01°Cp14'57 - 8°00'29|Nova 1905 V 1015 Sagittarius
         Early rapid development
N  02°Cp04'43 -11°02'41|Nova 1942 Puppis
N  02°Cp22'57 - 7°19'29|Nova 1952 V 1175 Sagittarius
N  02°Cp58'36 +68°57'27|Nova 1934 Hercules DQ
N  03°Cp32'23 +35°21'43|Nova 1919 Ophiuchus
N  03°Cp51'10 - 0°50'00|Nova 1899 Sagittarius No. 3
N  04°Cp28'01 - 1°33'12|Nova 1924 GR Sagittarius
N  04°Cp43'03 -11°16'08|Nova 1941 V 909 Sagittarius
N  05°Cp42'36 +64°38'01|Nova 1963 Hercules
N  06°Cp23'09 - 4°56'13|Nova 1901, 1919, V1017 Sagittarius
N  07°Cp44'23 +25°15'37|Nova 1970 Serpens
N  12°Cp49'00 +23°39'10|Nova 1918 Aquila No. 3
N  14°Cp15'11 +20°26'23|Nova 1927 EL Aquila
N  14°Cp36'11 + 9°57'12|Nova 1898 V1059 Sagittarius
         Rapid early development
N  15°Cp41'39 +18°45'58|Nova 1905 Aquila No. 2
N  16°Cp40'12 +36°24'20|Nova 1960 Hercules
N  18°Cp30'17 +52°29'56|Nova 1919 Lyra
N  20°Cp28'36 +23°48'18|Nova 1936 Aquila
N  20°Cp48'59 +22°16'15|Nova 1945 V 528 Aquila
         Rapid early development
N  21°Cp25'46 +22°41'38|Nova 1899 Aquila No. 1
N  23°Cp57'39 +28°44'25|Nova 1936 Aquila
N  27°Cp52'30 +42°07'51|Nova Vulpecula 1976
         10/21/76, Mag. 6.5, 1800 pcs
N  28°Cp06'09 +38°53'26|Nova 1783, WY Sagitta
N  00°Aq15'56 +39°12'51|Nova Sagittae 1977, Jan. 7,1977
N  01°Aq28'24 +28°59'31|Nova V 500 Aquila, 1943
N  05°Aq48'13 +47°35'48|Nova 1670 Vulpecula (11)
N  06°Aq00'40 +47°41'17|Nova 1968 Vulpecula LV
N  08°Aq08'10 +36°39'03|Nova 1913 Sagitta
N  08°Aq14'48 +36°42'18|Nova 1913, 1946 WZ Sagitta
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N  18°Aq15'39 +34°59'16|Nova 1967 Delphinus HR
N  20°Aq30'53 +54°38'41|Nova 1600, Cygnus No. 1 (P)
N  26°Aq10'10 - 9°46'59|Nova 1937b 220723 anon
N  01°Pi22'31 +70°32'29|Nova 1920 Cygnus No. 3
N  01°Pi33'06 +49°37'18|Nova 1942 V 450 Cygnus
N  349 10'51|19°Pi10'51 +52°24'24|Nova 1876
        Cygnus No. 2 (Q)
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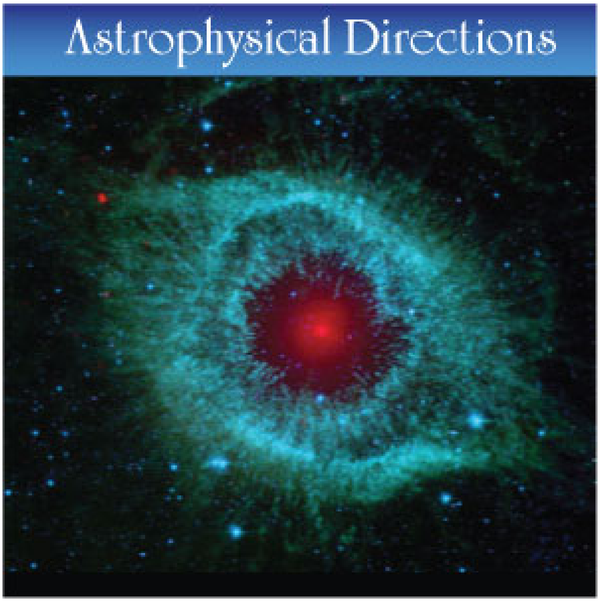

Supernovae

The nature of the Supernova explosion is another story entirely from that of the relatively tranquil nova process. Unlike the novae, whose essential condition remains unaltered after the blow-up, the supernova may suffer a complete collapse of its stellar core resulting in a super-dense star or even a black hole. (see Pulsars, Black Holes, Neutron Stars).

Supernovae are exploding stars reaching extreme luminosity (-18 Absolute Magnitude maximum), and a supernova may outshine the combined luminosity of the entire galaxy in which it appears! Supernovae are also quite rare. There have been but a handful of supernovae within our galaxy in recorded history. Most supernovae are found in external systems or galaxies, and to date more than 400 such supernovae have been discovered. One of the best known appeared in M.31 (the Andromeda Galaxy) in 1885.

There are at least two types of supernovae: SN I and SN II. Type I SN are powerful and brilliant, while Type II SR are faint and much less energetic. It is now believed that Type I SN are formed by the members of double-star systems. The cause of a supernova outburst is still the subject of intensive investigation (even controversy), but it is agreed that the onset of the explosion is ultimately related to instabilities in the structure of the star that arise when the supply of nuclear fuel in the central parts of the star is exhausted (see section on Evolution of Stars for more detail).

These instabilities occur only in stars whose mass is greater than about 1 1/2 times that of our Sun. Less massive stars, including the Sun, begin to contract when their nuclear fuel is consumed. In time, the pull of gravity is balanced by the pressure of degenerate electrons, an incompressible electron fluid that finally emerges because no two electrons can occupy the same energy state. When this stable configuration is reached, the star is called a white dwarf (which see), and gradually dies "not with a bang, but a whimper" as scientists delight in quoting. With stars of 1.5 solar masses, the density and temperature in the central core exceed the critical values beyond which stability is possible. The star collapses under the influence of gravity and an explosion occurs. In supernovae the outer shells of the collapsing star are ejected at ultrahigh velocity. In some, if not all, cases, a dense relic is left behind – rotating neutron star or perhaps even a black hole! The resulting magnetic field on the surface of a neutron star can be more than a thousand billion times stronger than the average magnetic field on the Sun.

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Table of Supernovae

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## Zodiac     Latitude  Name
SN 10°Ar23'01 -10°43'14|1939 D (Nov) M 16.00
SN 23°Ar58'14 + 6°47'07|1936 B (Aug) M 14.00
SN 26°Ar25'24 +54°39'57|SN Cas A (Our Galaxy) 1667
SN 17°Ta21'22 +18°29'29|1938 A (Nov) M 15.2
SN 19°Ta34'12 +23°27'45|1937 D (Sep. 16) M 12.8 NGC 1003
SN 20°Ta09'19 -39°14'13|1937 E (Dec) M 15.00 NGC 1482
SN 12°Cn57'37 +42°35'01|1954 J (Oct) M 16.0 NGC 2403
SN 28°Cn50'33 + 4°45'19|1901 A (Jan) M 14.7 NGC 2535
SN 03°Le24'28 + 8°54'32|1920 A (Jan) M 11.8 NGC 2608
SN 04°Le47'00 +34°00'02|1912 A (Feb) M 13.0 NGC 2841
SN 19°Le42'42 +28°44'60|1937F, 1921C, 1921B
        (Dec.12, Mar, Apr) NGC 3184
SN 26°Le30'30 +57°30'49|1940 D (Jul) M 15.0 NGC 4545
SN 27°Le15'27 +18°26'14|1941 B (Mar) M 15.1 NGC 3254
SN 27°Le39'31 + 9°47'05|1946 A (May) M 18.0 NGC 3177
SN 06°Vi07'25 +45°33'09|1937 A (Aug) M 15.3 NGC 4157
SN 16°Vi30'13 +34°08'02|1954 A (Apr 19) M 9.8 NGC 4214
SN 18°Vi11'14 +28°35'23|1941 C (Apr) M 16.8 NGC 4136
SN 23°Vi57'09 +51°22'11|1945 A (Feb) SN I M 14.0 NGC 5195
SN 23°Vi57'10 +59°38'47|1909 A (Feb) Peculiar SN
        M 12.1 NGC 5457
SN 25°Vi17'32 +29°06'38|1941 A (Feb 26) M 13.2 NGC 4559
SN 25°Vi33'06 +45°18'56|1971 I (June) SN I M 11.8 NGC 5055
SN 28°Vi05'07 +16°45'44|1914 A (Feb-Mar) M12.3 NGC 4486
SN 00°Li18'14 +27°33'41|1940 B (May 8) M 12.8 NGC 4725
SN 00°Li51'23 +31°51'02|1950 A (Feb) M 17.70 I 4051
SN 01°Li36'32 +13°52'38|1919 A (Feb-Mar) M 12.3 NGC 4486
SN 01°Li51'24 + 6°38'16|1936 A (Jan 13) M 14.4 NGC 4273
SN 01°Li58'57 +10°52'03|1895 A (Mar) M 12.5 NGC 4424
SN 02°Li30'15 + 6°20'43|1926 A (May) M 14.3 NGC 4303
SN 04°Li16'34 +14°48'26|1939 B (May 2) M 11.9 4621
SN 04°Li46'60 +68°13'12|1954 C (Oct 4) SN II M 14.9
        NGC 5879
SN 05°Li25'19 +67°27'32|1940 C (Apr) M 16.3 I 1099
SN 06°Li06'17 + 5°47'56|1915 A (mar) M 15.5 NGC 4527
SN 07°Li15'08 +68°31'23|1940 A (Feb 16) SN II M 14.3
        NGC 5907
SN 07°Li34'04 -17°17'18|1921 A (Mar) NGC 4038
SN 08°Li26'20 + 5°53'58|1939 A (Jan 2) M 12.2 NGC 4636
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SN 13°Li26'14 - 3°50'57|1907 A (May 10) M 13.5 NGC 4674
SN 14°Li03'20 - 3°20'33|1948 A (Mar) M 17.0 NGC 4699
SN 02°Sc53'29 -18°19'27|1923 A (May Peculiar SN M 14.0
       NGC 5236
SN 01°Sa35'14 +40°46'52|1926 B (Jun) M 14.8 NGC 6181
SN 04°Cp47'29 -32°55'21|1934 A (Oct 11) M 13.6 I 4719
SN 00°Aq31'06 -85°55'39|Supernova 1987A
       brightest since 1885
SN 25°Pi55'33 +71°31'34|1917 A (Jul) M 14.6 NGC 6946
SN 29°Pi30'10 -27°31'12|SN I 1940E (Nov) NGC 253 M 14.00
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We have not observed any Supernovae in our galaxy in over 300 years. Tycho Brahe wrote in *De Stella Nova* in 1573 about the supernovae that appeared in 1572: "...it was brighter than any other fixed star, including Sirius and Vega. It was even brighter than Jupiter and maintained approximately its luminosity for almost the whole of November. On a clear day it could be seen ... even at noon."

The list below (with one exception) shows some of the major bright supernovae discovered in external galaxies. The diagram a page or so below shows some of the remnants of supernovae that have been discovered in our own galaxy. Many of these remnants are listed in the sections on Radio and x-ray sources. Supernovae remnants are often strong emitters of energy in the radio and x-ray frequencies

Supernovae release gravitational energy in several forms. There is the radiant energy emitted in the early phases of the explosion. The matter simultaneously ejected carries away translational kinetic energy. The neutron star that survives is endowed with an enormous amount of rotational kinetic energy. As mentioned, it is believed that Type I supernovae are members of double-star systems. Their early evolution is similar to that of a single massive star. When they reach the white-dwarf stage, however, matter is transferred suddenly from the companion star, adding matter to the white dwarf and pushing the mass beyond the critical limit of 1.44 solar masses. At that point the core of the white-dwarf collapses violently, releasing energy as a supernova, leaving behind a binary system of an ordinary giant star and an x-ray source.

For a star much more massive than the Sun, the supernova evolution is different. The star also fuses hydrogen into helium in its core for a few hundred million years and, when the hydrogen is almost exhausted, the core contracts, the outer layers of the star expand, and the star becomes a red giant. Hydrogen continues to be burned in a shell around the core, as the core itself contracts until it heats up enough to fuse helium into carbon. When the helium is nearly exhausted, the core begins to burn the carbon.

At that point, one of two conditions can occur. The ignition of the carbon could induce instabilities that would detonate the star as a SN II, leaving behind nothing but an expanding gaseous remnant. Or, if the carbon is safely ignited, the extraordinarily high temperatures in the core could generate neutrinos at an ever-increasing rate sapping the stars energy, causing the core to plunge to a total collapse. In this event, a final burst of neutrinos might carry away so much of the red giant's rotational momentum, that it would blow off the entire outer envelope of the star. An explosion of this kind would leave behind a gaseous remnant, in the center of which would be a pulsating pulsar a rapidly rotating neutron star) or a black hole.

Supernovae Remnants

In our Galaxy of about 100 billion stars, a supernova occurs, on the average, once in every 100 years. For this reason, much of the research in supernovae has been done in galaxies external to our own. It is possible we may experience a supernova within our galaxy in the course of our lifetimes. Until that time, we must content ourselves with a search for the remains of previous supernovae. When a star does supernova, it radiates more energy than a billion Suns and ejects matter at close to the velocity of light for a period of about two weeks!

The expanding shell of debris creates a nebula that for hundreds, even thousands of years radiates vigorously in both the x-ray and radio regions of the spectrum. About two dozen of these remains of past supernovae or supernovae remnants have been discovered in our galaxy. Four of the remnants have been identified with supernovae whose sudden appearance in the sky can be found in historical records: A.D. 1006, 1054 Crab Nebula), 1572 (Tycho’s Nova) and 1604 (Kepler's Nova) – all prior to the telescope. Some of the most intense discrete radio and x-ray sources are associated with supernovae remnants. As pointed out earlier in this article, many supernovae remnants contain a rapidly rotating super-dense neutron star called a pulsar. For more information, and the positions of galactic remnants, see Radio, X-ray, Pulsar sections of this series. (Also see the diagram of the supernovae list).

White Dwarf Stars

White dwarfs are sub-luminous and super-dense stars. A white dwarf results when the thermonuclear reactions are exhausted in the stellar core. Not all stars become white dwarfs. Only stars of less than 14 solar masses go the route of the white dwarf. A typical white dwarf would have shed a large fraction of its mass into space perhaps in the nova or supernova process. With the exhaustion of the thermonuclear radiation, the gravitational forces cause the star to contract until the atoms have been stripped of their orbital electrons, due to the high internal pressure. The electrons, themselves, still exert an outward pressure and the star resists further, and a stable state results.

Weak nuclear reactions and the gravitational energy of contraction continue to furnish energy to keep the white dwarf feebly shining. White dwarfs have been known to astronomers for many years and are so common that it was believed that all dying stars somehow manage to eject enough material to become white dwarfs. White-dwarfs cool off and become, in time, black dwarfs. It is hard enough to see the dim white-dwarfs and no black-dwarfs have ever been found. White dwarfs occur in the lower left-hand corner of the Hertzspring-Russell Diagram (which see) or are, in other words, hot and dim.

White Dwarfs

##	Zodiac	Latitude	Name
WD	10°Ar29'13	+30°38'37	L1512-34 B
WD	12°Ar43'17	+ 0°30'49	v. Maanen 2
WD	19°Ar47'38	-14°33'31	L870-2
WD	29°Ta38'49	-27°55'19	40 Eridanus B
WD	09°Cn01'54	+13°53'46	He 3 = Ci20 398
WD	13°Cn25'22	-39°41'54	Sirius B
WD	25°Cn11'41	-16°06'05	Procyon B
WD	24°Le45'30	-48°07'49	L532-81
WD	12°Vi38'55	+15°58'11	R 627
WD	04°Sa41'06	+ 5°25'13	L770-3
WD	18°Aq26'37	+41°16'11	W1326

Wolf-Rayet Stars

The Wolf-Rayet stars or W stars are very blue and very hot. Their spectra display wide emission lines. About 25% of them are spectroscopic binaries and some are eclipsing binaries. They are enormously concentrated toward the galactic equator. Forty percent are within one degree of the equator, 70% within two degrees, and 95% within 5 degrees. Wolf-Rayet stars are highly luminous and very short-lived. They are of great value (potentially) in locating and tracing the spiral-arm pattern of our galaxy, since they do not have time to move far from the spiral arm where they originate. Several of these stars have been discovered as the central exciting star in planetary nebulae.

The Wolf-Rayet stars seem to comprise two separate spectral sequences, carbon and nitrogen stars, whose special characteristics indicate different chemical compositions. It has not been decided just where these stars fit into the Hertzsprung-Russell diagram. Their high temperatures and high luminosities indicate that they should come before the O's, while their tenuous atmospheric shells or envelopes suggest a relationship with the giant M's or the symbiotic objects.

Wolf-Rayet Table

##	Zodiac	Latitude	Name
WR	27°Le00'09	-65°02'44	gamma two Vela
WR	20°Li30'11	-59°25'16	Wolf-Rayet star
WR	21°Li58'42	-59°10'04	eta Carina
WR	19°Sc20'38	-51°50'43	Theta Musca
WR	16°Sa19'29	-19°50'17	Wolf-Rayet star

Chapter 9: The Constellations

The constellations are as old as time. Coma Berenices was added to the ancient list around 200 BC. No further additions were made until the 17th century, when some constellations were formed in the hitherto uncharted southern sky.

Since the middle of the 18th century, when 13 names were added in the southern hemisphere (and the old constellation Argo or Argo Navis was sub-divided into Carinai Malus [now Pyxis], Puppis and Vela), no new constellations have been recognized.

The star names listed below have, for the most part, been handed down from classical or early mediaeval times – most are Arabic. In 1603, a system was devised that designated the bright stars of each constellation by the small letters of the Greek alphabet, the brightest star usually designated as alpha, the second brightest beta, etc. --although, in some cases, the sequence or position in the constellation figure was preferred. When the Greek letters were exhausted, the small Roman letters a, b, c, etc., were employed, and after these the capitals, A, B, etc. (mostly in southern constellations). The capitals after Q were not required, from R, S, etc, have been used to denote variable stars .(which see).

The fainter stars have been designated by their numbers in some star catalog. The numbers of Flamsteed have been adopted for stars to which no Greek letter has been assigned, while for stars not appearing in that catalog, the numbers of some other catalog are used. The standard method of denoting any lettered or numbered star in a constellation is to give the letter or Flamsteed number, followed by the genitive case of the Latin name of the constellation.

Thus alpha Cygnus is described as a Cygnii. We have not used the genitives in this writing, to avoid confusion for beginning students.

Table of Constellations

And	Andromeda, Andromedae
Ant	Antlia, Antliae
Aps	Apus, Apodis
Aqr	Aquarius, Aquarii
Aql	Aquila, Aquilae
Ara	Ara, Arae
...	Argo, Argus
Ari	Aries, Arietis
Aur	Auriga, Aurigae
Boo	Bootes, Bootis
Cae	Caelum, Caeli
Cam	Camelopardalis, Camelopardalis
Cnc	Cancer, Cancri
CVn	Canes Venatici, Canum Venaticorum
CMa	Canis Major, Canis Majoris
CMi	Canis Minor, Canis Minoris
Cap	Capricornus, Capricorni
Car	Carina, Carinae
Cas	Cassiopeia, Cassiopeiae
Cen	Centaurus, Centauri
Cep	Cepheus, Cephei
Cet	Cetus, Ceti
Cha	Chamaelon, Chamaeleontis
Cir	Circinus, Circini
Col	Columba, Columbae
Com	Coma Berenices, Comae Berenices
CrA	Corona Australis, Coronae Australis
CrB	Corona Borealis, Coronae Borealis
Crv	Corvus, Corvi
Crt	Crater, Crateris
Cru	Crux, Crucis
Cyg	Cygnus, Cygni
Del	Delphinus, Delphini
Dor	Dorado, Doradus
Dra	Draco, Draconis
Equ	Equuleus, Equulei
Eri	Eridanus, Eridani
For	Fornax, Fornacis
Gem	Gemini, Geminorum
Gru	Grus, Gruis
Her	Hercules, Herculis
Hor	Horologium, Horologii
Hya	Hydra, Hydrae
Hyi	Hydrus, Hydri
Ind	Indus, Indi
Lac	Lacera, Lacertae
Leo	Leo, Leonis

LMi	Leo Minor, Leonis Minoris
Lep	Lepus, Leporis
Lib	Libra, Librae
Lup	Lupus, Lupi
Lyn	Lynx, Lyncis
Lyr	Lyra, Lyrae
Men	Mensa, Mensae
Mic	Microscopium, Microscopii
Mon	Monoceros, Monocerotis
Mus	Musca, Muscae
Nor	Norma, Normae
Ocr	Octans, Octantis
Oph	Ophiuchus, Ophiuchi
Ori	Orion, Orionis
Pav	Pavo, Pavonis
Peg	Pegasus, Pegasi
Per	Perseus, Persei
Phe	Phoenix, Phoenicis
Pic	Pictor, Pictoris
Psc	Pisces, Piscium
PsA	Piscis Australis, Piscis Australis
Pup	Puppis, Puppis
Pyx	Pyxis, Pyxis
Ret	Reticulum, Reticuli
Sge	Sagitta, Sagittae
Sgr	Sagittarius, Sagittarii
Sco	Scorpius, Scorpii
Sci	Sculptor, Sculptoris
Sct	Scutum, Scuti
Ser	Serpens, Serpentis
Sex	Sextans, Sextantis
Tau	Taurus, Tauri
Tel	Telescopium, Telescopii
Tri	Triangulum, Trianguli
TrA	Triangulum Australe, Trianguli Astralis
Tuc	Tucana, Tucanae
UMa	Ursa Major, Ursae Majoris
UMi	Ursa Minor, Ursae Minoris
Vel	Vela, Velae
Vir	Virgo, Virginis
Vol	(Piscis) Volans, Volantis
Vul	Vulpecula, Vulpeculae Of modern origin.

The Abbreviation (as used by astronomers), Name (nominative case), and Genitive case of each Constellation is given in the above table. Note that the abbreviation of the zodiacal constellations differs, in some cases, from that used by astrologers. Bright stars are designated by a Greek letter followed by the genitive case. Thus, Alpha Virginis (Spica) refers to the brightest star in the constellation Virgo.

The constellation Argo, which is very large, is often divided into four smaller constellations: Carina, Puppis, Pyxis, and Vela.

The Named Stars

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## Zodiac     Latitude  Name
01°Ar52'27 -20°47'31|2.24|gK0 |Diphcla
     beta Cetus, Deneb Kaitos, Diphcla
08°Ar55'45 +64°09'20|0 |cM2e|ERAKI
     eta Cepheus, ERAKIS
12°Ar02'06 +68°53'54|2.6 |A7n |ALDERAMI
     alpha Cepheus, ALDERAMIN, (5)
13°Ar00'07 +82°52'11|3.24|gG8 |ALDIB
     delta Draco, ALDIB, (57)
13°Ar26'05 +25°21'10|2.15|B8p |Alpheratz
     21 alpha Andromeda spectroscopic double, Alpheratz
21°Ar22'56 -20°01'42|3.92|gK0 |BATEN KAITOS
     (55) zeta Cetus, BATEN KAITOS, spectroscopic double.
22°Ar53'54 -53°22'59|3.42|A2 |ACAMAR
     theta Eridanus, ACAMAR, spectroscopic double
28°Ar47'57 - 8°44'45|3.94|A2np|ALRISHA
     alpha Pisces, ALRISHA,(113), spectroscopic double
00°Ta49'19 -15°56'21|0 |gM6e|MIRA,
     omicron Cetus, MIRA, double, (68)
01°Ta44'44 +79°29'32|3.99|gG3 |TY
     epsilon Draco, TYL, (63), double
02°Ta43'06 + 7°45'45|4.83|A0p |MESARTHIM
     (5) gamma Aries, MESARTHIM, double
03°Ta25'01 + 8°51'40|2.72|A5 |SHERATAN
     beta Aries (6), SHERATAN, spectroscopic double
03°Ta51'55 +71°03'49|3.32|B2s |ALPHIR
     beta Cepheus, ALPHIRK, (8), variable, double, spectr.
04°Ta10'06 +51°01'21|2.42|dF2 |Caph
     11 beta Cassiopeia, Caph
06°Ta15'00 +17°00'08|3.58|dF2 |METALLAH,
     (2) alpha Triangulum, METALLAH, spectroscopic double.
06°Ta54'50 + 9°49'51|2.23|gK2 |HAMAL
     alpha Aries (13), HAMAL
07°Ta13'02 +46°44'26|2.47|gK0 |Schedir
     alpha Cassiopeia,Schedir
08°Ta51'54 +47°17'46|3.64|dF9 |Achird
     eta Cassiopeia, Achird, double
13°Ta00'46 -26°15'35|4.9 |A3 |ZIBAL
     zeta Eridanus, ZIBAL, spectroscopic double, (13)
13°Ta34'48 +27°54'21|2.28|gK2 |ALAMAK
     gamma Andromeda (50), ALAMAK, double
16°Ta57'52 +46°06'32|2.8 |A5n |KSORA
     37 delta Cassiopeia, KSORA, eclipsing binary.
20°Ta03'32 + 1°28'58|4.53|gK2 |BOTEIN
     delta Aries, BOTEIN, (57)
24°Ta16'42 +47°46'12|3.44|B3s |SEGIN
     (45) epsilon Cassiopeia, SEGIN
26°Ta56'43 +25°56'36|4 |gG8 |MISAM
     kappa Perseus, MISAM, (27)
28°Ta36'17 + 3°42'47|3.81|B5ne|ELECTRA
     17 Taurus, ELECTRA
28°Ta48'36 + 4°40'20|5.43|B7n |CALAENO
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     16 Taurus, CALAENO
28°Ta52'28 -26°51'54|4.14|dF1 |BEID
     omicron one Eridanus, BEID, (38)
28°Ta55'19 + 4°44'58|4.37|B7n |TAYGETA
     19 Taurus, TAYGETA
29°Ta00'39 + 3°59'30|4.25|B5ne|MEROPE
     23 Taurus, MEROPE
29°Ta05'41 + 4°52'07|4.02|B9s |MAIA
     20 Taurus, MAIA
29°Ta06'37 + 3°14'20|2.96|B7ne|ALCYONE
     eta Taurus, ALCYONE, (25), the Pleiades
29°Ta06'58 + 4°53'00|5.85|B9n |ASTEROPE
     21 Taurus, ASTEROPE
29°Ta16'59 -51°34'13|3.88|K0 |THEEMIN
     upsilon Eridanus, THEEMIN,(52),(u2)
29°Ta19'33 +64°38'50|3.42|sgK1|ALRAI
     gamma Cepheus, ALRAI, (35)
29°Ta34'44 + 3°33'46|3.8 |B9n |ATLAS
     27 Taurus, ATLAS, double
29°Ta35'08 + 3°34'02|0 |B8ne|PLEIONE
     28 BU Taurus, PLEIONE, spectroscopic double
00°Ge25'57 +13°53'45|5.04|B1s |ATIKS
     omicron Perseus, (40), ATIKS, double
01°Ge12'53 +29°38'24|1.9 |cF5 |ALGENIB
     alpha Perseus, ALGENIB, (33)
02°Ge25'41 +11°20'03|2.91|cB1 |MENKHIB
     zeta Perseus, MENKHIB, spectroscopic double
04°Ge25'47 -36°34'18|3.98|gK4 |SCEPTRUM
     53 Eridanus, SCEPTRUM, double
09°Ge04'05 - 5°37'11|1.06|gK5+|ALDEBAREN
     alpha Taurus, ALDEBAREN, double
11°Ge12'23 -15°29'10|3.31|dF5 |TABIT
     pi3 Orion, TABIT,(1)
14°Ge33'16 -28°03'59|2.92|A3 |CURSA
     beta Eridanus, CURSA,(67)
15°Ge58'54 +10°47'17|2.9 |gK3 |MASSALEH
     iota Auriga, MASSALEH,(3)
16°Ge09'20 -30°54'29|.34 |cB8e|RIGEL
     beta Orion, RIGEL, (19) spectroscopic double
18°Ge01'17 +18°55'44|0 |ck4+|HOEDUS I
     zeta Auriga, HOEDUS I, (8), spec. eclipsing binary
18°Ge48'40 +18°51'17|3.28|B3 |HOEDUS II
     eta Auriga, HOEDUS II, (10)
19°Ge00'14 -43°39'02|2.96|gG2 |NIHAL
     beta Lepus, NIHAL,(9), double
20°Ge16'12 -16°31'09|1.7 |B2s |BELLATRIX
     gamma Orion, (24), BELLATRIX
20°Ge42'06 -40°50'29|2.69|cF0 |ARNEB
     alpha Lepus, ARNEB, (11)
21°Ge05'34 +22°09'46|.21 |gG5+|ALHAJOTH
     alpha Auriga, ALHAJOTH,(13), spectroscopic double
21°Ge25'18 -57°44'33|2.75|B8ne|PHAKT
     alpha Columba,PHAKT, double
21°Ge42'25 -22°51'57|2.48|O9 |MINTAKA,
     delta Orion, MINTAKA,(34), double, spectr. eclipsing
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21°Ge53'26 + 5°35'37|1.78|B7 |NATH,
     beta Taurus, NATH, (112)
22°Ge20'29 -28°30'55|2.87|O9s |HATYSA,
     iota Orion, HATYSA,(44), spectroscopic double
22°Ge45'18 -24°42'06|1.75|B0e |ALNILAM
     epsilon Orion, ALNILAM, (46)
22°Ge58'01 -14°11'04|3.66|O8se|HEKA
     lamda Orion,HEKA,(39), double
24°Ge00'07 -24°53'38|2.05|B0ne|ALNITAK
     zeta Orion, ALNITAK,(5O), double
25°Ge42'44 -32°44'23|2.2 |cB0 |SAIPH
     kappa Orion, SAIPH, (53)
28°Ge03'07 -16°19'10|0 |cM2 |Betelgeuse
     alpha Orion, Betelgeuse, (58), spectroscopic double
28°Ge14'33 +66°10'37|2.12|cF8r|CYNOSURA
     (1) alpha Ursa Minor, CYNOSURA, var. spectr. double.
29°Ge12'46 +21°31'11|0 |A2n |MENKALINAN
     beta Auriga, MENKALINAN,(34), Spec. Eclip. binary
00°Cn35'52 +70°28'07|4.44|A0 |PHERKARD
     delta Ursa Minor, PHERKARD, (23)
02°Cn43'47 - 0°27'19|0 |gM3 |TEJAT PRIOR
     eta Gemini, TEJAT PRIOR,(7), spectroscopic double
04°Cn35'15 - 0°23'06|3.19|gM3 |TEJAT POSTERIOR
     mu Gemini, TEJAT POSTERIOR,(l3), double
06°Cn26'27 -40°27'28|1.99|cB1 |MIRZAM
     beta Canes Major, MIRZAM,(2)
06°Cn43'56 -53°56'21|3.1 |B5s |FURUD
     zeta Canes Major, FURUD,(1), spectroscopic double
08°Cn23'23 - 6°29'21|1.93|A1 |ALHENA
     gamma Gemini, ALHENA,(24)
09°Cn14'18 + 2°05'35|3.18|cG8 |MEBSUTA
     epsilon Gemini,MEBSUTA, (27)
11°Cn38'33 +83°40'11|4.9 |dF5 |DZIBAN
     psi Draco, DZIBAN, (31), double
13°Cn24'16 -39°41'10|-1.4|A1s |SIRIUS,CANICULA
     alpha Canis Major, SIRIUS,CANICULA,(9), double
14°Cn18'02 -75°52'29|-.8 |cF0 |CANOPUS
     alpha Carina, CANOPUS
14°Cn19'48 - 2°24'15|0 |cG0v|MEKBUDA
     zeta Gemini, MEKBUDA, (43)
17°Cn47'38 + 0°01'12|3.51|dA8n|WASAT
     delta Gemini, WASAT, (55), double
18°Cn52'53 -37°49'11|4.07|B8 |MULIPHEIN
     gamma Canes Major, MULIPHEIN, (23)
19°Cn24'27 +10°55'56|1.58|A2s+|CASTOR
     alpha Gemini, CASTOR, (66), double, spectr.double
19°Cn53'15 -50°38'22|1.63|cB1 |ADARA
     epsilon Canis Major, ADARA
21°Cn32'16 -13°46'23|3.09|B8ne|GOMEISA
     beta Canis Minor, GOMEISA, (3)
21°Cn53'15 +44°27'11|4.76|gK2 |MUSCIDA
     pi2 Ursa Major, MUSCIDA, (4)
22°Cn27'11 + 7°05'19|1.21|gK0 |POLLUX
     beta Gemini, POLLUX, (78)
22°Cn46'27 -48°44'02|1.98|G3c |WEZEN
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     delta Canes Major, WEZEN, (25)
25°Cn07'42 -16°11'32|.48 |dF5 |ELGOMAIS
     alpha Canis Minor, ELGOMAISA, (10),doub1e
28°Cn57'27 -50°55'59|2.43|cB5p|ALUDR
     eta Canes Major, ALUDRA, (31)
01°Le50'37 +30°14'45|3.12|A4n+|TALITHA,
     iota Ursa Major, TALITHA, (9), double
02°Le35'17 -46°56'25|4.5 |B8 |MARKEB
     K Puppis, MARKEB, double
05°Le22'19 -45°00'31|3.47|cG6p|AZMIDISKE
     xi Puppis, AZMIDISKE, spectroscopic, double
06°Le45'52 + 0°48'45|0 | |PRAESEPE
     epsilon Cancer, PRAESEPE
06°Le58'57 + 2°39'08|4.73|A0 |ASELLUS BOREALI
     gamma Cancer, ASELLUS BOREALIS, (43) spectroscopic
07°Le59'30 + 0°11'31|4.17|gK0 |ASELLUS AUSTRALIS
     delta Cancer, ASELLUS AUSTRALIS, (47), double
10°Le16'59 +56°53'46|4.06|gM0 |GIANFAR
     lamda Draco, GIANFAR, (1)
11°Le24'58 +72°57'49|2.24|gK4 |KOCHAB
     beta Ursa Minor, KOCHAB, (7)
12°Le41'50 - 4°14'04|4.27|dFo |ACUBENS
     alpha Cancer, ACUBENS, (65), double
14°Le21'38 +49°47'27|1.95|gK0 |DUBH
     alpha Ursa Major, DUBHE, (50), double
17°Le34'17 -57°58'45|2.27|O5n |NAOS
     zeta Puppis, NAOS
18°Le40'47 +30°12'26|3.53|A2 |TANIA BOREALIS
     lamda Ursa Major, TANIA BOREALIS, (33)
18°Le40'59 +45°10'34|2.44|A1s |MERAK
     beta Ursa Major, MERAK, (48)
20°Le08'45 +75°13'47|3.14|A2n |PHERKAD
     gamma Ursa Minor, PHERKAD,(l3), spectroscopic double.
20°Le29'33 +29°04'23|3.21|gM0 |TANIA AUSTRALIS
     mu Ursa Major, TANIA AUSTRALIS, (34)
20°Le38'56 +12°34'06|0 |gK3 |RAS ELASED BOREALIS
     mu Leo, RAS ELASED BOREALIS, (24)
23°Le23'16 - 3°17'16|3.76|cF5+|SUBRA
     omicron Leo, (14), SUBRA
26°Le31'37 -22°14'16|2.16|gK3 |ALFARD
     alpha Hydra, ALFARD, (30)
26°Le56'07 +11°41'05|3.65|gF0 |ADHAFERA
     zeta Leo, ADHAFERA, (36)
28°Le50'00 + 9°00'22|2.61|gK0p|ALGIEBA
     gamma Leo, ALGIEBA, (41), double
29°Le03'31 + 0°39'50|1.34|B7n |KALB,
     alpha Leo, KALB, (32), double
00°Vi25'38 +51°35'52|3.44|A3n |KAFEA
     delta Ursa Major, KAFEA, (69)
05°Vi40'12 +26°40'47|3.71|gK3 |ALULA BOREALE
     nu Ursa Major, ALULA BOREALE, (54), double
06°Vi25'59 +66°26'04|3.64|A0p |THUBAN
     alpha Draco, THUBAN, (11), spectroscopic double
06°Vi36'33 +24°47'39|3.88|dG0 |ALULA AUSTRALE
     xi Ursa Major, ALULA AUSTRALE, (53), double, spect.
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07°Vi22'50 +54°51'22|1.68|A0p |ALIOT
     epsilon Ursa Major, ALIOTH, (77), spec. variable
10°Vi35'11 +14°23'30|2.58|A2n |ZOSMA
     delta Leo, ZOSMA, (68)
10°Vi47'17 -56°08'16|2.22|cK4 |ALSUHAIL
     lamda Vela, ALSUHAIL
12°Vi38'34 + 9°51'32|3.41|A4s |COXA,
     theta Leo, COXA, (70)
14°Vi28'09 +56°57'30|4.02|A1n |ALCOR
     80 Ursa Major, ALCOR, spectroscopic double
14°Vi37'40 +56°35'34|2.4 |A2sp|MIZAR
     zeta Ursa Major, MIZAR, (79) spectroscopic double
16°Vi52'02 +40°43'37|4.32|dG0 |ASTERION
     beta Canes Venatici, ASTERION, (8)
21°Vi00'58 +12°03'56|2.23|A4n |DENEBOL
     beta Leo, DENEBOLA, (94)
23°Vi58'27 +39°58'46|2.9 |A0p |CHARA, COR CAR0LI
     alpha Canes Venatici, CHARA, COR CAR0LI,(12), variable
26°Vi24'07 +54°15'19|1.91|B3n |ALKAID
     eta Ursa Major, ALKAID, (85)
26°Vi27'51 + 0°40'18|3.8 |dF8 |ALARAPH
     beta Virgo, ALARAPH,(5)
08°Li12'42 +23°04'04|4.32|dF4 |DIADEM
     alpha Coma Berenices, DIADEM,(42), double
08°Li33'13 -68°15'40|2.25|F0 |TUREIS
     iota Carina, TUREIS
08°Li55'38 +84°34'37|3.22|A3 |NODUS I
     zeta Draco, NODUS I, (22)
08°Li57'09 +16°50'39|2.95|gG6 |VINDEMIATRIX
     epsilon Virgo,VINDEMIATRIX, (47)
09°Li41'17 + 2°14'17|2.91|dF0+|ARICH
     gamma Virgo, ARICH, (29), double
10°Li55'28 + 8°15'10|3.66|gM3 |AUVA
     delta Virgo, (43), AUVA
11°Li12'58 -20°09'54|3.21|gK3 |MINKAR
     epsilon Corvus, MINKAR, (2)
11°Li33'05 -21°45'13|4.18|dF2 |ALCHITA
     alpha Corvus (1), ALCHITA
12°Li59'52 -12°43'20|3.11|A0n |ALGORAB
     delta Corvus, ALGORAB, (7), double
14°Li08'10 +58°20'50|5.76|dF4 |MERGA
     38 h Bootes, MERGA
16°Li57'60 +49°32'43|3 |dA7n|HARIS
     gamma Bootes, HARIS, (27)
17°Li01'49 -18°47'08|2.84|gG4 |KRAZ
     beta Corvus, KRAZ, (9)
18°Li53'21 +27°33'38|2.8 |dG0 |MUFRID
     eta Bootes, MUFRID, (8) spectroscopic double
21°Li41'54 + 7°59'44|3.44|A2 |HEZE
     zeta Virgo, HEZE, (79)
23°Li02'45 - 1°48'24|1.21|B2v |AZIMECH
     alpha Virgo, AZIMECH, SPICA,(67), spec. eclip. binary
23°Li34'41 +30°40'57|.24 |gK2p|ARCTURUS
     alpha Bootes, ARCTURUS, (16)
24°Li00'18 +53°39'13|3.63|gG5 |MEREZ
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     beta Bootes, MEREZ, (42)
00°Sc12'18 -72°08'37|1.8 |A0n |MIAPLACIDUS
     beta Carina, MIAPLACIDUS
02°Sc24'12 +53°30'57|4.47|dA7n|ALKALUROPS
     mu Bootes, ALKALUROPS, (51), double
04°Sc47'24 +56°45'44|5.41|gG5 |CEGINUS
     theta Bootes, CEGINUS, (54)
08°Sc19'50 +46°12'49|3.72|gA8s|NUSAKAN
     beta Corona Borealis, NUSAKAN, (3), spectroscopic
11°Sc55'46 +43°37'59|2.31|A0n |ALPHECCA
     alpha Corona Borealis, ALPHECCA,(5)
     var.spec.eclipsing binary
14°Sc08'48 + 1°06'47|2.9 |A3n |ZUBEN ELGENUBI, KIFFA
     AUSTRALIS
     alpha' Libra, ZUBEN ELGENUBI, KIFFA AUSTRALIS, (9)
14°Sc39'26 + 8°00'42|0 |A1s |ZUBEN ELAKRIBI
     delta Libra, ZUBEN ELAKRIBI, (19), spec. ecl. bin.
18°Sc19'12 + 0°20'40|5.28|gK5 |ZUBEN HAKRABI
     nu Libra, ZUBEN HAKRABI, (21)
18°Sc46'31 + 8°08'20|2.74|B8n |ZUBEN ELSCHEMALI
     KIFFA BOREALIS
     beta Libra, ZUBEN ELSCHEMALI, KIFFA BOREALIS, (27)
21°Sc24'31 +25°23'15|2.75|gK2 |COR SERPENTIS
     alpha Serpens, COR SERPENTIS, (24)
24°Sc19'56 + 4°49'23|4.02|gG6 |ZUBEN ELAKRAB
     gamma Libra, ZUBEN ELAKRAB, (38)
24°Sc48'27 +75°48'54|5.06|dF6 |ARRAKIS
     mu Draco, ARRAKIS, (21) double
24°Sc56'02 +37°29'25|5.34|gG4 |MARSIK
     kappa Hercules, MARSIK, (7), double
00°Sa33'23 +42°08'38|2.81|gG8 |KORNEPHOROS
     beta Hercules, KORNEPHOROS, (27), spect. double
00°Sa43'06 +35°47'38|4.53|A2sp|KAJAM
     omega Hercules, KAJAM, (24), double
01°Sa40'23 +16°53'44|3.03|gM1 |YED PRIOR
     delta Ophiuchus, YED PRIOR, (1)
01°Sa50'41 - 1°50'32|2.54|B0n |DSCHUBBA
     delta Scorpio, DSCHUBBA. (7)
02°Sa29'02 + 1°03'15|2.9 |B1n |ACRAB
     beta Scorpio, ACRAB, (8), spectroscopic double
02°Sa52'31 +16°06'24|3.34|gG8 |YED POSTERIOR
     epsilon Ophiuchus, YED POSTERIOR, (2)
03°Sa56'02 + 1°42'06|4.29|B2n |LESATH
     nu Scorpio, LESATH, (14), double, spectroscopic
08°Sa53'15 +78°42'58|4.98|dA8s|KUMA,
     nu Draco, KUMA, (24), double
09°Sa06'20 - 4°49'09|1.22|cM1+|ANTARE
     alpha Scorpio, ANTARES, (21), dbl,variable, spect.
11°Sa16'15 +75°16'28|2.99|cG2 |ALWAID
     beta Draco, ALWAID, (23), double
14°Sa10'43 +47°02'55|3.16|A3n |SARIN
     delta Hercules,SARIN, (65), double, spectroscopic
15°Sa29'58 +36°56'36|5.39|F8 |RAS ALGETH
     alpha2 Hercules, spectroscopic double, RAS ALGETHI
16°Sa36'21 -20°06'55|3.75|gK5 |GRAFIAS
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     zeta2 Scorpio, GRAFIAS
17°Sa17'25 + 6°59'37|2.63|A2s |SABIK
     eta Ophiuchus, SABIK, (35), double
19°Sa11'56 +49°20'04|4.48|gK4 |MAASYM,
     lamda Hercules, MAASYM, (76)
21°Sa46'45 +35°24'21|2.14|A5n |RAS ALHAGUE,
     alpha Ophiuchus, RAS ALHAGUE, (55)
23°Sa54'49 -14°15'42|1.71|B2n |SHAULA
     lamda Scorpio, SHAULA, (35)
24°Sa20'41 +79°34'39|390 |gK3 |GRUMIUM
     xi Draco, GRUMIUM, (32)
24°Sa39'10 +27°36'36|2.94|gK1 |KELB ALRAI
     beta Ophiuchus, KELB ALRAI, (60)
27°Sa13'37 +75°17'53|2.42|gK5 |ETAMIN
     gamma Draco, ETAMIN, (33)
00°Cp33'46 - 7°12'07|3.07|K0 |NASH
     gamma Sagittarius, NASH, (10), spectroscopic double
03°Cp53'40 - 6°03'37|2.84|gK2 |KAUS MEDIU
     delta Sagittarius, KAUS MEDIUS, (19), double
04°Cp23'16 -10°50'41|1.95|B9 |KAUS AUSTRALIS
     epsilon Sagittarius, KAUS AUSTRALIS, (20)
05°Cp37'44 - 1°53'39|2.94|gK1 |KAUS BOREALIS
     lamda Sagittarius, KAUS BOREALIS, (22)
11°Cp42'55 - 3°07'20|2.14|B3n |NUNKI
     sigma Sagittarius, NUNKI, (34)
12°Cp50'45 - 8°04'13|2.71|A4n |ASCELLA
     zeta Sagittarius, ASCELLA, (38), double
14°Cp38'13 +61°48'45|.14 |A1s |VEGA
     alpha Lyra, VEGA, (3)
15°Cp02'37 -22°20'26|4.24|B8 |ARKAB PRIOR
     beta1 Sagittarius, ARKAB PRIOR, double
15°Cp05'31 +27°10'49|4.5 |A5n |ALYA
     theta Serpens, ALYA, (63), double
15°Cp07'41 -22°29'40|4.51|A9n |ARKAB POSTERIOR
     beta2 Sagittarius, ARKAB POSTERIOR
16°Cp01'40 -17°46'15|4.11|B8s |ALRAMI
     alpha Sagittarius, ALRAMI, spectroscopic double
18°Cp07'32 +55°44'60|0 |B2+B|SHELIAK
     beta Lyra, SHELIAK, dbl, spectroscopic eclip binary
21°Cp07'29 +54°40'27|3.3 |B9sp|SULAPHAT
     gamma Lyra, SULAPHAT, (14), double
23°Cp03'45 +25°32'46|3.44|dA5n|DENEB OKAB
     delta Aquila, DENEB OKAB, (30), spectroscopic double
00°Aq15'35 +38°22'37|4.37|cF8 |SHAM
     alpha Sagitta, SHAM, (5)
00°Aq19'32 +48°18'55|3.24|gK1p|ALBIREO
     beta Cygnus, ALBIREO, (6), double
00°Aq21'30 +31°43'17|2.8 |gK3 |RED
     gamma Aquila, REDA, (50)
01°Aq42'47 +26°36'29|3.9 |dG8 |ALSHAIN
     beta Aquila, ALSHAIN, (60), double
03°Aq03'32 + 6°56'31|4.55|cG5p|GRED
     alpha Capricorn, GREDI, (5), double
03°Aq26'14 + 4°58'32|3.25|dF8+|DABIH
     beta Capricorn, DABIH, (9), spectroscopic doubles
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04°Aq10'00 +18°31'47|3.37|B9s |ANCHA
     theta Aquila, ANCHA, (65), spectroscopic double
11°Aq08'32 + 8°30'34|3.83|A1n |ALBALI
     epsilon Aquarius, ALBALI, (2)
15°Aq10'08 -32°58'01|2.16|B5n |ALNAIR
     alpha Grus, ALNAIR
15°Aq46'40 +32°17'19|3.72|dF3 |ROTANE
     beta Delphinus, ROTANEV, (6), double, spectroscopic
16°Aq32'27 +32°38'28|3.86|B8n |SUALOCIN
     alpha Delphinus, SUALOCIN (9)
21°Aq16'13 - 2°01'22|3.8 |dF2p|NASHIRA
     gamma Capricorn, NASHIRA, (40)
22°Aq52'40 + 9°09'05|3.07|cG0 |SADALSU
     beta Aquarius, SADALSUD, (22)
22°Aq56'08 - 2°19'24|2.98|A5n |DENEB ALGIEDI
     delta Capricorn, DENEB ALGIEDI, (49), spectroscopi c
24°Aq09'51 +57°08'25|2.32|cF8p|SADOR
     gamma Cygnus, SADOR, (37), double
26°Aq35'54 +48°45'01|2.64|gK0 |GIENAH
     epsilon Cygnus, GIENAH, (53), double, spectroscopic
01°Pi06'27 +21°54'17|2.54|cK2 |ENIT
     epsilon Pegasus, ENIT, (8)
02°Pi12'38 + 9°30'17|3.19|cG1 |ALTAIR
     alpha Aquarius, ALTAIR, (34)
03°Pi13'38 -20°58'41|1.29|A2s |FORMALHAUT
     alpha Pisces Austrinus, FORMALHAUT, (24)
05°Pi30'26 +60°37'17|1.33|vA2e|ARIDED
     alpha Cygnus, ARIDED, (50)
05°Pi58'04 + 8°07'09|3.97|A0 |SADALACHBIA
     gamma Aquarius, SADALACHBIA, spectroscopic double
08°Pi36'21 + 3°49'52|5.33|gK1 |SITULA
     kappa Aquarius, SITULA, (63)
08°Pi42'45 - 9°24'00|3.51|A2n |SKAT
     delta Aquarius, SKAT, (76)
13°Pi55'38 -59°42'17|.6 |B9n |ACHERNAR
     alpha Eridanus, ACHERNAR
15°Pi31'32 +17°50'23|3.61|B8n |HOMAM
     zeta Pegasus, HOMAM, (42)
22°Pi37'48 +19°04'14|2.57|B9 |MARKAB
     alpha Pegasus, MARKAB, (54)
24°Pi34'48 +34°24'02|3.1 |gG2 |MATAR
     eta Pegasus, MATAR, (44), spectroscopic double
26°Pi32'13 +58°11'14|4.78|B3 |AZELFAFAGE
     pi Cygnus, AZELFAFAGE, (80), spectroscopic double
28°Pi25'45 +30°42'56|2.61|gM2v|SCHEAT
     beta Pegasus, SCHEAT, (53), variable
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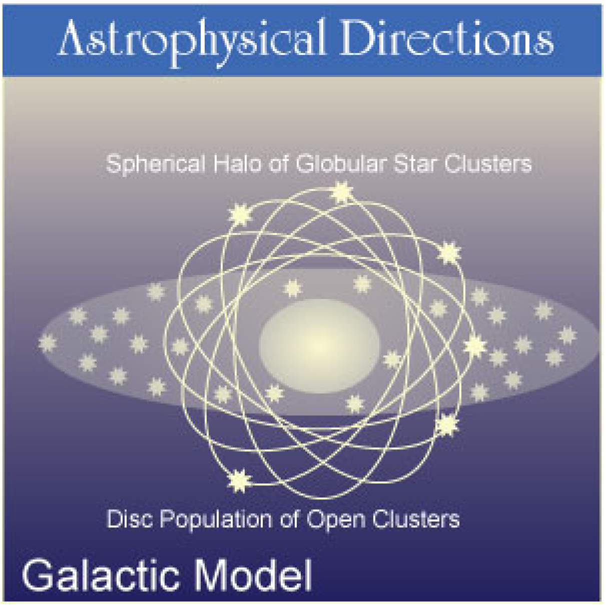


Chapter 10: Clustering

Star Clusters

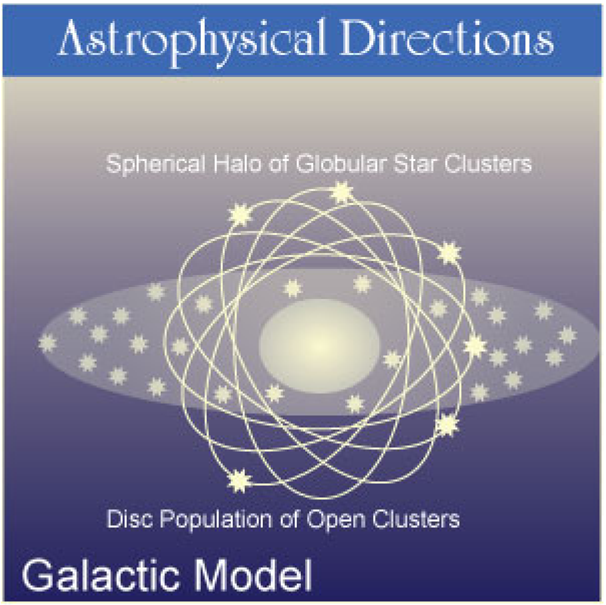
The first and only astrologer that I am aware of who has as concerned himself with star clusters is Charles A. Jayne. Jayne points out that clusters of dozens and thousands of stars exist at various distances and directions from our Sun. These clusters cohere for hundreds of millions of years in most cases. Jayne goes on to point out that these star clusters are at least as deserving of our attention as the more familiar constellations, composed of stars (in most cases) at different distances and having no physical relationship with one another.

The reader should understand that single stars are not the rule, but very much the exception. Clusters of stars are the rule, and in fact clusters of almost all astrophysical objects are the rule.

All objects in space show a decided preference toward groups, clumps, and clusters.

This tendency of stellar objects toward clustering helps to define the various planes of cosmic structure and the larger or more vast the distances we consider, the greater is this tendency of objects to clumps. In other words, galaxies show an even greater preference for clustering than do the stars!

The most obvious and gigantic cluster of stars is our galaxy itself. It is estimated that our galaxy contains some hundred billion stars. We will examine these vast clusters (galaxies) in a later section. Here we want to look at the various kinds of star clustering within our galaxy. There are two major cluster types: the Open or Galactic Cluster and the Globular Star Cluster. Each of these types shows a preference for different parts of the galaxy. The open clusters are groups of dozens or hundreds of stars that occur in the equatorial plane of the galaxy and seem to form the very backbone of our Milky Way. The globular clusters are systems of hundreds of thousands of stars packed tight in a globe or sphere and these great globes circle the galactic nucleus in highly inclined orbits. The globular clusters act as beacon lights to indicate the overall dimensions of our galaxy in all directions. The diagram on the next page illustrates both of these basic cluster types.



Open or Galactic Star Clusters

The Open Star Clusters (OC) are ragged and irregular groups of dozens or hundreds of stars that have a closer gravitational relation than that of the surrounding star field. These open clusters define the galactic equatorial plane and form a flattened disk-like system 1,000 parsecs thick and with a diameter of 10,000 parsecs. There is a distinct anti-center emphasis among open clusters with a maximum concentration of these objects toward a point 350 parsecs from our Sun, in the vicinity of galactic longitude 280°. The spatial distribution of the open clusters defines the spiral arm structure of our galaxy much as the globular clusters define the nucleus and spherical shape of the galactic system. The open clusters are much smaller than the globulars, with a maximum linear diameter for the largest of not over 15 parsecs, the smallest around 1.5 parsecs, and a range of 2-6 parsecs for those clusters of average size.

They are also much closer to us than the globulars, or at least the ones visible from our vantage point in the galaxy. The open clusters occur in the disk or plane of the galaxy along with the great concentration of gas and dust clouds. For this reason, we cannot see the more distant members of this group. Keep in mind that not only are the globular clusters intrinsically brighter, but their relatively higher galactic latitudes put them out of the dusty galactic plane and into view. All open clusters show a concentration to the plane of the galaxy with the exception of those clusters, which are situated so near to us that they appear projected in high galactic latitudes. The Coma Berenices cluster is one of these. While some 1,000 open clusters are known, it is estimated that there are about 18,000 of these objects distributed throughout the galactic plane.

We have noted that the dense globular clusters are able to defy the disruptive tidal forces within our galaxy and survive forever in terms of the life of the galaxy, not so for the open clusters. The great disk of our galaxy revolves like some great wheel through space and time. While to us, this spinning disk appears stationary (we are like a flashbulb picture), it has a powerful motion in terms of the life span of stellar objects. The open clusters have much shorter life spans than do the globular clusters. The fact that so many open clusters are found tells us that these objects are continuously being born or formed. Otherwise they would have vanished from the galaxy long ago.

In fact, the open clusters are the Johnny Appleseeds of our galaxy. In endless formation, they arise together in clusters from the great dust and gas clouds and move together through space, away from their birthplace. They cohere or hang together as long as possible in defiance of the galactic tidal waves, yet suffer loss of star after star until all are dispersed in an endless trail across the galactic plane. The speed of "evaporation" of the cluster stars depends greatly on their density in the cluster. A dense, compact cluster will be much more stable than a cluster of low density. The Hyades cluster is perhaps safe for about a thousand million years, whereas the Pleiades and Praesepe may endure for ten times that period.

Table of Open Clusters

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## Zodiac      Latitude  Name
OC 23°Ta30'07  +40°21'51  9  NGC 869
          rich member of double cluster, h Persei
OC 04°Ge44'55  +43°20'32 13  H 1
          intermediate rich, Cassiopeia
OC 29°Ta09'42  + 4°05'27 16  Mel 22, M. 45
          Pleiades, very loose, Taurus
OC 10°Ge47'29  +29°27'59 18  NGC 1528
          intermediate rich, Perseus
OC 11°Ge34'31  +28°19'14 20  NGC 1545, Perseus
OC 22°Ge38'32  +12°03'46 27  NGC 1907
          fairly rich, Auriga
OC 24°Ge06'15  +10°48'51 29  NGC 1960
          M.36, fairly rich, Auriga
OC 00°Cn58'53  + 0°39'28 33  NGC 2158
          quite rich and concentrated, Gemini
OC 01°Cn17'55  + 0°53'38 35  NGC 2168
          M.35, intermediate rich, Gemini
OC 14°Cn21'24  -42°11'16 39  NGC 2287
          M.41, intermediate rich, Canis Major
OC 09°Cn02'56  +18°01'48 40  NGC 2281
          intermediate rich, Auriga
OC 17°Cn25'10  -30°16'08 41  NGC 2323
          M.50, intermediate rich, Monoceros
OC 22°Cn52'39  -36°24'37 43  NGC 2360
          quite rich and concentrated, Canis Major
OC 29°Cn42'07  -34°12'47 47  NGC 2437
          M.46, fairly rich, Puppis
OC 12°Le27'57  -57°01'35 50  NGC 2477
          quite concentrated & rich, globular?, Puppis
OC 03°Le51'13  -29°34'08 51  NGC 2506
          quite rich & concentrated, Monoceros
OC 15°Vi50'08  -74°45'20 52  NGC 2516
          quite rich, concentrated, Carina
OC 07°Le18'01  -30°41'57 53  NGC 2539
          fairly rich, Puppis
OC 08°Vi55'25  -62°01'40 59  IC 2395
          intermediate rich, Vela
OC 00°Sc59'30  -55°03'04 64  NGC 3766
          concentrated and quite rich, Centaurus
OC 12°Sc17'50  -48°36'21 66  NGC 4755
          'Jewel Box', concentrated, rich, kappa Crux
OC 11°Sa07'27  -32°16'12 67  NGC 6067
          fairly rich, G & K Supergiants, Norma
OC 03°Cp42'48  + 5°49'45 78  NGC 6603
          M.24, Milky Way Patch, rich, Sagittarius
OC 10°Cp51'19  +14°29'46 85  NGC 6694
          M.26, fairly rich, Scutum
OC 12°Cp36'58  +17°15'02 86  NGC 6705, M.11
          concentrated, quite rich, Scutum
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OC 21°Pi58'40  +57°41'09 90  NGC 7092
          M.39, intermediate rich, Cygnus
OC 00°Ta16'40  +56°45'33 94  NGC 7654
          M.52, intermediate rich, Cassiopeia
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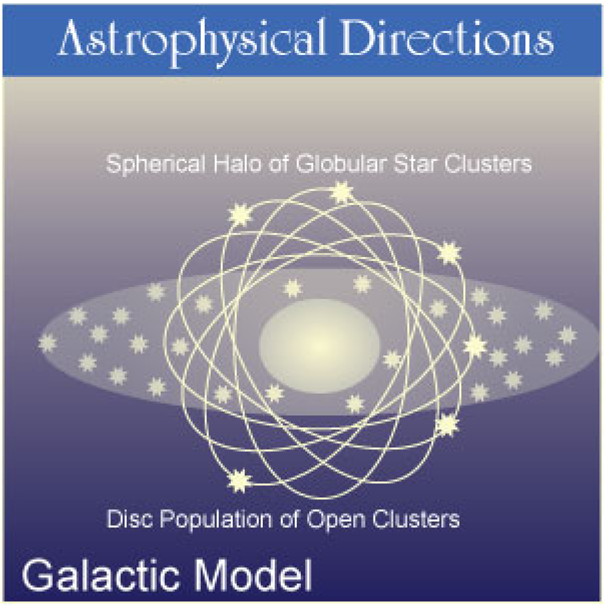

The Globular Star Clusters

The globular clusters form a more or less spherical system of satellites around the galactic nucleus. If we could speed up our time process, we would find that these objects circle the nucleus of our galaxy, in their very inclined orbits, at high speeds, very much like diagrams of the atomic nucleus surrounded by orbiting electrons. The anticenter of the galaxy is almost devoid of globulars and most occur between our Sun and the center of the galaxy (GC).

With the exception of the very much more diffuse stellar associations (to be mentioned later), the globular clusters are the most massive and vast star clusters known (the associations are vast but not massive). A globular cluster may contain hundreds of thousands of stars packed into a spherical region of space some 100 parsecs in diameter. Globulars, therefore, are very bright and can be observed at relatively greater distances than any other form of star cluster. The largest are visible to the naked eye as fuzzy patches and the two brightest are Omega Centauri and 47 Tucanae. Messier Object 13 (M.13) in Hercules is very well known.

Globular clusters are also very old and are essentially permanent members of the galactic system. They are the eternal guardians of the galactic nucleus. The large number of stars in these clusters and their density or compactness creates a self-gravitating system that is very effective against the disruptive tidal forces in the galaxy. There is a distinct absence of blue giants and supergiant stars (superluminous stars of short lifetimes) in the globular clusters. This along with the absence of dust and gas clouds points to their great age. The globular clusters seem to move, more or less, at random about the galactic center, very much like individual stars in a cluster seem to have mainly incoherent motions about the center of the cluster. Some astronomers claim that the globulars make radial oscillations (in and out) rather than spherical orbits.

Table of Globular Clusters

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 ## Zodiac     Latitude  Name
GC 11°Aq49'60 -61°58'28 1 NGC 104
      47 Tucana, one of two brightest
GC 23°Vi59'37 +17°57'46 7 NGC 4147
      Coma Berenices
GC 08°Sc54'54 -34°58'53 10 NGC 5139 1964
      omega Centaurus, one of brightest, GC
15°Sc53'07 +19°39'13 15 NGC 5904, M.5
      old cluster in Serpens
GC 05°Sa25'44 + 0°04'55 16 NGC 6093
      M80, Scorpio
GC 07°Sa40'11 - 4°03'38 17 NGC 6121
      M.4, Scorpio
GC 28°Sc52'18 +57°51'03 19 NGC 6205 M.13
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      perhaps finest, very old, Hercules
GC 16°Sa31'26 - 7°13'32 23 NGC 6266 M.62
      Ophiuchus
GC 09°Sa55'09 +65°52'25 29 NGC 6341
      M.92. Hercules
GC 19°Sa30'56 + 5°30'53 30 NGC 6333
      M.9, Ophiuchus
GC 23°Sa19'58 +20°31'04 32 NGC 6402
      M.14, Ophiuchus
GC 04°Cp56'35 + 0°15'13 36 NGC 6626
      M.28, Sagittarius
GC 06°Cp02'31 - 8°19'05 37 NGC 6637
      M.69, Sagittarius
GC 07°Cp42'53 + 1°11'23 38 NGC 6656
      M.22, Sagittarius
GC 08°Cp35'45 - 8°30'08 39 NGC 6681
      M.70, Sagittarius
GC 11°Cp22'09 - 6°31'58 41 NGC 6715
      M.54, Sagittarius
GC 26°Cp35'37 +51°49'15 44 NGC 6779
      M.56, Lyra
GC 20°Cp53'14 - 9°14'40 45 NGC 6809, M.55
      Sagittarius
GC 04°Aq38'29 +38°48'07 46 NGC 6838 M.71
      Sagittarius
GC 28°Cp22'06 - 1°28'14 47 NGC 6864
      M.75, Sagittarius
GC 11°Aq57'50 + 6°10'46 49 NGC 6981
      M.72, Aquarius
GC 28°Aq31'07 +25°28'37 51 NGC 7078
      M.15, Pegasus
GC 24°Aq45'24 +13°02'45 52 NGC 7089
      M.2, Aquarius
GC 19°Aq19'34 - 7°47'38 53 NGC 7099
      M.30, Capricorn
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The Stellar Associations

Very loose galactic clusters are called Stellar Associations and were discovered in the late 1940s. These associations are almost spherical in shape and yet have very low spatial density. The differential revolution about the galactic center should have elongated these groups of stars in a few hundred million years. This is due to the fact that the portion of the galactic disc nearer the center of the galaxy revolves more rapidly than the outer edge of the disk, in a pseudo-Keplerian motion. The lack of elongation noted in associations indicates that they must have been recently formed and are expanding at velocities of the order of 5 to 10 km/sec. If so, their ages cannot exceed a few millions or tens of millions of years. Young associations are of spherical shape (circular in outline) and older associations suffer distinct elongation as would be expected from the effect of galactic differential rotation, the spinning galactic disk.

The official definition of stellar associations in the words of their founder V.A. Ambartsumian: "O-Associations are stellar systems where the partial density of '0' and 'B2' stars [spectral class] is larger than the average field density of these stars in such a way that this difference cannot be explained by chance fluctuations; moreover, '0' or 'BO' stars are present."

The radii of these associations range up to 200 parsecs, far exceeding a typical open cluster or even that of the mighty globular clusters. It has been found that many associations outline the three major spiral arms of our galaxy. An association may contain 100 stars and it is estimated that ten million stellar associations have passed through their evolutionary cycle during the lifetime of our galaxy, each ending in total disintegration and the scattering of its members through the galaxy.

Perhaps the most famous association is that in Orion, where the great nebula and its central cluster form the nucleus of a large expanding association. Many associations include well-known galactic clusters and emission nebulae. Some are so young that only their most massive stars have had time to condense out of the interstellar medium and reach the hydrogen burning stage on the main sequence. The less massive young stars (still in the contracting stage) are usually embedded in bright and dark nebulosity and many of these stars are variable. It has even been reported that a star (FU Orion) has become visible in the Orion association where a few years prior none appeared in the photographs.

Moving Clusters

Certain open clusters, for which the individual stars have a pronounced motion toward a convergent point, are known as Moving Clusters. The Hyades is one of the earliest known and the nearest of these clusters. Except for small peculiar motions, all stars that are members of a moving cluster move in space along more or less parallel paths, much like meteors in a meteor stream. The individual proper motions of these stars seem to converge toward or diverge from a common point in the sky in the same way that meteors in showers appear to diverge from their radiants (see Meteors). The point of divergence marks the direction in space toward which the Sun is moving with respect to the cluster. The point of convergence of the proper motions (opposite the point of divergence on the celestial sphere) marks the direction toward which the cluster is moving with respect to the Sun.

The Ursa Major cluster is of particular interest to us since it occupies the same volume of space as our Sun. In fact, it is moving through our space, although the Sun is not a member of this cluster. The Ursa Major cluster is composed of two subgroups which consist of a moderately compact cluster of 14 stars with the same proper motion and an extended stream of stars which has approximately the same motion. The nucleus of this cluster is located about 23 parsecs from the Sun and occupies (roughly) ellipsoidal region 4x6x10 parsecs in diameter. The shortest diameter is perpendicular to the galactic plane, while the longest is in the direction of the motion of the cluster. The motion of the local centroid is 29 km/sec.

Another moving cluster of great interest is the Scorpio-Centaurus or Southern Stream cluster. The Sco-Cen moving cluster is a relatively ancient one as indicated by its rather elongated shape. It is also part of the local system of stars (which see) of which our Sun is a member. The total annual proper motions for the Sco-Cen cluster range from O.02" to O.05." The group formed about 70 million years ago in a region 2200 parsecs distant, in the direction of galactic longitude 59 degrees.

The seven most conspicuous open-type clusters are the Pleiades, Hyades, Praesepe, Coma Bereneces, IC 2602, NGC 3532, and Messier Objects 6 & 7. The Pleiades, perhaps the most photographed object in this universe, has been recorded in ancient times by the Chinese, Hindus, Chaldeans, and the Greeks and is mentioned in the Bible. Called the seven sisters or pigeons, only six stars can be seen today with the unaided eye. It is thought that one of the original stars may have faded since ancient times. There is somewhere between 300-500 stars in the Pleiades cluster with the center 6' west of Alcyone, the Lucida, at R.A. 56° 01'01" and Declination of +23°57126." The brightest Pleiades are late B-type, an indication of the youth of this particular cluster. The Pleiades has always received much attention from astrologers and it is more than interesting to note that the position of the cluster in the Zodiac coincides with the intersection of the Galactic and Super-Galactic equators, as projected onto the ecliptic.

Moving Clusters

```
## Zodiac      Latitude  Name
MC 20°Ge52'45 -66°17'23|Pleiades
MC 23°Ge39'42 -41°20'17|Orion
      100x70x60 parsecs diameter
MC 02°Cn59'37 -11°25'01|Hyades Moving Cluster
      250 parsecs diameter
MC 05°Cn17'15 -19°21'23|Praesepe
      About 10 parsecs diameter
MC 17°Cn25'28 -46°39'53|Perseus Moving Cluster
MC 06°Le27'14 -68°03'24|Sco-Cen 90x300
MC 25°Le04'20 -64°37'56|Coma Berenices
MC 28°Cp36'54 -16°57'56|Ursa Major-Sirius
```

O-Associations

Astronomer V. A. Ambartsumian describes O-Associations as:

"... [S]tellar systems where the partial density of 'O-B2' stars is larger than the average field density of these stars in such a way that this difference cannot be explained by chance fluctuations; moreover, 'O' or 'BO' stars are present. The properties of O-associations may be described as follows:

- (a) The linear diameters range between 30 and 200 parsecs.
- (b) The associations contain an open star cluster of type "O" as nucleus.
- (c) They include, besides O-B2 stars, also stars of types later than B2, sometimes even Wolf-Rayet stars (though it is difficult to ascertain the number of faint stars).
- (d) Sometimes multiple star systems of Trapezium type and star chains may be part of the nuclei,
- (e) hot stars occur also outside the nuclei.
- (g) There are reasons for presuming the O-associations to be unstable systems."

The Associations have also been called aggregates and groups, but the lack of basic data on individual members of the associations or groups often resulted in a specific system receiving a completely different and independent description, which produced confusion among the identifications.

Table of O-Associations

```
## Zodiac  Latitude  Name
OA 22°Ta52'21 +40°46'5   8 Perseus OB 1
        (Ma) Per I, (Mo) I Per 6
OA 29°Ta37'28 +42°54'2   9 Cassiopeia OB 6
        (Ma) Cas VI, (Sch) X Cas, (Ru) Ca 5
OA 00°Ge15'40 +13°23'2  12 Perseus OB 2
        (Ma) Per II, (Mo) II Per 2
OA 21°Ge27'09 -24°29'55 16 Orion OB 1
        (Ma) Ori, (Mo) I Ori, (Ru) Ori I
OA 01°Cn34'53 - 1°50'11 18 Gemini OB 1
        (Ma) Gem, (Mo) I Gem
OA 07°Cn45'10 -14°22'29 19 Monoceros OB 1
        (Ma) Mon I, (Sch) II Mon
OA 09°Cn03'16 -18°17'30 20 Monoceros OB 2
        (Ma) Mon II, (Mo) I Mon
OA 18°Cn52'11 -32°00'37 21 Canis Major OB 1
        (Ma) CMa, (Sch) I CMa, (Ru) CMa
OA 07°Le10'06 -44°55'35 23 Puppis OB 1
        (Ma) Pup, (Sch) II Pup, (Ru) Pup I
OA 05°Vi18'58 -57°29'12 25 Vela OB 1
        (Ma) Vela, (Sch) 1 Vel, (Ru) Vel I
OA 18°Li43'54 -57°12'14 26 Carina OB 1
        (Ma) Car, (Sch) I Car, (Ru) Car I
OA 14°Sa04'26 -23°02'41 33 Ara OB 1
        (ma) Ara-Nor, (Sch) I Ara
OA 16°Sa02'54 -17°31'54 34 Scorpius OB 1
        (Ma) Sco, (mo) I Sco, (Ru) Sco I
OA 01°Cp08'55 + 2°54'27 37 Sagittarius OB 1
        (Ma) Sgr I, (Mo) I Sgr,(Mo) II S
OA 03°Cp59'54 +13°22'28 41 Serpens OB 2
        (Ma) Sgr III, (Mo) II Ser, (Sch) III
OA 04°Cp25'12 + 9°58'38 42 Serpens OB 1
        (Ma) Sgr II, (Mo) I Ser,(Ru) Ser
OA 28°Aq10'34 +57°12'25 56 Cygnus OB 2
        (Sch) VI Cyg, (Ru) Cyg II
OA 13°Ar58'54 +65°12'38 60 Cepheus OB 2
        (Ma) Cep II, (Mo) I Cep
OA 08°Ar02'13 +57°53'01 61 Ceph-Lacerta OB 1
        (Ma) Cep-Lac
OA 11°Ar46'36 +57°42'58 62 Cepheus OB 1
        (Ma) Cep I, (Mo) II Cep
OA 00°Ar07'59 +43°02'23 63 Lacerta OB 1
```

```
        (Sch) I Lac, (Ru) Lac I
OA 00°Ta20'40 +60°25'41 64 Cepheus OB 3
        (Mo) III Cep, (Ru) Cep IlI
OA 28°Ar57'20 +56°52'49 66 Cassiopeia OB 2
        (Ma) Cas II, (Sch) V Cas
OA 04°Ta04'21 +52°59'07 68 Cassiopeia OB 5
        (Ma) Cas V, (Mo) I Cas
```

T-Associations

T-Associations are groups or clusters of very young stars that are very near to our Sun. Along with the O-Associations, these are the nearest groups of celestial objects. T-Associations are loose groups of T Tauri and RW Aurigae stars at distances from about 100 to 1000 parsecs from the Sun. There are about forty of these associations known, most with fewer than thirty members, although there may be as many as four hundred. T-Associations have received much attention in recent years from astronomers due to the fact that T Tauri stars are closely associated with strong clouds of interstellar dust and are often observed near or within these dark nebulae. Armenian astronomer V. A. Ambartsumian sees in these compact associations of variable stars a special class of stars, possible in the condensing stage – young or very young stars. These T Tauri stars help to bridge the gap between protostars (newborn stars) and the younger stars (T Tauri stars = age less than 10^7). The spherical shape of the T-Associations or clusters is an indication that these young stars will disband in a relatively short period of time. They are unstable.

The T Tauri stars exhibit erratic variations that may be, in part, extrinsic. They have luminosity comparable to our Sun, although their spectra are peculiar, with bright lines of hydrogen and the metals and continua of unusual energy distribution. These stars are strong emitters of infrared radiation.

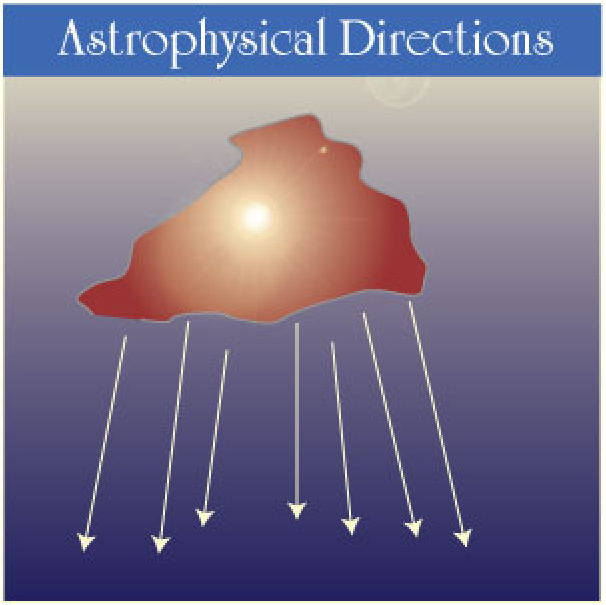
Table of T-Associations

##	Zodiac	Latitude	Name
T	00°Ar49'39	-46°20'49	Phe T1-SY Phe (?)
T	16°Ar55'06	+60°49'02	Cep T3-DI Cep (?)
T	18°Ar28'31	+46°11'53	And T1-BM And (?)
T	25°Ar27'56	+72°56'37	Cep T1-NGC 7023
T	27°Ar51'29	+56°23'36	Cas T2-NGC 7635
T	08°Ta48'53	+52°45'13	Cas T1-VX Cas
T	13°Ta26'01	+68°28'03	Cep T2-BO Cep (?)
T	22°Ta39'28	+38°03'48	Per T1-EO Per
T	29°Ta42'27	+11°46'47	Per T2-IC 348
T	06°Ge14'51	+ 6°47'57	Tau T1-RY Tau
T	07°Ge47'56	- 3°06'36	Tau T2-T Tau
T	09°Ge10'25	+ 4°00'53	Tau T3-UZ Tau
T	10°Ge08'19	+14°10'25	Per T3-NGC 1579
T	15°Ge22'37	+ 8°27'42	Aur T1-RW Aur
T	21°Ge32'35	-11°39'14	Ori T1-CO Ori
T	21°Ge35'23	-27°46'17	Ori T2-T Ori
T	22°Ge56'16	-23°49'56	Ori T3-sigma Ori
T	24°Ge35'34	-13°40'39	Ori T4-FU Ori
T	26°Ge26'59	+ 2°39'09	Tau T4-RR Tau
T	09°Cn01'43	-13°14'53	Mon T1-NGC 2264, S Mon
T	11°Cn09'09	- 9°42'52	Gem T1-FY Gem
T	13°Cn05'34	-25°42'19	Mon T2-WX Mon (?)
T	28°Cn11'07	-34°42'39	Pup T1-UY Pup (?)
T	19°Li02'12	-58°14'13	Car T1-eta Car (?)
T	25°Li12'46	-39°44'18	Cen T1-V 654 Cen
T	07°Sa01'02	- 1°27'22	Sco T1-α Sco
T	29°Sa11'45	+ 0°19'13	Sgr T1-NGC 6514
T	29°Sa29'47	- 0°00'14	Sgr T2-NGC 6530
T	00°Cp53'54	+ 0°28'09	Sgr T3-S 188, IC 1274b
T	03°Cp19'54	+11°03'44	Ser T1 - NGC 6611
T	06°Cp55'11	+56°52'12	Lyr T1 - LT Lyr
T	07°Cp37'01	+31°48'55	Oph T1 - V 426 Oph

Chapter 11: Deep Space Objects

Nebulae

Not all of the material in our universe is contained in stars. A large amount of interstellar matter exists in the form of cloud-like objects called nebulae. A nebula is made up of very tenuous gas and dust. Gaseous nebulae are of such great importance because it seems that it is here that stars are born. It is here that fresh stars are condensing out of the nebular material. The three main types of nebulae are illustrated above. In most of space, these interstellar dust clouds are cold and dark. Dark clouds block our view to the very center of our Galaxy. Were it not for these obscuring dark nebulae, the nuclear region of the galaxy would be a blaze of light filling the night sky in that direction. There are two types of nebulae that "shine": emission nebulae and reflection or continuum nebulae.

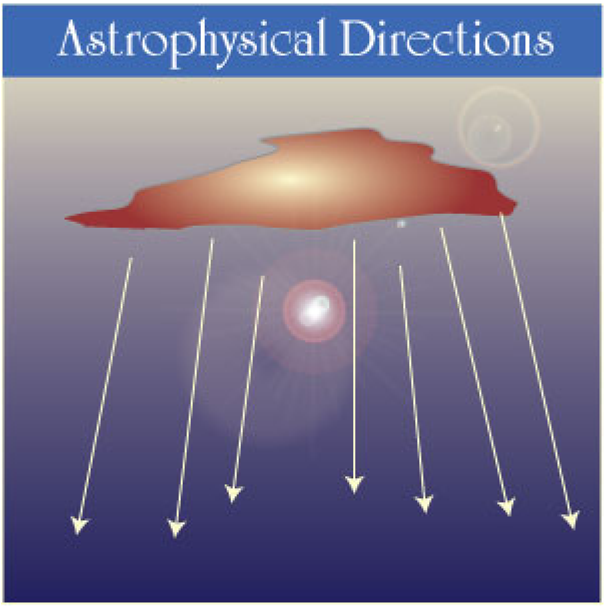


Emission Nebulae

A nebula containing a very hot star can be excited to self-luminosity, resulting in what is termed an emission nebula. A nebulous region which is excited to luminosity in this way is also called an H-II region since hydrogen (H) is the most abundant element.

Emission nebulae are huge masses of gas that absorb ultraviolet radiation from nearby hot stars and reradiate it as bright-line emission. The most famous example of an emission nebula is Messier Object 42 (M.42), the great nebula in Orion. Another is the Eta Carinae Nebula in the southern sky. The larger emission nebulae are most often associated with the very hot "O" and "BO" stars and may contain dense groups of these most luminous stars. The hot central stars in the emission nebulae often appear to have cleared away the dust from their immediate surrounding, creating a hole or dust-free bubble inside an otherwise dusty region of space. (See the section on Solar Wind)

Nebulae can also become luminous when a nearby bright star causes them to shine by reflected light. The Pleiades was the first reflection nebula to be observed. The reflection nebulae reflect the light of stars embedded within them. It is not known whether reflection nebulae are only dark clouds that happen to be near a bright star or whether some actual physical relationship may exist between the reflection nebulae and the stars that illuminate them. It has been noted that stars of "B1" or later (see section on spectral Type) produce reflection nebulae, while stars of "BO" or earlier produce emission nebulae.



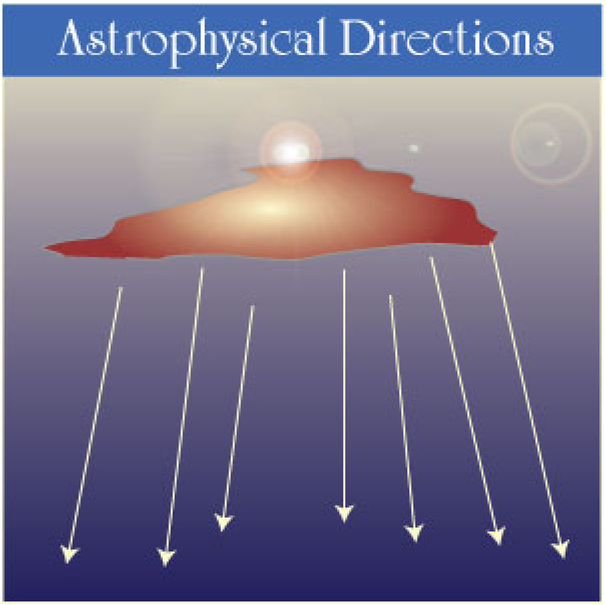
Reflection Nebulae

In some nebulae, the star producing the illumination is not hot enough to make the nebulosity shine by its own light and the result is a reflection nebula.

Perhaps the most famous reflection nebula is the one in the Pleiades star cluster.

Table of Bright Diffuse Nebulae

##	Zodiac	Latitude	Name
DI	23°Ar28'03	+72°37'20	NGC 7023, Cepheus
DI	29°Ar26'17	+58°02'53	NGC 7538, Cepheus
DI	09°Ta28'09	+45°53'59	NGC 281, Cassiopeia
DI	13°Ta06'13	+57°36'28	
DI	13°Ta13'27	+48°47'22	IC 59, gamma Cassiopeia
DI	27°Ta53'46	+43°22'19	IC 1805, Cassiopeia
DI	28°Ta58'05	+ 3°57'44	IC 349, 23 Taurus, MEROPE
DI	00°Ge39'58	+42°12'53	IC 1848, Cassiopeia
DI	00°Ge42'22	+12°29'41	IC 8, omicron Perseus
DI	05°Ge15'23	+15°07'02	IC 1499, Perseus, California Nebula
DI	18°Ge21'38	-25°31'29	Orion
DI	21°Ge24'40	+10°40'47	IC 410, Auriga
DI	21°Ge34'17	+10°50'39	IC 417, Auriga
DI	22°Ge22'42	-27°29'38	NGC 1976, Orion, M.42
DI	22°Ge24'18	-27°31'13	NGC 1980, Orion
DI	22°Ge25'54	-27°32'48	NGC 1982, Orion, M.43
DI	22°Ge48'58	-23°42'33	NGC 1990, epsilon Orion
DI	24°Ge05'53	-24°59'19	IC 434, zeta Orion, Horsehead
DI	24°Ge21'11	-24°11'50	NGC 2024, zeta Orion
DI	25°Ge41'50	-23°20'21	NGC 2068, Orion, M.78
DI	01°Cn34'08	- 2°45'50	NGC 2174-5, Orion
DI	07°Cn47'55	-18°50'53	NGC 2237-9, Monoceros, Rosette
DI	09°Cn19'53	-15°03'14	NGC 2261, R Monoceros, Hubble's Var
DI	09°Cn41'23	-13°34'39	NGC 2264, S Monoceros, Cone Nebula
DI	20°Li34'04	-58°28'43	NGC 3372, eta Carina, Keyhole
DI	02°Sc06'19	-55°49'14	IC 2944, lamda Centaurus
DI	03°Sa45'09	+ 2°40'54	IC 4592, nu Scorpio
DI	07°Sa32'60	- 1°00'40	IC 4603-4. rho Ophiuchus
DI	08°Sa57'47	- 2°59'04	IC 4605, 22 Scorpio
DI	08°Sa57'47	- 3°50'43	IC 4606, alpha Scorpio, ANTARES
DI	29°Sa54'28	+ 0°32'53	NGC 6514, M.20, Trifid, Sagittarius
DI	00°Cp09'39	+ 0°16'23	NGC 6523, M.8, Lagoon, Sagittarius
DI	04°Cp21'14	+ 7°54'20	NGC 6618, M.17, Omega/Horseshoe
DI	02°Aq24'30	+42°47'11	NGC 6820, Vulpecula
DI	05°Aq49'03	-86°55'18	NGC 2070, Dorado, Tarantula, 30 Dor
DI	25°Aq11'11	+46°49'13	NGC 6960, 52 Cygnus, Veil Nebula
DI	25°Aq48'40	+56°14'16	IC 1318, gamma Cygnus
DI	26°Aq13'09	+47°10'37	Cygnus, Veil Nebula
DI	28°Aq38'26	+46°33'01	NGC 6992-5, Veil Nebula in Cygnus
DI	06°Pi24'46	+58°56'13	IC 5067-0, alpha Cygnus, Pelican
DI	08°Pi52'53	+57°36'03	NGC 7000, North America, α Cygnus
DI	26°Pi39'59	+55°18'07	IC 5146, Cygnus, Cocoon Nebula



Dark Nebulae

If there are no stars in or near the nebulosity, the nebula will obscure or block all light beyond or behind itself. The result are dark patches or "holes" in the sky. The most celebrated dark nebula is the Coal Sack in the Southern Cross.

Until the 20th century, astronomers assumed that the immense distance between stars was empty, in effect a perfect vacuum. Numerous dark patches were thought to be some sort of "holes in space" where there were no stars. A few of these dark areas are visible to the naked eye, in particular the "Coal Sack" near the Southern Cross and the "Great Rift" in the Milky Way. The Great Rift splits the luminous background from Cygnus to Sagittarius through a succession of large overlapping dark clouds in the equatorial plane of the galaxy. It has been discovered that these "holes in the stars" are in fact obscuring clouds of small grains of matter, dust. Like cigarette smoke, this dust diffuses the light coming from behind them. There is no essential difference between a bright nebula and a dark one; it all depends on whether there are any suitable stars to provide illumination.

Dark Nebulae Table

##	Zodiac	Latitude	Name
DN	12°Ar12'18	+62°07'58	Cepheus
DN	07°Ge25'08	+ 6°01'47	Taurus
DN	18°Ge41'44	-28°03'23	Orion
DN	22°Ge22'16	-25°22'19	Orion dark nebulae
DN	08°Cn05'37	-13°13'25	S Monoceros
DN	17°Li28'05	-11°32'58	Coal sack
DN	18°Li35'58	-59°08'27	eta Carina
DN	05°Sa33'20	- 2°02'39	rho Ophiuchus
DN	21°Sa25'32	- 2°20'03	theta Ophiuchus
DN	10°Cp29'06	+18°05'05	Scutum
DN	20°Aq58'22	+47°31'49	52 Cygnus
DN	07°Pi00'45	+59°04'19	North America
DN	20°Pi43'58	+63°56'25	Cygnus

Planetary Nebulae

A Planetary Nebula, in essence, appears to be a roughly spheroidal or ellipsoidal shell of gas with a nuclear star in or close to its center. These nebulae (planetaries) received their name not due to any possible generic relationship to planets, but because early observers, while searching for planets with primitive telescopes, sometimes came across these disc-like objects and they at first glance looked like planets. The central star of a planetary is usually quite dim. It is not often brighter than eleventh magnitude and it is the exception that can be seen at all. The body or expanded shell-like ring of gas of the nebula is also faint and tends to blend into the sky background. The hot central stars in these nebulae seem to be evolving to the white-dwarf stage and radiate by far the greatest portion of their energy in the far ultraviolet portion of the electromagnetic spectrum. Since these objects are expanding, they are probably short-tem and will disappear as a result of expansion in something like 30,000 years. The Ring Nebula in Lyra is perhaps the best known of the planetaries. The Crab Nebula, while often considered as an example of this category, is not a true planetary, but rather the remains of a massive supernova, the ghost of a cosmic firework.

Planetary Nebulae Table

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## Zodiac     Latitude  Name
PL 05°Ar45'39 -14°38'58|NGC:  246, Cet
PL 12°Ar46'47 +42°06'09|NGC: 7662, And
PL 18°Ar19'20 +66°43'33|NGC: 7139, Cep
PL 25°Ar19'08 +57°21'09|NGC:  *  , Cep * I 1470
PL 28°Ar50'30 +56°34'34|NGC: 7635, Cas
PL 14°Ta25'00 +38°08'11|NGC:  650, Per M76 NGC 650-1
PL 22°Ta36'04 +60°26'46|NGC:   40, Cep
PL 23°Ge23'18 - 1°24'35|NGC: 1952, Tau Ml Crab Nebula
PL 19°Cn58'38 - 0°24'56|NGC: 2392, Gem
PL 29°Cn51'02 -34°48'09|NGC: 2438, Pup
PL 01°Le00'21 -38°46'19|NGC: 2440, Pup
PL 08°Le38'26 +89°48'36|NGC: 6543, Dra
PL 21°Le24'33 +45°33'30|NGC: 3587, UMa M97 Owl Nebula
PL 14°Vi29'16 -25°43'38|NGC: 3242, Hya
PL 22°Vi24'07 -46°45'41|NGC: 3132, Ant
PL 28°Li24'13 -50°31'56|NGC: 3918, Cen
PL 04°Sa22'03 +45°21'48|NGC: 6210, Her
PL 06°Sa29'14 -30°04'26|NGC:     , Nor
PL 11°Sa29'04 -17°01'09|NGC: 6153, Sco
PL 17°Sa49'45 +11°08'02|NGC: 6309, Oph
PL 22°Sa13'27 + 0°38'45|NGC: 6369, Oph
PL 02°Cp33'58 + 4°43'27|NGC: 6567, Sgr
PL 02°Cp46'43 +29°50'59|NGC: 6572, Oph
PL 19°Cp24'20 +55°31'44|NGC: 6720, Lyr M57 Ring Nebula
PL 24°Cp48'47 + 8°01'18|NGC: 6818, Sgr
PL 07°Aq39'24 +42°03'29|NGC: 6853, Vul M27 Dumbell Nebula
PL 13°Aq06'09 +37°23'55|NGC: 6905, Del
PL 14°Aq45'34 + 6°19'52|NGC: 7009, Aqr Saturn Nebula
PL 22°Aq18'40 +69°38'36|NGC: 6826, Cyg
PL 00°Pi49'41 -10°15'43|NGC: 7293, Aqr
PL 09°Pi20'59 +55°08'59|NGC: 7027, Cyg
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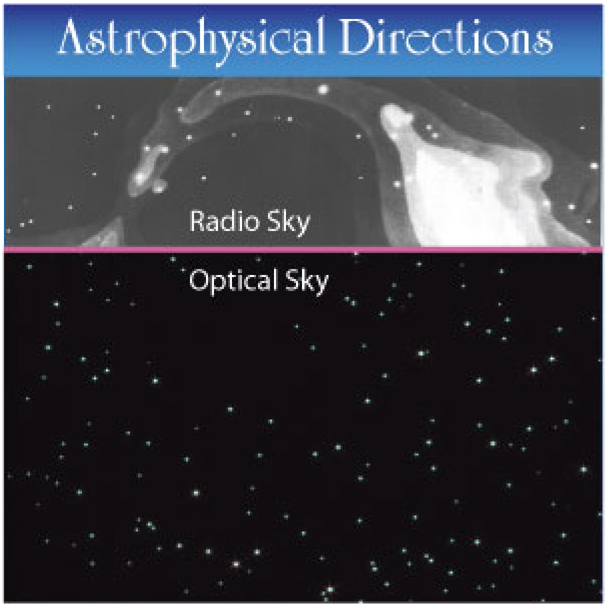


Chapter 12: The Non-Visual Sky

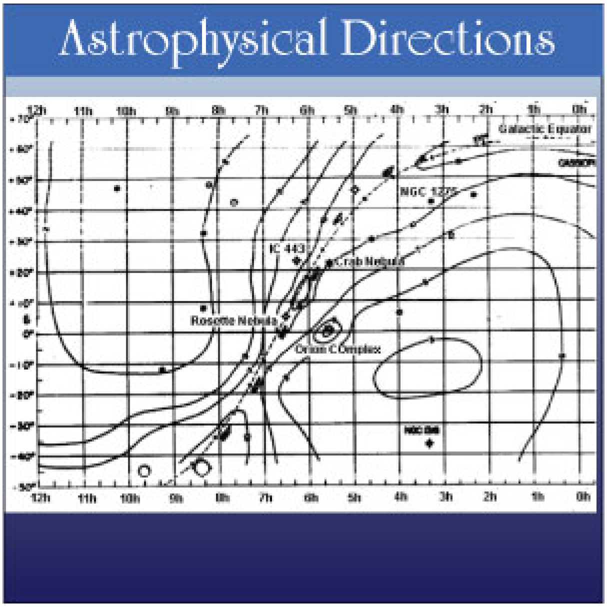
The above picture represents a panoramic view of how the sky would appear if our eyes were sensitive to radio waves rather than to light. Such a sight would go a long ways toward persuading astrologers as to the existence of preferential directions in space. While "bright" discrete radio sources do stand out, the overpowering sense received from such a view is of the shape or body of our galaxy. There is no mistaking the galactic plane and the very heart, the center of the galaxy. It abounds with light. We could renew our sense of cosmic direction almost any night of the year by just walking outside.

Why we cannot see at visual frequencies the great light of the galactic center (GC) is very simple. At visual wavelengths, great clouds of relatively near dust intervene and block our view of the GC and of much of the galactic plane. These dark clouds, in general, prevent us from seeing more than a few kilo parsecs in any direction along the galactic plane. If we could see our galaxy from the vantage point of a neighboring galaxy, such as Andromeda, the center would appear filled with light.

Radio and infrared waves are able to bend around the particles of dust and to reach us. Only in recent years has it been possible to really "see" the actual center and structure of our galaxy. The radio maps of the heavens shown on these pages bring out the basic shape, body, and "aura" of our galaxy. Our dependence upon the EYE and optical frequencies results in an idea of the Heavens as filled with an infinite number of points of light or stars, but otherwise relatively empty of form. The stars are "set" in space, but most of us do not have much sense or feel for the fabric or matrix in which these stars are set. This shape becomes clear in radio maps and it is obvious that the great galaxy is the mother and home of the countless stars within it. Radio maps reveal that whole areas of the sky are filled with more light than others and that this light is graded, with a concentration toward the galactic plane and, of course, the galactic nucleus.

Until about 40 years ago, our knowledge of the cosmos outside the sphere of the Earth came almost entirely from the light we could collect with large mirrors and lenses. In fact "light" meant to us the eye and the visual part of the electromagnetic spectrum. The atmosphere surrounding the Earth is largely opaque (blocks) to most parts of the electromagnetic spectrum, although there are several transparent regions through which we may receive light and thus "look" out into space. These have been termed "windows," and the two most important windows are the optical and radio bands of the light spectrum. If we compare these two windows to the sound spectrum, the radio window represents a ten-octave span, while the optical window represents a little less than a single octave! There are several other bands of relative transparency in the Infrared range through which appear an almost entirely different set of stars and constellations. In fact, the range of energy between the extremes of the electromagnetic spectrum is so great that very different techniques have evolved for their study.

The atmosphere of the Earth serves to shield the Earth from much of the radiation reaching it from outer space, with the exception of the two windows in the visual and radio frequencies. In recent years man has removed the entire concept of windows by bypassing the atmosphere through the means of balloons, rockets, and other space vehicles. Beyond our atmosphere, the entire range of the "light" spectrum is wide open to our reception. In our lifetimes, we have experienced not only a fantastic increase in receptivity of light but have made active outreach beyond the atmosphere and Earth itself. We have stepped beyond ourselves into the space beyond and into ideas outside our imagination but a few years ago.



Radio Sky

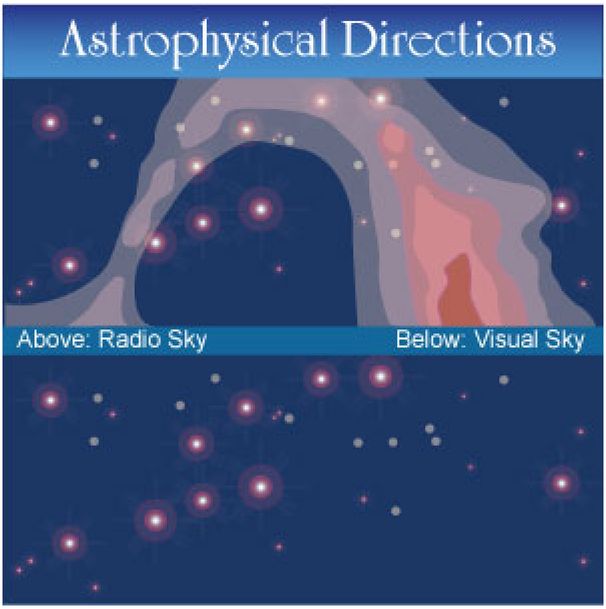
The above map was furnished through the courtesy of the Ohio State Radio Observatory.

How are these different kinds of light generated? Radio waves, the longest waves, are generated by oscillating electric currents. The Short Wave or Microwave has a wavelength similar to that of sound through air. Infrared radiation (such as a hot stove) is produced by heated solids or the molecular vibrations and rotations in gases and liquids. Visible radiation is produced by rearrangements of the outer electrons in atoms. Ultra-violet light immediately joins the visible spectrum. X-rays have wavelengths of the approximate size of atoms and originate in the rearrangement of the innermost electrons in atoms. The gamma rays (?-rays) are the electromagnetic waves of highest frequency (and thus the shortest wavelength) and originate in the rearrangement of the particles within the atomic nucleus itself. Each of these different portions of the light spectrum presents a different view of our universe.

If we examine the heavens through the longer radio waves (several meters) the "reading" we get is of a universe alive with radiant fog or haze in almost all directions. As we move to receivers of higher radio frequencies, certain shapes and forms begin to emerge or stand out from the general fog. The haze is thicker and more radiant in the direction of the galactic plane and is most bright at the galactic nucleus. The plane of our galaxy appears as a glowing archway across the sky. If we further increase the frequency, we can penetrate or see deeper through the fog and discover some discrete features. Now we find extended sources of radiation and at still higher frequencies point sources or "radio stars" begin to show up that shine (at these frequencies) more bright than any other objects in the heavens, yet never seen by the human eye. At yet higher frequencies, we reach the visual level of radiation, where bright point sources or stars are the main objects resolved. Beyond the visual window are the ultra-high frequencies of the x-ray and gamma ray wavelengths. These waves shine right through much of what we would call matter and indicate the sites of cataclysmic events and massive outpourings of energy beyond our comprehension.

Supernova Remnants

```
## Zodiac     Latitude  Name
R 27°Ar09'25 +33°20'59 1 M 31 Andromeda galaxy
R 12°Ta09'49 +53°44'24 2 Tycho's SN I remnant
          supernova year 1572
R 11°Aq48'28 -64°45'25 6 Small Magellanic Cloud
R 20°Ar15'10 + 5°33'27 7 Elliptical galaxy
R 26°Ta30'38 +47°54'35 8 Supernova Remnant
R 02°Ta34'52 -52°23'15 17 Fornax A, spiral galaxy NGC 1316
R 18°Ge24'15 +23°36'35 26 SN II, SN in galactic nebula
R 21°Aq59'45 -85°34'58 31 Centroid Large Magellanic Cloud
R 14°Ge48'59 -58°25'49 32 N galaxy (bright) NRAO 2068
R 23°Ge23'55 - 1°17'41 33 Tau A, SN in Crab Nebula
R 22°Ge20'35 -27°50'56 34 Orion A, M 42= NGC 1976
          emission nebula
R 24°Ge19'31 -23°25'07 35 Orion B, NGC 2024
          emission nebula
R 02°Vi47'19 -59°37'14 44 Vela X
R 20°Vi13'13 +29°09'11 58 BZ 1215+30 rapid radio variable
R 05°Sc41'11 -29°57'38 63 Centaurus A
          elliptical galaxy NGC 5128
R 18°Sc23'25 -45°55'19 64 Centaurus B
R 22°Sa25'46 + 2°41'12 82 SN REM Kepler's supernova 1604 AD
R 26°Sa12'30 - 3°40'37 83 Galactic Nucleus, Sagittarius A
R 21°Ge15'29 +76°29'18 100 3C 390.3 N galaxy
          (contains bright nucleus)
R 14°Cp42'09 +24°00'50 103 SN REM, supernova remnant
R 17°Aq00'38 +59°19'02 118 first localized source 1946
          Cygnus A, Dumbell galaxy
R 26°Aq14'33 +45°32'36 126 Cygnus loop SN II
R 26°Ar42'25 +54°50'43 141 SN II Remnant
          Cassiopeia A, 3C 461 (strongest source)
```



Radio Sources

By far the greatest amount of radio energy reaching the Earth comes from the galactic plane and in particular, the center of our galaxy. In addition to these vast extended radio regions, many thousands of discrete or point sources of radio emission have been detected. These may be divided into three major groups:

Objects within our solar system.

Objects within our galaxy.

Extragalactic objects.

Objects within our solar system

Radio emission has been detected from the quiet and the disturbed Sun (flares, etc.), the Moon, Mercury, Venus, Mars, Jupiter and Saturn. Jupiter appears to radiate as both a thermal and non-thermal source.

Radio emission from within our galaxy

Emission within our galaxy, aside from background emission, consists of several types:

(A) Supernovae Remnants. The most intense discrete radio source Cassiopeia A – a non-thermal source. Cassiopeia A is believed to be the remains or remnant of a supernova detonation around the year 1700 A.D. (SN II type). The first identification of a radio source with an optical object other than the Sun was the strong non-thermal Taurus A with the Crab Nebula – another remnant of a supernova explosion in A.D. 1054 (SN I type). Other strong non-thermal sources include Puppis A and the Tycho and Kepler supernovae remnants.

(B) Ionized hydrogen Clouds. The interstellar hydrogen in our galaxy tends to be distributed in vast clouds. When a hot star is in or near one of these clouds, its ultra-violet radiation tends to ionize the cloud and causes it to emit (thermal) continuum radiation. The young and hot O and B stars are often the exciting sources. Well-known examples of thermal -hydrogen (H II) cloud radio sources are the Orion and Rosette nebulae, the Cygnus X source, and the North American, Omega, and Lagoon Nebulae.

(C) Neutral Hydrogen (21cm) Emission. One of the more important results of radio astronomy has been the detection of 21-cm emission in the clouds of neutral hydrogen that occurs in the spiral arms of the galaxy. A tendency in the hydrogen atom toward a lower energy state results in the emission of radiation at a wavelength of 21 cm. Radio astronomers can detect this radiation and the resulting maps have provided us with the first real picture of the spiral arm structure of the galaxy.

(D) Flare Stars. Radio emission has been detected from certain red dwarf stars that show occasional sudden increases in optical brightness or flares. Some of these stars are among those listed in the section on flare stars given elsewhere.

Extragalactic Radio Sources

The space beyond our galaxy contains billions of-other galaxies and some of these are strong emitters at radio wavelengths. Extra-galactic radio sources are often divided into two groups: "normal" galaxies and "radio" galaxies. The great Andromeda galaxy (M.3,I) is an example of a normal radio galaxy as are the Large and Small Magellanic Clouds. Our own galaxy is also normal at radio wavelengths with an output of less than 1022 watts.

The so-called "radio" galaxies have a power output of a very different order. The second strongest radio source is Cygnus A (Cas A is the first),a remote galaxy located some 184 Mpc. in distance from our Sun, with a radio output of some 1038 watts! In the words of radio astronomy pioneer John D. Kraus: "The tremendous magnitude of Cygnus A's power may take on more significance if we note that the radio wave energy radiated by Cygnus A in just one millionth of one second is sufficient to supply all of the world's electric power requirements for all purposes (light, heat, mechanical work, etc.) at a million times the present rate for the next 10 million years." That is hot stuff!

Some other strong radio galaxies include Virgo A, Perseus , Centaurus A, Fornax A and Hercules A. Included elsewhere is a list of the stronger of the known radio sources within and without the galaxy. Some attempt has been made to indicate the nature of the radiating object in the notes column. The column marked "flux" will provide the reader with some idea as to the relative strength of the various radio sources. The values listed (under flux) are for 1400 Mhz, with the exception of those marked with an asterisk which are for 178 Mhz. The reader should keep in mind that some of these objects are very remote, while others are within our galaxy. Readers are referred to the excellent book by John D. Kraus, *Radio Astronomy*, for further details.

Pulsars

In the late summer of 1967 radio astronomers detected some very unusual signals consisting of short pulses of radio noise arriving at approximately one-second intervals. It was at first thought that perhaps a secret Soviet space satellite had been detected, but it was soon clear that the mysterious pulsating radio source came from among the very remote fixed stars. Detailed study proved the source to be extremely precise and regular, more regular than anything ever observed in nature. The next theory was that we had detected signals from an "alien" spacecraft or distant planet. By the spring of 1,968, three additional pulsating radio sources had been discovered and today over 100 such sources are known. In all cases, the periods of pulsation are extremely regular (note the number of decimal places listed in the table), with periods ranging from 1/30 of a second for the fastest to just over three seconds for the slowest.

Today it is considered a fact that pulsars (as these objects came to be called) are the final remains of ancient supernovae explosions, rapidly rotating neutron stars. These neutron stars (see section on Birth of Stars) have intense magnetic fields and radiation streaming out of the north and south magnetic poles and can account for the properties of pulsars, if high-speed rotation is assumed. One of the fastest pulsars (the Crab Nebula) his been observed flashing pulses of visible light on and off 30 times each second. The fastest and therefore youngest of the pulsars have been found at the sites of supernova detonations and it is known that these objects have high velocities. Astronomers therefore assume that the longer period (older) pulsars may have moved far from their original sites at the heart of a supernova. Pulsars are galactic objects of powerful intensity and extreme regularity. The column in the listing, "Period," will give you an idea of the degree of regularity for these objects.

Pulsars

```
## Zodiac      Latitude    Name
P 23°Ge23'51 - 1°18'03 10 NP 0531 1968, slowest
P 02°Cn35'53 - 0°53'13 12 PSR0611+22, Supernova remnant
P 13°Cn29'51 +52°42'12 16 CP 0809, 6th discovered
P 03°Vi42'49 -61°13'21 19 PSR0833-45, Vela X 1969
P 09°Le19'38 -11°55'02 20 CP 0834, 4th discovered
P 27°Le00'40 - 4°37'26 25 CP 0950, 3rd discovered
P 17°Vi27'21 +12°09'40 29 CP 1133, 2nd discovered
P 07°Li19'00 +67°13'10 40 MP 1508, 5th discovered
P 27°Sa44'36 - 4°28'27 59 PSR1749-28, 8th discovered
P 22°Cp28'09 +38°01'57 79 PSR1913+16, 1974
P 25°Cp48'57 +43°27'58 83 CP 1919 1967, 1st discovered
P 09°Aq39'49 + 2°23'04 94 PSR2045-16, 9th discovered
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Seyfert Galaxies

Seyfert Galaxies are a small class of galaxies (spirals) that have very small, intensely bright nuclei, whose broad emission lines (in spectrograms) indicate that the atoms present are in a very high state of-activity. They are powerful emitters of radio energy and several emit an enormous amount of energy in the infrared. They also emit in the ultraviolet.

The emission lines in Seyfert galaxies have only modest red shifts. The very compact nuclei observed in these galaxies indicate that the gases in them are in a high state of excitation and are traveling at high speed in clouds and filaments. It is now believed that the intense outbursts of energy observed in Seyfert galaxies may be normal to all galaxies and that even our own galaxy may experience such a renewal, from time to time.

Table of Seyfert Galaxies

##	Zodiac	Latitude	Name
SG	07°Ta37'19	-14°48'14	NGC 1068, M.77
SG	27°Ta42'46	+22°02'19	NGC 1275
SG	06°Ge47'21	-16°02'06	Radio source 3C 120
SG	29°Le39'05	+ 9°10'60	NGC 3227
SG	08°Vi59'56	+39°46'28	NGC 4051
SG	13°Vi48'26	+36°01'31	NGC 4151
SG	21°Li00'15	+36°55'44	NGC 5548
SG	19°Pi35'29	+13°22'11	NGC 7469

X-Rays, Black Holes

X-ray emission coming from the heavens was detected in the early 1960's by means of special detectors flown outside the Earth's atmosphere in rockets or satellites. By 1974, a total of 161 x-ray sources had been examined and cataloged. X-rays are high-energy emission in the region of the spectrum from about 1 to 140 Angstrom units, which is above the visual region. Most x-ray sources are strong, point like, and show a distinct concentration toward the galactic plane, an indication that they are members of the galaxy.

In 1966, the strongest x-ray source (Scorpio X-1) was identified optically with a faint blue star-like object that looked like an old nova. It had been known that old novas are close binary systems in which one of the stars is a white dwarf. Such binary systems involved a transfer of matter from the normal star to the white dwarf, leading to an explosion in the outermost envelope of the white-dwarf nova. With the discovery of Sco X-1, it was suggested that the x-ray sources were binaries and that x-rays were being emitted by a hot cloud around the white dwarf, consisting of matter captured from the normal companion star. Other suggestions for the phenomenon were a neutron star and a black hole.

A black hole is a star that hat collapsed under gravitational pressure to such a small radius that the tendency toward further collapse exceeds the velocity of light itself, with the result that light emitted from the object cannot get out. As the star suffers internal collapse, the intensity of gravity above its surface causes space-time to fold over the star, which vanishes from the universe, leaving a very highly warped region or "hole" in an otherwise flat area of space. The idea that any force can be greater than the speed of light has frightened and intrigued the modern mind and the literature -surrounding the black hole reads like a science-fiction novel. The vocabulary surrounding the black hole phenomenon represents some of the most fascinating terms to emerge in our lifetimes. For example:

At the center of a black hole is the SINGULARITY, a point of infinite pressure, density, and curvature. At the edge of a black hole is the EVENT HORIZON, a one-way surface from which there is no escape, once it is crossed. Great speculation exists concerning what may happen if an object falls into one of these gravitational vortices. At first astrophysicists decided that an object unfortunate enough to be drawn through the event horizon would simply be crushed beyond imagination when it came to the singularity, and that was that. Further speculation was able to demonstrate that this was not the only possibility and ways began to be found to avoid the singularity. It was felt that if the singularity could be avoided that the traveler would emerge, perhaps in another universe than our own or in a different part of our own universe or a different time.

It has been written that the black hole is connected through a tunnel called a "worm hole" to a "white hole" where the material gushes forth once again in re-birth and new life. All of these concepts are presented through very complex mathematics. Whatever the truth may be, the discovery of the black hole and gravitational physics in general has carried scientists to the brink of the known and threatens to plunge them into what may amount to a basic renewal similar to that induced through the Einstein theory of relativity.

X-Ray Points

```
## Zodiac     Latitude  Name
X 24°Ar06'16 +35°51'35 / 3U0021+42, M31 Andromeda Galaxy
X 12°Ta12'35 +53°46'03 / 3U0022+63, 3C 10
        (Tycho's SN) Cep XR-1
X 14°Aq51'49 -65°55'56 / 3U0115-73, SMC X-1
X 27°Ta55'60 +22°20'55 / 3U0316+41, Per X-1
        Perseus Cluster Abell 426
X 27°Cp38'10 -83°36'52 / 3U0521-72
        LMC X-2 in Large Magellanic Cloud
X 20°Ge53'50 -27°20'24 / 3U0527-05, M42 in Orion Nebula
X 23°Ge25'56 - 0°17'17 / 3U0531+21, Tau X-1 Crab Pulsar
        NPO531 (intense)
X 04°Cn40'46 + 0°02'13 / 3U0620+23, IC 443 (SNR) 3C157
        Pulsar 0611+22
X 21°Le57'27 -67°04'54 / 3U0750-49, Star V pup
X 25°Le30'44 -58°09'34 / 3U0821-42, Pup A Vel XR-2?
X 02°Vi36'45 -60°19'27 / 3U0838-45, Vela X Pulsar 0833-45
        Vel XR-1?
X 05°Vi46'57 -53°17'36 / 3U0900-40, Star HD 77581
        Vel X-R 1
X 28°Vi04'25 -64°02'13 / 3U0918-55, Star K Vel?
X 27°Li42'36 -55°52'16 / 3U1118-60, Cen X-3
        disc. 1971 binary ; 1973 summer optical I.D.
        2nd or 3rd brightest source
X 13°Vi14'48 +36°39'16 / 3U1207+39, NGC 4151
        Seyfert galaxy intense X-rays
X 01°Li17'49 +14°25'36 / 3U1228+12, M87 Virgo A
        Vir X-ray 1 Virgo Cluster
X 28°Li35'30 -32°40'16 / 3U1247-41, NGC 4696 PKS1245-41
        Rich Southern cluster
X 00°Li51'17 +31°21'41 / 3U1257+28, Coma cluster
        Abell 1656 Coma X-1
X 03°Li48'47 +34°09'18
        Very compact source in Coma
        Discovered June 15, 1974 MX1313+29
X 17°Sc11'22 -46°46'32 / 3U1320-61, Cen XR-2
        increased 4/4/67 NGC 5189?
X 02°Sa38'06 -35°22'55 / 3U1516-56, Cir X-1
        Large intensity changes in seconds
X 04°Sa35'39 -25°57'09 / 3U1543-47
        Increased 1000x late 1971; died away
X 04°Sa57'50 + 6°46'29 / 3U1617-15, Sco X-1 Sco-1
        (largest X-ray source)
X 15°Sa59'03 -11°45'48 / 3U1653+35, Star HZ Her, Her X-1
        1971 discovered binary; Jan 9, 1972
X 04°Cp27'59 - 6°14'40 / 3U1820-30, glob cluster NGC 6624
        SGR XR-4, Sgr 4
X 05°Ge13'15 +63°11'35 / strong source
        Not discovered by UHURU, perhaps variable
X 04°Aq09'05 +31°38'53 / 3U1956+11
         March-April 1971= radio increase
X 16°Aq49'56 +59°22'20 / 3U1957+40, Cyg A = 3C 405
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X 27°Aq53'16 +56°54'52 / 3U2030+40, Cyg X-3
        Short period binary
        With enormous increase in radio output Fall 1972
X 15°Pi59'49 +47°57'27 / 3U2142+38, Cyg X-2, Cyg 2
X 26°Ar43'21 +54°51'13 / 3U2321+58, Cas A = 3C 461
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Several x-ray binary star systems found to date may contain a black hole as one of their components. The only, more or less, official black hole is the x-ray source Cygnus X-1 (#101 in the x-ray list) located at 13° degrees of Aquarius on the ecliptic. It is now considered that black holes may be very common in the universe and that they are required or regular members rather than oddballs. Speculation ranges from black holes the size of a pinhead in existence to their being a black hole at the center of our galaxy. It has been suggested that globular clusters may contain black holes. More about some of the other super-dense stellar remains is given in the section on stellar evolution.

X-ray astronomy is experiencing rapid growth similar to that of high-energy particle physics in the 1960's. New data pouring in from orbiting x-ray satellites will help to revolutionize our knowledge of physics through a variety of ongoing research that includes (1) an understanding of how plasma behaves at temperatures of billions of degrees when immersed in magnetic fields millions of times stronger than any on the Earth, (2) the measurements of neutron star masses, (3) sources of rapidly repeating x-ray bursters, (4) x-ray polemetry, and (4) more details on the various black hole candidates.

We can expect detailed x-ray maps of our own and other galaxies to become available in the next few years. The gamma-ray astronomy (at even higher frequencies) is just now getting to the point of locating discrete sources and the coming years will see this branch of non-optical astronomy providing us with its unique perspective. However we choose to view the emergence of the non-optical astronomy, it has changed forever our way of viewing ourselves and our universe and has extended our window into space (in both directions) until what we now have is a panorama of light.

It is a good question what all of this means to the counseling astrologer. Some general thoughts would have to include: greater tolerance of the range of human genius extending from the more "feeling" or radio regions of the spectrum through the visual or conscious-mind regions to the x-ray or super-conscious levels of experience. It is a general tenet of many astrologers that there is a coincidence of new discoveries and ideas with a change of consciousness or life-perspective. If this is so, then we are changing now like we have never changed in the history of time, as we have recorded it. It has been my experience that these non-optical sources check out in the traditional astrological interpretative ways, i.e. by Sun/Earth axis, conjunctions, aspects, etc.

Infrared Points

Infrared radiation is below the visible spectrum (longer wavelengths), but above the radio portion of the spectrum. Infrared is considered to occur between wavelengths of 1 micron and 1 millimeter. Absorption by gases such as water vapor, carbon dioxide, and ozone prevent us from ground-based study of infrared (IF) except through a few "windows."

Our body and the entire world radiate at IF wavelengths and the problem facing infrared astronomers has been described as "comparable to that of an optical astronomer working in a lighted dome with a luminescent telescope." The objects of infrared study are cool, dim, and in general this means either stars that are dying (cooling off) or those stars that are just now forming and have not begun to radiate at visible frequencies: proto-stars.

Only a small fraction of the 6000-odd stars visible to the naked eye are prominent at IF wavelengths and an entire new set of constellations appear. Infrared radiation has been detected from the sun, moon, and several planets, in particular, Jupiter. Beyond the solar system, IF radiation has been associated with a great many red-faint stars, planetary nebulae, the galactic center, and other galaxies, in particular, the Seyfert galaxies.

The most interesting IF research involves attempts to discover the very young proto-stars in the vast dust complexes that are known to be the birth places of stellar bodies. The great Orion Nebula has received much attention, and astronomers believe stars are condensing and forming in these dark clouds at the present time. Infrared astronomy is quite young at the present time.

Table of Infrared Points

```
## Zodiac     Latitude  Name
IF 08°Ar55'45 +64°09'20|mu Cepheus, M supergiant
       Late-Type star
IF 12°Ar55'19 -60°35'52|R Horologium
       OH source with IF excess
IF 21°Ar01'29 -79°18'53|R Dorado
       2nd strongest at 2 microns
IF 01°Ta10'35 -14°59'57|omicron Cetus, MIRA
       Late-Type star, 6th strongest  at 2 microns
IF 25°Ta12'39 +41°51'34|s Perseus, M supergiant
       IF excess 40% total Luminosity
IF 27°Ta12'47 +44°05'10|W3, l0th strongest at 20 microns
IF 27°Ta28'07 +41°25'11|Maffei I, near galaxy
       At 2 microns = M.31 in brightness
IF 28°Ta17'19 - 8°06'20|NML Taurus, Mira-Type IF star
       Variable, OH radio emission
IF 08°Ge43'22 +25°54'32|48 Perseus, nu Perseus
       Variable IF excess
IF 09°Ge04'05 - 5°37'11|Aldeberan
       l0th strongest at 2 microns
IF 19°Ge41'39 -34°29'21|IC 418 Planetary nebula
       Large IF excess
IF 22°Ge20'51 -27°27'48|Kleinmann-Low Nebula in Orion
       3rd brightest IF at 20 microns, OH
       "infrared nebula"
IF 22°Ge21'39 -27°28'35|trapezium source in Orion
IF 28°Ge03'07 -16°19'10|Betelgeuse, alpha Orion
       Brightest at 2 microns, M supergiant, var cM2
IF 28°Ge19'55 - 3°12'46|U Orion, OH source with IF excess
IF 09°Cn20'01 -15°03'05|R Monoceros, large IF excess
       90% L emitted beyond 1 micron, like T-Tauri stars
IF 24°Cn05'25 -17°35'35|Z Canis Major, extreme IF excess
IF 26°Cn53'49 -45°48'27|VY Canis Major, M supergiant
       5th strongest at 20 microns, bright at 10 microns
IF 24°Le04'34 - 0°11'12|IRC+1021G
       At 5 microns is brightest known source
       outside Solar System, 18th mag star
IF 21°Vi39'53 -24°40'14|V Hydra, Late-Type carbon star
IF 20°Li34'33 -58°28'48|eta Carina
       brightest at 20 microns..outside solar
IF 23°Li34'41 +30°40'57|ARCTURUS, alpha Bootes
       8th strongest source at 2 microns
IF 04°Sc33'42 -46°24'24|gamma crux
       At 2 microns the 7th strongest source.
IF 04°Sc37'25 -15°27'51|W Hydra
       5th strongest source at 2 microns
IF 14°Sc56'21 +46°59'12|R Corona Borealis
       'R CrB variable , 40% IF excess
IF 08°Sa56'47 - 3°49'55|alpha Scorpio, Antares
IF 11°Sa27'20 -26°45'19|G333.6-0.2
       6th strongest source at 20 microns
IF 15°Sa29'58 +36°56'36|alpha Hercules
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        4th strongest source at 2 microns
IF 26°Sa06'50 - 4°14'09|Galactic Center
        7th strongest source at 20 micron
IF 27°Sa42'35 +49°47'06|89 Hercules, IF excess
IF 00°Cp22'02 + 0°02'51|M.8, NGC 6523, H II region
        13' east of 07 star Herschel 36
IF 02°Cp46'43 +29°50'59|NGC 6572, planetary nebula
IF 04°Cp22'39 + 7°52'47|M.17, Omega Nebula, H II region
        2nd strongest at 20 microns, strong IF excess
IF 09°Cp10'14 +44°14'59|AC Hercules, an RV Tauri star
IF 18°Cp10'20 + 9°58'27|RY Sagittarius, 'R CrB variable'
IF 19°Cp04'30 + 6°26'09|upsilon Sagittarius
        'R CrB variable', 20% total luminosity is IF
IF 29°Cp01'19 -16°19'09|BC Cygnus, OH source
        Late-Type star
IF 08°Aq52'60 +52°00'14|chi Cygnus
        9th strongest at 2 microns
IF 14°Aq45'34 + 6°19'52|NGC 7009, planetary nebula
IF 01°Pi09'14 +54°19'56|NML Cygnus, M supergiant
        8th brightest at 20, also bright at 10 microns
IF 09°Pi20'59 +55°08'59|NGC 7027, planetary nebula
IF 23°Pi40'10 +49°41'18|BL Lacerta
        At 3 microns=large portion of emitted energy
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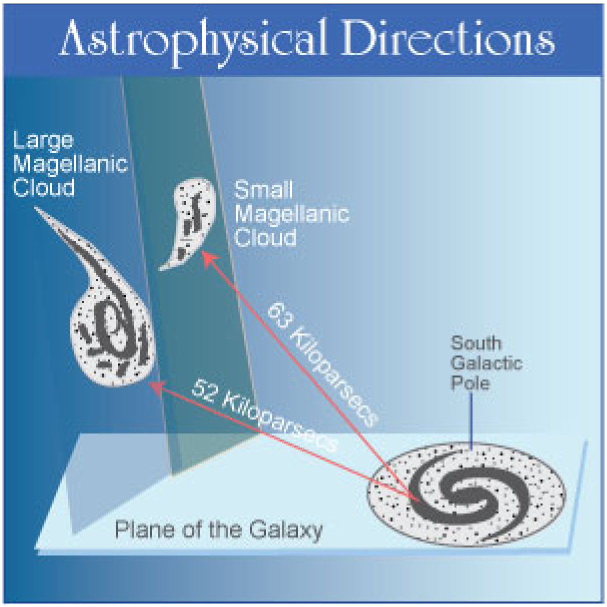


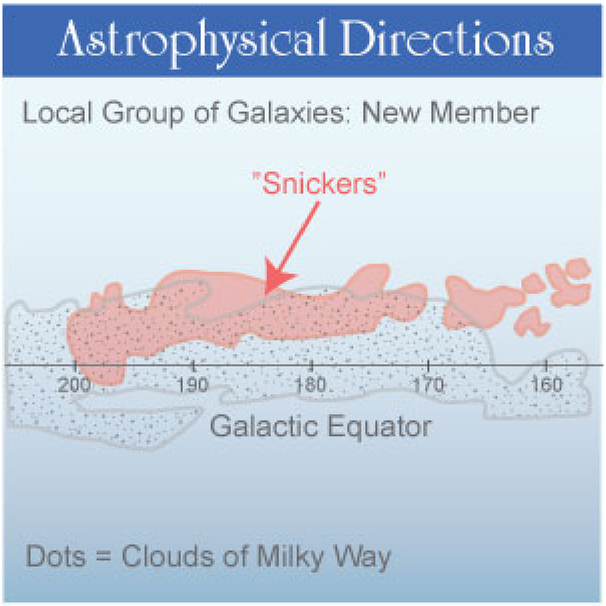
Chapter 13: External Galaxies

The Magellanic Cloud

The nearest neighbors to the Milky Way are the Magellanic Clouds in the southern hemisphere, where they appear as large nebulous naked-eye objects. The Large Magellanic Cloud (LMC) or Nubecula Major (the "Greater Little Cloud" and the Small Magellanic Cloud (SMC) or Nubecula Minor, the "Lesser Little Cloud") appear to the naked-eye as detached portions of the Milky Way and they are, in fact, satellites of our galaxy. The Magellanic Clouds are a close binary pair of Irregular dwarf galaxies that, along with our galaxy, form a loose triplet sharing a common barycenter and located about 5 kiloparsecs from the center of our galaxy in the direction of the LMC.

Zodiac Latitude Name

LG 18°Aq51'11 -85°57'59 Large Magellanic cloud
LG 11°Aq31'01 -64°29'32 Small Magellanic cloud



"Snickers"

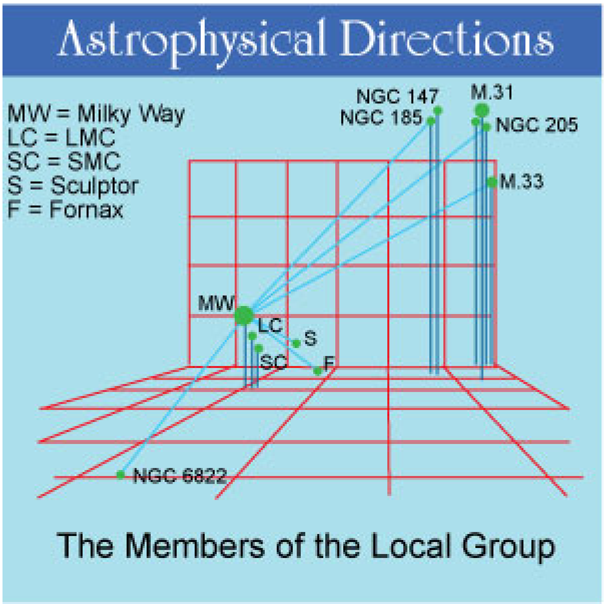
A new member of our Local Group was discovered in 1975. It is a dwarf satellite of our galaxy, like the two Magellanic Clouds, but is located at less than a third of their distance! It has been hidden behind the rim or equatorial plane of the galaxy, the very nearest part of that rim, in Gemini and Auriga. It was detected only by its rapidly moving hydrogen clouds. It is estimated that 1 percent of the stars of magnitude 15 and below which appear in this part of the Milky Way must really belong to this new galaxy. The little galaxy is brushing so close to the Milky Way that is has been torn out into the shape of a long streamer by tidal forces;

hence its enormous angular extent of over 45 degrees, from its core (55,000 light years away) near Almeisan in Gemini to its leading tip beyond Capella (Almeisan = Gamma Gemini, Capella = Alpha Auriga). The little dwarf galaxy has been unofficially christened "Snickers," due to its proximity to the Milky Way.

Most important: here is a large and very near galaxy, a kind of a third Magellanic Cloud, that covers a significant portion of the heavens in the anti-center direction of our galaxy. On the Ecliptic, it extends from later Gemini through the first 10 degrees of Cancer, with a central core around the 6th degree of Cancer. "Snickers" is close enough to disrupt the outer portion of the spiral-arms of our galaxy!

```
## Zodiac     Latitude  Name
06°Cn38'06  - 8°24'03 "Snickers"
```

The nearest dwarf galaxy, found 1975, 55,000 L.Y.



Local Group of Galaxies

Our Milky Way galaxy is not a lone sentinel set in space and time. It is a member of a small cluster of galaxies called the Local Group. The Local Group includes about 27 near galaxies that share a common center of gravity, and the best-known members are (besides the Milky Way), the Andromeda Nebula (M31), the Triangulum Nebula (M33), and the Magellanic Clouds.

The members of the Local Group exhibit a definite tendency toward sub-clustering. Perhaps the most striking example is provided by the Andromeda galaxy (M31) and its two companion galaxies M32 and NGC 205. Closer to home, the two Magellanic Clouds form a compact binary system that, along with our galaxy, create a loose triplet. This triplet and possibly the three nearest dwarf spheroidal systems form one of two major sub-groups. The other sub-group consists of NGC 147, NGC 185, NGC 205, M32, M33 and M31.

The entire Local Group appears to be an out-riding member of a super clustering of galaxies centered on the more distant Virgo Cluster (see Supergalaxy). The local group contains a rather typical distribution of types of galaxies and extends over a volume 1 mega parsecs in diameter. The group contains three spiral galaxies, each about 15 to 50 kilo parsecs in diameter: the Milky Way, Andromeda, and the Triangulum Nebula (M33). There are four irregular galaxies of some 3 to 10 kilo parsecs across, including the large and Small Magellanic Clouds. The other galaxies are ellipticals, including 4 regular ellipticals, 2 to 5 kilo parsecs across, two of which are the companions to the Andromeda galaxy. The remaining members are dwarf ellipticals, mostly less than 2 kilo parsecs across.

By far, the largest members of the Local Group are the Andromeda galaxy (M31) and our own Milky Way. Both are super-giant-spiral galaxies and the center of mass for the entire group is located along a line connecting the two, about 2/3 of the distance from our galaxy toward M31. It is believed that both M31 and our own galaxy are in a very slow orbit about the common barycenter. M31 (Andromeda) is both larger and brighter than our galaxy by about 50 per cent.

In addition to galaxies, the Local Group contains a number of intergalactic globular clusters, some of which may be out-riding members of our own galaxy. The cluster NGC 5694 appears to be moving through our galaxy in a hyperbolic orbit and can therefore be considered a true "intergalactic tramp." The known dwarf spheroidal galaxies and intergalactic clusters are mostly located rather close to the galaxy. The total mass of all dwarf spheroidal systems and intergalactic clusters is negligible compared to the mass of the galaxy or the mass of M31. 300 such clusters with 3x10x5 the mass of the Sun each would have only a total mass of 1x10x8 mass of the Sun, which is less than 0.1% of the total mass of our galaxy.

New candidates for membership in the local group continue to be found. Some of these newly discovered galaxies have been difficult to find even though they are very close, because they occur in the plane of our galaxy, and are thus hidden from view by dust. Others are very dim and have gone unnoticed; three such dwarf ellipticals were discovered in 1972. Another was discovered in 1975 and it is so close to our galaxy that it disrupts the otherwise regular spiral arm structure.

In 1967 and 1968, two large galaxies were discovered in the direction of Perseus, along the galactic plane. The intervening dust had prevented their earlier discovery and these objects first appeared on infrared plates. These two objects, Mafeii I and II as they have been called, are not much farther away from us than is the Andromeda Galaxy. This puts them on the outskirts of the Local Group, but with a high velocity such that they could only be passing through our local cluster of galaxies, rather than being a permanent member.

Maffei I is a giant elliptical galaxy and Maffei II a spiral galaxy. More recent distance estimates put the Maffei galaxies some 5 megaparsecs away from us. They are not at this point considered to be members of the local group but belong to a nearby grouping of galaxies called the Ursa Major-Camelopardalis Cloud. Astronomer Gerard De Vaucouleurs states that the

Maffei do not contribute to the location of the barycenter of our Local Group but dominate the small cluster of galaxies mentioned above, not far from us.

Perhaps the most important of all the external systems or galaxies is the Great Nebula (as it was at first, called) in Andromeda (NGC 224), the Andromeda galaxy. Aside from being the only super-giant spiral galaxy that is distinctly visible to the naked eye, M.31 (as the Andromeda galaxy is most often called) is bound to our own galaxy through mutual gravitational attraction. The Milky Way and M31 are in a bound orbit and share a center of mass that is located about two-thirds of the distance between the two galaxies, in a line toward the direction of M31. In other words, our own galaxy and the one in Andromeda dominate the local group of galaxies. M31 is considerably larger than our own, complete with a similar spiral structure and a well-defined semi-stellar nucleus.

Andromeda contains all of the stellar mater a we would expect to find in a normal super-giant spiral: star clouds, globular clusters, open clusters and clouds of nebulosity. Over forty Cepheid variables, 180 stellar associations, many novae have been discovered. The famous supernova of 1885, S. Andromeda, occurred very close to the nuclear region of M31. This particular supernova reached an absolute magnitude of about -14.0 (100 million Suns), which is brighter than many entire galaxies!

The Andromeda galaxy is a super-giant spiral with an integrated magnitude of V = 3.48 (apparent). Adopting an apparent distance modulus of (m-M) sub-v = 24.5 gives an absolute magnitude M sub-v = -21.0, which makes M31 the brightest member of the local group. M31 covers an area of 75'x245' on the sky. At an estimated distance of 690 kpcs, these dimensions correspond to 15x50 kiloparsecs.

This rather large ratio suggests that the galaxy is seen almost edge on. Estimates of the inclination range from 75.5 to 79 degrees. Inspection of the spiral arms suggests that the fundamental plane of the galaxy has been slightly warped, so that the spiral arms are not all strictly coplanar. Possibly these deformations are due to tidal interactions with its companions M32 (NGC 221) and NGC 205. M31 and the Milky Way are the two most massive objects in the local group and contain 90% of the total mass of the group. The most significant fact of all is that Our Galaxy and Andromeda are approaching each other and this may indicate that the local group is contracting!

M32 (NGC 221) is a small elliptical galaxy that is in close proximity to M31. It has been suggested that some of the irregularities in the spiral pattern of M31 may be the consequence of a deformation produced on M31 by the presence of M32. The other close companion to M31 is the highly elongated elliptical galaxy NGC 205. NGC 205 appears as an open barred spiral, one of whose extensions is pointing toward the center of M31 and which might be interpreted as a direct tidal interaction with the gravitational field of M31.

Two companion galaxies to M31, although more distant, are the dust-free elliptical galaxy NGC 147 and NGC 185. NGC 185 contains large quantities of dust and gas along with bright B stars. The great Triangulum Nebula, M33 (NGC 598), is another member of the Andromeda group. M33 is a spiral of type Sc II-III which covers an area 68'x40' on the sky at an estimated distance of 730 kpcs.

M33 has been found to contain types of variable stars which are also known to occur in our galaxy, star clusters, large amounts of neutral hydrogen, and a helium abundance that does not differ much from that observed in the Milky Way. NGC 6822 is a dwarf irregular galaxy located rather close to the plane of the Milky Way. The main body of the nebula has dimensions of approximately 20’x10’, which corresponds to 2.7xl.3 kpc at an assumed distance of about 470 kpc. A number of bright HII regions are located outside the main "bar" of the nebula. NGC 6822 is an Ir IV-V type galaxy and is slightly fainter than the SMC. IC 1613 is a dwarf irregular galaxy of the type Ir V and is similar, though much smaller, than the Magellanic Clouds. IC 1613 appears to be-a very old galaxy that is undergoing much star formation at the present time.

The Dwarf Systems in the Local Group

An entirely new type of sidereal organization was discovered by the astronomer Shapley in 1938. The Dwarf Spheroidal Systems, as they are called, consist only of resolved stars and no gas or dust has been observed in these galaxies. They can best be described as "super" globular clusters with a very low surface brightness. The dimensions of these galaxies are of the size of a small galaxy rather than of a large globular cluster. Morphologically the dwarf spheroidal galaxies occur at the end of a sequence which starts among the normal elliptical galaxies and passes through the dwarf ellipticals (such as NGC 147 & 185).

The dwarf galaxies in Fornax and Sculptor were the first discovered followed by those in Draco, Leo (I & II) and Ursa Minor. Globular clusters and dwarf systems do not have semi-stellar nuclei such as those, which are observed in M32 and NGC 205. The faint ellipticals NGC 147 and NGC 185 are intermediate between dwarf systems and the brighter elliptical galaxies. NGC 147 has only a faint nucleus and NGC 185 has no nucleus at all. A new and very near dwarf galaxy, discovered in 1975, appears to be disrupting the otherwise regular spiral structure of our galaxy! Dwarf spheroidal systems are difficult to detect due to their low surface brightness, but it is estimated ,that a very great number of these systems exist filling the space between the larger and brighter galaxies.

Motion of the Galaxy and the Local Group

Recent investigations (1976) into the nature of the motion of our Galaxy and the entire local group of galaxies indicates that the Milky Way is moving almost edge-on through space and that the leading edge is in the anticancer direction. Our galaxy along with the local group appears to be moving with an approximate velocity of 454 km/sec toward a point in the constellation Perseus, roughly in the direction of NGC 1499, the California Nebula. The direction is as listed:

Direction of Motion of the Galaxy

R.A.	Decl.	Long	Lat	MC	L2	B2
063 00 14	+35 26 11	067 35 13	+14 04 05	064 56 59	163 00 00	-11 00 00

The direction of this motion is approximately at a right angle to the direction of the center of the local supercluster, the Virgo Cluster. A question astronomers are attempting to decide is: is the local supercluster rotating, and are we orbiting the Virgo cluster? We cannot be in a bound Keplerian-type of orbit, for at our present distance from the center of the Virgo Cluster, such an orbit would take a time period of ten times the age of the Universe!

It is suggested that we may have moved away from a closer orbit in the same fashion that the ends of spiral-arms trail away from the nuclei of galaxies. At any rate, it appears that we are moving at about a right angle or edge-on toward SGL (super-galactic longitude) = 351° and SGB = -26°. We are moving, so it appears, away from the center of the supergalaxy (the Virgo Cluster) and slightly below the Supergalactic plane.

As we have seen, galaxies are often members of pairs, triplets and groups of increasing multiplicity. In fact, grouping or clustering (as it is called) is the rule rather than the exception. The Large Small Magellanic Clouds form a close pair and along with our galaxy, a loose triplet. M.31 (Andromeda) is the major component of a triplet including the two elliptical galaxies M.32 and NGC 205, and of a loose group with M.33 and the smaller ellipticals NGC 147 and 185.

Both the M.31 group and our galaxy's group are associated with a larger grouping: the local group. There are other groups similar to our own relatively nearby and the clustering phenomena does not stop with groups of galaxies. Galaxies appear to be arranged in a hierarchy of clusters. In fact, the tendency toward clustering increases with higher order structuring.

Clustering Among Galaxies

Thus galaxies tend to occur in small intense knots, the knots in clusters, and the clusters in larger clusters, and so on until vast clouds of clusters are formed. The general kinds of grouping look like this:

(1) A CLUSTER contains hundreds or even thousands of galaxies with a marked tendency to concentrate toward some center in the clusters.

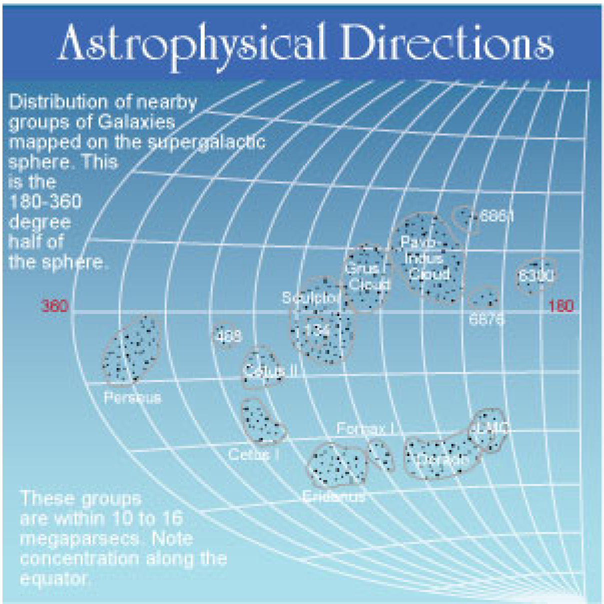
(2) A GROUP of galaxies contains several, perhaps up to 100 members but these groups do not show any marked concentration toward a center.

(3) A CLOUD of galaxies is just a large group containing hundreds or thousands of members gathered together in an irregular structure with no definite concentration toward a center.

(4) A CLOUD OF GROUPS is a distribution of galaxies containing many groups in which the concentration of galaxies in the spaces between the groups is larger than the concentration of galaxies in the general field.

(5) A CLOUD OF GALAXIES is the largest agglomeration of matter so far known to us, Supergalaxy or Metagalaxy. There are double clusters, triple clusters and so on. Large bodies of this type may contain as many as 100,000 member galaxies.

The nearest groups of galaxies to our local group are the M.81 group of galaxies and the Sculptor group near the galactic south pole. A table of most of the major clusters and groups within 12-15 megaparsecs of our position is given elsewhere. Almost all of these clusters occur between us and the very large cluster of galaxies in Virgo at a distance of some 50 million light years from us (15.3 Mpc). A more or less dense cloud of galaxies extends from the Virgo cluster to about our own position and our local group may be considered to be a minor irregularity or secondary agglomeration near the very edge of the system of galaxies which is ellipsoidally distributed around the center of the Virgo cluster, the local supergalaxy.

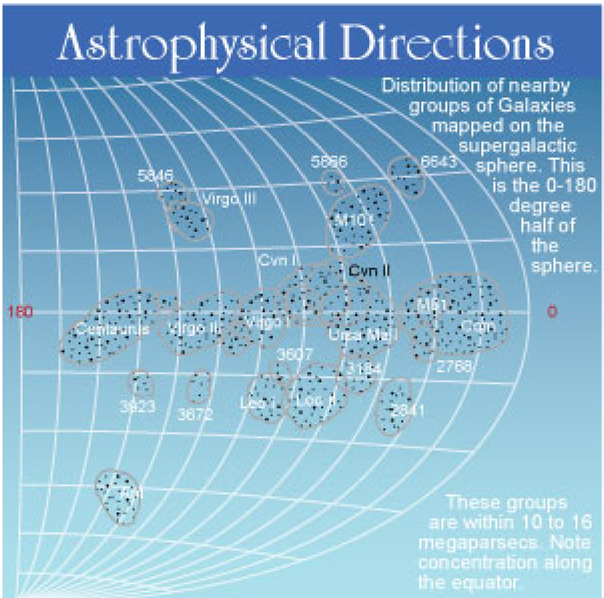


The Local Supergalaxy

The center of the local supergalaxy is either in or near the great Virgo cluster of galaxies located at a distance of 12 to 16 Mpc. Our position at the very edge of this supercluster is even more extreme than our somewhat out-riding position in the disk of our galaxy. Virtually all the matter concentrated in the supergalactic plane is to one side of our position and in the general direction of the zodiac signs Virgo and Libra.

A glance at the star maps (located elsewhere) will make the orientation of the supergalactic plane clear to the reader. The Supergalactic plane dominates the Autumn Equinox and the signs Virgo & Libra, just as the galactic plane dominates the solstice axis and the signs Sagittarius/Capricorn and Gemini/Cancer. It is of more than passing interest to notice that these two vast systems are at a right-angle (84°) to one another and that the centers of the two systems (GC at 266°, SGC at 181° zodiac longitude) almost coincide with the zero points of Libra and Capricorn! A very meaningful analysis of the traditional Sun-Sign interpretation can be made with these facts alone. The midpoint between these two cosmic centers is at about the middle of Scorpio (Tropical).

Here are some facts concerning our Supergalaxy: It is a vast flattened super system or "cloud of clusters" and the plane of maximum concentration defines the supergalactic equator. The overall diameter is about 40 megaparsecs and the thickness some10 megaparsecs and a volume of 16,000 Mpc (cubed) that contains about 10 (to the 15th) solar masses distributed among the tens of thousands of member galaxies.



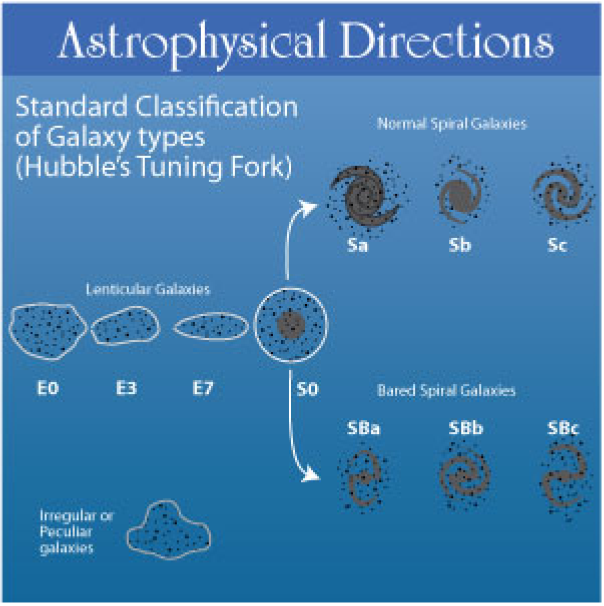
The Virgo Clusters

A much larger cluster of galaxies is that in the direction of Coma Berenices. The Coma cluster (as it is called) is a dense knot of an elliptical shape about six times as distant as the Virgo cluster and containing perhaps 10 times as many galaxies! Some 3000 such very large clusters have been catalogued. Other supergalaxies have been discovered. The nearest other supergalaxy is the Southern Supergalaxy that can be seen almost edge-on extending through the constellations Cetus, Fornax, Eridanus and Horologium to Dorado. Its apparent nucleus is marked by a dense group of more than a dozen galaxies (NGC 1365, 1374, 1379, 1380, 1381, 1387, 1389, 1399, 1404, 1437 & 1427).

At a distance modulus of 27.0, it is only slightly farther away than the Virgo cluster and is of similar size,. Astronomers feel (at this time) that there is little likelihood that supergalaxies are themselves part of still larger structures. Recent research suggests that the tendency toward clustering falls off rapidly after a mass of supergalactic proportions is reached. A list of some of the major giant clusters and superclusters is given elsewhere. At this point, well over a million external galaxies have been counted by astronomers and such research is still at an early stage.

Clusters of Galaxies

##	Zodiac	Latitude	Object
CG	08°Ar33'49	-21°54'29	Cluster A
CG	29°Ar28'12	+23°59'01	Pisces
CG	27°Ta12'31	+23°11'11	Perseus
CG	13°Cn57'09	+13°11'41	Gemini
CG	01°Le54'44	+ 1°56'39	Cancer
CG	15°Le57'39	-13°04'04	Hydra
CG	17°Le14'54	+45°47'47	UMa II
CG	25°Le00'53	+49°21'55	UMa I
CG	00°Vi51'59	+40°56'15	UMa III
CG	04°Vi11'53	+ 1°58'43	Leo
CG	00°Li00'26	+31°41'15	Coma
CG	01°Li08'32	+14°40'09	Virgo
CG	22°Li35'45	+43°24'40	Bootes
CG	02°Sc01'33	-19°22'50	Centaurus
CG	08°Sc45'16	+43°16'38	Corona Borealis
CG	24°Sc37'36	+37°03'47	Hercules
CG	17°Aq46'39	-36°21'30	Cluster B
CG	20°Pi40'05	+12°16'32	Pegasus II
CG	22°Pi07'08	+11°19'40	Pegasus I



Galaxies

The existence of galaxies external to our own ("Island Universes" as they were first called) was not considered an established fact until the early 1900s. The galactic nebulae (bright diffuse nebulae) and the so-called external nebulae were thought of as one.

Today over a million external galaxies have been counted and we are yet in the early stages of deep space exploration. The astronomer Hubble introduced a system of galaxy classification in 1925 that, with some revision, is still in general use. It recognizes three main classes of galaxies: (1) Elliptical shaped galaxies, (2) Spiral shaped galaxies, and (3) Barred spiral galaxies.

There are also a large group of galaxies that are classified as "Irregular" in shape. Among the Spirals there are three stages Sa, Sb and Sc and these are distinguished according to the relative size of the nuclear or central bulge (decreasing from Sa to Sc) and the relative strength of the arms (increasing from Sa to Sc). Elliptical galaxies have a smooth structure from a bright center out to indefinite edges and they differ only in ellipticity, from round (E0) to a 3:1 axis ratio (E7). Spiral galaxies show their typical spiral arms or whorls emerging either directly from a bright round nucleus (ordinary spirals) or at the ends of a diametrical bar (barred spirals). Irregular galaxies are either of the Magellanic Cloud type or chaotic, and difficult to classify in the Hubble method. This method was later revised to include the SO Or lenticular type of galaxy, which shares the smooth structure of the ellipticals, but has a definite, nucleus, occasional interstellar matter, and luminosity similar to the spirals. There are also two varieties of the barred spiral, the classical S-shaped spirals (s) and the ringed type (r) in which the arms start at the rim of an inner ring. Transition types exist between all the main types. There also appear to be large numbers of "dwarf galaxies" that are small, have low surface brightness, and are difficult to detect. Dwarfs exist only as ellipticals or Magellanic irregulars. The beautiful spirals appear to only occur among the giant galaxies.

Galaxies Table

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## Zodiac     Latitude  Name
G 26°Ar54'52 +33°55'48 NGC 205
         Local Group, Andromeda, A8
G 18°Ar49'51 +36°39'31 NGC 221
         Local Group, M.32, And.,G3
G 27°Ar09'25 +33°20'59 NGC 224, M.31
         Local Group, G5, And.
G 01°Ar26'55 -23°36'05 NGC 247,
         Sculptor Group, Cetus, Em
G 08°Ar55'46 -21°09'08 Cluster A
         400 galaxies
G 29°Ar25'39 +23°54'05 Pisces cluster
         100 galaxies
G 27°Ta37'33 +41°40'45 Maffei I
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          Local Group, IC 1805
G 22°Ar38'45 -45°36'39 Fornax system
          Local Group, A0237-34
G 28°Ta27'31 +41°20'53 Maffei II, Local Group
G 26°Ta54'33 +22°16'28 Perseus cluster of 500 galaxies
G 07°Ta55'37 -51°55'40 NGC 1380, Brightest, Fornax Group
G 00°Ta06'08 -62°58'26 NGC 1433
          Dorado Cloud of galaxies
G 18°Aq51'11 -85°57'59 Large Magellanic Cloud
          Local Group
G 13°Cn58'48 +12°58'17 Gemini Cluster of 200 galaxies
G 01°Le52'35 + 2°06'01 Cancer Cluster of 150 galaxies
G 16°Le02'35 -13°20'03 Hydra Cluster of galaxies
G 04°Vi25'21 + 1°21'54 Leo Cluster of 300 galaxies
G 17°Le38'16 +45°22'54 Ursa Major II
          Cluster of 200 galaxies
G 00°Vi28'19 +41°25'19 UMa III Cluster of 90 galaxies
G 01°Li28'49 +13°56'12 Virgo Cluster Centroid
G 01°Sc35'24 -18°24'29 Centaurus
          Cluster of 300 galaxies
G 08°Sc39'46 +43°27'33 Corona Borealis
          Cluster of 400 gal.
G 13°Sc40'37 +55°32'00 NGC 6207
          Hercules Supergalaxy
G 24°Sc33'59 +37°15'29 Hercules
          Cluster of 300 galaxies
G 26°Ar54'52 +33°55'48 NGC 205
          Local Group, Andromeda, A8
G 18°Ar49'51 +36°39'31 NGC 221
          Local Group, M.32, And.,G3
G 27°Ar09'25 +33°20'59 NGC 224, M.31
          Local Group, G5, And.
G 01°Ar26'55 -23°36'05 NGC 247
          Sculptor Group, Cetus, Em
G 08°Ar55'46 -21°09'08 Cluster A, 400 galaxies
G 29°Ar25'39 +23°54'05 Pisces cluster, 100 galaxies
G 27°Ta37'33 +41°40'45 Maffei I, Local Group, IC 1805
G 22°Ar38'45 -45°36'39 Fornax system
          Local Group, A0237-34
G 28°Ta27'31 +41°20'53 Maffei II, Local Group?
G 26°Ta54'33 +22°16'28 Perseus cluster of 500 galaxies
G 07°Ta55'37 -51°55'40 NGC 1380, Brightest, Fornax Group
G 00°Ta06'08 -62°58'26 NGC 1433
          Dorado Cloud of galaxies
G 18°Aq51'11 -85°57'59 Large Magellanic Cloud
          Local Group
G 13°Cn58'48 +12°58'17 Gemini Cluster of 200 galaxies
G 01°Le52'35 + 2°06'01 Cancer Cluster of 150 galaxies
G 16°Le02'35 -13°20'03 Hydra Cluster of galaxies
G 04°Vi25'21 + 1°21'54 Leo Cluster of 300 galaxies
G 17°Le38'16 +45°22'54 Ursa Major II
          Cluster of 200 galaxies
G 00°Vi28'19 +41°25'19 UMa III Cluster of 90 galaxies
G 01°Li28'49 +13°56'12 Virgo Cluster Centroid
G 01°Sc35'24 -18°24'29 Centaurus
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         Cluster of 300 galaxies
G 08°Sc39'46 +43°27'33 Corona Borealis
         Cluster of 400 gal.
G 13°Sc40'37 +55°32'00 NGC 6207, Hercules Supergalaxy
G 24°Sc33'59 +37°15'29 Hercules Cluster of 300 galaxies
G 18°Aq02'03 -35°57'08 Cluster B of 300 galaxies
G 22°Pi15'10 +11°37'55 Pegasus I
         Cluster of 100 galaxies
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Chapter 14: The Messier Catalogue

Charles Messier (1730-1817) was a comet hunter, who from his tower observatory at the Hotel de Cluny In Paris, is said to have discovered 21 of them. In the course of his nightly searches for comets, he came upon many comet-like objects which might conceivably be mistaken for the real thing. He published a list of these non-cometary objects in 1771 to prevent other comet hunters from wasting time on them. This list has been added to over the years and many of the objects included were not discovered by Messier himself or, like the Pleiades, were well known. The messier Catalog contains some of the most spectacular deep space objects visible In the Northern Hemisphere that are easily accessible to amateur astronomers. There Is continual reference to this catalog throughout the literature of astronomy, most often simply a number prefaced by the letter "M." (for example: M.31, the Andromeda Galaxy). The types of objects in this table use the following abbreviations:

CL = Open Star Clusters
Di = Diffuse Nebulae
EL = Elliptical Galaxies
GB = Globular Star Clusters
IR = Irregular Galaxies
PL = Planetary Nebulae
SP = Spiral Galaxies

The Messier Catalog

M#	Long	Lat	NGC	##	Size	M
M-001	083 23 37	-01 17 57	1952	PL	6x4	9
M-002	324 43 24	+12 57 04	7089	GB	12	7
M-003	190 37 47	+35 57 02	5272	GB	19	7
M-004	247 48 16	-04 50 58	6121	GB	23	6
M-005	225 53-07	+19 39 13	5904	GB	20	6
M-006	265 00 47	-08 50 18	6405	CL	26	6

M-007	268 01 55	-11 22 13	6475	CL	50	5
M-008	270 09 34	-00 56 16	6523	DI	90x40	6
M-009	259 35 12	+04 35 03	6333	GB	6	8
M-010	252 45 22	+18 26 04	6254	GB	12	7
M-011	282 33 20	+16 35 11	6705	CL	12	6
M-012	249 51 52	+20 16 15	6218	GB	12	7
M-013	238 52 18	+57 51 03	6205	GB	23	6
M-014	263 21 15	+20 05 06	6402	GB	7	9
M-015	328 31 07	+25 28 37	7078	GB	12	7
M-016	273 56 22	+09 35 28	6611	CL	8	7
M-017	274 19 52	+07 10 43	6618	DI	46x37	-
M-018	274 05 06	+06 14 08	6613	CL	7	7
M-019	256 26 00	-03 26 50	6273	GB	5	8
M-020	269 54 29	+00 24 45	6514	Di	29x27	-
M-021	270 22 11	+00 56 43	6531	CL	12	7
M-022	277 36 12	-00 44 25	6656	GB	17	6
M-023	268 33 14	+04 26 17	6494	CL	27	7
M-024	273 41 23	+04 57 46	6603	CL	4	6
M-025	276 48 39	+03 59 32	4725	CL	35	6
M-026	280 37 30	+13 35 56	6694	CL	9	8
M-027	307 43 45	+42 15 26	6853	PL	8x4	8
M-028	274 52 33	-01 32 43	6626	GB	15	8
M-029	323 23 24	+55 25 13	6913	CL	7	7
M-030	318 59 45	-08 44 20	7099	GB	9	8
M-031	027 09 24	+33 20 59	224	SP	l6Ox40	4
M-032	026 55 59	+32 59 47	221	EL	3x2	9
M-033	032 33 09	+19 21 15	598	SP	6Ox4O	6
M-034	051 02 23	+25 41 04	1039	CL	30	6
M-035	091 19 16	+00 54 39	2168	CL	29	6
M-036	084 16 18	+10 47 22	1960	CL	16	6
M-037	087 40 25	+09 06 34	2099	CL	24	6
M-038	082 47 59	+12 34 15	1912	CL	18	7
M-039	351 58 40	+57 41 09	7092	CL	32	5
M-040	152 23 17	+54 17 57	none	2 stars		
M-041	104 33 22	-43 33 48	2287	CL	32	6
M-042	082 18 24	-28 40 54	1976	DI	66x6O	-
M-043	082 22 14	-28 34 04	1982	Di	2Oxl5	-
M-044	126 29 47	+01 33 45	2632	CL	90	4
M-045	059 17 31	+04 02 39	none	CL	120	-
M-046	120 03 02	-55 35 01	2437	CL	27	7
M-047	118 25 40	-35 31 51	2422	CL	25	5
M-048	126 32 13	-25 01 38	2548	CL	30	6
M-049	182 57 10	+10 17 39	4472	EL	4x4	9
M-050	107 31 22	-30 47 43	2323	CL	16	6
M-051	174 25 34	+50 56 08	5194/SP		12x6	9
M-052	030 16 40	+56 45 33	7654	CL	13	8
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M-054	184 15 33	+14 50 42	4621	EL	3x2	10
M-054	281 16 20	-07 35 42	6715	GB	6	8
M-055	290 52 13	-09 20 35	6809	GB	15	6
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M-058	183 10 22	+14 33 38	4579	SP	4x3	10
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M-061	182 33 27	+06 17 10	4303	SP	6x6	10

M-062	256 32 05	-07 19 30	6266	GB	6	7
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M-065	164 42 13	+07 59 23	3623	SP	8k2	10
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M-077	037 32 18	-15 02 51	1068	SP	2x2	10
M-078	085 41 49	-23 21 12	2068	Di	8x6	8
M-079	077 12 27	-47 35 37	1904	GB	8	8
M-080	245 44 11	-01 37 26	6093	GB	5	18
M-081	118 47 41	+51 34 30	3031	SP	16xlO	7
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M-083	212 54 28	-18 21 50	5236	SP	lOx8	8
M-084	179 50 29	+14 18 26	4374	EL	3x3	10
M-085	177 35 50	+19 09 09	4382	EL	4x2	10
M-086	180 04 21	+14 27 44	4406	EL	4x3	10
M-087	181 21 39	+14 25 03	4486	EL	3x3	10
M-088	180 46 23	+16 23 31	4501	SP	6x3	10
M-089	182 23 45	+15 02 49	4552	EL	2x2	11
M-090	182 25 06	+15 42 50	4569	SP	6x3	10
M-091	183 08 57	+13 56 55	4567	SP	-	10
M-092	249 55 09	+65 52 25	6341	GB	12	7
M-093	123 33 06	-44 15 20	2447	CL	18	6
M-094	170 50 56	+42 00 59	4736	SP	5x4	9
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M-100	178 05 09	+16 45 44	4321	SP	5x5	10
M-101	173 39 16	+59 47 22	5457	SP	22x22	8

|

M-102	186 07 46	+67 05 34	5866	SP	-	10
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M-107	247 45 21	+08 46 09	6171	GB	8	9
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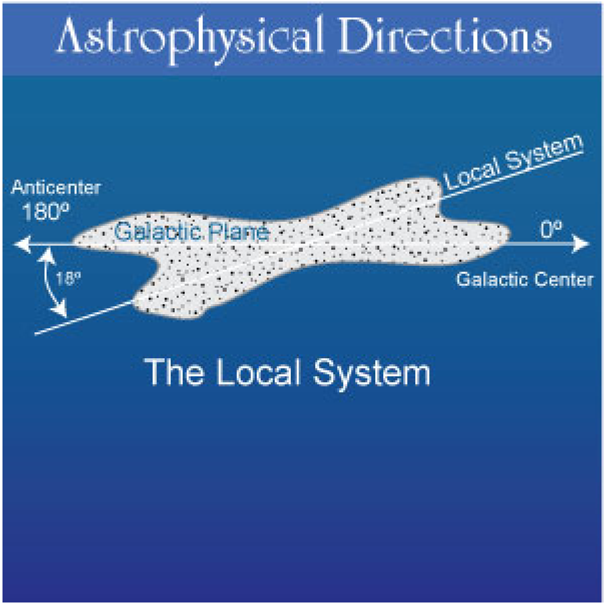


Local System of Stars

07 Local system's North Pole R.A.
171 53 10Dec +29 20 32Long
160 22 03Lat +23 36 60MC
171 10 01GLon 202 00 00GLat +72 00 00

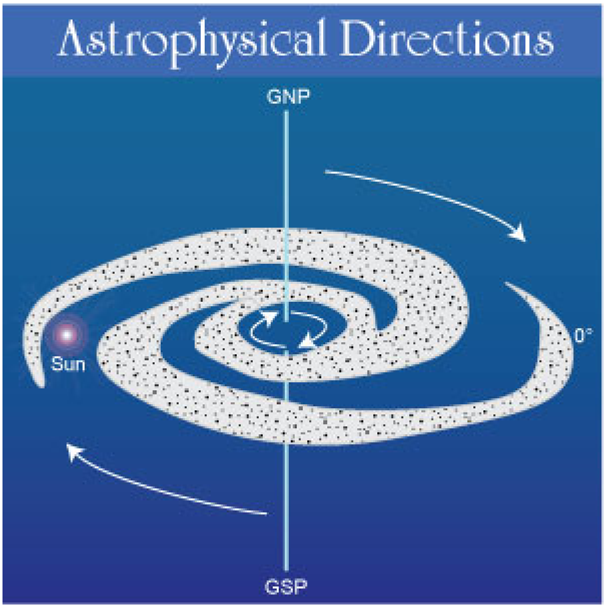
08 Local system's South PoleR.A.
351 53 10Dec -29 20 32Long
340 22 03Lat -23 36 60MC
352 10 01GLon 022 00 00GLat -72 00 00

09 Ascending Node of Local System Equator to EclipticR.A. 248 45 08Dec -22 00 32Long 250 22 02Lat 000 00 00MC 250 22 02GLon 356 41 15GLat +16 22 08

10 Descending Node of Local System Equator to EclipticR.A. 068 45 08Dec +22 00 32Long 070 22 02Lat 000 00 00MC 700 22 02GLon 176 41 15GLat -16 22 08

11 Ascending Node of Local System Equator to EquatorR.A. 261 53 10Dec 000 00 00Long 261 10 01Lat +23 11 50MC 262 32 53GLon 023 18 23GLat +17 59 44

12 Descending Node of Local System Equator to EquatorR.A. 081 53 10Dec 000 00 00Long 081 10 01Lat -23 11 50MC 082 32 53GLon 203 18 23GLat -17 59 44



Our Galaxy

13 North Pole of GalaxyR.A.
192 15 00Dec +27 24 00Long
179 19 15Lat +29 48 43MC
193 18 53GLon 033 00 00GLat +90 00 00

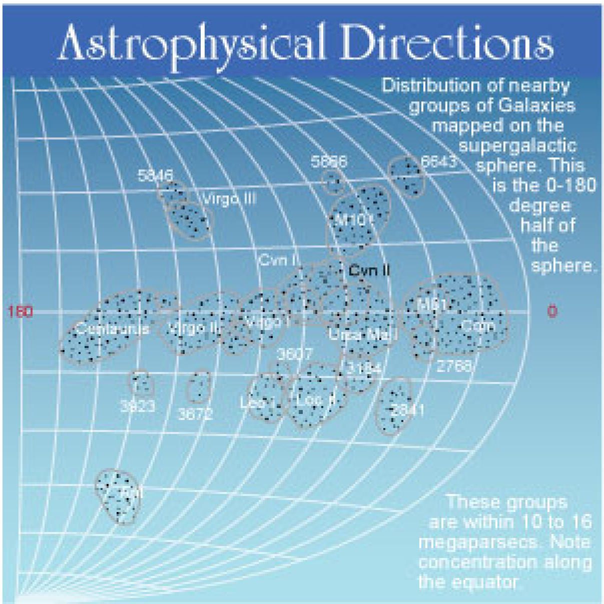
14 South Pole of GalaxyR.A.
012 15 00Dec -27 24 00Long
359 19 15Lat -29 48 43MC
013 18 53GLon 033 00 00GLat -90 00 00

15 Ascending Node of Galactic Equator to EclipticR.A. 269 15 35Dec -
23 26 39Long 269 19 15Lat 000 00 00MC
269 19 15GLon 006 22 35GLat 000 00 00

16 Descending Node of Galactic Equator to EclipticR.A. 089 15 35Dec
+23 26 39Long 089 19 15Lat 000 00 00MC
089 19 15GLon 186 22 35GLat 000 00 00

17 Ascending Node of Galactic Equator to EquatorR.A. 282 15 00Dec 000 00 00Long 283 18 52Lat +22 52 52MC 281 15 56GLon 033 00 00GLat 000 00 00

18 Descending Node of Galactic Equator to EquatorR.A. 102 15 00Dec 000 00 00Long 103 18 53Lat -22 52 52MC 101 15 56GLon 213 00 00GLat 000 00 00



Our SuperGalaxy

19 SuperGalactic North Pole R.A. 283 11 22Dec +15 38 39Long 286 16 11Lat +38 20 52MC 282 08 03GLon 047 22 12GLat +06 19 12

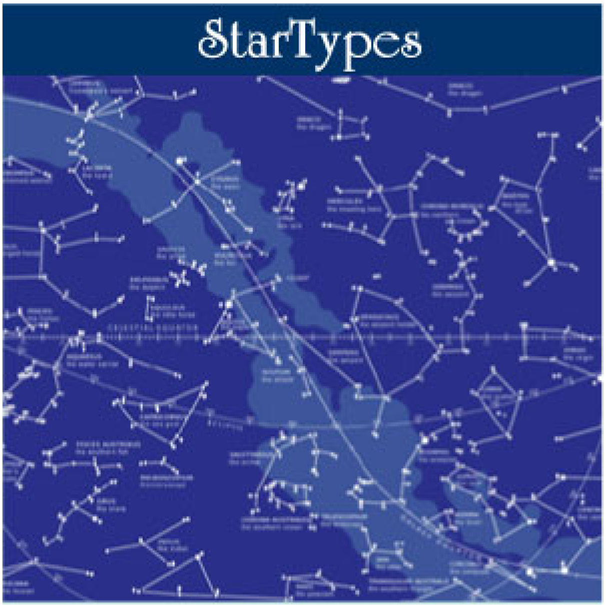
20 SuperGalactic South PoleR.A. 283 11 22Dec -15 38 39Long 106 16 11Lat -38 20 52MC 102 08 03GLon 227 22 12GLat -06 19 12

21 Ascending SuperGalactic Node to EclipticR.A. 014 59 22Dec +06 24 00Long 016 16 11Lat 000 00 00MC 016 16 11GLon 127 53 05GLat -56 05 47

22 Descending SuperGalactic Node to EclipticR.A. 194 59 22Dec - 06 24 00Long 196 16 11Lat 000 00 00MC 196 16 11GLon 307 53 05GLat +56 05 47

23 Ascending SuperGalactic Node to EquatorR.A. 013 11 22Dec 000 00 00Long 012 08 03Lat -05 12 32MC 014 19 46GLon 125 02 27GLat -62 35 07

24 Descending SuperGalactic Node to EquatorR.A. 193 11 22Dec 000 00 00Long 192 08 03Lat +05 12 32MC 194 19 46GLon 305 02 27GLat +62 35 07



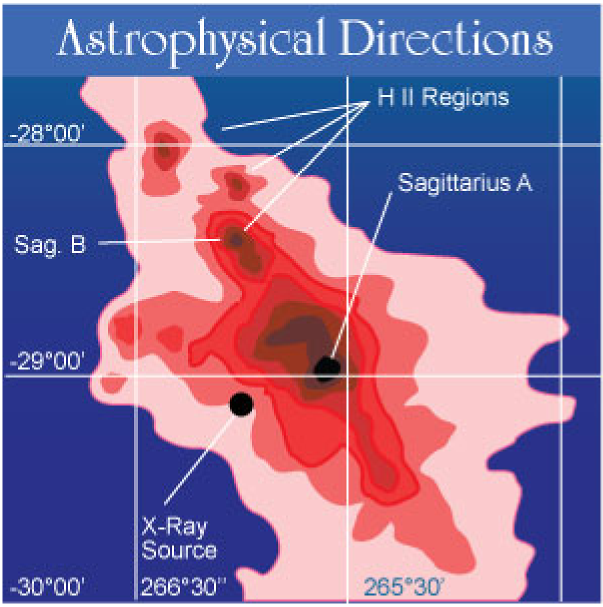
Intersections

25 Intersection of Galactic and SuperGalactic EquatorsR.A. 041 12 49Dec +59 21 19Long 059 28 47Lat +40 58 19MC 043 40 18GLon 137 17 24GLat 000 00 00

26 Intersection of Galactic and SuperGalactic Equators/td> R.A. 221 12 49Dec -59 21 19Long 239 28 47Lat -40 58 19MC 223 40 18GLon 317 17 24GLat 000 00 00

27 Intersection Local System and Galactic EquatorsR.A. 169 21 06Dec -60 38 02Long 208 40 43Lat -56 40 43MC 168 25 06GLon 292 00 00GLat 000 00 00

28 Intersection Local System and Galactic EquatorsR.A. 349 21 06Dec +60 38 02Long 028 40 43Lat +56 40 43MC 348 25 06GLon 112 00 00GLat 000 00 00



Cosmic Centers

29 Centroid of Local SystemR.A.
134 10 54Dec -50 08 36Long
165 24 57Lat -62 30 54MC
131 43 12GLon 270 00 00GLat -03 00 00

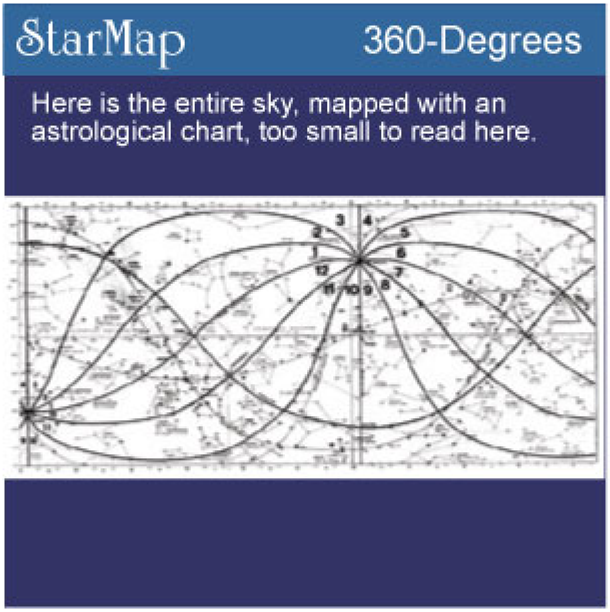
30 Center of our GalaxyR.A.
265 36 00Dec -28 55 00Long
266 07 53Lat -05 31 48MC
265 57 43GLon 000 00 00GLat 000 00 00

31 Center of Local Groups of GalaxiesR.A. 010 00 00Dec
+41 00 00Long 027 09 24Lat +33 20 59MC
010 52 46GLon 121 10 27GLat -21 34 05

32 Centroid Local Triplet (LMC,SMC and Our Galaxy) approx. directionR.A.
187 01 59Dec +13 12 51Long
181 05 29Lat +14 54 03MC
187 39 32GLon 283 00 02GLat -33 00 00

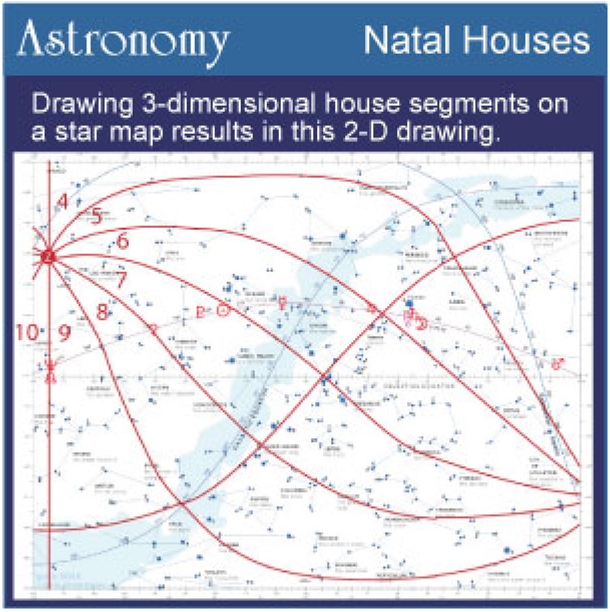
33 Ascending Node of Galactic Equator to EquatorR.A. 282 15 00Dec 000 00 00Long 283 18 52Lat +22 52 52MC 281 15 56GLon 033 00 00GLat 000 00 00

34 Descending Node of Galactic Equator to EquatorR.A. 102 15 00Dec 000 00 00Long 103 18 53Lat -22 52 52MC 101 15 56GLon 213 00 00GLat 000 00 00



Chapter 15: Mapping the Birth Chart

This diagram represents my natal horizon system laid out on an equatorial star map, although this image is too small to see much. We will show you some enlarged sections, coming right up. I have found that this form of chart representation is very helpful in making clear the traditional sensitive points such as the Ascendant, Midheaven, house cusps, etc. This panoramic view shows the entire 360 degrees of the heavens surrounding the Earth (what Earth sees during each 24-hour rotation). On this is plotted a natal chart, showing the twelve house cusps, which are like segments of an orange, but here laid flat on a two-dimensional map.



Steps in Mapping the Chart

Here is an enlargement of one half of the heavens, what is sometimes called the summer sky (in the northern hemisphere), from Aries to Libra in the zodiac signs. I am using my chart, which has all of the planets in the first six zodiac signs. This is an equatorial star map, as used by astronomers.

Please examine this map along with the following statements:

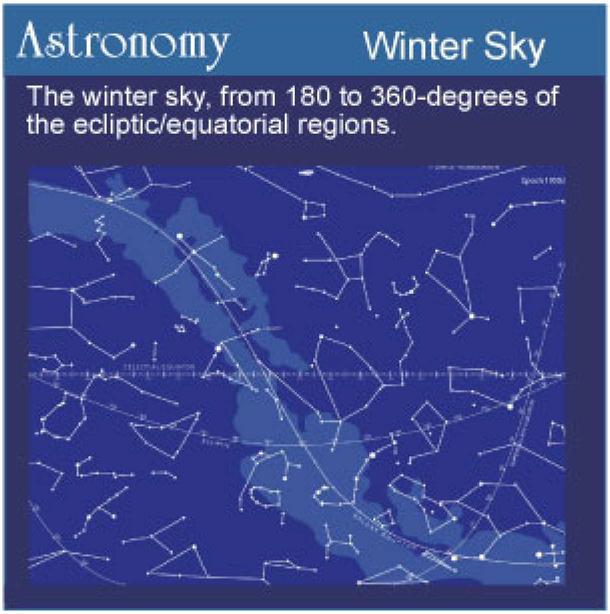
1. The very light straight line through the middle of this map is the celestial equator, which is the Earth's geographic equator extended infinitely out into space. .
2. The very light curved line (above the center of the chart) that intersects the celestial equator at 0° and 180° is the zodiac or ecliptic, which

becomes a curved line when projected on a two-dimensional surface.

3. You can get a better idea of what the zodiac is by imagining this map wrapped around your head, at which point the curving zodiac would appear at a plane set at a 23 1/2° angle to the plane of the equator.
4. The Local Sidereal Time at my birth was 11h 42m 54s of right ascension along the equator and this is equivalent to a RAMC (right ascension of the Midheaven) of 175.70 of arc along the equator.
5. Locate this RAMC on the map. It is the vertical RED line, running up and down the map, at the extreme left side.
6. I was born at a geographic latitude of 40° and that is equivalent to 40° declination on the star map. This is the point where all the curved house lines converge to a single point. This is the large red dot with the letter “Z” (for Zentih) at the left side of the chart.
7. The Zenith or north pole of my horizon system (above my head at birth) points in the direction of 175.70° right ascension and 40° of declination, which is the constellation Ursa Major (the Great Bear).
8. All points along the 175.70° of right ascension were aligned at my birth. Thus I might also look into the constellations Virgo, Crater, Hydra, and Centaurus to the South and the constellations Andromeda, Pegasus, Aquarius, Sculptor and Tucana to the North in relation to my birth.

9. The Midheaven or M.C. at my birth is the point where the RAMC crosses or intersects the Zodiac and this is around 175° of ecliptic longitude.
10. You can see that the M.C. is far to my south and not in my "mid-heaven" at all but rather, the mid-heaven of someone living near the equator. This is where you can see the planetary glyph for Neptune at the left side of the chart, just above the celestial equator (the straight line in the center of the map).
11. My natal horizon is the long dark red curved line running across the map, starting in the lower left-hand corner and ending in the upper right-hand corner of the map. .
12. This line of the horizon is 90° from my zenith and nadir. Remember this whole thing is a globe.
13. The intersection of this horizon line to the zodiac in two places defines my Ascendant and descendant at 8° of Sagittarius and Gemini. Here, since we are only showing one half of the star map, you can only see the descendant.
14. The intersection of the East-West Prime Vertical to the ecliptic (zodiac) defines my vertex (West) and anti-vertex (East). This is the red house cusp line that marks the seventh house cusp. The Vertex is a couple of degrees before my Sun in the zodiac, actually about 23 degrees Cancer (113 degrees).
15. My planets are marked along the zodiac in their approximate positions.

16. As you can see, planets can only be near the horizon at the Ascendant-descendant axis, because they never get too far from the plane of the zodiac or ecliptic.
17. The houses you see in this diagram are the Horizontal House System (I call it the Radiant House system), rather than one of the other systems. I include it here, because it is less confusing to view than some of the other house systems.
18. The points along the ecliptic intersected by these 12 house circles mark the "cusps" or sensitive points on the ecliptic or zodiac.



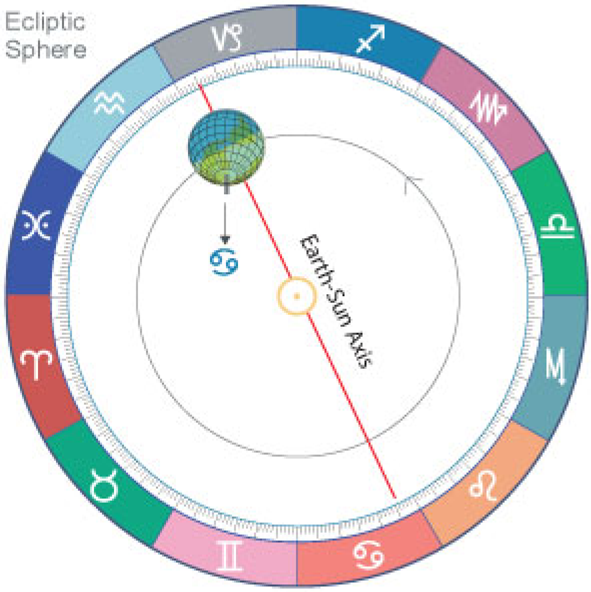
Maps of the Earth and Heavens

It is hoped that these diagrams have helped. We will close this section by giving you the traditional formal definitions of these coordinate systems as well as the standard diagrams.

This author has found that the ENTIRE horizon is sensitive and not only the points were it relates to the zodiac, such as the Ascendant, etc. The orientation of the Horizon Sphere provides a framework in which to examine our relationship to ALL cosmic structure. For instance, the natal horizon passes through a particular band of constellations that becomes your own set of constellations. The horizon crosses other significant planes besides the ecliptic, such as the galactic and supergalactic planes.

You will have a galactic and supergalactic Ascendant and descendant – a particular relation to these planes. Every star and every bit of cosmic structure fits somewhere into your natal chart and the natal horizon is a valuable KEY and perspective on how an individual relates to the cosmos. The idea to have in mind as you approach this is:

If the horizon is able to give me points of sensitivity or power (such as the Ascendant, etc.), then it must be a complete and integral system of reference in itself.



The Moment of Birth and the Natal Chart

Much of this will be clear through study on your part. I have found that it is very difficult to explain these different coordinate systems in words. Illustrations help a lot and drawing out your own horizon helps most of all. I apologize for the awkwardness of this presentation and can imagine an entire book devoted to a careful presentation of these three coordinate systems.

Let us review these systems once again. We will examine some diagrams that represent the systems at work in a natal chart. Be sure you understand each of the following statements:

(1) The birth day is July 18, and the Earth is at 295° or 25° Capricorn along the plane of the ecliptic.

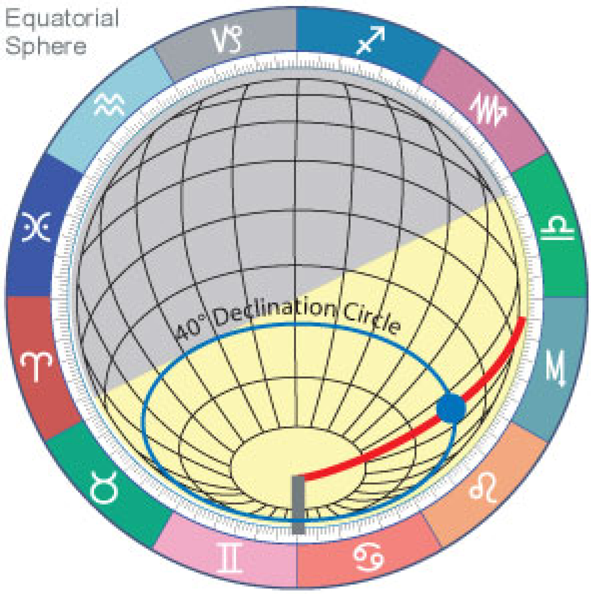
(2) The Sun in this natal chart is at 25° Cancer or 115° of Absolute Longitude. The Earth sees the Sun in the zodiac sign Cancer.

(3) It is Summer in the northern hemisphere since the arctic circle is exposed to the Sun.

(4) Half the Earth is in darkness, half in light.

(5) Noon is that point on the Earth that is in line with the Earth/Sun axis.

(6) The time of birth is in the later afternoon.



The Equatorial Sphere

The above diagram represents the Earth and/or the celestial sphere. The zodiac or ecliptic is surrounding the Earth, and the North Pole is tilted toward the solstice point. Then:

(1) A late afternoon birth puts the birthplace to the right of the Earth/Sun line and toward the twilight region of the globe.

(2) The birth geographic latitude is 40°.

(3) A line from the North Geographic Pole (or celestial pole) through the birthplace and on to the South Pole represents the RAMC for this birth.

(4) The point where it cuts or intersects the zodiac is the M.C. (25° Virgo).

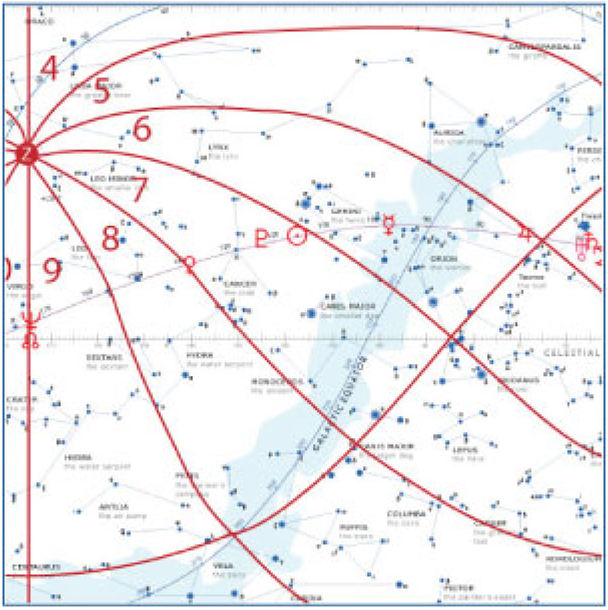
(5) The Zenith (Z) extends out above the birthplace (dark blue dot).

(6) The plane of the horizon is 90° from the zenith.

(7) The intersection of the horizon to the zodiac at 7° of Sagittarius and Gemini marks the Ascendant and descendant axis.

(8) The horizon system is oriented or tilted toward 7° Virgo. This point is called the Nonagesimal, a point on the ecliptic +/- 90° from the Ascendant/descendant axis and near the zenith.

(9) The Prime Vertical intersects the ecliptic to form the vertex and anti-vertex.



Plotting Your Birth Chart on a Star Map

It will be important for you to get some idea as to what your own natal horizon looks like. At the present time this is made difficult due to the fact that tedious trigonometric calculation is the only way to plot the horizon on a star map. There are computer generated star map programs available. Here is what you will need:

1) Plot your RAMC line on a star map (also the line 180° opposite).

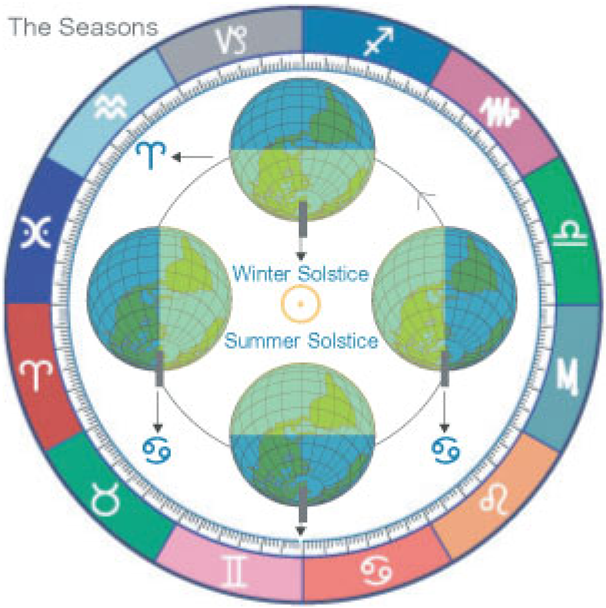
(2) Mark in your Zenith on the RAMC line at the declination that equals your geographic latitude at birth.

(3) Count South from the Zenith (for the northern hemisphere) 90° to find your South Point.

(4) Plot your Nadir and count north 90° to find your North point.

(5) The intersection of your horizon line to the line of the celestial equator will be two points 90° (+/-) on either side of your RAMC.

(6) Perhaps you already have such points along the ecliptic as the Ascendant and Descendant. These will give you two more points. Now, sketch a line through the points you have found that represents a smooth curve such as the line in our diagram. You will have some idea as to what the natal horizon looks like and how the horizon sphere was oriented at your birth to the rest of the cosmos.



The Earth's Tilt

The Earth moves in the plane of the ecliptic around the Sun center. The diagram shows the Earth at the moment of the summer and winter solstices, and the two equinoxes. You will notice that the Earth does not sit-up-straight in its own orbit. The polar axis (the line of the North and South Poles) is forever tilted away from the plane of the Earth's orbit. This "tilt" or angle is the whole of the difference between the ecliptic (zodiac) system of coordinates and the equatorial system. If the Earth were not tilted, the two systems would be identical. As it is, there is a difference between longitudes measured along the ecliptic and those longitudes measured along the equator in right ascension. This is why.

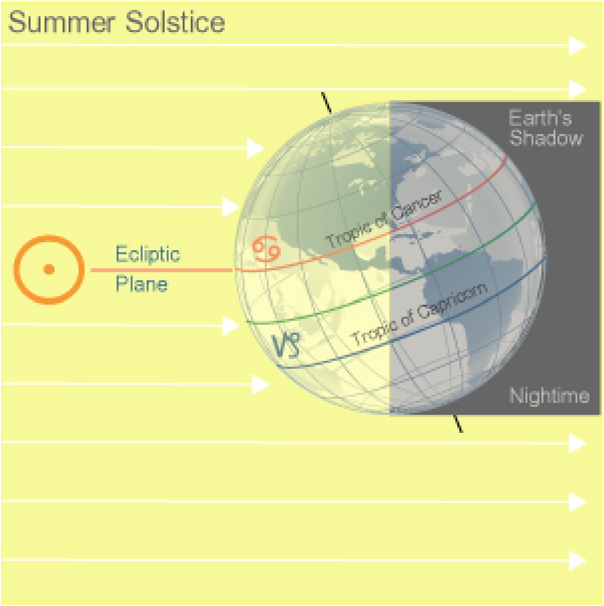
The diagram on this (and adjacent) pages should help you to see the difference between these two systems. Be sure you can understand the following statements:

1. The Earth always stays in the plane of the ecliptic.
2. The North Pole of the Earth is tilted toward the plane of the ecliptic by an angle of 23 1/2° in the direction of zero-degrees Cancer.
3. The polar tilt is permanent, although it changes somewhat over a long period of time.
4. As the Earth moves around the Sun, the North Pole always points in the same direction.
5. That direction amounts to the zero-degrees of the zodiac sign Cancer.
6. The North Pole of the Earth is tilted at a 23 1/2° angle toward 0° of Cancer (tropical zodiac).
7. In fact, the direction of 0° Cancer is defined by the direction toward which the North Pole is tilted (in the Tropical zodiac).

The important idea so far is that the axis of .the Earth is frozen or fixed in space, no matter where the Earth happens to be in its orbit around the Sun. Here are some other facts to consider in relation to these same diagrams:

1. The seasons result from the "tilt" of the North Pole into or toward the Sun.
2. At the moment of the summer solstice, the North Pole is tilted most toward the Sun and therefore is aligned with a vertical light ray coming from the Sun.
3. The polar axis of the Earth is in line with a vertical light ray only twice a year, at the summer and winter solstices.

4. At the equinoctial points (Spring and Fall), the polar axis of the Earth is at right-angles or "square" to a vertical light ray coming from the Sun.
5. At all other times of the year besides these four cardinal points, the angle between the polar axis of the Earth and a vertical light ray coming from the Sun will be somewhere between 0° and 90°. It gradually changes all the time.



The Tropics of Cancer and Capricorn

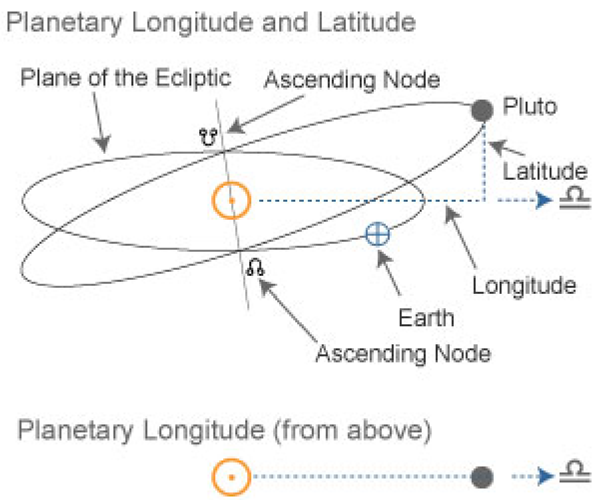
1. The seasons result from the "tilt" of the North Pole into or toward the Sun.
2. At the moment of the summer solstice, the North Pole is tilted most toward the Sun and therefore is aligned with a vertical light ray coming from the Sun.
3. The polar axis of the Earth is in line with a vertical light ray only twice a year, at the summer and winter solstices.
4. At the equinoctial points (Spring and Fall), the polar axis of the Earth is at right-angles or "square" to a vertical light ray coming from the Sun.
5. At all other times of the year besides these four cardinal points, the angle between the polar

axis of the Earth and a vertical light ray coming from the Sun will be somewhere between 0° and 90°. It gradually changes all the time.

6. A parallel of latitude on the Earth at 23 1/2° North is called the Tropic of Cancer since this line marks the "high-water" point for the summer solstice, after which the Sun declines in strength.
7. A similar point at 23 1/2° South latitude is called the Tropic of Capricorn.
8. The Arctic and Antarctic circles are those circles near the Earth's poles defined by the difference between the North Pole of the Earth and the north ecliptic pole.
9. Half of the Earth is always in darkness.

The ecliptic and equatorial systems are both measured from the same point – zero-degrees Aries or the Vernal Equinox. Longitude is measured from this point along both the celestial equator and the ecliptic in degrees from 0° to 360°. The Vernal Equinox or 0° Aries point originates or is defined as the intersection of the ecliptic and the celestial equator and this intersection (of these two infinite planes) creates an axis and a pair of nodes set in space.

It must be kept in mind that it does not matter that the orbital plane of the Earth is very large and the physical equator of the Earth relatively small. In spherical coordinate systems, we are not concerned with the size of the structures, but with the angles and planes of orientation of these structures. We extend the equator of the Earth out until it reaches the heavens – infinity. We extend the orbital plane of the Earth out until it reaches the heavens – infinity. The points and axis where these two planes intersect in the heavens is all that we are concerned about.



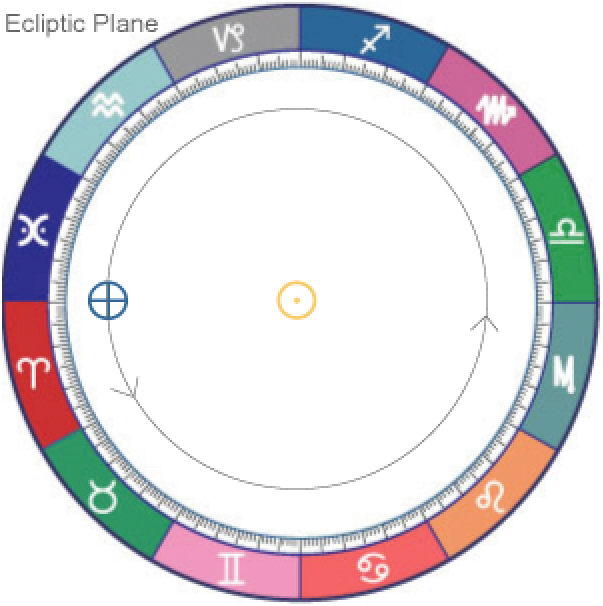
Planet Longitude and Latitude

Examine the diagram until you understand of the following:

1. The plane of the ecliptic (orbital plane of Earth) is different from the orbital plane of, for example, Pluto.
2. However, both planes pass through the Sun center.
3. While the orbits of the two planets are, in distance, larger and smaller, the planes of the orbits ignore this distance factor and are considered as "infinite."
4. These planes are inclined to one another by an angle or inclination. This is show here by the planet of the Earth’s orbit (horizontal), and the

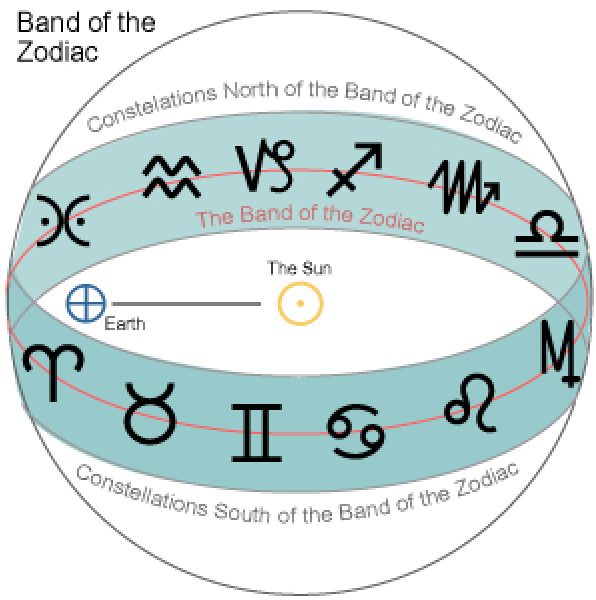
plane of Pluto's orbit inclined or titled at an angle to it.

5. The orbital plane of Pluto intersects the orbital plane of the Earth (ecliptic) at two points, called the "nodes."
6. The north or ascending node refers to that zodiac point where Pluto passes from under to above the plane of the ecliptic, while the south or descending node refers to where Pluto passes through the zodiac plane, from above (ecliptic north) to below (ecliptic south).
7. The diagram shows Pluto and Earth at different points in their orbit. If Earth were also at the point where Pluto is (horizontal dotted line), then this would be a conjunction of the Earth and Pluto is an alignment of the Earth, Pluto, and the Sun center in zodiac longitude and not necessarily in zodiac latitude. When might a conjunction in both longitude and latitude take place? The answer is if both the Earth and Pluto were at one of their nodes. At that point, there would be no latitude for Pluto.
8. Be sure to note that most astrologers' charts ignore the latitude factor in planetary positions, and just list the longitude.



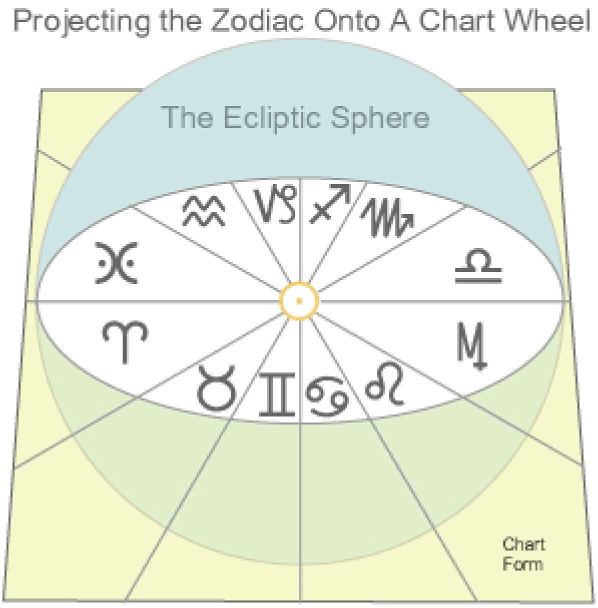
From the Sky to the Chart Form: Part 1

Our astrological 360° chart form (open style chart wheel) represents the plane of the zodiac along which our Earth moves in the course of a year. In addition, the fact that almost all of the planets move in planes that are almost (but not quite) identical or coincident with our ecliptic gives the zodiac plane even greater importance than it would otherwise have. In fact, most astrologers use just the zodiac longitude of the planet's positions on the plane of the zodiac and ignore the latitude or elevation of the planet either above or below the ecliptic plane.



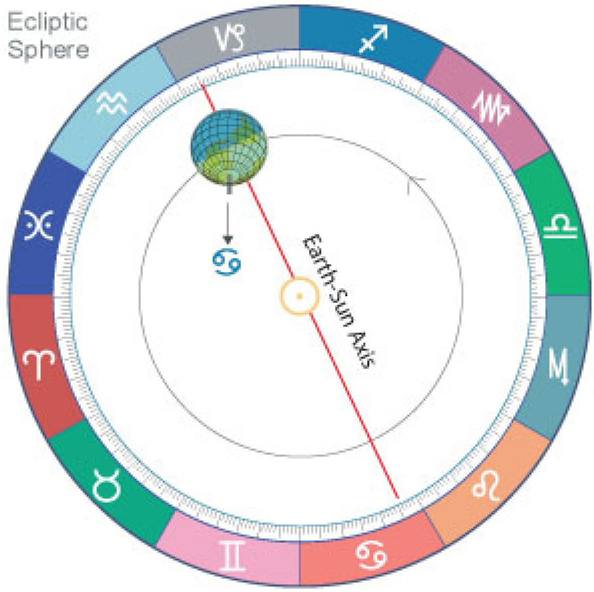
From the Sky to the Chart Form: Part 2

Our astrological 360° chart form (open style chart wheel) represents the plane of the zodiac along which our Earth moves in the course of a year. In addition, the fact that almost all of the planets move in planes that are almost (but not quite) identical or coincident with our ecliptic gives the zodiac plane even greater importance than it would otherwise have. In fact, most astrologers use just the zodiac longitude of the planet's positions on the plane of the zodiac and ignore the latitude or elevation of the planet either above or below the ecliptic plane. Here you can see what is called the “band of the zodiac.”



From the Sky to the Chart Form: Part 3

Our astrological 360° chart form (open style chart wheel) represents the plane of the zodiac along which our Earth moves in the course of a year. In addition, the fact that almost all of the planets move in planes that are almost (but not quite) identical or coincident with our ecliptic gives the zodiac plane even greater importance than it would otherwise have. In fact, most astrologers use just the zodiac longitude of the planet's positions on the plane of the zodiac and ignore the latitude or elevation of the planet either above or below the ecliptic plane. The diagram shows how the ecliptic sphere is projected on a paper chart form used by astrologers.



Snapshots of Earth at a Birth

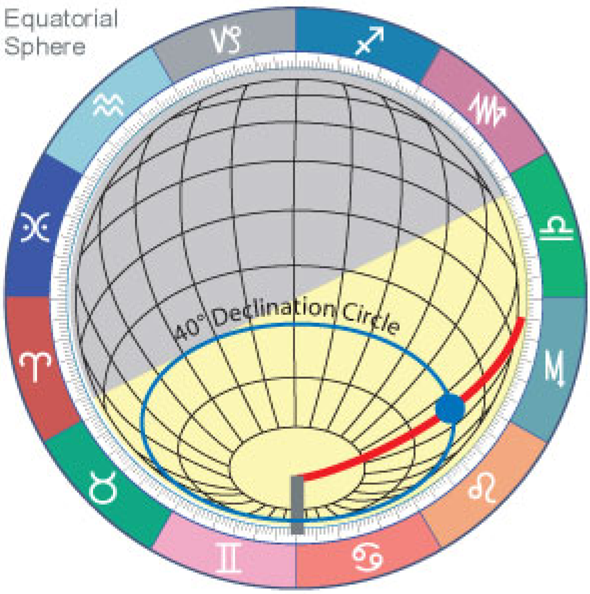
Although many students of astrology are only aware of the zodiac sphere and zodiac coordinates (longitude and latitude), there are actually three separate spheres/coordinate systems that make up a birth chart. They are the Ecliptic (zodiac) Sphere, the Celestial Sphere (equatorial), and the Horizon Sphere (azimuth and altitude). Each is oriented differently in space, so it is worthwhile to take the time to understand this.

Much of this will be clear through study on your part. I have found that it is very difficult to explain these different coordinate systems in words. Illustrations help a lot and drawing out your own horizon helps most of all. I apologize for the awkwardness of this presentation and can imagine a small book devoted to a careful presentation of these three coordinate systems.

The Ecliptic Sphere

Let us review these systems once again. We will examine some diagrams that represent the systems at work in a natal chart. Be sure you understand each of the following statements:

1. The birth day is July 18, and the Earth is at 295° or 25° Capricorn along the plane of the ecliptic.
2. The Sun in this natal chart is at 25° Cancer or 115° of Absolute Longitude. The Sun and Earth are always opposite each other, so that if I am a Cancer Sun, this means the Earth was actually in Capricorn on that day. This is clear from the diagram.
3. It is Summer in the northern hemisphere since the arctic circle is exposed to the Sun. Notice the North Pole is facing the Sun, pointing at zero-degrees of Cancer.
4. Half the Earth is in darkness, half in light.
5. Noon is that point on the Earth that is in line with the Earth/Sun axis, the red line.
6. The time of birth is in the later afternoon.



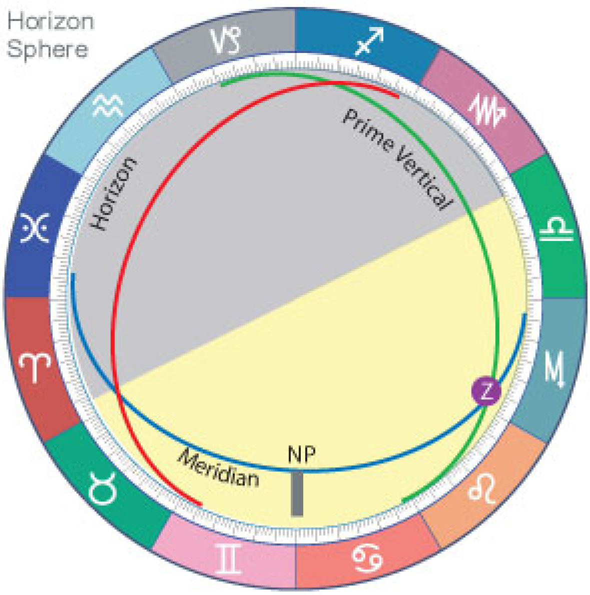
The Celestial/Equatorial Sphere

This diagram represents the Earth and/or the celestial sphere. The zodiac or ecliptic is surrounding the Earth, and the North Pole is tilted toward the solstice point. Then:

1. A late afternoon birth puts the birthplace to the right of the Earth/Sun line and toward the twilight region of the globe.
2. The birth geographic latitude is 40°.
3. A line from the North Geographic Pole (or celestial pole) through the birthplace and on to the South Pole represents the RAMC (right ascension of the Midheaven) for this birth.

4. The point where it cuts or intersects the zodiac is the M.C. (25° Virgo).

The Earth is floating in space, in the plane of its orbit (of course), with its pole tilted toward zero-degrees of the zodiac sign Cancer. It rotates (in this diagram) in a counter-clockwise motion. Therefore, the birth place (blue dot here), is turning into or toward the dark half of the Earth, which is night. The latitude (both geographically and celestially) is 40-degrees north. This is marked on the diagram by the blue oval.



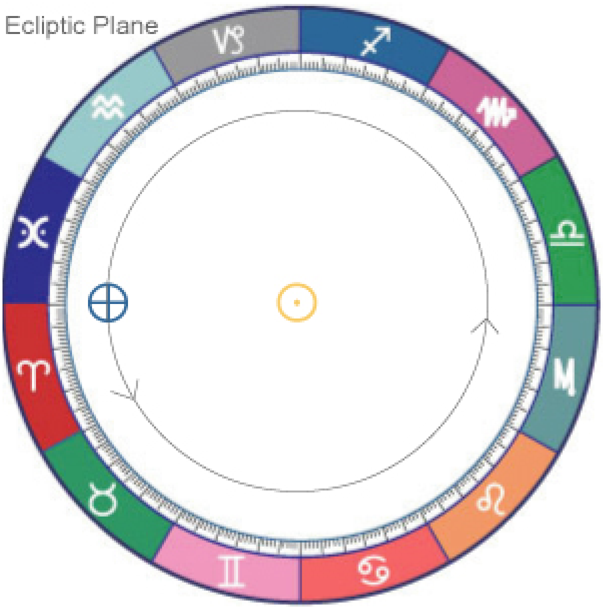
The Horizon Sphere

This diagram shows the third (and final) coordinate system that makes up a birth chart, in this case the local horizon, measured in Altitude and Azimuth. Here we are looking at the exact spot on the Earth where the birth took place, the most local coordinates. Please note:

1. The Zenith (Z), which is the point directly above the birth place, extends out above the birthplace (purple dot).
2. The plane of the horizon is 90° from the zenith. This is shown by the red semi-arc in the diagram, extending from the Ascendant (top) to the Descendent (bottom)
3. The intersection of the horizon to the zodiac at 8° of Sagittarius and Gemini marks the

Ascendant and Descendant axis. The Ascendant is where the local horizon intersects the zodiac.

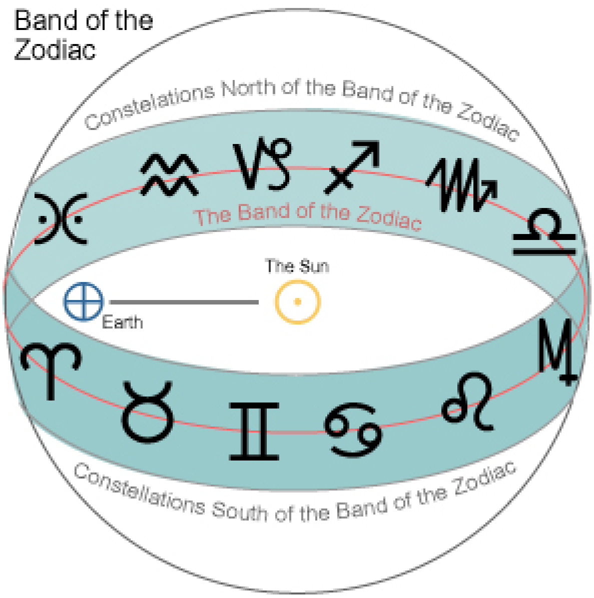
4. The horizon system is oriented or tilted toward about 8° Virgo. This point is called the Nonagesimal, a point on the ecliptic +/- 90° from the Ascendant/Descendant axis and near the zenith.
5. The Prime Vertical (East-West plane) intersects the ecliptic to form the vertex and anti-vertex. This would be about 23-degrees of the sign Cancer.
6. The North Pole (NP) is shown, which is the same on the geographic globe and the Celestial Sphere.



The Tropical Zodiac or Ecliptic

The term "ecliptic" is the astronomical word for what astrologers call the plane of the zodiac. Although, as astrologers, we all use the zodiac or ecliptic in our work, let us review just what it, in fact, is:

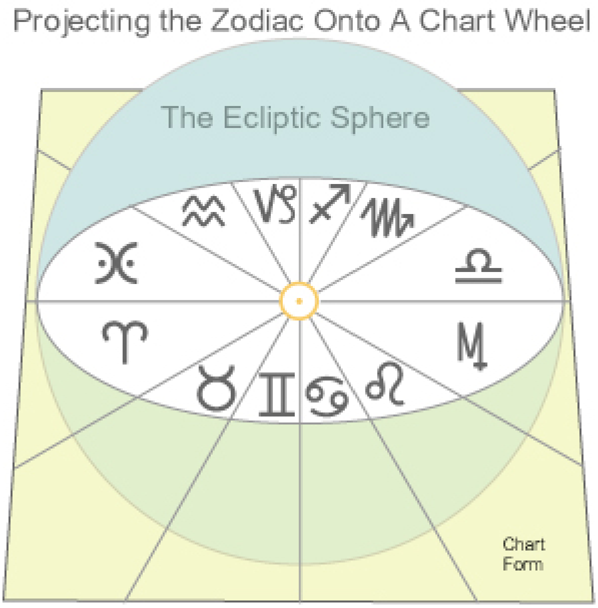
The Ecliptic or zodiac is the plane of the Earth's orbit and, like a vast sheet of glass, it can is considered to extend infinitely in all directions. In other words, the 360° orbit of the Earth around the Sun describes a plane that passes through the center of the Earth and the Sun. By definition, our Earth ever moves only within this thin plane in its endless orbit around the Sun. In the diagram, the Earth revolves in a counter-clockwise direction (as seen from looking down from the north pole of the ecliptic).



The Ecliptic Plane

Let's examine what the zodiac or ecliptic coordinate system is and how we use it in our work. All reference coordinate systems (like the ecliptic) must have a center and here that will be either the Earth or the Sun. We use the Earth as a center for traditional geocentric (Earth-centered) astrology and the Sun as the center for heliocentric (Sun-centered) astrology. As far as the zodiac is concerned, there is no difference between these centers in terms of the infinite distance at which the Zodiac is considered to be. In other words, the geocentric and heliocentric zodiacs are the same because the zodiac is considered to be at an infinite distance from both. The differences between geo and helio planetary positions are due to the differing perspectives of the Sun and planets as seen from either the Earth or the Sun, and are not due to differing zodiacs. Since every center for a coordinate system is surrounded by 360 equal degrees of space in any direction, we must have a plane to which all objects, stars, planets, etc. may be referred – a reference plane. Every coordinate system must have a plane of reference that passes through the center of the system and which divides all space into two equal halves or hemispheres.

We have mentioned, when speaking of the zodiac, that it is the plane of the Earth's orbit that is used as the fundamental reference plane for the ecliptic system of coordinates. We may specify the position of all objects as either above (north) or below (south) of this plane by a number of degrees of arc that range from 0° (the plane itself) to 90° above or below this plane – the north and south poles of the ecliptic. We must also choose (and this is the most arbitrary factor) a point or direction in space (somewhere along the plane itself) from which to measure longitude of arc from 0° to 360°– zodiac longitude. In the tropical ecliptic system used by most Western astrologers, this point is the zero-degrees Aries point or Vernal Equinox (to be explained later).

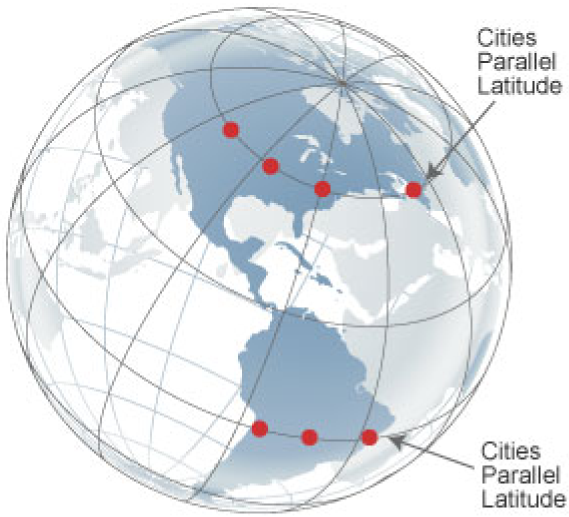


The Ecliptic Sphere

Be sure to get a feeling for what a system of coordinates is and how such a system is defined. All coordinates systems will have a center, a plane of reference (i.e. a north and south pole), and a point along the plane from which to measure the longitude factor. The latitude factor is measured above and below the reference plane.

There are many useful coordinate systems in astrological work besides the zodiac or ecliptic. The two outstanding other systems that must be understood for competent astrological considerations are the Equatorial System of right ascension and declination and the Horizon System of azimuth and altitude. Yet other systems include the Galactic System, Supergalactic System, and the Local System (the systems of near stars of which our Sun is one member). This is in addition to the various orbital planes of the planets other than Earth, each of which has its own "ecliptic," based on the inclination of its particular orbital plane. Still other systems exist, based on the equatorial inclination of the planets, the equator of the Sun, and the Invariable Plane of the solar system. It can get complex.

Parallels of Latitude - Geographic/Celestial



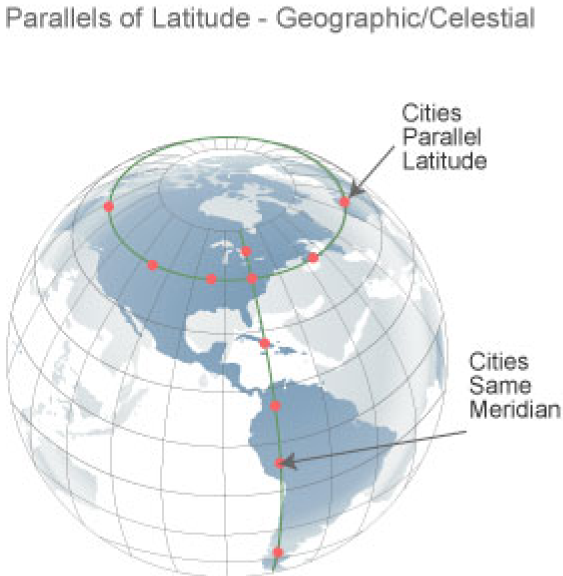
Geographic and Celestial Latitude

We will examine the Equatorial coordinate system of right ascension and declination to see how it differs from the Zodiac or Ecliptic system and how it relates to that system. The equator or equatorial system is based, as many of you will know, on the Earth and its equator as the fundamental reference plane. In fact, the equatorial system is nothing more than the complete set of geographic coordinates (circles of longitude and circles of latitudes of the Earth) expanded and projected to cosmic size. This expanded sphere is called the Celestial Sphere.

In other words, the North Pole of the Earth is extended until it reaches the stars and that point becomes the north pole of the equatorial sphere around which the entire heavens appear to turn. The North Star is used as a reference point for the north celestial pole, because the geographic (and thus celestial) pole points right at it. It is one of two points in the heavens that never change, the other being the South Pole and the south equatorial pole.

The equator of our Earth is also projected to the heavens and becomes the celestial equator and this equatorial plane is the fundamental plane of reference for this system. This celestial equator also forms a band or circle through a series of constellations (like the band of the zodiac) although this circle of the signs of the equator is, for the most part, different from those in the zodiac. Thus there is another set of signs of which most astrologers are unaware.

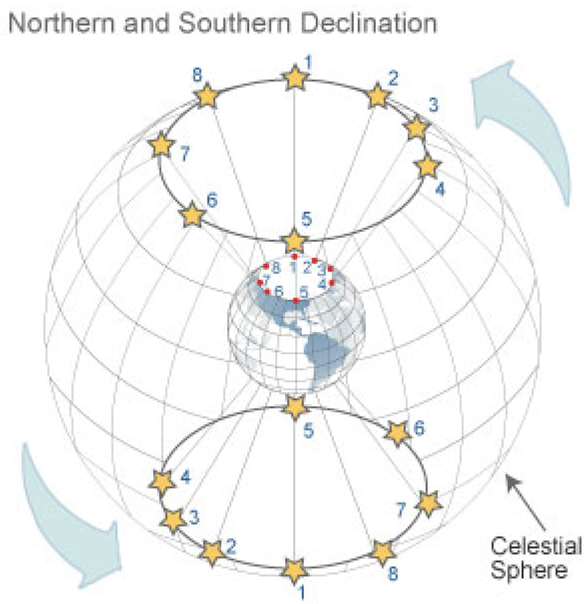
As mentioned, the Celestial Sphere is an exact projection of the geographic sphere and this fact allows for some very interesting astrological considerations. Coordinates on the celestial equatorial sphere are measured in right ascension (similar by analogy to zodiac longitude) and declination (similar to zodiac latitude). We shall explain more about right ascension a little later on. For now, we will investigate the relation between the latitude factor (declination) in the equatorial system and geographic latitude. In a word, they are identical.



Circles of Latitude

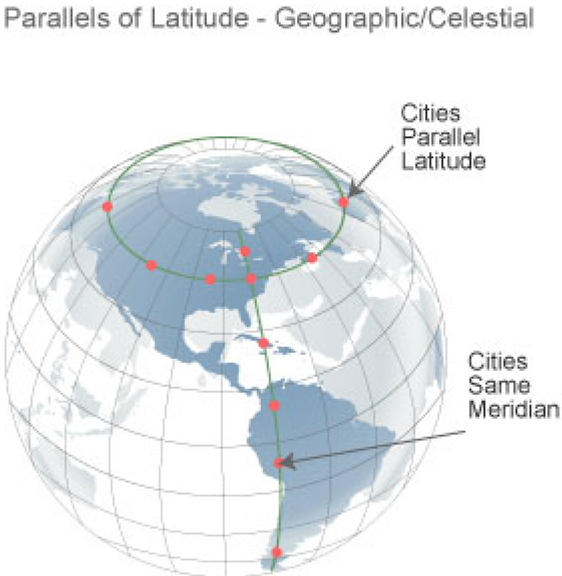
Each place and city on this Earth is located at a specific latitude, somewhere between the equator and the North and South poles. Ann Arbor, Michigan, where I used to live, is located at some 42° latitude, north of the equator. In fact, there is a circle of cities at 42° latitude that stretch across the U.S.A. and on around the Earth. Thus there are other cities on the globe that also are located at 42° north geographic latitude.

Now the interesting fact about the relation between geographic latitude and declination in the equatorial sphere is that there exists a circle of stars on the celestial sphere located at a declination that matches the geographic latitude of your home. This circle of declination and the stars at 42° of declination are the only stars that ever pass directly (by zenith transit) overhead your town. Thus, each parallel of geographic latitude on the Earth has a matching parallel of declination on the celestial sphere. The diagram will illustrate this fact.



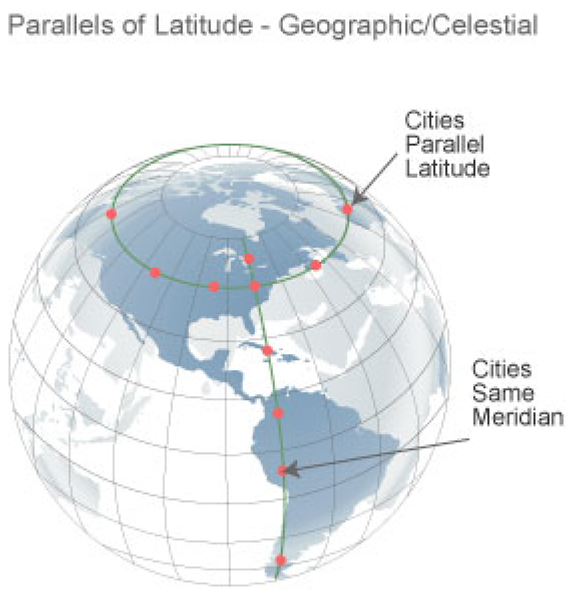
North and South Circles

Ann Arbor is located at point "5" on the rotating Earth. Star "a" is directly overhead at what is called the zenith. As the Earth turns, it will carry Ann Arbor to point "6", "7", and on around in a circle until point "5" is reached once again. There is also another circle of stars that pass exactly under Ann Arbor on the far side of the Earth each day. This circle would be those stars located at a declination circle of -42° (42 degrees south declination). Every city on Earth could be described in terms of the kind of stars and other objects that make up the declination circles that equal the circle of geographic latitude at which they are located.



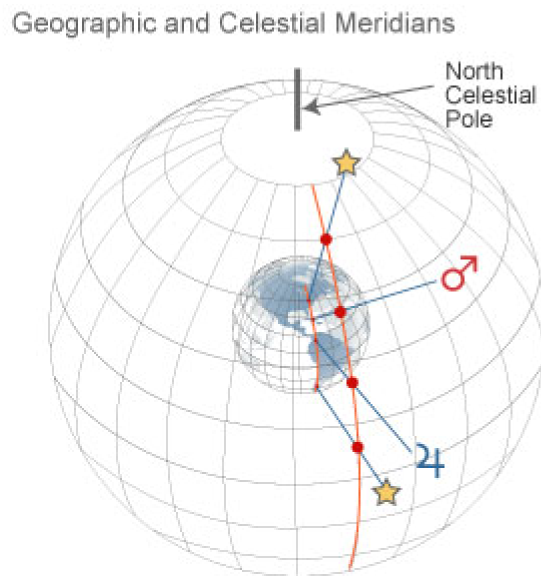
Cities on the Same Meridian

What we have done for the declination factor on the celestial sphere, we could also do for the right ascension or longitude equivalent in this coordinate system. Right ascension is similar to zodiac longitude in that it is measured from 0° to 360°, but it is measured along the equator and not along the ecliptic or zodiac. We shall return to the difference between these two systems later on. Right now, we will investigate the relationship between right ascension and the geographic meridian that runs from the North Pole on the Earth through your birthplace and on to the South Pole.



Longitude and Latitude

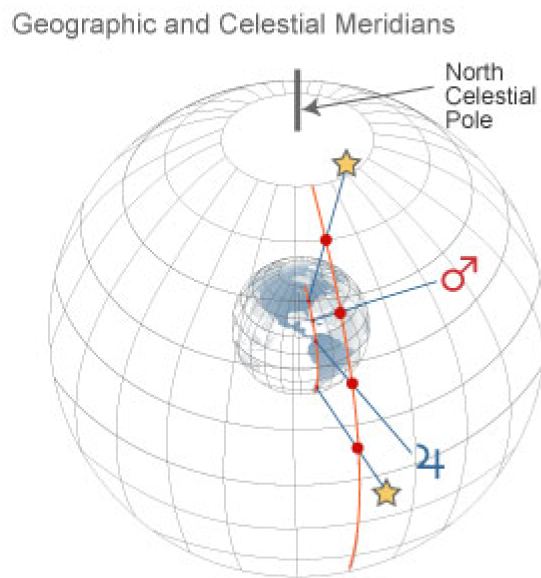
This diagram shows the Earth, on which we have drawn both parallels of geographic latitude and north/south geographic meridians of longitude. The arrow pointing to one of the red dots illustrates a city located somewhere along this geographic circle of latitude. Any atlas will allow you to find other cities (by geographic longitude & latitude) located along the parallel of latitude where you are, and also cities located along the north/south geographic meridian that passes through your location. We have illustrated this with small circles in the diagram that represent other cities located along these two directions on the globe.



Longitude Meridian

We have seen how there is a circle of stars on the celestial sphere that equals the circle of geographic latitude for any spot on Earth. We can do the same for the geographic longitude factor. In fact we do this each time we cast a natal chart and locate the Local Sidereal Time (LST) or Right Ascension of the Mid-Heaven (RAMC). We stop the Earth's motion and hold it still (frozen in time) to see what part of the heavens is overhead our birth place. Another way of saying this: we determine in what direction of the heavenly sphere the Earth was pointed or oriented.

Once we have found the LST or RAMC for a birth, we can look up the equivalent Midheaven (M.C.), ascendant, and house-cusps in any table-of-houses. We can also look up the direction of the heavens "out-there" or overhead on the star maps elsewhere in this section. Your LST. (Local Sidereal time) may be expressed in Hours-Minutes-Seconds (HMS), which you will find along the edge of these maps or in Degrees-Minutes-Seconds (DMS) of arc (rather than time). These too are given on the maps. (HMS may be converted to DMS by simply multiplying by 15, and DMS may be converted to HMS by dividing by 15).



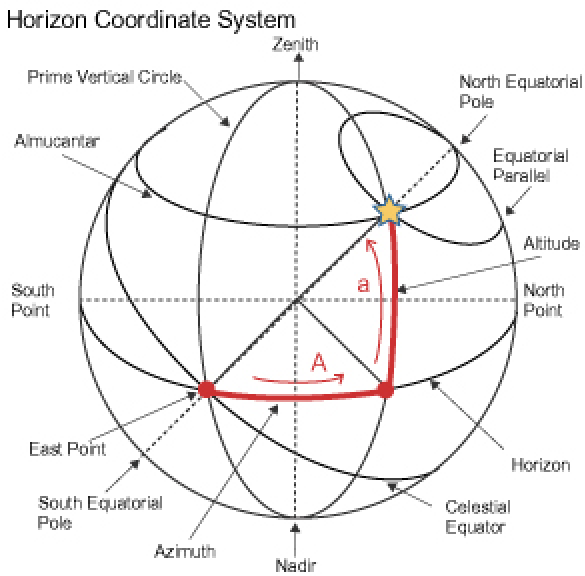
Meridian Alignment

For those of you with access to a standard star map, you might like to look up your RAMC or LST and locate the right-ascension meridian that was overhead at your birth, which gives you the direction in space to which your birth location was pointed or oriented. All stars and points along the line of right ascension running from top to bottom on this map were in line with the geographic meridian for your birth. The diagram will illustrate this:

1. Ann Arbor is located along the 42nd parallel of Earth latitude.
2. The North/South geographic meridian (red arc) passes through Ann Arbor.
3. This geographic meridian equals is then projected onto the Equatorial Celestial Sphere.

4. All points located along this celestial meridian will be aligned and in conjunction with the North/South geographic meridian for Ann Arbor.
5. However, only the upper star is also conjunct by declination (= latitude) for Ann Arbor.
6. The planet Jupiter (shown) would be overhead, but to the South of Ann Arbor and directly overhead a city in South America.
7. However, all the points/objects shown would be conjunct the Midheaven for this chart.

At this point, it is hoped the reader has some feel for how the geographic sphere fits or matches the equatorial sphere. Perhaps it is clear to you why the equatorial coordinates right ascension (RA) and declination are so important in mundane astrology (politics, etc.). For one, any planetary position can be matched to a spot on the Earth by both longitude and latitude, and this is what is done when we trace eclipse paths on the globe. There is not space to go into great detail with this subject, but if the reader understands the simple relationship between the geographic and mundane (equatorial) spheres, many interesting ideas may occur.



Horizon Coordinates

In the Horizon system a plane through the observing point parallel to the horizon is the plane of reference. The poles are the Zenith (point overhead) and the Nadir (point underfoot). The vertical circle through a celestial object (such as a star) and the zenith is the Object Circle. The coordinates are given (for the object) by Azimuth, which is the horizontal angle (A in the diagram) measured from an arbitrary reference direction – East in our case – counterclockwise to the object circle) and the Altitude (a), which is the elevation angle measured upward from the horizon to the object). The great circle through the north and south points and the zenith is the Meridian, and the great circle through the east and west points and the zenith is the Prime Vertical. Circles of parallel altitude to the horizon that are not great circles are called Almucantars.

Horizon Sphere -- A heavenly sphere based on the plane of the observer's local horizon (90° from both the zenith and the nadir), but taken from the center of the Earth.

Zenith -- The zenith is the point directly overhead any spot on Earth.

Nadir -- The nadir is the point directly beneath (opposite the zenith) any spot on Earth.

Altitude -- The angular distance of any body above or below the plane of the local horizon. Altitude is measured from 0° to 90° from the plane of the horizon to either pole.

Azimuth -- The angle measured around the 360° circumference of the horizon, either east or west (there are different practices). The azimuth of an object as measured from the meridian plane of the observer and a vertical plane through any body.

Prime Vertical -- A great circle passing through the zenith (north pole), nadir (south pole), and the east and west points on the horizon.

Altitude Circles -- Parallel circles of altitude, whether north or south of the plane of the horizon.

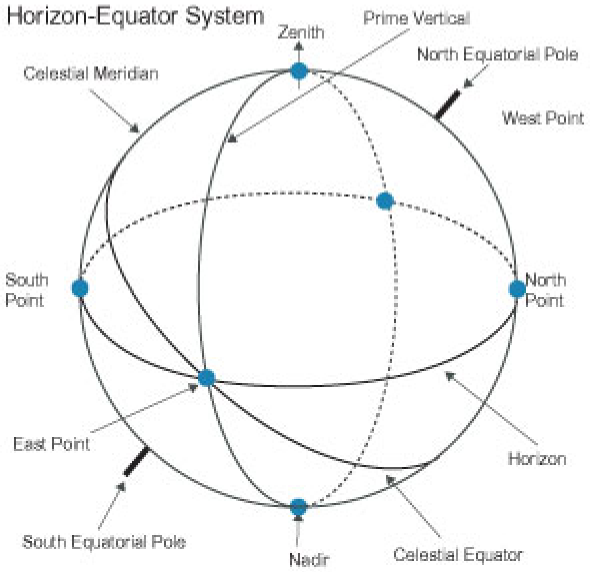
Almuncantar -- Parallel circles of altitude, wither north or south of the plane of the horizon.

North Point -- A point on the horizon to the north of the observer, where the meridian plane intersects the horizon.

South Point -- A point on the horizon to the south of the observer, where the meridian plane intersects the horizon.

East Point -- A point on the horizon to the east of the observer, where the prime vertical plane intersects the horizon.

West Point -- A point on the horizon to the west of the observer, where the prime vertical plane intersects the horizon.



The Horizon System

We will return to some additional ideas as to the relationship between the equator and the ecliptic after we introduce the third major astrological system of coordinates, that of the Horizon.

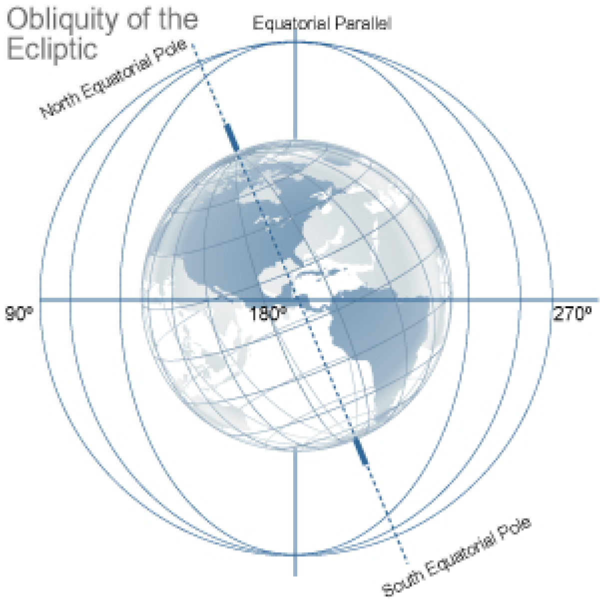
The Horizon system of coordinates represents the third and last of the spherical systems used in constructing a natal chart. In this system, the reference plane is one through the birthplace or observing point that is parallel to the horizon. The poles of this system are the Zenith (point overhead) and Nadir (point underfoot). The latitude-type coordinate in this system is called Altitude and is measured from 0° to 90° from the plane of the horizon to either pole. The longitude coordinate is called Azimuth and is measured from 0° to 360° along the horizon (for astrological use in this book), starting from the East point and moving in a counterclockwise direction through the North point and on around, in the same way that we are used to measuring houses or signs.

The Horizon System is built around the specific place on Earth of the event and all other objects, such as planets, stars, cities, etc. are then expressed in terms of how they were oriented or appear from this perspective. The horizon system is most like the standard road map in that it has a North-South-East-West orientation. The North-South axis is identical to the Celestial Meridian running from the north celestial (or geographic) pole through the observer to the south pole. The East-West circle is called the Prime Vertical and runs due East or West from the observer. It does not follow the East-West geographic parallels of latitude. The horizon system can be anyplace on Earth you are.

The Pole Star (North Star)

The Earth is endlessly revolving, exposing us, wherever we are, to the entire circle of the heavens. At night, we can see the stars, planets, and constellations, change every few hours or so. But there are two places in the heavens that do not change, and that is the part of the heavens directly above (and below) the north and south geographic poles, respectively. Everything revolves around those two points.

In the Northern Hemisphere, there happens to be a star right above the North Pole, and this is called (obviously) the Pole Star. It is also called the North Star. This star has been used forever as a guide star for travelers and seamen, because it is the one celestial object in the Northern Hemisphere that is always there. It does not change.

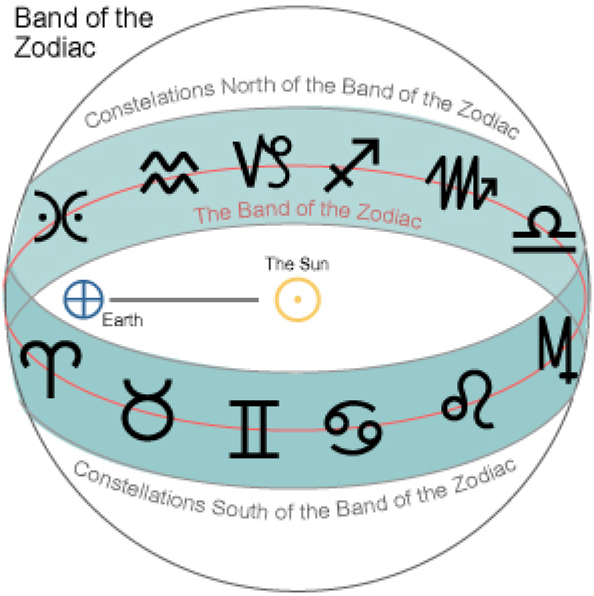


The Obliquity of the Ecliptic

The angle between the ecliptic and equatorial systems, some 23.5 degrees, is called the Obliquity of the Ecliptic, and this angle creates the difference in perspective between the two systems. Let's go over some of the main points of difference between these two systems.

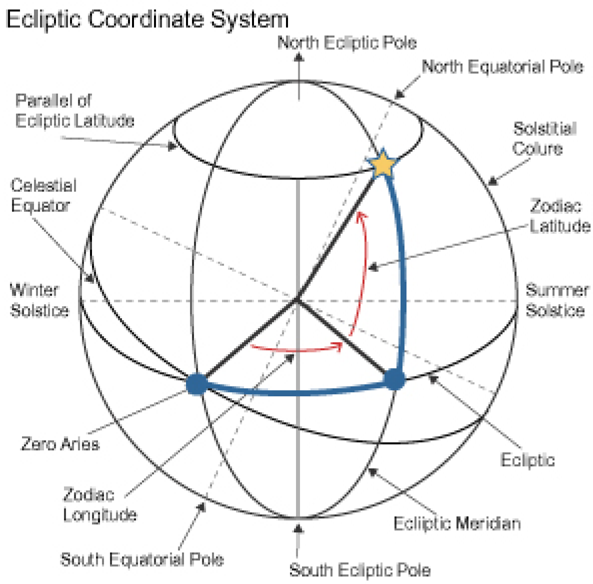
1. The celestial equator and the ecliptic plane intersect to form the two equinoxes and the equinoctial axis.
2. The Vernal Equinox or 0° Aries node or point is the ascending node of the ecliptic plane to the equatorial plane.
3. The Autumnal Equinox or 0° Libra point is the descending node of the ecliptic plane to the equatorial plane.

4. These points and these two coordinate systems are FIXED in space.
5. AT ANY MOMENT and AT ANY PLACE in the Earth's orbit, the ZERO° Aries point is ALWAYS in the same direction and at an infinite distance.
6. The measurement of longitude along the ecliptic or the equator is only identical at the four Cardinal points: the two equinoctial and solstitial points.
7. At all other points, there is a difference between a degree of longitude (the same degree) as measured along the ecliptic and the same degree measured on the equator.
8. Each system is simply tilted at an angle to the other.



The Band of the Zodiac

In fact, this great plane divides all of the universe in two sections or hemispheres containing those constellations of stars above (north) the zodiac plane and those constellations of stars below (south) this plane. The ecliptic plane is also commonly divided into twelve equal 30° sections, the signs of the zodiac. We will ignore for now the argument as to whether the 12 signs of the zodiac fit the star constellations bearing their names. Of the 89 common constellations, these 12 zodiac signs have received very much more attention than the remaining 77 or so other constellation that are scattered about, above and below the ecliptic plane.



Ecliptic Coordinate System

Ecliptic Coordinates -- In this system, the ecliptic or plane through the Earth's orbit is taken as the plane of reference. The co-ordinates used are Celestial Latitude (the perpendicular distance of the object from the ecliptic in angular measure) and Celestial Longitude (the angular distance along the ecliptic between the plane through the object and the First Point of Aries). The Solstitial Colure is the great circle which passes through the summer and winter solstices (the hour circle of R.A. 90° and 270°).

Ecliptic Sphere – Also called the Zodiac Sphere, this is the sphere resulting from projecting the plane of the Earth's orbit and points (its poles) 90° north and south of that plane.

Ecliptic Plane – The ecliptic is a plane that passes through the centers of the Earth and the Sun. It represents the path the Sun's center takes each year on the celestial sphere as seen from the Earth or the Earth's path as seen around the Sun.

North Ecliptic Pole – The point on the ecliptic sphere that are 90 degrees from the plane of the ecliptic, to the North or "above."

NEP -- North Ecliptic Pole.

South Ecliptic Pole – The point on the ecliptic sphere that are 90 degrees from the plane of the ecliptic, to the South or "below."

SEP – South Ecliptic Pole.

Obliquity of the Ecliptic – The 23 1/2° angle (23°27') that represents the inclination of the ecliptic to the celestial equator. This also marks the maximum angular distance that the Sun can reach north or south of the celestial equator at the times of the solstices.

Celestial Latitude (Ecliptic Latitude) -- The angular distance of any object measured north or south of the plane of the ecliptic to the poles, from 0° to 90°.

Celestial Longitude (Ecliptic Longitude) – The angular distance of any object as measured from zero Aries to a plane through an object.

Zodiac – From a Greek word meaning the "circle of animals" is a belt about 18° wide (9° above and 9° below the plane of the ecliptic) within which the planets travel. This circle is divided into 12 equal 30° sections, the signs of the zodiac – Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricorn, Aquarius, and Pisces. At one point (over 2,000 years ago), the signs of the zodiac corresponded with the constellations of the same name. However, due to precession, the signs have drifted westward (backward) until today they are almost an entire sign (30°) off.

Solstices – The longest and shortest days of the year, when the Sun reaches its greatest angular distance from the equator. The longest day is the summer solstice (around June 21) and the shortest day is the winter solstice (around December 22). These two are reversed in the southern hemisphere.

Solstice Points – The instant when the Sun is at either the summer or winter solstice.

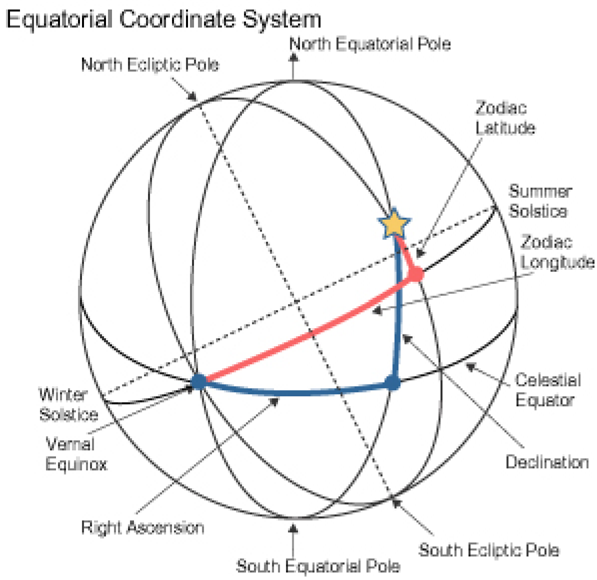
Equinoxes (Spring and Fall) -- This is the instant when Sun crosses the celestial equator at either its ascending node (Spring Equinox, about March 21) or its descending node (Fall Equinox, September 23). At the Spring Equinox, the Sun moves north of the ecliptic plane, while at the fall Equinox, it moves from north to south.

Spring Equinox (Vernal Equinox)

Fall Equinox (Autumnal Equinox)

Zero Aries – The intersection of the celestial equator and the ecliptic. This point undergoes a very slow backward movement.

Colures – There are two, the equinoctial colure and the solstitial colure. The equinoctial colure is the hour circle that passes through the vernal and autumnal equinoctial points (RA 0h and 12 h). The solstitial colure is the hour circle that passes through the summer and winter solstices (0° points of the tropical zodiac signs Cancer and Capricorn at RA 6h and 18h).



Equatorial Coordinates

In this system, the Earth's Equator is the plane of reference. The poles are at the intersection of the Earth's pole and the pole of the celestial sphere, an imaginary surface at an infinite distance with the Earth as its center. This is true for all points on the Earth, latitude and longitude. The poles are the North Celestial Pole (NCP) and South Celestial Pole (SCP). The circle at the intersection of the plane of the Earth’s equator and the celestial sphere is the Celestial Equator.

The great circle through the celestial poles and the object (such as a star) is the object's Hour Circle and the great circle which passes through the celestial poles and the zenith is the Meridian Circle. The coordinates in this system are given by Declination (angle between the celestial equator and the object) and the Right Ascension (angle measured from an arbitrary reference direction -- the Vernal Equinox -- to the object's hour circle). In the above diagram, the darker lines express the position of a star (S) in both ecliptic and equatorial coordinates.

Equatorial Sphere – Also called the Celestial Sphere, this is the sphere resulting from projecting the Earth infinitely into space and it is defined by the celestial equator and the north and south celestial poles.

Celestial Poles – These are directly overhead the Earth’s geographic poles and are the poles of rotation of the celestial sphere of right ascension and declination.

NCP – North Celestial Pole

SCP – South Celestial Pole

Celestial Equator – A great circle projected from the Earth’s equator unto the heavens, an infinite projection. The celestial equator has as its poles the celestial poles and all points on the celestial equator are equidistant from the two poles. As the Earth’s equator rotates each day, it exposes each city on the equator to every degree of the celestial equator.

Equinoctial – Another term for the celestial equator (which see).

Celestial Sphere – An infinite extension of the sphere of the Earth in space.

Hour Circles – Hour circles are great circles passing through any celestial object and through the celestial poles. All hour circles are at right angles to the celestial equator.

R.A. – (See Right Ascension)

Right Ascension (R.A.) – The angle between an hour circle passing through an object and the meridian plane, in the case of equatorial coordinates, zero degrees of Aries. R.A. is measured eastward on the celestial equator from what is called the True Equinox to the body in question. R.A. is expressed in either degrees (0° to 360°) or in Hours-Minutes-Seconds (0h to 24h).

Declination – The angular distance of any object measured north or south of the plane of the celestial equator, from 0° to 90°.

Declination Circle – Parallel circles of declination either north or south of the plane of the celestial equator.

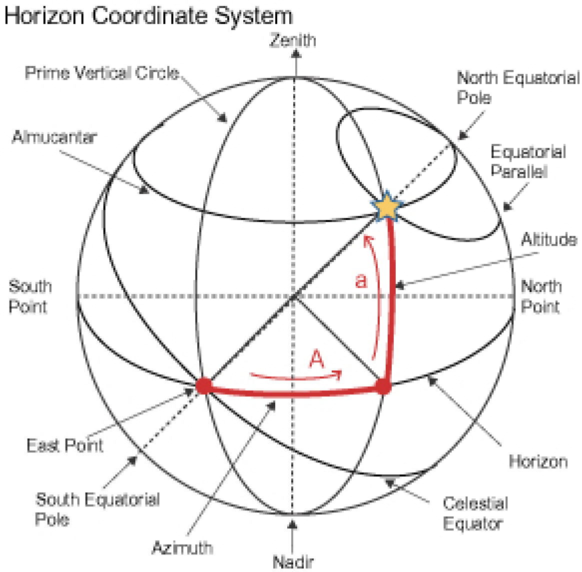
Parallel of Declination -- Parallel circles of declination either north or south of the plane of the celestial equator.

Equatorial Plane – The infinite extension of the equator of the Earth in all directions.

Meridian – A great circle on the celestial sphere through the celestial poles, the zenith of any place or locale, and the north and south points on the horizon.

Prime Meridian – The point of zero longitude measurement for any celestial body. In the case of the Earth, the prime meridian is considered to be Greenwich, England.

Transit – The passage of a celestial object across a particular meridian.



Horizon Coordinate System

In this system a plane through the observing point parallel to the horizon is the plane of reference. The poles are the Zenith (point overhead) and the Nadir (point underfoot). The vertical circle through a celestial object (such as a star) and the zenith is the Object Circle. The coordinates are given (for the object) by Azimuth (horizontal angle measured from an arbitrary reference direction – East in our case – counterclockwise to the object circle) and the Altitude (elevation angle measured upward from the horizon to the object). The great circle through the north and south points and the zenith is the Meridian, and the great circle through the east and west points and the zenith is the Prime Vertical. Circles of parallel altitude to the horizon that are not great circles are called Almucantars.

Horizon Sphere – A heavenly sphere based on the plane of the observer's local horizon (90° from both the zenith and the nadir), but taken from the center of the Earth.

Zenith – The zenith is the point directly overhead any spot on Earth.

Nadir -- The nadir is the point directly beneath (opposite the zenith) any spot on Earth.

Altitude – The angular distance of any body above or below the plane of the local horizon. Altitude is measured from 0° to 90° from the plane of the horizon to either pole.

Azimuth – The angle measured around the 360° circumference of the horizon, either east or west (there are different practices). The azimuth of an object as measured from the meridian plane of the observer and a vertical plane through any body.

Prime Vertical – A great circle passing through the zenith (north pole), nadir (south pole), and the east and west points on the horizon.

Altitude Circles – Parallel circles of altitude, whether north or south of the plane of the horizon.

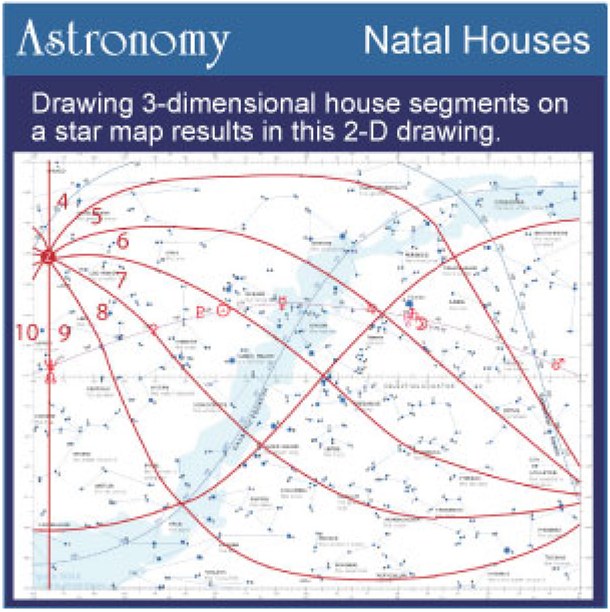
Almuncantar – Parallel circles of altitude, whether north or south of the plane of the horizon.

North Point – A point on the horizon to the north of the observer, where the meridian plane intersects the horizon.

South Point – A point on the horizon to the south of the observer, where the meridian plane intersects the horizon.

East Point – A point on the horizon to the east of the observer, where the prime vertical plane intersects the horizon.

West Point – A point on the horizon to the west of the observer, where the prime vertical plane intersects the horizon.



The Summer Sky

Here is an enlargement of one half of the heavens, what is sometimes called the summer sky (in the northern hemisphere), from Aries to Libra in the zodiac signs. I am using my chart, which has all of the planets in the first six zodiac signs. This is an equatorial star map, as used by astronomers.

Please examine this map along with the following statements:

1. The very light straight line through the middle of this map is the celestial equator, which is the Earth's geographic equator extended infinitely out into space.

2. The very light curved line (above the center of the chart) that intersects the celestial equator at 0°

and 180° is the zodiac or ecliptic, which becomes a curved line when projected on a two-dimensional surface.

3. You can get a better idea of what the zodiac is by imagining this map wrapped around your head, at which point the curving zodiac would appear at a plane set at a 23 1/2° angle to the plane of the equator.

4. The Local Sidereal Time at my birth was 11h 42m 54s of right ascension along the equator and this is equivalent to a RAMC (right ascension of the Midheaven) of 175.70 of arc along the equator.

5. Locate this RAMC on the map. It is the vertical RED line, running up and down the map, at the extreme left side.

6. I was born at a geographic latitude of 40° and that is equivalent to 40° declination on the star map. This is the point where all the house lines converge to a single point. This is the large red dot with the letter “Z” (for Zentih) at the left side of the chart.

7. The Zenith or north pole of my horizon system (above my head at birth) points in the direction of 175.70° right ascension and 40° of declination, which is the constellation Ursa Major (the Great Bear).

8. All points along the 175.70° of right ascension were aligned at my birth. Thus I might also look into the constellations Virgo, Crater, Hydra, and Centaurus to the South and the constellations

Andromeda, Pegasus, Aquarius, Sculptor and Tucana to the North in relation to my birth.

9. The Midheaven or M.C. at my birth is the point where the RAMC crosses or intersects the Zodiac and this is around 175° of ecliptic longitude.

10. You can see that the M.C. is far to my south and not in my "mid-heaven" at all but rather, the mid-heaven of someone living near the equator. This is where you can see the planetary glyph for Neptune at the left side of the chart, just above the celestial equator (the straight line in the center of the map).

11. My natal horizon is the long dark red curved line running across the map, starting in the lower left-hand corner and ending in the upper right-hand corner of the map. .

12. This line of the horizon is 90° from my zenith and nadir. Remember this whole thing is a globe.

13. The intersection of this horizon line to the zodiac in two places defines my ascendant and descendant at 8° of Sagittarius and Gemini. Here, since we are only showing one half of the star map, you can only see the descendant.

14. The intersection of the East-West Prime Vertical to the ecliptic (zodiac) defines my vertex (West) and anti-vertex (East). This is the red house cusp line that marks the seventh house cusp. The Vertex is a couple of degrees before my Sun in the zodiac, actually about 23 degrees Cancer (113 degrees).

15. My planets are marked along the zodiac in their approximate positions.

16. As you can see, planets can only be near the horizon at the ascendant-descendant axis, because they never get too far from the plane of the zodiac or ecliptic.

17. The houses you see in this diagram are the Horizontal House System (I call it the Radiant House system), rather than one of the other systems. I include it here, because it is less confusing to view than some of the other house systems.

18. The points along the ecliptic intersected by these 12 house circles mark the "cusps" or sensitive ecliptic points.

Chapter 16: Introduction Summary

Summary of Ideas

What follows is a brief list of concepts that will help in understanding and using this material:

(1) The "strength" of a natal chart does not depend solely on the familiar zodiac. It involves three distinct and interdependent coordinate systems: Ecliptic (zodiac), Equatorial, and Horizon.

(2) Each of these three systems possesses complete integrity, stands alone, and refers to a different order or level of our life activity. We can benefit from familiarity with all three, and should not be dependent only on the zodiac frame of reference.

(3) These three coordinate systems (zodiac, equatorial, and horizon) are inclined to one another by attitudes or angles. It is a matter of “inclination.”

(4) The angles of inclination of these three coordinate systems to one another must be appreciated in any attempt to evaluate the "meaning" of each coordinate system as well as the standard astrological chart.

(5) It is my experience that these differences in angle or inclination refer to similar changes in approach or attitude, to life perspectives, as in: “As above, so below, *but after another manner*.”

(6) There is great opportunity and need for research as to the appropriate astrological use for each of the above three coordinate systems. We know the zodiac system, but are lacking in understanding of the other two, not to mention heliocentric coordinates.

(7) Each system is as useful in combination with the others as it well-understood in its own right as a "stand-alone" way of looking at an event. In other

words: learn about each coordinate system *before* you try to combine them.

More: The Natal Horizon

(1) The radix (natal) Horizon system should be traced upon both a map of the heavens and a map of the Earth. These two maps can be superimposed on one another. If the drawn lines are crude, much can be learned.

(2) The natal horizon provides the most "personal" or unique sense of the individuals orientation to space and time.

(3) The natal horizon is oriented at a unique attitude or angle to the zodiac, equator, galactic, and supergalactic planes and has a "Ascendant-Descendant"-type axis to each of these planes. This fact needs to be appreciated, and the horizon must be drawn out to visualize this.

(4) Sensitive or powerful points in astrological work such as the Ascendant, vertex, and house cusps are but the tip of the iceberg, so to speak. Each point or node is the result of an interaction of at least two coordinate systems. Study is required.

(5) The entire Horizon system is sensitive, not just the commonly used points like the Ascendant and Midheaven, and the local horizon provides a unique orientation for an individual to all cosmic structure.

More yet: Cosmic Systems

(1) The vast cosmic planes, such as the galaxy and supergalactic systems (as well as their centers) are important, way beyond what astrologers currently imagine.

(2) Where the celestial matter is concentrated along these planes, in these directions, and at these inclinations or angles is of the utmost importance regardless of any distance considerations.

(3) The fact that the galactic and supergalactic planes are at about right-angles (84°) to one another has yet to be appreciated by the average astrologer. This intersection should be studied and understood. One node falls on the Pleiades star cluster at 29 degrees of tropical zodiac sign Taurus.

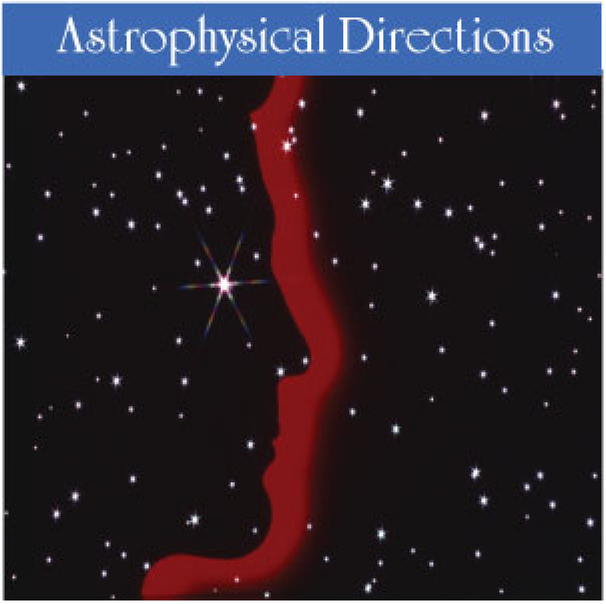
(4) The centers of these two massive systems (galactic and supergalactic) are at about right-angles to one another along the ecliptic and near the cardinal points of the tropical zodiac.

(5) The closer center of the galaxy possesses more "attraction" upon our self than the more expansive and inclusive supergalactic center and plane. See the section on “Cycles, Circles, and Circulation” elsewhere in this book.

(6) The traditional tropical sun-sign interpretations take on increased meaning in terms of their alignment to either the axis of the galaxy versus the supergalaxy.

(7) I suggest that the galactic axis (Sagittarius-Capricorn and Gemini/Cancer) may be associated with the more aggressive nature of the Western Judeo-Christian religion (as a type), while the supergalactic axis (Virgo/Libra and Pisces/Aries) may be associated with some of the Eastern religions, in particular Buddhism.

These centers are in harmony or resonance with the type of religion mentioned and these religions act out or serve as local representatives of the principles at work in these cosmic centers.



Last But Not Least ...

And last but not least, it has been my experience that:

(1) A given an individual will be attracted to those points or parts of cosmic structure that are prominent or important in their own natal configurations.

(2) This amounts to a process of self-discovery in a "macro" sense.

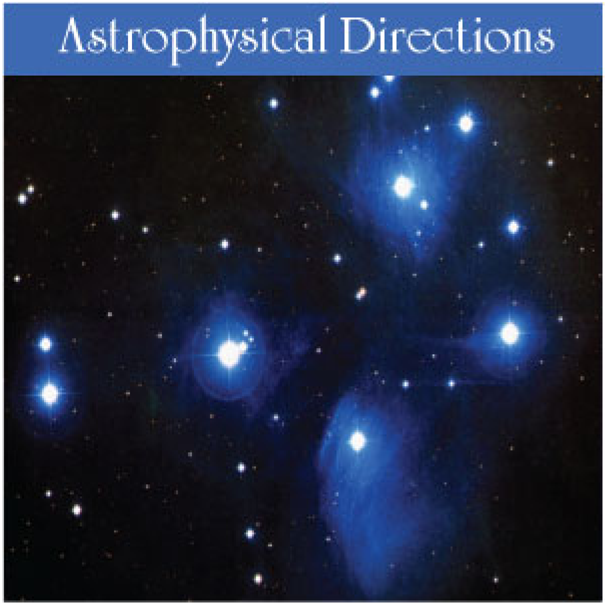
(3) That remote events (in space/time) are represented, portrayed, and acted out by individuals on this Earth.

(4) The KEY to this is the orientation of the various systems to one another, their inclinations.

(5) The Earth/Sun axis has shown itself of great importance in our research in this regard.

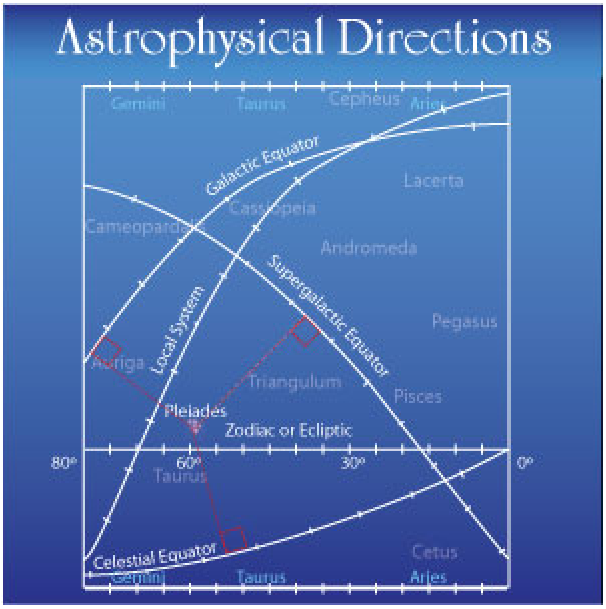
(6) Even a simple classification of individuals in terms of whether their Midheaven is more aligned to the

galactic or the supergalactic axis may provide a great amount of useful and dependable information. In fact the galactic plane/center and the supergalactic plane/center pass overhead each day.



The Pleiades: Most Photographed Object

Our cover illustration is of the Pleiades cluster of young stars in the constellation Taurus. The Pleiades is said to be the most photographed celestial object. This star cluster is aligned by zodiac conjunction with the point or node of intersection of the vast galactic and supergalactic planes. When the Earth stands at this point (by conjunction and opposition) twice a year, it is at the mid-point or balance point between these great planes.



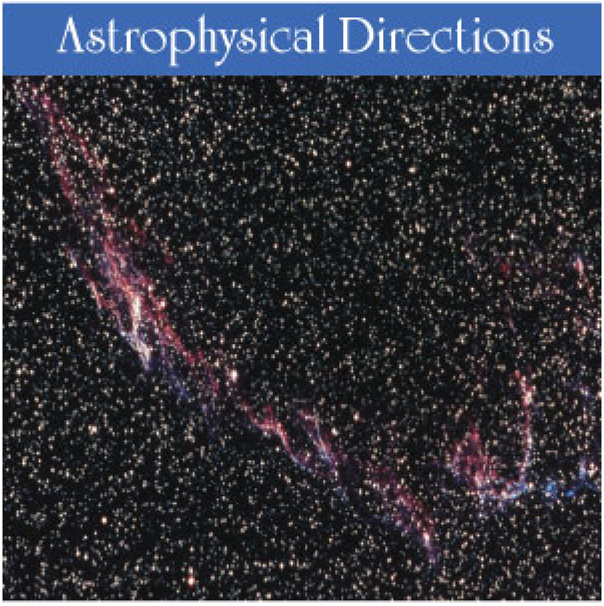
Pleiades Map

The diagram (above) shows how the Pleiades may be related to five different coordinate systems:

Locate the Zodiac, Celestial Equator, Galactic Equator, Supergalactic Equator, and the equator of the Local System. The dotted lines (and squares) represent a right-angled projection of the position of the Pleiades to the various reference planes.

Where the Galactic and Supergalactic equators intersect and cross (toward the upper part of the chart), if this point is projected unto the zodiac, this is the Pleiades star group, the seven sisters, which is also the guiding impulse for this book, and the stars shown on the cover.

Space Coordinate Systems



Discovering Coordinate Systems

There are yet other coordinate systems of interest to astrology besides the ecliptic, equator and horizon systems. There is the equator of the Sun and the Invariable Plane of the solar system (described elsewhere) as well as the orbital and equatorial planes for the various planets.

Beyond our solar system are much larger orderings of stellar material such as the Local System, the near stars in the solar neighborhood, the galaxy to which we belong, the Local Group of galaxies that includes our galaxy, and the local Supergalaxy or cloud of clusters of galaxies.

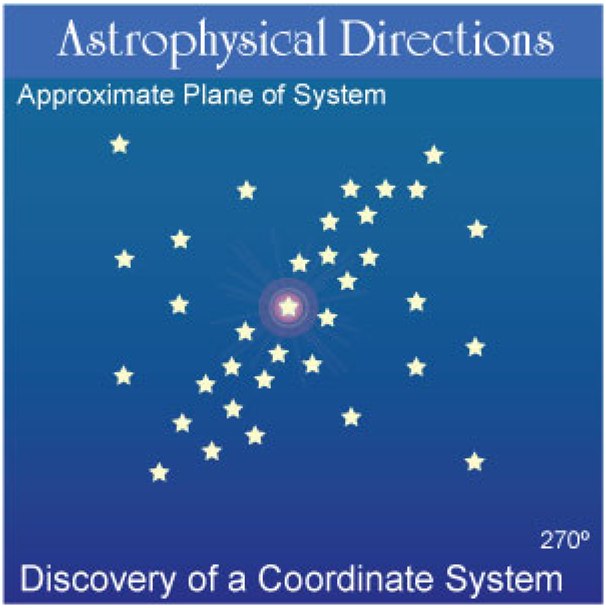
Each of these larger orderings has a plane of reference toward which its members concentrate and that plane is inclined to our zodiac by a particular angle or attitude. While all of these systems are worth investigating, the two which have shown themselves to be of greatest value in my research have been the galactic plane and the supergalactic plane. We will describe how some of these large systems are discovered and defined.

A Central Starting Point

Every system of coordinates (such as the zodiac) has a center. The most common centers in use are the Earth & the Sun, although for certain purposes it is useful to use more distant centers such as the galactic center or supergalactic center.

Connecting the Dots

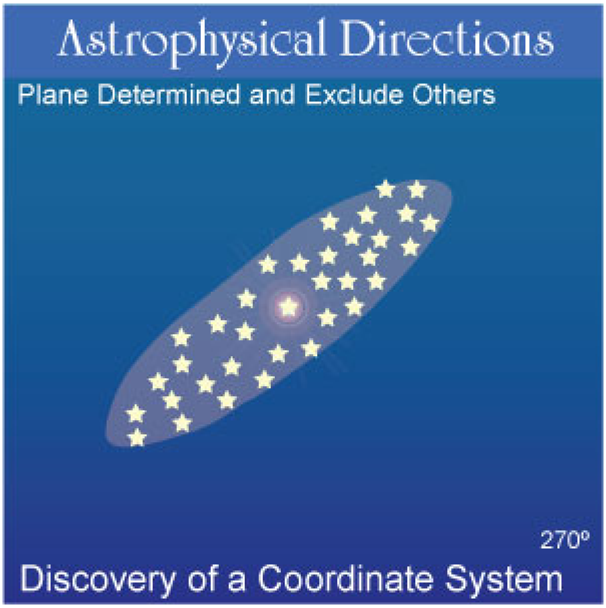
Centers are easy to understand. Every star in the heavens is itself a center and is connected to every other star by at least one beam of light.



Resolving the Equatorial Plane

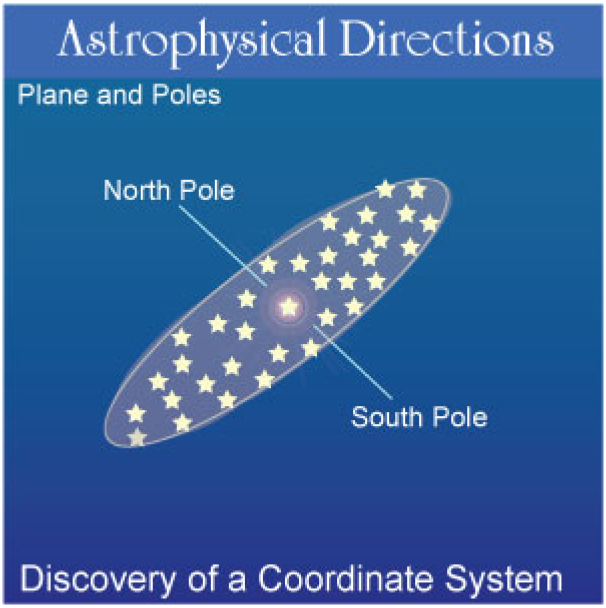
As we have presented earlier, a center (considered by itself) offers no way to measure or point out the direction of objects in space, all centers being equal. A coordinate system must not only have a center, it must also have some kind of equatorial reference plane that divides the heavens into two parts, so that ideas of "above" or "below" are possible. This plane should have some reason to be placed where it is rather than just anywhere. We must also have some point along this reference plane from which to measure arc from 0° to 360°.

The vast cosmic reference planes like the galaxy were discovered in a gradual fashion. Men who studied the stars noticed that in some sections of the sky, there were many more stars than in other sections. In time it became clear that the area in which many more stars were concentrated extended on either side of the Earth, forming a vast belt or ring around the heavens in all directions. It was seen that this concentration of material was not a chance clustering, but a vast superstructure containing the majority of all the material, light, etc. in the near universe of our solar system.



The Circle of Best Fit

When a "best fit" circle was imagined and drawn through the denser parts of this belt, it divided the heavens into material located above and below this circle or equatorial plane, like a vast sheet of glass.



The Poles

A north and south pole were also projected that "fit" the equator. The equatorial plane and the poles defined, there remains but one other step to perform: pick a point in space along this plane from which to measure longitude.

How to Measure on the Circle

This is the most arbitrary step in the process of defining a new coordinate system, since all directions are equal along a circle. Astronomers attempt to choose the most significant and least arbitrary point along the equatorial plane of a system to be the zero longitude point. For instance, in galactic coordinates, the direction of the galactic center is now used as the zero point, and so forth. All of the above mentioned cosmic super-system were discovered in this manner.

Chapter 17: Centers and Circulation

Cycles, Circles, Centers, and Circulation

A central idea emerging through my recent cosmic or deep-space research is the use and value of the various astrological coordinate systems (Local Space, Geocentric, Heliocentric, Galactic, etc.) as actually best representing the different levels of our life experience. We have been using some of these systems for calculating our astrology charts for centuries, but few of us have thought to extract from them their unique perspectives *interpretively*.

The word CENTER can mean both the same and yet different things to individuals. The center about which our own life appears to revolve is sacred to each of us in its ability to reveal or communicate to us the essence or identity of ourselves, who we are. It is our wellspring or source, our identity.

The center for each of us always refers inward toward our essence, and yet the center or lifeline for one individual may be a new car at one point in their life, a new wife or a child at another point, and so on. However, at each point that center is inviolate for each of us, although the outward form of what we take for our "lifeline to the center" may be constantly changing.

It should come as no surprise to us that the different kinds of “center” may be conveniently expressed in the various coordinate systems of astrology, each of which represents a different perspective on the same given moment in time and space. These different perspectives, each with their individual centers and views, are appropriate or useful for different kinds of inquiry into life.

The particular origin or center chosen for each inquiry should most correspond to the center of gravity, the "kind" of question or inquiry or level being considered.

For example, astrology as we know it, combines three different coordinate systems and planes to arrive at the traditional natal chart that we all use, the Ecliptic (Zodiac Longitude and Latitude, the Equatorial (Right Ascension and Declination) and the Horizon (Azimuth and Altitude).

Although these three (and other) coordinate systems interpenetrate and are related to one another in various ways and are used conjointly, they each offer a very distinct and valuable perspective, when used alone. Why do we not study these views?

Thus for an examination of our personal differences and circumstances, the specific terms of our life (what passes for astrology in most parts of the world), astrologers traditionally use the traditional geocentric astrological chart, with its familiar M.C., Ascendant, houses, etc. In general, Studies of the general terms of mankind (mundane astrology) involve consideration from the center of the Earth where we live and work: Geocentric Astrology.

For a study of the motion and relation of the self within the solar system considered as a functioning whole, the Heliocentric Ecliptic System with the origin at the Sun center would be appropriate. In this helio coordinate system, we can examine the archetypes of life and consciousness, and in general questions traditionally referred to religion, perhaps more recently also considered by some as psychological.

In like manner, Galactocentric and super Galactocentric coordinates are appropriate for dynamical studies of the larger or more cosmic structure of our reality, in particular the direction (or anti-direction) of their centers. For each of us, there may be moments and even days when our awareness is truly of or in synch with cosmic dimensions. After all, it is there. It just may be too obvious or general for us to pick up on. Vast centers are ubiquitous.

Perhaps we could agree that there are different levels of truth or reality. What is essential as a kernel of truth to one may appear to another as one example among many of a larger ordering or structure. When we each refer to our center, the center around which we revolve, we share in the common idea of centers and yet different ones among us revolve around or consider what is central or essential differently. All reference to different centers simply points out the lack of “identity,” and that these seemingly different levels or centers (in fact) form a continuum – a continuing experience or identification. All centers are linked or shared, somehow.

In other words: all of these larger systems such as the Solar System, Galaxy, and so forth include us (here on Earth) within their reaches like a mother holds a child within her womb. We are the children and particular representatives of Earth, and the solar system, but also of the Galaxy and beyond. Their nature, identity, and self (Earth, Sun, Galaxy, Supergalaxy, etc.) are Identical with our own. In fact, we have come up through this "outer space" *through all the time there is* to BE HERE NOW our self.

Our day-to-day consciousness continually circulates from more particular awareness to more "cosmic" awareness and back again. The exercise of various coordinate systems, like exercising our muscles, can serve to remind us that *all* reference to centers (all referral in fact) indicates an attempt to achieve circulation (circle or cycle) or identity, and to “RE”-MEMBER or remind ourselves of who we already are and have always been.

In other words: all discovery is Self discovery and *identification is circulation*! Cosmic events and cosmic structure are a very consistent and most stable reference frame through which to come to know ourselves. If, in the flux of life, as astrologers, we are looking for a convenient map of our inner and outer experience, we already have it in the various coordinate systems we have always had at hand.

The use of these inclusive (nested) meta-coordinate systems is not the symbolic process some suggest, but here the symbol in fact is real. We are not working with analogies or, if we are, the analogy is complete down to the specific example through which we discover the virtual process itself – our Life.

As my teacher taught me, “God” is no beggar, creating a symbolically true but specifically disappointing creation such that we should have to "touch up" his creation or somehow have to make the ends meet. The ends already meet! It is we who will change first our attitude and then our approach to this creation. And these changes in attitude, this reorientation in our approach to what is unchanging or everlasting in life, represent the specific areas where the exercise and use of various coordinate systems of understanding our life become important to present day astrologers. To discover our own orientation and inclination -- that we are already perfect representatives of all space and all time, acting out in detail through our persons events of a so called "cosmic" nature that occur in space at remote distance and times. Is this not what astrology is about?

That we may each discover that supernovae and black holes are not simply some ever-distant cataclysmic events, but are (rather) part of our own everyday experience acted out in fact by persons within the galaxy of our own experience, and that the goal of our study and our inquiry into astrology is to re-present and reveal the nature of ourselves and our intimate circulation and connection and identity in the Heart of the Sun, Heart of the Galaxy, Heart of the Supergalaxy. In a word, and here is the point: the fact that all *identification is simple circulation (a* continuing or circle), and all Inquiry, questioning and search can but end in the discovery of our Self whether "writ small" in the corners of our personal struggle or "writ large" across the very heavens. Again: all self discovery, all Identification is re-discovery and simple: CIRCULATION.

Local Attraction

As we look into the Sun during the course of a year and describe the qualities of those who are born in the various signs, we succeed in defining NOT the position of the Sun, but that of the Earth in relation to the Sun. We all know this.

This illustrates an important axiom: All inquiry into greater centers does not reveal the nature of that center (in itself), but rather reveals our relationship to that center, reveals something about ourselves. In other words:

Centers serve to mirror or reflect.

Their function is to reveal to us not their intrinsic nature, but our own. Revelation is (and has always been) the sign of communication with *greater* centers or planes. Revelation, not of some far off distant entity or "God," but always of ourselves and the “God” in us. We discover the God in ourselves.

In a discussion as to the qualities of the centers of the Galaxy and Super Galaxy, we can understand that inquiry into the direction of the Galaxy will serve to reveal the nature of our own Sun, while inquiry into the Super Galaxy will serve to reveal the nature of our Galaxy. The idea presented here is that it is the *nature* of higher centers to reflect and respond to more particular or local centers. Higher centers reflect or show us, ourselves.

At this point another very significant Axiom emerges. The experience of physical attraction (traction = to draw across or towards) or gravity is primarily a *local* phenomenon. For instance: we directly respond to the attraction we call “gravity,” that of the center of the Earth. Our Earth responds (by gravity) to the center of the Sun, the Sun to the Galaxy, and so forth. Yet as individuals we are not aware of the pull of the Sun on the entire Earth, much less of the galaxy on the Earth, or again: attraction or gravity is always a sign of a *local phenomenon*. This is an important point. Let me explain.

This perhaps will make more sense in our practical affairs if we put it this way: A sign of our communication with higher or "vaster" centers (“God” or “Total Awareness”) is not a physical gravity (graveness) or attraction, but always an *enlightenment*, a releasing and accepting of the nature of the particular terms (terminals) of our existence. Knowledge of so-called inner planes exhibits itself to us through a process of reflection or mirroring of our self rather than through the presentation to us of something new or somehow "other."

Let me put it crudely, as we might encounter this principle on a day-to-day basis. When I was growing up I was seemingly attracted and drawn into the sphere of all kinds of local power merchants, would-be "gurus" who ruled by their personal power and attractiveness. I, who knew nothing then, lived in terror of these powerful merchants of fear, and struggled to keep from being drawn into an orbit around them. I was foolish enough to think this was what teachers were supposed to look and act like.

Later, when I met my first real teacher, all of this changed, and I could see all of these phonies were no different that I was, struggling to define and assert themselves. What my teacher showed me was not a powerful center around which I was to orbit, but, instead, a kindness and interest in me that I had never before experienced. In fact, my teacher knew how to appreciate and care for me more than I know how to care for myself. In his long-gone reflection I saw myself, and learned something about who I was, not how powerful he was. He had the power to reflect me to myself.

From that day forward, I never was fooled by the would-be guru, with their fierce looks and demands. I knew that any real teacher would reflect me and help me to better know myself.

This is what I am trying to say here, when I say that higher centers mirror or reveal to us, reflect our own self, and do not themselves exhibit a greater <u>intrinsic</u> attractiveness or gravity than we (ourselves) already have. In other words, inquiry into centers reveals to us our own essential sense of attractiveness or gravity, not of some "other."

In fact, it is the nature of centers, higher centers, to be “non”-material or non-physical, by definition. Our inquiry into this realm of centers is limited only by our fear or reluctance to see our self in this mirror, and seeing through the back of the mirror has always been a sign of Initiation. To sum this up:

Greater centers mirror or reflect our own self and nature, revealing to us our essential identity as already a part of a larger whole, and enlightening us of (or from) our "grave-ness” and the burden of an apparent loneliness or imagined separation from that whole.

These centers are our personal welcoming committee, helping us identify ourselves as already belonging to a line or lineage, stretching back as far as life itself.

With this idea in mind, let us resume our investigation as to the nature of the Galactic and Supergalactic Centers. Given the above, we can expect the Galactic Center to exercise considerable greater physical attraction on our Sun (and ourselves) than that of the local Super Galactic Center. In fact, one of the identifying features of the Galactic Center (GALACTIC CENTER) at work as revealed in chart analysis (research by astrologers Charles Harvey, Theodore Landscheidt) is a certain "macho" like quality, a sense of strength and power perhaps typified in the zeal and self-righteousness of certain extreme religious factions. Or more simply: this tendency in the qualities of Sagittarius and Capricorn of sternness and physical action or "power." Everything is already conveniently embedded in the meaning of the common zodiac signs.

Another way to put this is to point out the great ability and power of the Galactic Center as represented (when strongly aspected) in the natal chart to move and attract others. We find this feature in the charts of great political and religious leaders who possess the power to move nations to action. The Galactic Center figures in these charts in the traditional astrological ways -- by conjunctions and other aspects to the Galactic Center. We may contrast this "macho-like" quality found in the Galactic Center to the qualities that indicate the presence of Super Galactic Center (SGC) in natal charts. Here we look to the traditional qualities of Virgo and Libra -- that of care, service, reflection, and love.

Perhaps the best representative of the Super Galactic nature occurs in the Eastern religion Buddhism, in the idea of compassion and especially in the beloved figure of the Bodhisattva, a being who is literally devoted to the service of all life until ignorance vanishes in every one in complete identification of self as one with “God.”

The Galactic Center is located around 26 degrees of Sagittarius. The Supergalactic Center is located around 1 degrees of Libra, roughly at right angles to one another.

We do not find the SGC as physically powerful and moving as we do the GC. In the West, the traditional god figures are more fierce and full of the "fire and brimstone" approach than of the endless care and service as typified in some of the Eastern traditions.

In fact, only in these times we are now living are the "servile" qualities associated with Virgo sun sign coming to be appreciated as a power in themselves. In other words, the SGC represents a non-material or essentially a passive power rather than the more active kind of power as seen in the Galactic Center Idea. In the Bible it repeatedly says "This came to pass... that came to pass." The passive genius, not active in the "doing of things" but rather active in the "undoing of things," that is: helping things to pass from this world. This SGC is a non-material or spiritual task and genius equally to be valued along with the more active One-who-does-things or brings-things-to-be in this world (G.C.). We can see these two archetypes at work in the world, and they may be conveniently studied in their local representatives: the Galactic and Super Galactic centers and planes.

So Inclined

"As Above ,So Below, *but after another manner*," familiar as an occult maxim, might be the perfect description of what is involved in understanding the various astrological coordinate systems and their transformations. It is easy to communicate the concept of "wheels within wheels" (larger systems containing within them nested smaller systems), and this has resulted in the popular idea of the chakras or planes (planets) of our experience and Self as an ascending hierarchy of levels, each inclusive of the preceding level.

What is not generally appreciated, but which becomes increasingly clear when we examine the actual structure of the various cosmic systems is not only the idea of larger systems embracing the small systems within them (levels), but the fact that each larger system is also differently *inclined* to the preceding one. It should be understood that aside from the often tedious mathematics involved in coordinate transformations, there is an accompanying philosophical or psychological adjustment to be made, a shift in viewpoint, a change in the approach or attitude to the subject.

So, there is not only an “expansion” in perspective when we move to a larger coordinate system, but there is also a reordering of our sense of direction. This is what makes it so difficult for an individual to see beyond his or her present dimension and get a feel for what is perhaps their inevitable future. There exist what are termed "event horizons," beyond which we cannot understand how life can go on.

An example of some event horizons: puberty, marriage, child birth, and death, to name a few of the classics. We cannot see beyond our present sphere into what our future might be like in these other dimensions because we cannot help but conceive of these events in terms of our present line (linear) of thought. To pass through these event horizons involves total change, not just an extension or expansion. We do not watch our own change, for we are what “Is” in fact in transition or change. *We* are changing. As I used to put it to myself: I was wondering what I was going through, until I realized I was going through.

The idea presented here should be obvious: the crossing of an event horizon involves simple reorientation on our part, call it a change of approach or attitude. The new dimension or sphere we enter turns out, after our adjustment or change, to reveal our previous or past life in new light. We see our old behavior and opinions differently in our new approach to life. It may be very difficult, as we all know, to communicate this difference to one who has not yet had that experience. What has changed perhaps most is our INCLINATION. We do not want the same things we did want, or we now want them in a different manner. We are no longer inclined such that we feel the way we used to. Our life now revolves around a different center than before -- a wife or child, for instance.

We not only revolve around a different center or point to a different star, but that amounts to a change in inclination and direction. That change in inclination is what is hard to convey to someone looking to have that experience. We call all grasp the idea that a “greater" experience will embrace our previous experience like a set of Russian nesting dolls. We all get that.

What has not been properly presented is that along with the expanded experience and the embracing of what went before is a shift in inclination, a new perspective. If we are studying with an enlightened teacher (from our perspective), we tend to imagine an expanded consciousness, but always in relation to our current center. We don’t know, spiritually or psychotically speaking, where a deeper or “greater” center is located, and this by definition. If we did, we would already be oriented.

What the teacher does is very clear in Asian religions, where the teacher gives what are (interestingly enough) called the “pointing out” instructions, after which the student, with some practice in day-to-day life experience, manages to get the “point,” and, through an often slow and painful time, manages to reorient themselves to point to the new center. To “get the point” here means to get reoriented.

Everything shifts, and the previous center is no longer considered “central,” and either dissolves or looses interest or magnetism for the student. This is the idea of centers we are presenting here, only through the wonderful precision of these natural astrological coordinate systems.

In fact, many of these principles are graphically revealed through the study and exercise of the various astrological coordinate systems. For instance: what appears in one system as isolated and singular entities that are apparently unconnected, when viewed in the perspective of another system define the basic shape of the system itself. How often in our lives does some singularity appear as if an other and foreign entity, but later, when we have experienced several of this type as representatives of a kind at first unfamiliar, this same event becomes recognizable to us and loses its threatening quality. It happens all the time to each of us.

I cannot recommend strongly enough the exercise of these various ways or systems for understanding our universe to astrologers practicing today. Let us examine briefly some of these larger systems and their systems and their Centers. For those of you interested in a more thorough description and catalog of the various members of these systems see my book: “Astrophysical Directions” (1976).

Cosmic Systems and Centers

1. SOLAR SYSTEM Center: Sun

2. LOCAL SYSTEM (Gould's Belt) This is a group of some 10 to the 8^{th} stars of which the Sun is a member. The Local System, originally thought to be a minute galaxy embedded with the Milky Way, is considered to be an ellipsoid of 700x200 parsecs with the long axis parallel to the New Galactic Longitudes 160-deg/340-deg and located in Orion-Cygnus spiral arm. The centroid of the Local System is in Virgo at about 15deg25' with nodes to the Ecliptic at 10deg22' of Sagittarius (North node) and Gemini. The system is inclined to the ecliptic by about 66 degrees. Note – positions are of the Epoch 1950.0.

3. LOCAL GALAXY The Milky Way. Estimated to contain 10 to the 11th stars, The Galaxy is a disc-like structure with a diameter of some 30,000 parsecs, a central ellipsoidal nucleus of about 4000 parsecs, and an average disc thickness of several hundred parsecs. The nodes and center (about 26-degree of Sagittarius) in relation to the ecliptic are given elsewhere. The Sun is located some 10,000 from the Galactic Center.

4. LOCAL GROUP OF GALAXIES The local group includes about a score of member galaxies...the largest of which is the Andromeda Galaxy (M 31), our galaxy, and M-31 revolve around a common center of mass roughly in the direction of 27-degress in the Sign Aries.

5. LOCAL SUPERGALAXY Our Galaxy is part of a vast flattened super system of galaxies some 40 megaparsecs in diameter, with the center (at 1 degrees of Libra) in the great Virgo Cluster some 12-16 megaparsecs from our Sun.

Chapter 18: Star Catalog

This Section provides several features. First, here you will find more extensive listings of the various types of objects. For example, here are some 750 fixed stars listed here, and so on. This is not true for all object types, but is true for the majority of them. Each group is sorted in zodiacal order. Below is a list of the various groups to enable you to find them quickly.

After the type lists you will find a complete running list of all points (fixed stars and deep-space objects) in zodiacal order, making it simple to located any particular part of the zodiac.

CG Clusters of Galaxies

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CG 08°Ar33'49 -21°54'29    Cluster A
CG 29°Ar28'12 +23°59'01    Pisces
CG 27°Ta12'31 +23°11'11    Perseus
CG 13°Cn57'09 +13°11'41    Gemini
CG 01°Le54'44 + 1°56'39    Cancer
CG 15°Le57'39 -13°04'04    Hydra
CG 17°Le14'54 +45°47'47    UMa II
CG 25°Le00'53 +49°21'55    UMa I
CG 00°Vi51'59 +40°56'15    UMa III
CG 04°Vi11'53 + 1°58'43    Leo
CG 00°Li00'26 +31°41'15    Coma
CG 01°Li08'32 +14°40'09    Virgo
CG 22°Li35'45 +43°24'40    Bootes
CG 02°Sc01'33 -19°22'50    Centaurus
CG 08°Sc45'16 +43°16'38    Corona Borealis
CG 24°Sc37'36 +37°03'47    Hercules
CG 17°Aq46'39 -36°21'30    Cluster B
CG 20°Pi40'05 +12°16'32    Pegasus II
CG 22°Pi07'08 +11°19'40    Pegasus I
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CS Cosmic Structure

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CS 00°Ar00'00 - 0°00'00
    Equinox, Spring
CS 12°Ar12'28 - 5°02'05
    Ascending Supergalactic Node to Equator
CS 16°Ar29'47 + 0°32'36
    Ascending Supergalactic Node to Ecliptic
CS 27°Ar09'29 +33°20'55
    Center of Local Group Galaxies
CS 28°Ar19'04 +56°28'44
    Intersect Local System & Galactic Equator
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```
CS 29°Ta27'50 +40°52'32
    Intersect Galactic & Supergalactic Equators
CS 10°Ge28'28 + 0°44'00
    Desc. Node Local System to Ecliptic
CS 21°Ge13'31 -22°18'54
    Descending Node Local System  Equator to Equator
CS 29°Ge19'12 - 0°11'12
    Descending Node of Gal Equator to Ecliptic
CS 00°Cn00'00 +66°33'07
    North Celestial Pole
CS 00°Cn00'00 -23°26'53
    Solstice, Summer
CS 00°Cn00'00 -88°26'53
    South Pole Ecliptic
CS 16°Cn03'35 -36°54'18
    Supergalactic South Pole
CS 16°Cn31'11 -22°19'39
    Descending Node of Gal Equator to Equator
CS 12°Le22'31 -45°42'27
    South Pole  of Galaxy
CS 10°Vi06'37 +24°06'24
    Local System North Pole
CS 14°Vi11'59 -61°44'30
    Centroid of Local System
CS 29°Vi23'49 +29°40'40
    North Pole of Galaxy
CS 00°Li00'00 - 0°00'00
    Equinox, Fall
CS 01°Li10'02 +14°44'08
    Center of Local Supergalaxy
CS 12°Li03'36 + 5°23'02
    Descending Supergalactic Node to Equator
CS 16°Li06'43 + 0°22'47
    Descending Supergalactic Node to Ecliptic
CS 27°Li03'33 -55°45'59
    Intersect Local System & Galactic Equator
CS 06°Sc47'29 -28°41'13
    The Great Attractor, center of Mega-SuperGalaxy
CS 26°Sc07'48 -21°42'49
    Centroid of Sco-Cen (Southern Stream)
CS 28°Sc53'27 -39°55'13
    Intersect Galactic & Supergalactic Equators
CS 10°Sa19'48 + 0°15'22
    Asc. Node Local System Equator to Ecliptic
CS 21°Sa06'27 +24°05'03
    Ascending Node Local System  Equator to Equator
CS 26°Sa05'27 - 4°12'42
    Center of our Galaxy
CS 29°Sa18'53 + 1°11'12
    Ascending Node of Galactic Equator to Ecliptic
CS 00°Cp00'00 +23°26'53
    Solstice, Winter
CS 00°Cp00'00 +89°26'53
    North Pole Ecliptic
CS 00°Cp00'00 -66°33'07
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```
    South Celestial Pole
CS 13°Cp20'23 +23°07'57
    Ascending Node of Galactic Equator to Equator
CS 16°Cp12'12 +37°53'53
    Supergalactic North Pole
CS 20°Cp58'01 -34°13'33
    Centroid Local Triplet
CS 10°Pi34'47 -23°12'14
    Local System South Pole
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DI Diffuse Nebulae

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DI 23°Ar28'03 +72°37'20
    NGC 7023, Cepheus
DI 29°Ar26'17 +58°02'53
    NGC 7538, Cepheus
DI 09°Ta28'09 +45°53'59
    NGC 281, Cassiopeia
DI 13°Ta06'13 +57°36'28
    NGC 7538, Cepheus
DI 13°Ta13'27 +48°47'22
    IC 59, gamma Cassiopeia
DI 27°Ta53'46 +43°22'19
    IC 1805, Cassiopeia
DI 28°Ta58'05 + 3°57'44
    IC 349, 23 Taurus, MEROPE
DI 00°Ge39'58 +42°12'53
    IC 1848, Cassiopeia
DI 00°Ge42'22 +12°29'41
    IC 8, omicron Perseus
DI 05°Ge15'23 +15°07'02
    IC 1499, Perseus, California Nebula
DI 18°Ge21'38 -25°31'29
    Orion
DI 21°Ge24'40 +10°40'47
    IC 410, Auriga
DI 21°Ge34'17 +10°50'39
    IC 417, Auriga
DI 22°Ge22'42 -27°29'38
    NGC 1976, Great Nebula in Orion, M.42
DI 22°Ge24'18 -27°31'13
    NGC 1980, Orion
DI 22°Ge25'54 -27°32'48
    NGC 1982, Orion, M.43
DI 22°Ge48'58 -23°42'33
    NGC 1990, epsilon Orion
DI 24°Ge05'53 -24°59'19
    IC 434, zeta Orion, Horsehead Nebula
DI 24°Ge21'11 -24°11'50
    NGC 2024, zeta Orion
DI 25°Ge41'50 -23°20'21
    NGC 2068, Orion, M.78
DI 01°Cn34'08 - 2°45'50
    NGC 2174-5, Orion
DI 07°Cn47'55 -18°50'53
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    NGC 2237-9, Monoceros, Rosette Nebula
DI 09°Cn19'53 -15°03'14
    NGC 2261, R Monoceros, Hubble's Var
DI 09°Cn41'23 -13°34'39
    NGC 2264, S Monoceros, Cone Nebula
DI 20°Li34'04 -58°28'43
    NGC 3372, eta Carina, Keyhole Nebula
DI 02°Sc06'19 -55°49'14
    IC 2944, lamda Centaurus
DI 03°Sa45'09 + 2°40'54
    IC 4592, nu Scorpio
DI 07°Sa32'60 - 1°00'40
    IC 4603-4. rho Ophiuchus
DI 08°Sa57'47 - 2°59'04
    IC 4605, 22 Scorpio
DI 08°Sa57'47 - 3°50'43
    IC 4606, alpha Scorpio, ANTARES
DI 29°Sa54'28 + 0°32'53
    NGC 6514, M.20, Trifid Nebula, Sagittarius
DI 00°Cp09'39 + 0°16'23
    NGC 6523, M.8, Lagoon Nebula, Sagittarius
DI 04°Cp21'14 + 7°54'20
    NGC 6618, M.17, Omega/Horseshoe Nebula, Sgr
DI 02°Aq24'30 +42°47'11
    NGC 6820, Vulpecula
DI 05°Aq49'03 -86°55'18
    NGC 2070, Dorado, Tarantula Nebula, 30 Dor
DI 25°Aq11'11 +46°49'13
    NGC 6960, 52 Cygnus, Veil Nebula
DI 25°Aq48'40 +56°14'16
    IC 1318, gamma Cygnus
DI 26°Aq13'09 +47°10'37
    Cygnus, Veil Nebula
DI 28°Aq38'26 +46°33'01
    NGC 6992-5, Veil Nebula in Cygnus
DI 06°Pi24'46 +58°56'13
    IC 5067-0, alpha Cygnus, Pelican Nebula
DI 08°Pi52'53 +57°36'03
    NGC 7000, North America Nebula, alpha Cygnus
DI 26°Pi39'59 +55°18'07
    IC 5146, Cygnus, Cocoon Nebula
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DN Dark Nebulae

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DN 12°Ar12'18 +62°07'58    Cepheus
DN 07°Ge25'08 + 6°01'47    Taurus
DN 18°Ge41'44 -28°03'23    Orion
DN 22°Ge22'16 -25°22'19    Orion dark nebulae
DN 08°Cn05'37 -13°13'25    S Monoceros
DN 17°Li28'05 -11°32'58    Coal sack
DN 18°Li35'58 -59°08'27    eta Carina
DN 05°Sa33'20 - 2°02'39    rho Ophiuchus
DN 21°Sa25'32 - 2°20'03    theta Ophiuchus
DN 10°Cp29'06 +18°05'05    Scutum
DN 20°Aq58'22 +47°31'49    52 Cygnus
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DN 07°Pi00'45 +59°04'19   North America
DN 20°Pi43'58 +63°56'25   Cygnus

EB Eclipsing Binaries

EB 28°Ar13'27 +54°32'57   AR Cassiopeia
EB 25°Ta17'48 +21°54'22   beta Perseus, ALGOL
EB 28°Ta36'06 +59°52'38   YZ Cassiopeia
EB 29°Ta57'35 - 7°50'44   lamda Taurus
EB 05°Ge43'19 +49°59'36   RZ Cassiopeia
EB 11°Ge20'16 +63°10'28   U Cecheus
EB 20°Ge29'56 +10°40'20   AR Auriga
EB 22°Ge03'38 -23°59'55   VV Orion
EB 06°Cn14'35 + 9°00'36   WW Auriga
EB 22°Le59'18 +34°15'47   TX Ursa Major
EB 23°Le53'50 -66°16'04   V Puppis
EB 02°Sc07'55 +76°24'06   CM Draconis
   Dwarf eclipsing binary
EB 11°Sc56'05 +43°38'32   alpha Corona Borealis
EB 14°Sc22'07 + 8°58'09   delta Libra
EB 13°Sa02'56 +56°40'12   u Hercules
EB 17°Sa21'15 +24°26'40   U Ophiuchus
EB 20°Sa20'13 -10°30'34   RS Sagittarius
EB 26°Cp58'48 + 7°19'37   V 505 Sagittarius
EB 28°Pi11'08 +52°01'14   AR Lacerta

FL Flare Stars

FL 00°Ar52'53 +20°40'43   EQ Pegasus B
FL 05°Ar35'37 +47°02'11   EV Lacerta
FL 12°Ar30'31 -23°51'57   UV Ceti
FL 15°Ar45'31 +59°12'15   DO Cepheus
FL 26°Cn47'48 -17°36'24   YZ Canis Minor
FL 27°Le57'11 +34°18'32   WX Ursa Major
FL 28°Le48'19 + 8°56'13   AD Leo
FL 27°Sc50'31 -43°53'32   alpha Centaurus C
FL 22°Pi00'52 + 0°57'33   Jun 7, 1976, unusual flare

G Galaxies

G 01°Ar49'59 -22°50'49   NGC 247, Sculptor Group, Cetus
G 09°Ar00'13 -20°59'45   Cluster A, 400 galaxies
G 14°Ar57'12 - 4°40'47   IC 1613, Local Group
G 18°Ar08'39 -14°23'31   NGC 584, Cetus
G 18°Ar27'50 +36°08'10   NGC 221, Local Group, M.32
G 20°Ar26'08 - 2°23'09   NGC 488, Pisces
G 21°Ar03'23 -19°17'08   NGC 681, Cetus
G 22°Ar31'03 -45°47'29   Fornax system
   Local Group, A0237-34
G 22°Ar31'36 + 0°48'53   NGC 524, Pisces
G 26°Ar54'22 +33°54'51   NGC 205, Local Group, Andromeda
G 27°Ar09'29 +33°20'55   NGC 224, M.31
   Local Group, G5, And.
G 27°Ar26'24 + 5°17'39   NGC 628, Pisces

G 27°Ar47'40 -55°47'37 INGC 1291, Eridanus
G 29°Ar28'12 +23°59'01 Pisces cluster, 100 galaxies
G 29°Ar46'51 +26°14'06 NGC 404, Local Group?
Andromeda, F8
G 00°Ta01'03 +40°47'45 NGC 147, Local Group, Cassiopeia
G 00°Ta24'16 -72°50'16 NGC 1553, Dorado Cloud
G 00°Ta27'34 -72°41'39 NGC 1549, Dorado Cloud
G 00°Ta38'29 -62°32'28 NGC 1433, Dorado Cloud of
galaxies
G 00°Ta41'33 +39°48'50 NGC 185, Local Group
Cassiopeia,GO
G 02°Ta01'36 -73°05'31 NGC 1566, Dorado Cloud
G 02°Ta42'29 +19°41'54 NGC 598, M.33, Local Group, A7
G 02°Ta51'20 -52°01'03 NGC 1316, Fornax Group, For A
G 03°Ta41'29 -51°30'36 NGC 1326, Fornax Group
G 04°Ta38'25 -21°56'56 NGC 1052, Cetus
G 05°Ta05'60 -78°02'40 NGC 1672, Dorado Cloud
G 06°Ta21'51 -52°43'14 NGC 1365, Fornax Group
G 06°Ta44'17 +50°44'09 IC 10, Local Group Member?
G 07°Ta37'19 -14°48'14 NGC 1068 , Cetus Group, M.77
G 07°Ta39'13 -13°59'51 NGC 1055, Cetus Group
G 08°Ta02'53 -51°44'40 NGC 1380, Brightest,Fornax Group
G 08°Ta18'15 -13°40'46 NGC 1073, Cetus Group
G 08°Ta34'21 -15°07'58 NGC 1090, Cetus
G 08°Ta51'39 -14°11'54 NGC 1087, Cetus Group
G 08°Ta58'00 -51°26'14 NGC 1399, Fornax Group
G 08°Ta59'14 -73°08'38 NGC 1617, Dorado Cloud
G 09°Ta01'48 -51°33'39 NGC 1404, Fornax Group
G 11°Ta22'12 -37°36'09 NGC 1325, Holmberg VI, Eridanus
G 12°Ta05'36 -37°12'52 NGC 1332, Eridanus
G 16°Ta55'14 -35°45'37 NGC 1407, G3
G 17°Ta23'59 +27°11'28 NGC 891, Andromeda
G 27°Ta12'31 +23°11'11 Perseus cluster of 500 galaxies
G 27°Ta28'07 +41°25'11 Maffei I, Local Group, IC 1805
G 27°Ta42'46 +22°02'19 s-Perseus near irregular cloud
G 28°Ta32'20 +41°28'42 Maffei II, Local Group?
G 11°Ge06'13 -56°07'51 a, Local Group?, discovered 1964
G 11°Ge43'50 +46°13'09 IC 342, Local Group?, obscured
G 19°Ge34'37 +82°03'31 NGC 6643, Draco
G 04°Cn39'08 -43°57'55 NGC 2207, Canis Major
G 06°Cn38'23 - 8°29'57 Local Group, disc.
1975, 55,000 1.y.
G 10°Cn23'47 +47°12'19 NGC 2366, M81 Group,
Camelopardalis
G 12°Cn57'37 +42°35'01 NGC 2403, M81 Group
Camelopardalis
G 13°Cn57'09 +13°11'41 Gemini Cluster of 200 galaxies
G 16°Cn17'31 +48°52'02 Holmberg II = DDO 50 = A0813+70
G 19°Cn47'18 +54°12'28 Holmberg III, A0909+74
G 25°Cn30'52 +52°18'41 Holmberg I = DDO 63 = A0936+71
G 28°Cn12'52 +50°45'19 NGC 2976, M81 Group, UMa
G 28°Cn14'37 +52°09'27 NGC 3034, M.82, UMa
G 28°Cn17'10 +52°03'18 NGC 3031, M81 Group, UMa
G 28°Cn33'28 +42°04'31 NGC 2768, Ursa Major
G 28°Cn58'08 +51°43'27 Holmberg IX = DDO 66 = A0953+69

G	01°Le54'44	+ 1°56'39	Cancer Cluster of 150 galaxies
G	04°Le47'23	+34°01'46	NGC 2841 Ursa Major
G	05°Le39'28	+15°03'09	NGC 2683, Lynx
G	09°Le22'23	-26°42'07	NGC 2574, M81 Group
G	14°Le05'16	-66°37'10	NGC 2427, Local Group?, Puppis
G	14°Le37'16	+60°16'24	NGC 4236, M81 Group, Draoc
G	15°Le57'39	-13°04'04	Hydra Cluster of galaxies
G	16°Le35'30	+17°00'50	NGC 2964, Leo
G	17°Le14'54	+45°47'47	Ursa Major II
	Cluster of 200 galaxies		
G	17°Le51'53	+ 6°08'49	NGC 2903, Leo
G	19°Le42'14	+28°43'10	NGC 3184, Ursa Major
G	20°Le44'10	+16°29'52	Leo A = DDO 69 = A0956+30
G	21°Le29'54	+44°38'30	NGC 3556, M.108, Ursa Major
G	25°Le00'53	+49°21'55	UMa I Cluster of 300 galaxies
G	25°Le05'19	-25°30'06	Hya A, A09
G	27°Le26'07	+16°53'02	NGC 3245, Leo Minor
G	27°Le29'36	+11°13'26	NGC 3190, Leo
G	28°Le56'31	+31°57'01	Mayall's Nebula, A1101+41
G	29°Le04'01	+ 0°40'57	Local Group
	Leo I = Regulus System		
G	29°Le35'15	- 6°41'22	Sextans B, Local Group?, DDO 199
G	29°Le39'05	+ 9°10'60	NGC 3227, Seyfert galaxy in Leo
G	29°Le47'55	+24°01'17	NGC 3396, Leo Minor
G	00°Vi37'39	+47°16'60	NGC 3992, M.109, UMa
G	00°Vi51'59	+40°56'15	UMa III Cluster of 90 galaxies
G	03°Vi27'08	- 6°46'14	NGC 3169, Sextans, G5
G	04°Vi01'46	+65°06'55	NGC 5322, Ursa Major
G	04°Vi11'20	+ 1°57'26	Leo Cluster of 300 galaxies
G	05°Vi07'15	+20°01'19	NGC 3504, Leo Minor
G	05°Vi14'22	-17°29'03	NGC 3115, Sextans
G	05°Vi17'23	-13°38'51	Sextans A, Local Group?, DDO 75
G	05°Vi49'55	+ 5°55'22	NGC 3338, Leo Group of galaxies
G	06°Vi01'39	+ 6°24'23	NGC 3346, Leo Group
G	07°Vi10'39	+ 5°31'22	NGC 3367, Leo Group, F5
G	07°Vi34'33	+ 2°47'48	NGC 3351, Leo Group, M.95
G	07°Vi57'41	+ 3°44'08	NGC 3368, Leo Group, M.96
G	08°Vi05'37	+ 4°03'33	NGC 3379, Leo Group, M.105
G	08°Vi10'22	+ 4°15'13	NGC 3389, Leo Group, Leo
G	08°Vi30'48	+73°24'35	UMi dwarf, Local Group, DDO 199
G	08°Vi59'56	+39°46'28	NGC 4051, UMa Group, Fo, UMa
G	09°Vi40'45	+16°01'17	Leo II, Local Group
	Leo B = DDO 93		
G	10°Vi01'19	+43°46'21	NGC 4258 UMa Group, M.106, Cvn
G	10°Vi56'06	-40°34'57	NGC 2997, Antlia
G	11°Vi12'39	- 1°17'04	NGC 3423, Leo Group, Sextans
G	11°Vi18'20	+34°51'53	Zwicky No. 2, DDO 105, A1155+38
G	12°Vi09'38	+12°33'49	NGC 3607, Leo
G	12°Vi17'25	-33°48'38	NGC 3109, Hydra
G	12°Vi24'18	+59°03'47	NGC 5204, CVn Group, UMa
G	13°Vi48'26	+36°01'31	NGC 4151, Seyfert 9alaxy, CVn
G	13°Vi52'27	+42°24'18	NGC 4449, UMa Group, CVn
G	14°Vi49'22	+17°53'45	NGC 3745-54, Copeland Septet
G	14°Vi49'34	+ 7°42'21	NGC 3623, M.65, Leo Group
G	14°Vi59'24	+ 8°07'45	NGC 3627, Leo Group, M.66

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   Bright
G  15°Vi00'10 + 8°09'42    NGC 3628, Leo Group
   Bright member
G  15°Vi25'49 +36°28'45    NGC 4244, UMa Group, CVn
G  16°Vi44'31 +39°46'19    NGC 4490, UMa Group, CVn
G  18°Vi32'52 +41°27'04    NGC 4618, UMa Group, CVn
G  18°Vi52'50 +57°38'31    Holmberg V, A1338+54
G  20°Vi00'48 +36°00'29    NGC 4214, UMa Group, CVn
G  20°Vi06'48 +33°00'16    NGC 4395, UMa Group, Cvn
G  20°Vi25'14 + 8°29'56    NGC 3810, Leo Group, Leo
G  21°Vi00'39 +41°49'02    NGC 4736, UMa Group, M.94, CVn
G  21°Vi12'38 +28°25'22    NGC 4274, Coma Berenices
G  22°Vi20'41 +58°41'53    Holmberg IV = DDO 185 = A1352+54
G  23°Vi57'09 +51°22'11    NGC 5195, CnV Group, CVn
G  23°Vi57'16 +51°20'23    NGC 5194, CVn Group, M.51, CVn
G  23°Vi57'55 +59°37'05    NGC 5457, CVn Group, M.101, UMa
G  24°Vi14'15 +33°49'37    NGC 4631, UMa Group, Cvn, Em
G  24°Vi20'54 +62°48'02    NGC 5585, CVn Group, UMa
G  24°Vi50'26 -11°38'04    NGC 3672, Crater
G  24°Vi57'00 +33°31'12    NGC 4656, UMa Group, CVn
G  25°Vi04'51 +59°23'26    NGC 5474, CVn Group, UMa
G  25°Vi33'06 +45°18'56    NGC 5055, UMa Group, M.63
G  26°Vi07'47 +15°36'28    NGC 4192, M.98, Virgo Cluster
G  26°Vi21'26 +27°28'59    NGC 4565, Coma Berences
G  27°Vi08'05 - 3°25'47    Wild Triplet, A1144-03
G  27°Vi29'34 +19°21'51    NGC 4382, Virgo Cluster, M.85
28°Vi00'54 +14°30'34    NGC 4254 Virgo Cluster, M.99, Com
G  28°Vi05'07 +16°45'44    NGC 4321, Virgo Cluster, M.100
G  28°Vi56'54 +40°14'24    Holmberg VIII, A1310+36
G  29°Vi38'11 +14°44'53    NGC 4374, Virgo Cluster, M.8
G  29°Vi46'19 +15°06'31    NGC 4406, Virgo Cluster, M.8
G  00°Li00'26 +31°41'15    Coma Cluster of 800 galaxies
G  00°Li06'57 +16°01'31    NGC 4459, UMa Group, Com
G  00°Li43'48 +31°25'53    NGC 4874, Coma Cluster
G  00°Li46'43 +31°35'33    NGC 4889, Coma Cluster
G  00°Li54'42 +16°05'45    NGC 4501, Virgo Cluster, M.88
G  01°Li08'32 +14°40'09    Virgo Cluster Centroid
G  01°Li36'32 +13°52'38    NGC 4486, M.87, Virgo Cluster
G  02°Li21'27 +15°50'36    NGC 4569, Virgo Cluster, M.90
G  02°Li31'01 + 6°22'41    NGC 4303 M.61, Virgo Cluster
G  02°Li37'49 +14°32'14    NGC 4552, Virgo Cluster, M.89
G  02°Li43'27 +10°48'20    NGC 4472, Virgo Cluster, M.49
G  02°Li52'51 +15°11'33    NGC 4579, Virgo Cluster, M.58
G  03°Li09'45 +13°55'06    NGC 4567, Virgo Cluster, M.91
G  03°Li24'50 +25°06'02    NGC 4826, M.64, Blackeye Neb.
G  04°Li05'35 +10°23'07    NGC 4526, Virgo Cluster, G4, Vir
G  04°Li16'34 +14°48'26    NGC 4621, Virgo Cluster, M.59
G  04°Li53'51 +14°25'02    NGC 4649, Virgo Cluster, M.60
G  04°Li58'52 + 8°44'56    Holmberg VIII = DDO 137
   A1232+06
G  06°Li21'56 -16°04'58    NGC 4027, Corvus
G  06°Li33'29 + 3°06'29    NGC 4517, Reinmuth 80
   Virgo  Cluster
G  06°Li36'34 +59°02'57    NGC 5676, Bootes
G  07°Li08'00 -16°22'44    NGC 4038, Corvus
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G  07°Li13'50 +18°26'15    GR8 = DDO 155 = A1256+14
G  07°Li15'08 +68°31'23    NGC 5907, CVn Group, Dra
G  07°Li19'31 +66°36'39    NGC 5866, M.102, Draco
G  08°Li58'48 -25°51'07    NGC 3923, Hydra
G  12°Li37'54 - 5°47'48    NGC 4594, Virgo Cluster
   M104,Vit
G  21°Li00'15 +36°55'44    NGC 5548, Seyfert galaxy, Boo
G  22°Li35'45 +43°24'40    Bootes Cluster of
G  28°Li38'09 -22°11'22    Hardcastle Nebula, A1310-32
G  00°Sc37'00 +17°11'37    NGC 5566, Vir III Cloud
G  01°Sc36'51 -18°27'34    Centaurus Cluster
   300 galaxies
G  02°Sc29'20 -17°24'02    NGC 5236, M.83, Hydra
G  03°Sc45'56 -18°44'16    NGC 5253, Centaurus
G  05°Sc50'20 -30°17'31    NGC 5128, Centaurus A
G  05°Sc55'59 -38°07'36    NGC 4945, Centaurus
G  06°Sc52'09 +15°00'32    NGC 5713, Vir III Cloud, Vir
G  08°Sc45'16 +43°16'38    Corona Borealis Cluster
   400 galaxies
G  13°Sc13'45 +17°35'25    NGC 5846, Vir III Cloud, Vir
G  14°Sc08'01 +54°50'57    NGC 6207, Hercules Supergalaxy
G  14°Sc35'43 +22°57'34    ''Shane' Cloud of galaxies
G  19°Sc22'52 + 2°56'12    Fath 703, A1511-15
G  21°Sc27'02 +39°40'16    NGC 6027 A-D, Sefert Sextet
G  24°Sc37'36 +37°03'47    Hercules Cluster of 300 galaxies
G  26°Sc50'32 +80°04'06    Draco dwarf
   Local Group, DDO 208
G  27°Sc20'25 -47°16'40    Circinus galaxy, A1409-65
G  27°Sc50'54 +67°33'03    Zwicky Triplet, A1648+45
G  22°Sa43'16 -37°55'41    NGC 6300, Ara
G  16°Cp17'43 -48°42'14    NGC 6876, Pavo
G  22°Cp42'47 -26°53'13    NGC 6861, Telescopium
G  25°Cp00'42 + 7°44'01    NGC 6822, Local Group, Sag. G
10°Aq13'03 -26°54'27    NGC 7079, Grus
G  10°Aq27'29 -64°42'09    Small Magellanic Cloud, SMC,
G  12°Aq19'54 -35°52'51    IC 5152, Local Group?, Indus
G  13°Aq17'03 -85°40'12    Large Magellanic Cloud
   Local Group
G  15°Aq43'49 -32°23'18    NGC 7213, Grus
G  18°Aq19'60 -35°27'56    Cluster B of 300 galaxies
G  20°Aq17'07 -28°15'47    NGC 7599, Grus
G  01°Pi20'23 -33°06'32    Grus Cluster, Gru
G  01°Pi28'21 -33°49'05    Grus Cluster, Gru
G  02°Pi03'46 -33°05'19    Grus Cluster, Gru
G  14°Pi12'11 -25°16'57    NGC 7755, Sculptor Group, Scl
G  15°Pi06'48 -28°28'47    NGC 7793, Sculptor Group,
G  15°Pi16'58 -35°41'40    NGC 55, Sculptor Group
G  19°Pi35'29 +13°22'11    NGC 7469, Seyfert galaxy
   In Pegasus
G  20°Pi40'05 +12°16'32    Pegasus II Cluster of galaxy
G  21°Pi35'23 -32°40'28    NGC 134, Sculptor
G  21°Pi49'17 +17°15'35    NGC 7479, Pegasus
G  22°Pi07'08 +11°19'40    Pegasus I Cluster
   100 galaxies
G  23°Pi01'56 -21°59'33    NGC 45, Cetus, SP=Em
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G  23°Pi16'26 +11°01'21    NGC 7619, Pegasus Cluster
G  23°Pi24'26 +11°04'29    NGC 7626, Pegasus Cluster
G  23°Pi26'45 +11°05'23    NGC 7611, Pegasus, Cluster
G  23°Pi37'27 +11°55'02    Pegasus Cluster, NGC 7617
G  23°Pi44'44 +11°12'26    NGC 7623, Pegasus Cluster
G  23°Pi50'28 -13°32'23    Wolf-Lundmark-Melotte
   Nebula,A2359-15
G  25°Pi11'15 -37°54'00    NGC 300, Sculptor Group, Cetus
G  25°Pi20'59 +38°50'49    Stephan Quintet
G  26°Pi00'45 +71°31'55    NGC 6946m Cepheus
G  28°Pi07'25 +16°39'49    Pegasus dwarf = DDO 216
   A2326+14
G  28°Pi33'31 -35°06'32    A0057-33, Sculptor System
   Local Group
G  29°Pi59'42 -26°37'16    NGC 253, Sculptor Group, Em
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GA Galactic Associations

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GA 27°Ge02'56 +45°48'41
    NGC 1961 -- contains 3 superassociations
GA 02°Cn48'08 +62°28'31
    NGC 2276 -- contains 3 superassociations
GA 11°Cn02'33 +80°34'09
    NGC 6412 -- 1 superassociation
GA 17°Cn43'23 +76°28'41
    NGC 6217 -- 4 superassociations
GA 07°Vi57'46 + 5°35'59
    NGC 3395 -- contains 4 superassociations
GA 14°Vi34'08 +29°16'30
    NGC 3991 -- contains 2 superassociations
GA 23°Vi17'27 +65°31'23
    NGC 5678 -- 2 superassociations
GA 04°Li58'47 + 6°48'48
    NGC 4496 -- contains 1 superassociation
GA 21°Pi53'54 +20°17'29
    NGC 7448 -- 2 superassociations
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GC Galactic Clusters

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GC 10°Ge14'60 -61°44'04    NGC 1851, Columba
GC 17°Ge21'00 -46°35'02    NGC 1904, M.79, Lepus
GC 18°Cn57'14 +17°47'57    NGC 2419, Lynx
GC 23°Vi57'22 +18°02'17    NGC 4147, Coma Berenices
GC 00°Li24'06 -51°18'35    NGC 3201, Vela
GC 08°Li34'22 +24°01'39    NGC 5024, Coma Berenices
GC 10°Li26'21 +36°15'24    NGC 5272, M.3, old cluster
   Canes Venatici
GC 14°Li19'10 -70°14'30    NGC 2808, Carina
GC 16°Li17'21 +38°21'15    NGC 5466, Bootes
GC 18°Li41'22 -19°27'15    NGC 4590, M.68, Hydra
GC 08°Sc54'59 -34°58'48    NGC 5139
   omega Centaurus, one of brightest, 1964
GC 14°Sc40'42 - 9°22'04    NGC 5694, Hydra
   perhaps escaping galaxy towards L MC/SMC
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GC 15°Sc57'47 +19°23'57
    NGC 5904, M.5, old cluster in Serpens
GC 21°Sc28'41 - 1°32'24    NGC 5897, Libra
GC 28°Sc39'46 +58°15'48    NGC 6205, M.13
   Perhaps finest', very old, Hercules cluster
GC 05°Sa29'54 - 0°18'05    NGC 6093, M80, Scorpio
GC 07°Sa30'58 +10°16'40    NGC 6171, M.107, Ophiuchus
GC 07°Sa35'39 - 3°36'53    NGC 6121, M.4, Scorpio
GC 09°Sa35'15 +66°33'47    NGC 6341, M.92. Hercules
GC 09°Sa36'38 +21°58'24    NGC 6218, M.12, Ophiuchus
GC 12°Sa42'17 +18°50'42    NGC 6254 M.10m Ophiuchus
GC 13°Sa51'17 + 0°52'40    NGC 6235 Ophiuchus
GC 16°Sa24'05 - 3°08'18    NGC 6273, M.19, Ophiuchus
GC 16°Sa28'42 - 6°48'02    NGC 6266 M.62, Ophiuchus
GC 16°Sa33'03 + 1°14'59    NGC 6287, Ophiuchus
GC 16°Sa35'53 - 0°36'18    NGC 6284, Ophiuchus
GC 18°Sa05'45 - 2°52'19    NGC 6293, Ophiuchus
GC 19°Sa19'14 - 5°51'05    NGC 6304, Ophiuchus
GC 19°Sa28'43 + 5°59'56    NGC 6333, M.9, Ophiuchus
GC 20°Sa29'50 + 6°56'58    NGC 6356, Ophiuchus
GC 23°Sa19'51 +20°33'13    NGC 6402, M.14, Ophiuchus
GC 25°Sa56'44 -28°50'01    NGC 6397, Ara
GC 00°Cp05'16 - 5°39'07    NGC 6522, Sagittarius
GC 00°Cp51'41 -18°39'19    NGC 6541, Corona Australis
GC 04°Cp55'58 - 0°01'08    NGC 6626, M.28, Sagittarius
GC 06°Cp04'17 - 7°43'29    NGC 6637, M.69, Sagittarius
GC 07°Cp41'53 + 0°54'03    NGC 6656, M.22, Sagittarius
GC 08°Cp38'30 - 7°51'05    NGC 6681, M.70, Sagittarius
GC 10°Cp23'41 -36°44'59    NGC 6752, Pavo
GC 11°Cp24'41 - 6°03'56    NGC 6715, M.54, Sagittarius
GC 11°Cp43'51 -12°10'21    NGC 6723, Sagittarius
GC 12°Cp55'48 +15°18'37    NGC 6712, Scutum
GC 21°Cp00'30 - 8°31'38    NGC 6809, M.55, Sagittarius
GC 26°Cp47'10 +52°22'38    NGC 6779, M.56, Lyra
GC 28°Cp23'44 - 1°20'16    NGC 6864, M.75, Sagittarius
GC 04°Aq42'42 +39°01'20    NGC 6838 M.71, Sagittarius
GC 11°Aq51'09 + 5°47'18    NGC 6981, M.72, Aquarius
GC 12°Aq08'36 -61°52'41    NGC 104,47 Tucana
   One of two brightest
GC 12°Aq36'19 +25°56'12    NGC 6934, Delphinus
GC 19°Aq20'22 - 7°45'11    NGC 7099, M.30, Capricorn
GC 22°Aq58'15 +32°21'35    NGC 7006, Delphinus
GC 24°Aq49'56 +13°15'36    NGC 7089, M.2, Aquarius
GC 28°Aq30'01 +25°25'53    NGC 7078, M.15, Pegasus
GC 11°Pi54'06 - 7°56'14    NGC 7492, Aquarius
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IF Infrared Points

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IF 08°Ar55'45 +64°09'20
    mu Cepheus, M supergiant, Late-Type star
IF 12°Ar55'19 -60°35'52
    R Horologium, OH source with IF excess
IF 21°Ar01'29 -79°18'53
    R Dorado, 2nd strongest at 2 microns
IF 01°Ta10'35 -14°59'57
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omicron Cetus, MIRA, Late-Type star, 6th strongest at 2 microns
IF 25°Ta12'39 +41°51'34
s Perseus, M supergiant, IF excess 40% total Luminosity
IF 27°Ta12'47 +44°05'10
W3, l0th strongest at 20 microns
IF 27°Ta28'07 +41°25'11
Maffei I, near galaxy, at 2 microns = M.31 in brightness
IF 28°Ta17'19 - 8°06'20
NML Taurus, Mira-Type IF star, variable
OH radio emission
IF 08°Ge43'22 +25°54'32
48 Perseus, nu Perseus, variable IF excess
IF 09°Ge04'05 - 5°37'11
Aldeberan, l0th strongest at 2 microns
IF 19°Ge41'39 -34°29'21
IC 418 Planetary nebula, Large IF excess
IF 22°Ge20'51 -27°27'48
Kleinmann-Low Nebula in Orion, 3rd brightest IF at 20 microns, OH, "infrared nebula"
IF 22°Ge21'39 -27°28'35
trapezium source in Orion
IF 28°Ge03'07 -16°19'10
Betelgeuse, alpha Orion, Brightest at 2 microns, M supergiant, var cM2
IF 28°Ge19'55 - 3°12'46
U Orion, OH source with IF excess
IF 09°Cn20'01 -15°03'05
R Monoceros, large IF excess
90% L emitted beyond 1 micron
like T-Tauri stars
IF 24°Cn05'25 -17°35'35
Z Canis Major, extreme IF excess
IF 26°Cn53'49 -45°48'27
VY Canis Major, M supergiant, 5th strongest at 20 microns
Bright at 10 microns
IF 24°Le04'34 - 0°11'12
IRC+1021G, at 5 microns is brightest known source
outside Solar System, 18th mag star
IF 21°Vi39'53 -24°40'14
V Hydra, Late-Type carbon star
IF 20°Li34'33 -58°28'48
eta Carina, brightest at 20 microns..outside solar
IF 23°Li34'41 +30°40'57
ARCTURUS, alpha Bootes
8th strongest source at 2 microns
IF 04°Sc33'42 -46°24'24
gamma crux, at 2 microns the 7th strongest source.
IF 04°Sc37'25 -15°27'51
W Hydra, 5th strongest source at 2 microns
IF 14°Sc56'21 +46°59'12
R Corona Borealis, 'R CrB variable , 40% IF excess
IF 08°Sa56'47 - 3°49'55

```
    alpha Scorpio, Antares
IF 11°Sa27'20 -26°45'19
    G333.6-0.2, 6th strongest source at 20 microns
IF 15°Sa29'58 +36°56'36
    alpha Hercules, 4th strongest source at 2 microns
IF 26°Sa06'50 - 4°14'09
    Galactic Center, 7th strongest source at 20 micron
IF 27°Sa42'35 +49°47'06
    89 Hercules, IF excess
IF 00°Cp22'02 + 0°02'51
    M.8, NGC 6523, H II region, 13
    East of 07 star Herschel 36
IF 02°Cp46'43 +29°50'59
    NGC 6572, planetary nebula
IF 04°Cp22'39 + 7°52'47
    M.17, Omega Nebula, H II region
    2nd strongest at 20 microns
    Strong IF excess
IF 09°Cp10'14 +44°14'59
    AC Hercules, an RV Tauri star
IF 18°Cp10'20 + 9°58'27
    RY Sagittarius, 'R CrB variable'
IF 19°Cp04'30 + 6°26'09
    upsilon Sagittarius, 'R CrB variable'
    20% total luminosity is IF
IF 29°Cp01'19 -16°19'09
    BC Cygnus, OH source, Late-Type star
IF 08°Aq52'60 +52°00'14
    chi Cygnus, 9th strongest at 2 microns
IF 14°Aq45'34 + 6°19'52
    NGC 7009, planetary nebula
IF 01°Pi09'14 +54°19'56
    NML Cygnus, M supergiant, 8th brightest at 20
    Also bright at 10 microns
IF 09°Pi20'59 +55°08'59
    NGC 7027, planetary nebula
IF 23°Pi40'10 +49°41'18
    BL Lacerta, at 3 microns= large portion
    of emitted energy
```

LG Local Group

```
LG 14°Ar57'12 - 4°40'47    IC 1613
LG 21°Ar52'31 -46°41'14    Fornax system
LG 26°Ar36'08 +32°27'52    M.32 galaxy
LG 26°Ar54'22 +33°54'51    near galaxy, part of Local Group
LG 27°Ar09'29 +33°20'55    M.31 Andromeda galaxy
LG 29°Ar46'51 +26°14'06    Andromeda NGC 404
LG 00°Ta01'03 +40°47'45    galaxy in Local Group
LG 00°Ta41'33 +39°48'50    galaxy in Local Group
LG 02°Ta42'29 +19°41'54    M.33 Tri nebula
LG 06°Ta44'17 +50°44'09    IC 10
LG 27°Ta28'07 +41°25'11    Maffei I
LG 28°Ta32'20 +41°28'42    Maffei II IC 1805
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```
LG 11°Ge06'13 -56°07'51    Dwarf galaxy in Columba,
discovered in 1964
LG 11°Ge43'50 +46°13'09    IC 342
LG 06°Cn38'23 - 8°29'57    nearest dwarf galaxy
   found 1975, 55,000 L.Y.
LG 15°Le08'43 -67°31'51    Puppis NGC 2427
LG 20°Le44'10 +16°29'52    Leo A = DDO 69 = A056+30
LG 29°Le04'01 + 0°40'57    Leo I system
LG 29°Le35'15 - 6°41'22    Sextans B = DD0 199=A0957+05
LG 05°Vi39'49 -14°34'46    Sextans A= DD0 75=A1008-04
   IR I, 2 Mpc.
LG 08°Vi30'48 +73°24'35    UMi dwarf system
LG 09°Vi40'45 +16°01'17    Leo II system
LG 26°Sc50'32 +80°04'06    Draco dwarf system
LG 24°Cp50'14 + 6°44'55    NGC 6822
LG 10°Aq27'29 -64°42'09    Small Magellanic cloud
LG 11°Aq48'04 -36°47'06    Indus IC 5152
LG 13°Aq17'03 -85°40'12    Large Magellanic cloud
LG 23°Pi25'07 -14°27'06    Wolf-Lundmark-Melotte Nebula
LG 27°Pi58'34 -35°59'22    Sculptor system
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MC Moving Clusters

```
MC 20°Ge52'45 -66°17'23
    Pleiades Moving Cluster
MC 23°Ge39'42 -41°20'17
    Orion Moving Cluster, 100x70x60 parsecs diameter
MC 02°Cn59'37 -11°25'01
    Hyades Moving Cluster, 250 parsecs diameter
MC 05°Cn17'15 -19°21'23
    Praesepe Moving Cluster, about 10 parsecs diameter
MC 17°Cn25'28 -46°39'53
    Perseus Moving Cluster
MC 06°Le27'14 -68°03'24
    Sco-Cen, Scorpio-Centuarus Moving Cluster, 90x300
MC 25°Le04'20 -64°37'56
    Coma Berenices Moving Cluster
MC 28°Cp36'54 -16°57'56
    Ursa Major-Sirius Group Moving Clusters
```

ME Meteors

```
ME 00°Ta30'44 +16°28'49    Andromedids
ME 18°Ta15'32 + 5°58'15    Daytime Arietids
ME 22°Ta13'47 - 4°28'48    S. Taurids
ME 24°Ta53'25 + 2°03'55    N. Taurids
ME 01°Ge49'20 +38°46'48    Pereids
ME 04°Ge22'44 + 2°00'32    Daytime Perseids
ME 26°Ge12'25 - 4°23'44    beta Taurids-Day
ME 27°Ge11'49 - 2°25'08    chi Orionids
ME 03°Cn52'38 - 7°23'40    Orionids
ME 13°Cn19'26 -14°50'55    Monocerotids
ME 19°Cn40'08 +10°06'34    Geminids
ME 25°Cn51'25 +69°01'51    Ursids
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ME 14°Le08'41 +42°20'53    Whipple II
ME 26°Le10'57 + 9°48'53    Leonids
ME 01°Li09'29 + 4°51'46    Virginids
ME 22°Li05'17 +62°20'35    Quadrantids
ME 14°Sa00'26 +77°06'53    Draconids
ME 00°Cp00'00 +56°26'53    Lyrids
ME 08°Aq47'06 + 8°21'03    alpha Caricornids
ME 19°Aq33'26 +76°09'35    Kappa Cygnids
ME 01°Pi15'44 + 6°26'36    N. iota Aquarids
ME 04°Pi14'38 - 7°34'37    S. delta Aquarids
ME 04°Pi28'04 - 4°26'02    S. iota Aquarids
ME 07°Pi46'55 + 9°18'51    eta Aquarids
ME 08°Pi43'17 + 3°33'37    N. delta Aquarids
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MS Magnetic Stars

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MS 16°Ar10'40 +56°14'26    215 441
MS 27°Ar03'58 - 1°47'03    10 783
MS 13°Ge51'60 + 7°06'22    32 633
MS 17°Ge56'04 +10°51'40    32 633
MS 13°Cn33'43 -23°18'06    50 169
MS 18°Cn06'49 +38°44'54    53
MS 29°Cn08'35 +21°11'13    71 866
MS 07°Sc43'34 - 4°06'03    125 248
MS 06°Pi19'35 +69°01'24    192 678
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N Novae

```
N  10°Ar37'33 +58°55'28
    Nova 1936 Lacerta CP
N  10°Ar59'32 +54°43'44
    Nova 1910 Lacerta No. 1
N  15°Ar22'58 +54°30'30
    Nova 1950 Lacerta
N  26°Ar36'08 +32°27'52
    885 Andromeda (S)
N  11°Ta40'24 +53°30'54
    Nova Cassiopeia (8) 1572
N  20°Ta34'50 +41°08'29
    Nova 1887 Persei No. 1 (V)
N  00°Ge52'15 +24°16'31
    Nova 1901 Persei No. 2 (GK)
N  19°Ge28'48 - 6°55'36
    Nova 1927 (XX Tau) rapid development
N  23°Ge12'51 + 6°56'08
    Nova 1891 Auriga (T)
N  08°Cn54'41 + 7°07'07
    Nova 1903 Gemini No. 1
N  10°Cn59'22 + 9°58'08
    Nova 1912 Gemini No. 2
N  11°Cn13'48 -23°20'51
    Nova 1939(8T) Monoceros rapid early development
N  23°Cn39'37 -26°48'29
    Nova 1918 (GI) Monoceros Rapid early development
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N  12°Le41'47 -83°53'33
    Nova 1925 Pictoris (RR)
N  13°Le18'28 -44°32'47
    Nova 1902 DY Puppis
N  01°Vi01'16 -45°54'18
    Novae 1890, 1902, 1920, 1941 T Pyxis
N  23°Vi57'10 +59°38'47
    Nova 1970G NGC 5457
N  20°Li34'04 -58°28'43
    Nova eta Carina
N  26°Li42'17 -57°35'20
    Nova 1895 Carina (RS)
N  02°Sc29'20 -17°24'02
    1968 NGC 5236
N  03°Sc44'04 -18°43'23
    Nova 1895 Centaurus No. 2
N  19°Sc16'29 +45°33'29
    Nova 1866 Coronae (T) also 1946
N  19°Sc19'37 +33°34'20
    Nova 1948 (CT) Serpens, rapid early development
N  29°Sc04'52 +27°08'59
    Nova 1866 Scorpio (U) 1906, 1936
N  02°Sa12'41 -29°39'18
    Nova 1893 Norma (R)
N  02°Sa16'10 -46°58'50
    Nova 1926 X Circinus. slow development
N  05°Sa29'54 - 0°18'05
    Nova 1860 Scorpio (T)
N  13°Sa20'03 -62°19'51
    Nova 1953 RR Chamaeleon
N  14°Sa14'42 +11°20'26
    Nova 1848, Ophiuchus No. 2
N  14°Sa59'20 - 6°20'20
    Nova 1917 Ophiuchus No.5
N  15°Sa18'41 -28°49'53
    Nova 1910 Ara
N  21°Sa35'52 -11°47'41
    Nova 1944 V 696 Scorpio
N  26°Sa44'23 +17°32'16
    Nova 1898, 1933, 1958 RS Ophiuchus
N  27°Sa35'59 -10°43'32
    Nova 1950 V 720 Scorpio
N  28°Sa24'21 - 2°47'12
    Nova 1936 V 732 Sagittarius rapid early development
N  29°Sa06'30 -12°28'49
    Nova 1954 V 1275 Sagittarius
N  29°Sa17'53 - 5°45'14
    Nova 1937 V 787 Sagittarius
N  29°Sa18'14 - 2°46'43
    Nova 1910 Sagittarius No. 2
N  01°Cp09'56 - 9°55'57
    Nova 1936 Sagittarius
N  01°Cp14'57 - 8°00'29
    Nova 1905 V 1015 Sagittarius, early rapid development
N  02°Cp04'43 -11°02'41
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    Nova 1942 Puppis
N  02°Cp22'57 - 7°19'29
    Nova 1952 V 1175 Sagittarius
N  02°Cp58'36 +68°57'27
    Nova 1934 Hercules DQ
N  03°Cp32'23 +35°21'43
    Nova 1919 Ophiuchus
N  03°Cp51'10 - 0°50'00
    Nova 1899 Sagittarius No. 3
N  04°Cp28'01 - 1°33'12
    Nova 1924 GR Sagittarius
N  04°Cp43'03 -11°16'08
    Nova 1941 V 909 Sagittarius
N  05°Cp42'36 +64°38'01
    Nova 1963 Hercules
N  06°Cp23'09 - 4°56'13
    Nova 1901, 1919, V1017 Sagittarius
N  07°Cp44'23 +25°15'37
    Nova 1970 Serpens
N  12°Cp49'00 +23°39'10
    Nova 1918 Aquila No. 3
N  14°Cp15'11 +20°26'23
    Nova 1927 EL Aquila
N  14°Cp36'11 + 9°57'12
    Nova 1898 V1059 Sagittarius, rapid early development
N  15°Cp41'39 +18°45'58
    Nova 1905 Aquila No. 2
N  16°Cp40'12 +36°24'20
    Nova 1960 Hercules
N  18°Cp30'17 +52°29'56
    Nova 1919 Lyra
N  20°Cp28'36 +23°48'18
    Nova 1936 Aquila
N  20°Cp48'59 +22°16'15
    Nova 1945 V 528 Aquila, rapid early development
N  21°Cp25'46 +22°41'38
    Nova 1899 Aquila No. 1
N  23°Cp57'39 +28°44'25
    Nova 1936 Aquila
N  27°Cp52'30 +42°07'51
    Nova Vulpecula 1976, 10/21/76, Mag. 6.5, 1800 pcs
N  28°Cp06'09 +38°53'26
    Nova 1783, WY Sagittarius
N  00°Aq15'56 +39°12'51
    Nova Sagittae 1977, Jan. 7,1977
N  01°Aq28'24 +28°59'31
    Nova V 500 Aquila, 1943
N  05°Aq48'13 +47°35'48
    Nova 1670 Vulpecula (11)
N  06°Aq00'40 +47°41'17
    Nova 1968 Vulpecula LV
N  08°Aq08'10 +36°39'03
    Nova 1913 Sagittarius
N  08°Aq14'48 +36°42'18
    Nova 1913, 1946 WZ Sagittarius
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N  18°Aq15'39 +34°59'16
    Nova 1967 Delphinus HR
N  20°Aq30'53 +54°38'41
    Nova 1600, Cygnus No. 1 (P)
N  26°Aq10'10 - 9°46'59
    Nova 1937b 220723 anon
N  01°Pi22'31 +70°32'29
    Nova 1920 Cygnus No. 3
N  01°Pi33'06 +49°37'18
    Nova 1942 V 450 Cygnus
N  349 10'51
    19°Pi10'51 +52°24'24
    Nova 1876 Cygnus No. 2 (Q)
```

NG Near Groups of Galaxies

```
NG 28°Cn26'24 +51°40'11    M.81
NG 19°Le51'50 +46°40'29    UMa groups
NG 08°Vi04'02 + 3°59'40    near groups
NG 15°Vi41'30 + 7°59'34    M.66, M.96 Leo
NG 19°Vi57'23 +29°26'06    NGC 4274 group
NG 21°Vi06'54 +42°40'03    M.101 CVn
NG 00°Li21'22 +14°37'19    Virgo Cluster
NG 03°Sc44'04 -18°43'23    M.83
NG 28°Pi59'32 -28°23'05    Sculptor (S. Pole)
NS 07°Ar45'53 -35°45'31    Eggen's star in Sculptor
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NS Near Stars

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NS 15°Ar26'39 -25°09'16    UV Cet A, UV Cet B
NS 16°Ar47'46 +41°24'45    Ross 248
NS 24°Ar01'06 +38°03'31    Grb 34 A, Grb 34 B
NS 17°Ta47'12 -26°47'20    epsilon Eridanus
NS 13°Cn15'56 -38°40'49    Sirius A, Sirius B
NS 25°Cn07'53 -16°11'17    Procyon A, Procyon B
NS 01°Vi27'44 +27°20'37    Lal 21185
NS 11°Vi56'14 + 0°28'25    Wolf 359
NS 26°Vi06'05 - 0°14'44    Ross 128
NS 27°Sc55'57 -43°56'37    Proxima Centaurus
NS 27°Sc58'24 -41°08'15    alpha Centaurus, beta Centaur.
NS 28°Sa41'55 +28°17'35    Barnard's star
NS 10°Cp45'42 + 0°20'16    Ross 154
NS 08°Aq19'35 -42°09'13    epsilon Indus
NS 09°Aq07'60 +81°32'44    sigma 2398 A, sigma 2398 B
NS 02°Pi06'28 -27°02'13    Lacerta 9352
NS 04°Pi57'27 - 5°37'32    L 789-6
NS 05°Pi55'11 +51°35'41    61 Cygnus A, 61 Cygnus B
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OA O-Associations

```
OA 00°Ar04'17 +42°57'39
    Lacerta OB 1, (Sch) I Lac, (Ru) Lac I
OA 08°Ar16'17 +58°01'12
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```
    Cepheus-Lacerta OB 1, (Ma) Cep-Lac
OA 11°Ar23'27 +57°29'19
    Cepheus OB 1, (Ma) Cep I, (Mo) II Cep
OA 13°Ar32'53 +65°04'01
    Cepheus OB 2, (Ma) Cep II, (Mo) I Cep
OA 20°Ar02'54 +54°54'06
    Cepheus OB 5, (Sch) IV Cep
OA 28°Ar10'16 +56°27'06
    Cassiopeia OB 2, (Ma) Cas II, (Sch) V Cas
OA 29°Ar10'09 +53°46'24
    Cassiopeia OB 9, (Sch) IV Cas, (Ru) Cas IX
OA 00°Ta03'37 +60°18'41
    Cepheus OB 3, (Mo) III Cep, (Ru) Cep IlI
OA 04°Ta02'19 +52°57'32
    Cassiopeia OB 5, (Ma) Cas V, (Mo) I Cas
OA 10°Ta17'19 +53°08'45
    (Amb) Cassiopeia III
OA 10°Ta59'06 +52°25'02
    Cassiopeia OB 4,(Mo) IICas,(Ru) CAS IV
OA 12°Ta13'59 +53°13'09
    Cassiopeia OB 14, (Sch) VI Cas
OA 13°Ta08'14 +58°00'05
    Cepheus OB 4, (Ru) Cep IV
OA 14°Ta43'21 +49°18'39
    Cassiopeia OB 1, (Ma) Cas I, (Sch) VII Cas
OA 15°Ta45'54 +51°05'42
    Cassiopeia OB 7, (Mo) lII Cas, (Ru) Cas VII
OA 17°Ta11'44 +40°39'05
    Cassiopeia OB 10, (Sch) IX Cas, (Ru) Cas X
OA 21°Ta33'58 +46°32'01
    Cassiopeia OB 8, (Sch) VIII Cas, (Ru) Cas VIII
OA 23°Ta15'59 +41°22'40
    Perseus OB 1, (Ma) Per I, (Mo) I Per
OA 00°Ge00'15 +43°30'09
    Cassiopeia OB 6, (Ma) Cas VI, (Sch) X Cas, (Ru) Ca
OA 00°Ge22'44 +13°51'25
    Perseus OB 2, (Ma) Per II, (Mo) II Per
OA 01°Ge47'32 +29°20'48
    Perseus OB 3, (Sch) III Per, (Ru) Per III, alpha P
OA 05°Ge56'02 +38°35'42
    Camelopardalis OB 1,(Mo) I Cam,(Ru) Cam I,(Sch) XI
OA 10°Ge03'31 +35°14'17
    Camelopardalis OB 3, (Sch) II Cam, (Ru) Cam III
OA 21°Ge12'17 +10°28'08
    Auriga OB 1, (Ma) Aur, (Mo) I Aur, (Ru) Aur I
OA 21°Ge27'22 -24°26'34
    Orion OB 1, (Ma) Ori, (Mo) I Ori, (Ru) Ori I
OA 22°Ge38'23 +11°01'31
    Auriga OB 2, (Sch) II Aur, (Ru) Aur II
OA 28°Ge55'56 - 1°35'38
    Orion OB 2, (Sch) II Ori, (Ru) Ori II
OA 01°Cn34'49 - 1°44'20
    Gemini OB 1, (Ma) Gem, (Mo) I Gem
OA 07°Cn46'04 -14°38'36
    Monoceros OB 1, (Ma) Mon I, (Sch) II Mon
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OA 09°Cn04'18 -18°33'07
    Monoceros OB 2, (Ma) Mon II, (Mo) I Mon
OA 8°Cn47'56 -31°32'59
    Canis Major OB 1, (Ma) CMa, (Sch) I CMa, (Ru) CMa
OA 4°Le51'13 -47°10'25
    Puppis OB 2, (Sch) I Pup, (Ru) Pup II
OA 7°Le12'60 -45°02'55
    Puppis OB 1, (Ma) Pup, (Sch) II Pup, (Ru) Pup I
OA 8°Le44'21 -51°53'31
    Puppis OB 3
OA 5°Vi11'49 -57°22'19
    Vela OB 1, (Ma) Vela, (Sch) 1 Vel, (Ru) Vel I
OA 8°Li43'28 -57°11'49
    Carina OB 1, (Ma) Car, (Sch) I Car, (Ru) Car I
OA 4°Li21'33 -56°42'27
    Carina OB 2(?), (Ru) Car II
OA 1°Sc52'22 -55°46'26
    Centaurus OB 2, (Ru) IC 2944
OA 6°Sc08'01 -54°23'55
    Crux OB 1, (Ko) Cru, (Ru) Cru I
OA 4°Sc26'10 -48°12'55
    Centaurus OB 1, (Ma) Cen, (Sch) I Cru, (Ru) Cen I
OA 5°Sa37'11 - 3°47'10
    Scorpius OB 2, (Mo) lI Sco, (Ru) Sco II
OA 8°Sa35'57 -32°33'13
    Norma OB 1
OA 4°Sa10'44 -23°39'06
    Ara OB 1, (ma) Ara-Nor, (Sch) I Ara
OA 6°Sa05'49 -17°53'35
    Scorpius OB 1, (Ma) Sco, (mo) I Sco, (Ru) Sco I
OA 9°Sa39'43 - 9°50'13
    Scorpius OB 4, (Ru) Sco IV
OA 7°Sa17'47 - 5°30'21
    Sagittarius OB 5, (Sch) V Sgr, (Ru) Sgr V
OA 1°Cp09'05 + 3°13'06
    Sagittarius OB 1, (Ma) Sgr I, (Mo) I Sgr,(Mo) II S
OA 1°Cp58'37 + 8°24'33
    Sagittarius OB 6, (Mo) lV Sgr
OA 2°Cp45'18 + 3°29'43
    Sagittarius OB 7(?), (Sch) VII Sgr, (Ru) Sgr VI
OA 2°Cp57'33 + 5°18'59
    Sagittarius OB 4, (Mo) III Sgr, (Ru) Sgr IV
OA 3°Cp58'17 +12°26'37
    Serpens OB 2, (Ma) Sgr III, (Mo) II Ser, (Sch) III
OA 4°Cp25'03 + 9°54'16
    Serpens OB 1, (Ma) Sgr II, (Mo) I Ser,(Ru) Ser
OA 5°Cp35'36 + 9°39'47
    Scutum OB 3, (Sch) I Sct
OA 8°Cp24'15 +15°00'33
    Scutum OB 2, (Sch) II Sct
OA 8°Cp32'11 + 7°23'16
    (Ko) Serpens-Scutum I
OA 2°Cp30'07 +18°00'25
    3 (Amb) Scutum I
OA 6°Cp28'17 +26°21'30

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    3 Aquila OB 1, (Ko) Aql I
OA 3°Aq15'16 +44°49'30
    Vulpecula Ob 4, (Sch) II Vul
OA 3°Aq36'42 +44°59'39
    Vulpecula OB 1, (Mo) 1 Vul
OA 6°Aq14'30 +48°34'46
    Vulpecula OB 2, (Sch) III Vul
OA 8°Aq30'39 +50°18'48
    Cygnus OB 5, (Sch) VII Cyg, (Ru) Cyg V, (Ru) Vul I
OA 5°Aq25'53 +54°24'38
    Cygnus OB 3, (Ma) Cy9, (MO) I Cyg, (Ru) Cyg III
OA 1°Aq08'43 +55°33'02
    Cygnus OB 1, (Ma) Cyg, (Mo) II Cyg, (Mo) III Cyg,
OA 1°Aq39'22 +58°29'14
    Cygnus OB 8, (Sch) VIII Cyg
OA 3°Aq56'37 +56°23'20
    Cygnus OB 9, (Sch) IX Cyg
OA 8°Aq37'37 +57°41'03
    Cygnus OB 2, (Sch) VI Cyg, (Ru) Cyg II
OA 7°Pi24'19 +50°39'21
    Cygnus OB 4, (Mo) IV Cyg, (Ru) Cyg IV
OA 8°Pi53'12 +58°51'37
    Cygnus OB 6, (Sch) X Cyg, (Ru) Cyg VI
OA 5°Pi31'40 +61°23'49
    Cygnus ON 7, (Sch) XI Cyg, (Ru) Cyg VI
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OC Open Clusters

```
OC 3°Ar13'46 +54°18'12
    NGC 7243, loose and poor, Lacerta
OC 6°Ar07'32 +63°50'53
    IC 1396, Cepheus, TR 37
OC 8°Ar49'29 +57°12'51
    NGC 7380, loose and poor, Cepheus
OC 0°Ta12'29 +50°28'41
    NGC 7789, intermediate rich, Cassiopeia
OC 0°Ta31'16 +56°53'09
    NGC 7654, M.52, intermediate rich, Cassiopeia
OC 4°Ta24'54 +53°31'42
    NGC 7790, loose & poor, Cassiopeia
OC 8°Ta30'29 +50°15'31
    NGC 129, fairly rich cluster in Cassiopeia
OC 0°Ta25'49 +24°10'44
    NGC 752, very old loose & poor cluster, Andromeda
OC 1°Ta53'11 +50°18'59
    NGC 225, Cassiopeia
OC 5°Ta25'41 +46°00'45
    NGC 457, intermediate rich, Cassiopeia
OC 8°Ta44'25 +46°19'46
    NGC 581, M. 103, loose & poor, Cassiopeia
OC 0°Ta40'34 +49°07'25
    NGC 559, intermediate rich, Cassiopeia
OC 1°Ta05'26 +25°48'29
    NGC 1039, M. 34, loose & poor, Perseus
OC 1°Ta31'57 +46°31'06
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    NGC 663, intermediate rich, Cassiopeia
OC 3°Ta28'46 +40°19'29
    NGC 869, rich member of double cluster, h Persei
OC 3°Ta56'41 +39°59'21
    NGC 884, intermed. rich member od double cluster,
OC 8°Ta02'46 +43°27'29
    IC 1805, loose & poor, Cassiopeia
OC 9°Ta00'44 +28°47'28
    NGC 1245, intermediate rich, Perseus
OC 9°Ta03'44 +17°38'08
    NGC 1342, very loose, irregular, Perseus
OC 9°Ta09'49 + 4°05'49
    Mel 22, M. 45, Pleiades, very loose, Taurus
OC 4°Ge59'20 - 6°03'29
    Mel 25, Hyades, very loose and irregular cluster
    In Taurus
OC 05°Ge08'25 +44°02'05
    H 1, intermediate rich, Cassiopeia
OC 09°Ge29'17 +28°06'31
    NGC 1513, loose & poor, Perseus
OC 10°Ge58'07 +30°10'52
    NGC 1528, intermediate rich, Perseus
OC 11°Ge36'26 +28°27'26
    NGC 1545, Perseus
OC 11°Ge49'38 - 3°26'41
    NGC 1647, very loose and irregular, Taurus
OC 16°Ge22'10 + 0°24'07
    NGC 1746, intermediate rich, Taurus
OC 17°Ge27'29 - 5°55'54
    NGC 1807, intermediate rich, Taurus
OC 17°Ge44'09 - 6°36'32
    NGC 1817, loose & poor, Taurus
OC 20°Ge05'34 +65°31'04
    NGC 188, loose, oldest cluster, attention in 1959-
OC 21°Ge15'50 +16°01'50
    NGC 1857, loose & poor, Auriga
OC 22°Ge02'59 +10°24'40
    NGC 1893, loose & poor, Auriga
OC 22°Ge38'08 +11°57'08
    NGC 1907, fairly rich, Auriga
OC 22°Ge46'12 +12°05'40
    NGC 1912, M. 38, intermediate rich, Auriga
OC 24°Ge05'54 +10°41'43
    NGC 1960, M.36, fairly rich, Auriga
OC 27°Ge38'48 + 8°49'28
    NGC 2099, M.37, fairly rich, Auriga
OC 29°Ge33'52 + 0°04'39
    NGC 2129, loose & poor, Gemini
OC 00°Cn24'35 + 1°00'09
    IC 2157, loose & poor, Gemini
OC 00°Cn58'54 + 0°37'50
    NGC 2158, quite rich and concentrated, Gemini
OC 01°Cn17'51 + 0°58'60
    NGC 2168, M.35, intermediate rich, Gemini
OC 01°Cn24'27 -10°00'58

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    NGC 2169, loose & poor, Orion
OC 02°Cn43'46 -10°40'20
    NGC 2194, intermediate rich, Orion
OC 07°Cn49'25 -18°49'18
    NGC 2244, Rosette, very young cluster
    Very loose,  Monoceros
OC 09°Cn01'11 +18°21'35
    NGC 2281, intermediate rich, Auriga
OC 09°Cn44'13 -13°31'27
    NGC 2264, very loose & irregular, S Monoceros
OC 14°Cn20'48 -42°06'56
    NGC 2287, M.41, intermediate rich, Canis Major
OC 17°Cn20'09 -29°40'02
    NGC 2323, M.50, intermediate rich, Monoceros
OC 20°Cn59'32 -31°12'54
    NGC 2353, loose & poor, Monoceros
OC 22°Cn02'34 + 0°12'33
    NGC 2420, intermediate rich, Gemini
OC 22°Cn57'29 -36°48'26
    NGC 2360, quite rich and concentrated, Canis Major
OC 25°Cn13'10 -44°56'06
    NGC 2362, very young cluster, loose & poor
    tau Canis Major
OC 28°Cn14'11 -34°44'24
    NGC 2422, M.47, loose & poor, Puppis
OC 29°Cn51'02 -34°48'09
    NGC 2437, M.46, fairly rich, Puppis
OC 03°Le08'36 -43°08'46
    NGC 2447, M.93, quite rich and concentrated, Puppis
OC 03°Le49'51 -29°28'53
    NGC 2506, quite rich & concentrated, Monoceros
OC 06°Le17'21 -24°12'34
    NGC 2548, M.48, fairly rich, Hydra
OC 06°Le45'52 + 0°48'45
    NGC 2632, M.44, loose & poor, Cancer
    Praesepe or Beehive Cluster
OC 07°Le14'21 -30°29'28
    NGC 2539, fairly rich, Puppis
OC 09°Le40'47 -56°50'01
    NGC 2451, c Puppis
OC 11°Le10'34 - 5°33'41
    NGC 2682, M.67, fairly rich, Cancer
OC 12°Le29'40 -57°04'02
    NGC 2477, quite concentrated & rich, globular?, Puppis
OC 18°Le33'18 -54°43'46
    NGC 2546, Puppis
OC 21°Le37'24 -45°32'20
    NGC 2627, fairly rich, Pyxis
OC 09°Vi57'26 -62°43'55
    IC 2395, intermediate rich, Vela
OC 12°Vi27'02 -65°28'00
    IC 2391, very loose & irregular, O Vela
OC 17°Vi47'15 -75°10'47
    NGC 2516, quite rich, concentrated, Carina
OC 23°Vi43'40 +26°31'13
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    Mel 111, sparse, very loose, Coma Berenices
OC 12°Li15'49 -62°08'24
    NGC 3114, intermediate rich, Carina
OC 22°Li51'42 -55°56'44
    NGC 3532, fairly rich, Carina
OC 26°Li59'41 -61°36'48
    IC 2602, very loose, irregular, theta Carina
OC 01°Sc11'46 -55°10'13
    NGC 3766, concentrated and quite rich, Centaurus
OC 12°Sc03'48 -48°23'18
    NGC 4755, 'Jewel Box', concentrated, rich, kappa Crux
OC 10°Sa58'22 -31°41'25
    NGC 6067, fairly rich, G & K Supergiants, Norma
OC 16°Sa15'31 -18°03'00
    NGC 6231, 0 Supergiants, Wolf-Rayet stars
    Scorpio, intermediate.  rich
OC 20°Sa17'40 +28°36'38
    IC 4665, very loose, irregular, Ophiuchus
OC 23°Sa51'45 - 8°33'15
    NGC 6383, intermediate rich, Scorpio
OC 24°Sa59'39 - 7°51'09
    NGC 6405, M.6, intermediate rich, Scorpio
OC 27°Sa38'56 + 1°57'09
    NGC 6469, intermediate rich, Scorpio
OC 28°Sa02'02 -10°14'34
    NGC 6475, M.7, intermediate rich, Scorpio
OC 28°Sa31'39 -10°48'39
    H 18, loose & poor, Scorpio
OC 28°Sa34'20 + 4°56'27
    NGC 6494, M.23, intermediate rich, Scorpio
OC 00°Cp16'47 + 2°08'52
    NGC 6531, M.21, loose & poor, Sagittarius
OC 00°Cp22'02 + 0°02'51
    NGC 6530, intermediate rich,Sagittarius
OC 03°Cp42'18 + 5°31'24
    NGC 6603, M.24, Milky Way Patch
    Concentrated, rich, Sagittarius
OC 03°Cp59'28 +11°23'34
    NGC 6611, M.16, very loose, irregular, Serpens
OC 04°Cp06'43 + 7°08'15
    NGC 6613, M.18, loose & poor, Sagittarius
OC 04°Cp21'14 + 7°54'20
    NGC 6618, M.17, loose, irregular, Sagittarius
OC 06°Cp51'54 + 5°04'36
    IC 4725, M.25, loose & poor, Sagittarius
OC 07°Cp10'32 +29°34'01
    NGC 6633, loose and poor, Ophiuchus
OC 10°Cp21'35 +28°16'10
    IC 4756, loose and poor, Sagittarius
OC 10°Cp50'58 +14°25'25
    NGC 6694, M.26, fairly rich, Scutum
OC 12°Cp40'06 +17°49'03
    NGC 6705, M.11, concentrated, quite rich, Scutum
OC 14°Cp27'45 +33°06'31
    NGC 6709, loose & poor, Aquila
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OC 13°Aq19'42 + 6°01'08
NGC 6994, M.73
OC 23°Aq33'24 +55°34'52
NGC 6913, M.29, loose & poor, Cygnus
OC 22°Pi24'33 +57°59'40
NGC 7092, M.39, intermediate rich, Cygnus

P Pulsars

P	00°Ar51'12	+33°39'34	AP2303+30
P	02°Ar23'03	+52°21'39	PSR2217+47
P	05°Ar44'11	-65°03'49	MPO 254
P	18°Ar59'30	+66°21'06	PSR2148+63
P	20°Ar06'15	+53°52'21	PSR2305+55
P	22°Ar57'05	+57°25'30	PSR2225+58
P	28°Ar55'15	+55°39'10	PSR2324+60
P	29°Ar21'58	+64°39'27	PSR2223+65
P	29°Ar25'01	+56°40'57	JP 2319
P	18°Ta32'04	+ 2°10'29	PSRO3Ol+19
P	19°Ta14'52	+44°58'09	PSR0138+59
P	19°Ta23'39	+51°51'45	PSROlO5+65
P	22°Ta46'35	+45°32'23	PSR0153+61
P	04°Ge27'11	+34°08'33	CP 0329
P	08°Ge13'57	-39°43'58	NP 0450
P	08°Ge56'30	+33°33'50	PSR0355+54
P	22°Ge03'32	- 1°44'47	NP 0525
P	23°Ge23'33	- 1°24'21	NP 0531
P	25°Ge26'17	- 0°19'41	PSR0540+23
P	02°Cn35'33	- 0°36'37	PSR0611+22
P	10°Cn05'24	-50°24'30	PSR0628-28
P	13°Cn42'40	+52°21'03	CP 0809
P	16°Cn56'44	+56°16'35	PSR0904+77
P	01°Le51'31	+ 7°24'21	APO823+26
P	04°Le14'20	-47°41'45	PSRO74O-28
P	08°Le41'36	-59°26'58	MP 0736
P	09°Le16'37	-11°43'48	CP 0834
P	10°Le20'11	-31°15'53	MP 0818
P	24°Le26'44	- 2°41'50	P 0943
P	25°Le48'05	+40°45'16	PSR1112+5O
P	26°Le51'12	- 4°11'08	CP 0950
P	29°Le31'28	-56°35'05	MP 0835
P	03°Vi06'13	-60°43'14	PSR0833-45
P	17°Vi21'20	+12°22'51	CP 1133
P	27°Vi41'18	+26°45'24	AP1237+25
P	01°Li53'10	-61°15'47	MP 0940
P	05°Li47'06	-59°12'32	MP 0950
P	08°Li32'60	+66°42'58	MP 1508
P	13°Li51'12	-51°25'30	MP 1055-51
P	05°Sc40'15	-54°17'29	MP 1154
P	10°Sc26'03	-52°43'35	PSR1221-63
P	13°Sc48'27	-51°51'33	MP 1240
P	17°Sc33'48	-35°57'11	MP 1359
P	18°Sc58'41	-47°57'08	PSR1323-62
P	20°Sc26'43	+28°06'58	AP1541+09
P	23°Sc09'29	-45°43'20	PSR1354-62

P	28°Sc59'25	+20°33'15	MP 1604
P	00°Sa38'30	-47°32'42	MP 1426
P	03°Sa32'04	-46°12'55	MP 1449
P	04°Sa04'03	-32°27'49	MP 1530
P	05°Sa25'34	-48°24'19	PSR1451-68
P	06°Sa03'45	-22°08'27	MP 1556
P	07°Sa46'41	-28°10'01	PSR1557-50
P	08°Sa11'25	-28°30'50	PSR1558-50
P	09°Sa13'39	-30°09'03	PSR 1601-52
P	09°Sa23'55	+19°28'01	PSR 1642-03
P	14°Sa55'11	-21°51'59	PSR1641-45
P	15°Sa56'46	+ 4°29'49	MP1700-18
P	17°Sa02'11	+ 7°12'40	MP 1706
P	17°Sa02'48	- 8°13'27	PSR1700-32
P	20°Sa32'39	- 5°11'40	PSR1717-29
P	21°Sa07'09	- 8°32'12	PSR 1718-32
P	23°Sa04'57	+ 1°42'26	PSR 1730-22
P	24°Sa00'56	-23°40'38	MP 1727
P	26°Sa13'54	- 6°17'45	PSR 1742-30
P	27°Sa43'50	-22°33'32	MP 1747
P	27°Sa44'08	- 4°01'34	PSR1749-28
P	02°Cp58'39	- 1°52'39	PSR1813-26
P	04°Cp35'57	+ 1°24'38	PSR1819-22
P	04°Cp50'11	+19°48'48	MP 1818
P	05°Cp47'28	+14°40'03	PSR 1822-09
P	06°Cp19'59	+ 6°44'29	PSR1826-17
P	08°Cp15'60	+20°28'33	PSR1831-03
P	08°Cp22'18	+19°18'06	PSR1831-04
P	11°Cp58'58	+19°41'16	JP 1845
P	12°Cp02'08	+17°26'18	PSR 1846-06
P	12°Cp12'38	+22°43'21	JP1845-01
P	13°Cp01'21	- 2°38'08	MP 1857
P	15°Cp48'45	+17°29'47	PSR1900-06
P	16°Cp22'07	+26°17'06	JP 1858
P	16°Cp39'18	+23°46'52	PSR1900+01
P	18°Cp11'16	+23°05'16	PSR1906+00
P	18°Cp38'31	+25°11'54	PSR1907+02
P	18°Cp46'24	+18°28'55	MP 1911
P	19°Cp54'36	+33°09'49	PSR1907+10
P	20°Cp57'15	+22°21'59	PSR1917+00
P	22°Cp31'13	+38°16'54	PSR1913+16
P	22°Cp37'01	+42°39'37	PSR1910+20
P	22°Cp45'57	+35°49'25	0P1915+13
P	25°Cp03'45	+41°27'23	PSR 1918+19
P	25°Cp50'45	+43°34'42	CP 1919
P	25°Cp58'01	+42°47'53	PSR1920+21
P	26°Cp16'07	+31°53'17	PSR1929+10
P	28°Cp41'40	+37°31'48	JP 1933+16
P	02°Aq10'49	+37°43'42	MP 1944
P	08°Aq57'42	+48°56'49	JP 1953
P	09°Aq41'15	+ 2°28'26	PSR2045-16
P	09°Aq59'31	+55°27'13	JP 1946
P	12°Aq38'28	+49°39'20	JP 2002
P	15°Aq31'37	+46°13'05	AP2016+28
P	16°Aq57'39	+46°01'16	PSR2020+28

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P  06°Pi35'01 +66°48'34    JP 2021
P  11°Pi55'08 +57°01'47    PSR2106+44
P  15°Pi39'59 +58°26'58    JP 2111
P  21°Pi07'24 +49°02'19    PSR2154+40
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PL Planetary Nebula

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PL 05°Ar45'39 -14°38'58    NGC:  246, Cet
PL 12°Ar46'47 +42°06'09    NGC: 7662, And
PL 18°Ar19'20 +66°43'33    NGC: 7139, Cep
PL 25°Ar19'08 +57°21'09    NGC:  *  , Cep * I 1470
PL 28°Ar50'30 +56°34'34    NGC: 7635, Cas
PL 14°Ta25'00 +38°08'11    NGC:  650, Per M76 NGC 650-1
PL 22°Ta36'04 +60°26'46    NGC:   40, Cep
PL 23°Ge23'18 - 1°24'35    NGC: 1952, Tau Ml Crab Nebula
PL 19°Cn58'38 - 0°24'56    NGC: 2392, Gem
PL 29°Cn51'02 -34°48'09    NGC: 2438, Pup
PL 01°Le00'21 -38°46'19    NGC: 2440, Pup
PL 08°Le38'26 +89°48'36    NGC: 6543, Dra
PL 21°Le24'33 +45°33'30    NGC: 3587, UMa M97 Owl Nebula
PL 14°Vi29'16 -25°43'38    NGC: 3242, Hya
PL 22°Vi24'07 -46°45'41    NGC: 3132, Ant
PL 28°Li24'13 -50°31'56    NGC: 3918, Cen
PL 04°Sa22'03 +45°21'48    NGC: 6210, Her
PL 06°Sa29'14 -30°04'26    NGC:     , Nor
PL 11°Sa29'04 -17°01'09    NGC: 6153, Sco
PL 17°Sa49'45 +11°08'02    NGC: 6309, Oph
PL 22°Sa13'27 + 0°38'45    NGC: 6369, Oph
PL 02°Cp33'58 + 4°43'27    NGC: 6567, Sgr
PL 02°Cp46'43 +29°50'59    NGC: 6572, Oph
PL 19°Cp24'20 +55°31'44    NGC: 6720, Lyr M57 Ring Nebula
PL 24°Cp48'47 + 8°01'18    NGC: 6818, Sgr
PL 07°Aq39'24 +42°03'29    NGC: 6853, Vul M27
   Dumbell Nebula
PL 13°Aq06'09 +37°23'55    NGC: 6905, Del
PL 14°Aq45'34 + 6°19'52    NGC: 7009, Aqr Saturn Nebula
PL 22°Aq18'40 +69°38'36    NGC: 6826, Cyg
PL 00°Pi49'41 -10°15'43    NGC: 7293, Aqr
PL 09°Pi20'59 +55°08'59    NGC: 7027, Cyg
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Q Quasars

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Q  01°Ar15'18 + 0°29'45    3C 2
Q  04°Ar45'24 +13°58'07    2354+14
Q  05°Ar04'14 +30°09'36    4C 29.68
Q  07°Ar13'24 +14°10'42    4C 15.1
Q  10°Ar17'59 +12°23'41    3C 9 1965
   Red shift discovered, early quasar
Q  13°Ar03'07 - 5°27'22    4C-00.6
Q  15°Ar49'30 - 5°05'09    0106+01
Q  16°Ar01'43 - 1°10'41    4C 4.6
Q  16°Ar54'57 -11°30'04    0119-04
Q  19°Ar25'24 - 7°25'15    0122-00
Q  20°Ar14'58 -13°47'23    4C-05.6
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Q	23°Ar02'22	- 8°11'29	4C 1.4
Q	23°Ar41'21	-21°33'55	3C 57
Q	23°Ar41'39	-21°34'33	0159-11
Q	27°Ar52'11	-36°24'12	0237-23
Q	29°Ar11'39	+ 9°53'41	3C 47 discovered 1964
Q	03°Ta22'18	-16°09'55	4C-03.7
Q	04°Ta17'36	+21°10'08	3C 48 discovered December 1960
	Very bright in optical spectrum		
Q	09°Ta13'02	- 1°22'19	0229+13
Q	21°Ta26'18	-32°27'26	3C 95
Q	23°Ta36'04	-25°57'15	3C 94
Q	25°Ta31'46	-32°49'41	0403-13
Q	26°Ta32'29	-31°32'36	0405-12
Q	19°Ge56'09	- 6°31'13	3C 138
Q	26°Ge09'56	+26°18'22	3C 147 March 30, 1964
	One of first		
Q	08°Cn10'07	+21°34'18	OH 471
Q	17°Cn31'03	-10°49'20	3C 175
Q	20°Cn26'38	+16°33'12	3C 186
Q	20°Cn49'41	- 7°35'10	3C 181
Q	21°Cn21'30	+44°42'48	3C 204
Q	23°Cn42'27	+27°41'26	3C 196 One of the first
Q	25°Cn50'08	-20°09'11	0736+01
Q	27°Cn19'05	+53°00'52	A 0952+17
Q	29°Cn57'41	+18°18'10	4C 37.24
Q	00°Le26'15	- 9°45'51	3C 191 disc. 1966
	First to exhibit strange absorption lines		
Q	02°Le20'29	-14°41'15	4C 5.34
Q	04°Le58'37	-17°17'33	0812+02
Q	08°Le22'26	- 4°49'54	3C 207
Q	10°Le27'02	+23°25'18	4C 39.25
Q	10°Le59'35	- 2°59'03	3C 208
Q	13°Le25'38	+ 0°08'55	3C 215
Q	14°Le55'44	+55°30'03	3C 263
Q	15°Le13'17	-28°50'24	0837-12
Q	18°Le23'57	- 0°45'52	0922+14
Q	19°Le28'45	+18°57'04	3C 232
Q	21°Le39'33	+73°32'31	3C 309.1
Q	22°Le07'08	-29°39'14	0859-14
Q	01°Vi14'36	+32°37'01	3C 254 early quasar
Q	01°Vi23'23	-11°16'47	0957+00
Q	07°Vi02'15	+ 3°19'45	3C 245
Q	07°Vi33'19	+54°25'54	3C 277.1
Q	10°Vi32'39	+39°56'35	3C 268.4
Q	11°Vi02'22	+24°43'22	3C 261
Q	11°Vi27'21	+61°38'13	3C 288.1
Q	14°Vi58'37	+27°58'54	4C 31.38
Q	15°Vi13'23	+ 6°47'11	1116+12
Q	16°Vi48'13	- 7°41'18	3C 249.1
Q	16°Vi51'60	-14°34'23	3C 246, 1049-09
Q	18°Vi34'40	+33°04'10	3C 27O.1
Q	23°Vi31'07	+42°15'24	3C 28O.1
Q	26°Vi05'15	+21°56'41	4C 21.35
Q	27°Vi16'08	- 1°08'19	1148-00
Q	28°Vi13'07	-15°57'04	1127-14

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Q  29°Vi33'35 -13°27'46    1136-13
Q  02°Li48'17 +19°05'40    3C 275.1
Q  03°Li05'31 + 3°58'26    1217+02
Q  05°Li02'32 + 5°02'50    3C 273 1st real quasar (1963)
    Optical var. 1961
    Double source, infrared source/bright quasar
Q  07°Li05'10 +36°16'08    3C 286 One of the first
Q  07°Li17'56 + 1°40'16    inf1229-02
Q  07°Li33'38 +15°17'13    1252+11
Q  12°Li33'51 +12°16'12    3C 281
Q  14°Li01'59 + 1°14'15    3C 279 fluctuates
    In radio spectrum
Q  17°Li00'27 -18°02'33    1233-24
Q  18°Li46'04 +29°16'49    1354+19
Q  19°Li54'36 +11°11'38    3C 287 early quasar
    1959 radio source
    1968 bridge connection disc.
Q  25°Li20'19 +32°43'38    4C 20.33
Q  27°Li20'60 - 1°25'28    MSH 13-011
Q  27°Li58'12 -10°50'29    1327-21
Q  29°Li42'43 +18°42'02    3C 298
Q  04°Sc36'40 +25°11'09    OQ 172 red shift over 3!
Q  09°Sc39'54 +80°59'31    3C 351
Q  12°Sc44'28 +10°38'01    1454-06
Q  13°Sc39'13 + 6°57'11    MSH 14-121
Q  17°Sc12'57 + 9°49'37    1510-08
Q  17°Sc41'02 +40°00'49    3C 323.1
Q  27°Sc57'28 +60°36'18    3C 345 radio variable
    Summer-fall 1965 discovery
Q  28°Sc03'04 +44°24'53    3C 336
Q  28°Sc31'56 +38°14'22    3C 334
Q  09°Sa21'50 +51°57'44    4C 29.50
Q  14°Cp42'30 +71°08'26    3C 380
Q  12°Aq06'33 -13°11'16    2115-30
Q  21°Aq34'24 + 0°35'45    2135-14
Q  24°Aq37'24 + 0°39'56    2146-13
Q  28°Aq19'60 +29°59'11    3C 432
Q  05°Pi11'54 + 8°05'44    2216-03
Q  05°Pi49'15 + 4°55'31    3C 446 found late 1964
    Erupts fall 1965
Q  06°Pi33'46 + 4°59'45    4C-5.93
Q  13°Pi44'42 +19°24'53    CTA 102
Q  19°Pi01'18 +17°41'20    2251+11 1971 discovered
Q  20°Pi40'08 +21°19'25    3C 454.3
Q  21°Pi10'43 +23°44'60    3C 454
Q  29°Pi58'58 + 9°51'26    2344+09
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R Radio Points

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R  01°Ar57'02 +43°29'43    4C 39.71 elliptical galaxy
R  06°Ar06'08 +26°57'41    dumbell galaxy
R  07°Ar21'16 +67°43'48    elliptical galaxy
R  07°Ar26'49 - 5°19'59    4C-02.3
R  20°Ar26'39 + 6°00'55    elliptical galaxy
R  26°Ar25'24 +54°39'57    SN II Remnant, Cassiopeia A
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    3C 461 (strongest source)
R  27°Ar09'29 +33°20'55    M 31 Andromeda galaxy
R  02°Ta51'20 -52°01'03    Fornax A, spiral galaxy NGC 1316
R  03°Ta34'24 +42°04'14    galaxy
R  07°Ta45'12 +56°31'16    4C 64.25
R  11°Ta55'56 +53°35'03    Tycho's SN I remnant
    Supernova year 1572
R  17°Ta35'39 +27°18'01    Elliptical galaxy
R  19°Ta02'58 - 0°43'08    4C 16.7
R  20°Ta16'24 -19°24'02    4C-01.12
R  21°Ta00'35 +54°52'49    4C 68.2
R  24°Ta21'27 +45°15'37    Mult H II region OH
R  26°Ta25'20 +47°48'23    Supernova Remnant
R  27°Ta43'60 +22°48'04    Elliptical galaxy NGC 1265
R  27°Ta50'43 +22°07'48    Per A, Sefert galaxy NGC 1275
R  29°Ta01'53 -10°08'21    Ellipical galaxy
R  02°Ge58'09 - 9°11'44    4C 11.18
R  04°Ge06'43 +35°54'38
R  06°Ge47'21 -16°02'06    3C 120, Superluminal object
R  07°Ge28'36 +20°55'46    4C 42.11
R  08°Ge38'55 +16°14'10
R  08°Ge45'08 +29°44'33    NRAO 1560
R  09°Ge57'26 +29°16'51    NRAO 1650
R  10°Ge22'24 -67°14'02    Pic A, dumbell galaxy
R  11°Ge12'57 + 7°25'35    galaxy Per
R  14°Ge51'42 -58°14'37    N galaxy (bright nucleus)
    NRAO 2068
R  15°Ge43'47 +21°48'40    galaxy
R  16°Ge30'06 + 3°13'43    4C 25.16
R  18°Ge05'55 +15°28'52
R  18°Ge24'46 +23°40'25    SN II
    Supernovae in galactic nebula
R  20°Ge54'03 +76°42'53    3C 390.3 N galaxy (contains
bright nucleus)
R  21°Ge25'22 +10°41'30    Emission nebula
R  22°Ge21'55 -27°28'51    Orion A, M 42= NGC 1976
    Emission nebula
R  23°Ge23'36 - 1°24'18    Tau A, SN Rem in Crab Nebula
    Taurus A
R  24°Ge17'39 -24°08'21    Orion B, NGC 2024
    Emission nebula
R  01°Cn33'46 - 2°46'15    emission nebula
R  02°Cn23'58 + 3°15'20
R  03°Cn27'29 - 0°39'11    IC 443, SN II, supernova
R  06°Cn57'03 -27°28'45
R  07°Cn38'57 -19°00'21    Rosette nebula in Mon
R  08°Cn37'57 +31°43'41    4C 54.11
R  15°Cn31'38 -75°25'55    PKS 0625-53
R  28°Cn15'33 +52°07'13    NGC 3034 I galaxy
R  05°Le44'21 +25°44'03    4C 43.17
R  06°Le34'21 +61°26'24    4C 73.11
R  07°Le12'53 +28°11'45    dumbell galaxy
R  09°Le36'56 + 3°15'26    VRO 20.08.01,disc. 1968
    Rapid radio variations
R  12°Le42'49 +44°44'10    4C 58.21
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R  21°Le23'38 +16°19'01    4C 29.35
R  25°Le05'19 -25°30'06    Hya A, peculiar galaxy
    Dumbell galaxy
R  25°Le15'34 -58°07'34    Pup A
R  00°Vi29'37 +29°14'10    B2 1101+38
    New BL Lacertai object
    Rapid radio variable
R  00°Vi45'31 - 4°07'51    4C 07.30
R  01°Vi14'30 +32°36'29    4C 40.28
R  03°Vi24'19 -60°09'19    Vela X
R  16°Vi30'18 +18°24'40    4C 22.30
R  17°Vi14'26 +47°52'05    4C 47.36
R  18°Vi30'28 +79°00'53    4C 66.17
R  19°Vi59'14 +29°32'50    BZ 1215+30 rapid radio variable
R  21°Vi52'24 +28°02'60    VRO 28.12.02 (omega Com)
    Rapid radio variable
R  28°Vi17'53 +58°58'02    Dumbell galaxy
R  01°Li22'55 + 7°22'17    elliptical galaxy
R  01°Li36'32 +13°52'38    Virga A, M 87
    Peculiar jet galaxy
R  05°Li51'34 +62°05'54    3C 303, radio
    Two optical objects
    Different red
R  17°Li31'38 - 5°32'25
R  20°Li30'58 -58°28'14    Carina nebula
R  28°Li12'03 -44°56'31    PKS 1209-52
R  29°Li11'20 +19°18'60    4C 06.49
R  29°Li43'03 +18°42'45    PKS 1416106
R  03°Sc10'10 +41°48'46    dumbell galaxy
R  05°Sc52'54 -30°18'40    Centaurus A
    Elliptical galaxy NGC 5128
R  13°Sc49'10 +24°37'17    4C07.40
R  18°Sc46'29 -46°20'38    Centaurus B
R  22°Sc21'08 +60°10'29    4C 39.45
R  22°Sc22'01 +60°11'44    3C 338 four galaxies, NGC 6161
R  22°Sc36'41 - 5°26'48    OR-225, PKS 1514-24
    Rapid radio variable, N galaxy
R  27°Sc06'37 +23°03'56    3C 327.0 Dumbell galaxy
R  28°Sc02'39 +21°47'33    4C 01.48
R  09°Sa54'43 +27°22'50    3C 348.0, dumbell galaxy, Her A
R  12°Sa46'27 -37°41'10    PKS 1610-60
R  18°Sa30'54 +23°30'31    dumbell galaxy
R  20°Sa00'38 -14°43'33
R  21°Sa57'30 -10°19'00
R  22°Sa27'02 + 2°18'57    SN REM Kepler's supernova
    1604 AD
R  26°Sa13'43 - 4°21'27    major component on
    Galactic Nucleus, Sagittarius A
R  27°Sa21'37 - 5°34'31
    Compact OH source, approaching at 341 Km/sec
R  29°Sa32'17 + 0°56'50
    Triffid nebula, M 20, galactic nebula
R  00°Cp13'47 + 0°11'53    Lagoon nebula, M 8
R  00°Cp28'08 + 2°56'50R  02°Cp11'37 -39°17'03
    PKS 1814-63
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R  03°Cp17'32 +20°19'16
    weak, broad source (30' arc)
R  04°Cp22'39 + 7°52'47
    M 17 Omega nebula (galactic nebula)
R  07°Cp47'07 +22°02'18    NRAO 5670
R  08°Cp29'55 +17°02'11    NRAO 5690
R  09°Cp15'39 +17°16'33    NRAO 5720
R  10°Cp08'27 +18°27'48
R  11°Cp20'39 +40°08'29    4C 17.81
R  11°Cp39'51 +21°07'59    NRAO 5790
R  11°Cp58'35 +21°53'00
R  12°Cp07'12 +21°43'33
R  12°Cp42'05 +32°47'05    4C 09.68
R  12°Cp47'10 +23°37'46
R  14°Cp00'02 +24°33'01    NRAO 5840
R  14°Cp00'20 -40°23'12    PKS 1934-63 non thermal source
R  14°Cp43'13 +24°10'25    SN REM, supernova remnant
R  14°Cp47'20 +24°13'28    NRAO 5890
R  17°Cp10'25 +20°25'10
R  17°Cp25'25 +27°55'53
R  17°Cp30'21 -23°01'43    NRAO 6107
R  18°Cp36'36 +29°38'27
R  19°Cp43'22 +31°16'17    NRAO 5980
R  20°Cp08'50 +32°25'58    SN II, region OH emission
R  20°Cp28'52 +68°20'19    4C 45.39
R  21°Cp29'59 +32°25'08    NRAO 6020
R  22°Cp34'31 +33°57'60    NRAO 6010
R  22°Cp41'51 +34°54'45    NRAO 6070
R  24°Cp22'45 +35°55'23    3C 400
R  29°Cp52'50 -50°45'10    PKS 2152-69, MSH 21-64
R  06°Aq24'19 -78°03'13    PKS 0410-75
R  10°Aq02'47 +51°41'38
R  10°Aq43'57 -64°57'41    Small Magellanic Cloud
R  11°Aq30'46 - 7°03'20    NRAO 6435
R  12°Aq19'23 +41°47'02
R  13°Aq27'28 +52°58'34    NRAO 6210
R  16°Aq53'06 +47°30'17
R  16°Aq54'16 +59°11'04    First localized source
    1946 Cygnus A, dumbell galaxy
R  19°Aq12'41 -85°27'17    Centroid Large Magellanic Cloud
R  24°Aq27'22 +57°13'23
R  24°Aq45'32 -52°23'27    PKS 2356-61
R  26°Aq22'54 +45°46'32    Cygnus loop SN II
R  28°Aq49'38 - 5°22'50    dumbell galaxy
R  29°Aq33'06 +57°15'37    gamma Cygnus complex
R  01°Pi14'29 +57°41'47    NRAO 6365 emission nebula
R  02°Pi16'50 +37°34'32    dumbell galaxy
R  06°Pi15'49 +56°59'02    galactic nebula, America
R  06°Pi38'51 + 8°20'42    4C-02.83
R  11°Pi36'22 +63°36'51    SN II
R  14°Pi28'09 +77°43'45    4C 60.29
R  19°Pi50'11 +59°50'55    4C 49.38
R  20°Pi48'54 + 7°46'20    4C 03.57
R  22°Pi51'30 +63°09'42    NRAO 6500
R  23°Pi40'10 +49°41'18    OY 401,VR042.22.01
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    (optical 1929) type for rapid radio variables
R  24°Pi29'55 +60°05'53    NRAO 6620
R  24°Pi40'21 +61°14'39
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Radio Holes

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RH 21°Sa47'54 -10°09'07
    At 85.7 Mc in direction of the nebula NGC 6357
RH 08°Aq52'60 +52°00'14
    At low frequencies in the vicinity of star Cygnus
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Spectroscopic Binaries

```
SB 10°Ta50'20 +20°03'59    4 beta Triangulum
SB 21°Ta20'08 -53°26'52    41 nu Eridanus
SB 28°Ta51'58 +34°51'37    gamma Perseus
SB 29°Ta37'26 +11°43'14    omicron Perseus
SB 21°Ge32'48 -27°43'42    i Orion
SB 28°Ge27'49 +20°33'45    beta Aurigao
SB 23°Le00'37 - 4°04'23    omicron Leo
SB 14°Vi50'43 +56°03'16    zeta two Ursa Major
SB 03°Li08'35 + 2°10'46    eta Virgo
SB 04°Li39'37 -49°52'42    p Vela
SB 21°Li50'60 - 0°31'16    alpha Virgo
SB 12°Sc44'19 -31°33'07    zeta Centaurus
SB 18°Sc22'21 +45°47'00    T Corona Borealis
SB 01°Sa34'33 + 2°32'09    beta Scorpio
SB 06°Sa47'22 +53°09'58    epsilon Hercules
SB 14°Sa31'05 -13°48'16    mu (one) Scorpio
SB 17°Cp24'52 +56°15'17    Beta Lyra
SB 02°Aq38'04 + 4°57'19    beta Capricorn
SB 03°Aq37'27 +19°20'44    theta Aquila
SB 21°Aq44'19 +20°02'07    alpha equuleus
SB 26°Aq35'22 +63°41'60    31 omicron (one) Cygnus
SB 27°Aq49'16 +63°58'09    32 omicron (two) Cygnus
SB 12°Pi56'58 -53°46'21    zeta Phoenix
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SG Seyfert Galaxies

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SG 07°Ta37'19 -14°48'14    NGC 1068, M.77
SG 27°Ta42'46 +22°02'19    NGC 1275
SG 06°Ge47'21 -16°02'06    Radio source 3C 120
SG 29°Le39'05 + 9°10'60    NGC 3227
SG 08°Vi59'56 +39°46'28    NGC 4051
SG 13°Vi48'26 +36°01'31    NGC 4151
SG 21°Li00'15 +36°55'44    NGC 5548
SG 19°Pi35'29 +13°22'11    NGC 7469
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SM Solar Motion

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SM 27°Sa47'30 +48°49'36
    The basic solar motion or solar apex
SM 00°Cp14'29 +52°36'57
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    The standard solar motion or solar apex
SM 01°Cp27'15 +53°26'35
    Solar apex (most quoted value)
SM 03°Pi16'43 +70°15'19
    Solar motion (to RR Lyrae stars)
SM 17°Pi10'37 +59°56'27
    circular motion around the Galactic Center
SM 24°Pi44'38 +63°26'00
    Solar motion (to globular clusters)

SN Supernovae

SN 10°Ar23'01 -10°43'14
    1939 D (Nov) M 16.00
SN 23°Ar58'14 + 6°47'07
    1936 B (Aug) M 14.00
SN 26°Ar25'24 +54°39'57
    SN Cas A (Our Galaxy) 1667
SN 17°Ta21'22 +18°29'29
    1938 A (Nov) M 15.2
SN 19°Ta34'12 +23°27'45
    1937 D (Sep. 16) M 12.8 NGC 1003
SN 20°Ta09'19 -39°14'13
    1937 E (Dec) M 15.00 NGC 1482
SN 12°Cn57'37 +42°35'01
    1954 J (Oct) M 16.0 NGC 2403
SN 28°Cn50'33 + 4°45'19
    1901 A (Jan) M 14.7 NGC 2535
SN 03°Le24'28 + 8°54'32
    1920 A (Jan) M 11.8 NGC 2608
SN 04°Le47'00 +34°00'02
    1912 A (Feb) M 13.0 NGC 2841
SN 19°Le42'42 +28°44'60
    1937F, 1921C, 1921B (Dec.12, Mar, Apr) NGC 3184
SN 26°Le30'30 +57°30'49
    1940 D (Jul) M 15.0 NGC 4545
SN 27°Le15'27 +18°26'14
    1941 B (Mar) M 15.1 NGC 3254
SN 27°Le39'31 + 9°47'05
    1946 A (May) M 18.0 NGC 3177
SN 06°Vi07'25 +45°33'09
    1937 A (Aug) M 15.3 NGC 4157
SN 16°Vi30'13 +34°08'02
    1954 A (Apr 19) M 9.8 NGC 4214
SN 18°Vi11'14 +28°35'23
    1941 C (Apr) M 16.8 NGC 4136
SN 23°Vi57'09 +51°22'11
    1945 A (Feb) SN I M 14.0 NGC 5195
SN 23°Vi57'10 +59°38'47
    1909 A (Feb) Peculiar SN M 12.1 NGC 5457
SN 25°Vi17'32 +29°06'38
    1941 A (feb 26) M 13.2 NGC 4559
SN 25°Vi33'06 +45°18'56
    1971 I (June) SN I M 11.8 NGC 5055
SN 28°Vi05'07 +16°45'44

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    1914 A (Feb-Mar) M12.3 NGC 4486
SN 00°Li18'14 +27°33'41
    1940 B (May 8) M 12.8 NGC 4725
SN 00°Li51'23 +31°51'02
    1950 A (feb) M 17.70 I 4051
SN 01°Li36'32 +13°52'38
    1919 A (Feb-Mar) M 12.3 NGC 4486
SN 01°Li51'24 + 6°38'16
    1936 A (Jan 13) M 14.4 NGC 4273
SN 01°Li58'57 +10°52'03
    1895 A (Mar) M 12.5 NGC 4424
SN 02°Li30'15 + 6°20'43
    1926 A (May) M 14.3 NGC 4303
SN 04°Li16'34 +14°48'26
    1939 B (May 2) M 11.9 4621
SN 04°Li46'60 +68°13'12
    1954 C (Oct 4) SN II M 14.9 NGC 5879
SN 05°Li25'19 +67°27'32
    1940 C (Apr) M 16.3 I 1099
SN 06°Li06'17 + 5°47'56
    1915 A (mar) M 15.5 NGC 4527
SN 07°Li15'08 +68°31'23
    1940 A (Feb 16) SN II M 14.3 NGC 5907
SN 07°Li34'04 -17°17'18
    1921 A (Mar) NGC 4038
SN 08°Li26'20 + 5°53'58
    1939 A (Jan 2) M 12.2 NGC 4636
SN 13°Li26'14 - 3°50'57
    1907 A (May 10) M 13.5 NGC 4674
SN 14°Li03'20 - 3°20'33
    1948 A (Mar) M 17.0 NGC 4699
SN 02°Sc53'29 -18°19'27
    1923 A (May Peculiar SN M 14.0 NGC 5236
SN 01°Sa35'14 +40°46'52
    1926 B (Jun) M 14.8 NGC 6181
SN 04°Cp47'29 -32°55'21
    1934 A (Oct 11) M 13.6 I 4719
SN 00°Aq31'06 -85°55'39
    Supernova 1987A brightest since 1885
SN 25°Pi55'33 +71°31'34
    1917 A (Jul) M 14.6 NGC 6946
SN 29°Pi30'10 -27°31'12
    SN I 1940E (Nov) NGC 253 M 14.00
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Solar System Points

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SS SS 02°Ar01'58 + 0°02'34
    Ascending North Node Uranus to equator
SS 03°Ar05'38 - 1°03'30
    Ascending  North Node Jupiter to equator
SS 03°Ar12'57 - 1°00'36
    Asc North Node Mars to equator
SS 03°Ar25'57 - 0°55'28
    Ascending North Node Neptune to equator
SS 03°Ar53'25 - 0°44'35
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    Ascending North Node Invariable Plane to equator
SS 05°Ar51'56 - 1°28'51
    Ascending North Node Saturn to equator
SS 07°Ar43'03 - 2°15'56
    Ascending North Node Venus to equator
SS 10°Ar19'37 - 3°30'19
    Ascending  North Node Mercury to equator
SS 10°Ar22'01 - 4°15'06
    Ascending  North Node Juno to equator
SS 13°Ar19'51 +82°51'24
    North Pole of Vesta
SS 13°Ar21'02 +88°26'25
    North Pole of Invariable Plane of Solar System
SS 13°Ar49'51 - 0°33'27
    Perihelion Jupiter
SS 14°Ar46'19 - 6°17'00
    Ascending North Node Sun Equator to equator
SS 16°Ar49'55 - 6°58'01
    Asc North Node Vesta to equator
SS 18°Ar54'53 +72°39'18
    North Pole of Pluto
SS 21°Ar54'09 - 8°40'43
    Ascending North Node Ceres to equator
SS 22°Ar55'15 +89°12'40
    North Pole of Uranus
SS 04°Ta18'54 +87°17'33
    North Pole of Saturn
SS 06°Ta43'45 +88°19'22
    North Pole of Neptune
SS 11°Ta39'06 -15°59'23
    Ascending North Node Pluto to equator
SS 14°Ta21'48 - 0°12'04
    Perihelion Neptune
SS 14°Ta56'31 -15°53'59
    Aphelion Pluto
SS 17°Ta46'49 + 0°08'27
    Asc North Node Merc to ecliptic
SS 19°Ta13'31 + 0°11'11
    Ascending North Node Mars to ecliptic
SS 26°Ta02'52 -12°01'49
    Perihelion Juno
SS 29°Ta41'58 + 1°59'48
    Ascending North Node Venus to ecliptic
SS 13°Ge14'44 +57°51'24
    North Pole of Pallas
SS 13°Ge23'32 - 3°56'36
    Aphelion Vesta
SS 13°Ge44'06 - 0°05'17
    Ascending North Node Uranus to ecliptic
SS 15°Ge05'12 + 0°10'41
    Ascending North Node Sun Equator to ecliptic
SS 16°Ge40'35 + 3°23'13
    Perihelion Mercury
SS 20°Ge41'42 +76°59'28
    North Pole of Juno
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SS 21°Ge46'48 + 0°48'20
    Ascending North Node Ceres to ecliptic
SS 02°Cn04'24 - 1°11'33
    Perihelion Saturn
SS 09°Cn53'15 + 0°44'25
    Ascending North Node Jupiter to ecliptic
SS 12°Cn08'59 - 0°45'52
    Perihelion Earth
SS 13°Cn45'60 + 0°14'42
    Ascending North Node Vesta to ecliptic
SS 17°Cn02'43 + 0°08'18
    Ascending North Node Invariable Plane to ecliptic
SS 20°Cn33'06 - 0°46'58
    Ascending North Node Pluto to ecliptic
SS 23°Cn17'06 - 0°22'57
    Asc North Node Saturn to ecliptic
SS 02°Le50'30 -26°25'15
    Perihelion Pallas
SS 03°Le52'26 -87°23'50
    South Pole of Mars
SS 10°Le52'48 + 2°43'25
    Perihelion  Venus
SS 11°Le09'13 + 0°15'49
    Ascending North Node Neptune to ecliptic
SS 15°Le13'11 -82°34'16
    South Pole of Merc Orb
SS 17°Le19'52 -88°08'44
    South Pole of Jupiter
SS 17°Le31'21 -88°58'29
    South Pole of Uranus
SS 01°Vi40'53 +10°32'13
    Perihelion Ceres
SS 04°Vi20'40 -81°44'25
    South Pole of Sun
SS 05°Vi00'36 + 2°06'09
    Aphelion Mars
SS 08°Vi00'07 -88°17'48
    South Pole of Invariable Plane of Solar System
SS 08°Vi03'53 -86°22'14
    South Pole of Venus
SS 11°Vi44'51 - 7°19'16
    Ascending North Node Pallas to equator
SS 14°Vi38'09 -78°37'20
    South Pole of Ceres
SS 19°Vi45'06 + 0°59'39
    Perihelion Uranus
SS 20°Vi47'45 - 0°11'59
    Ascending North Node Juno to ecliptic
SS 173 06'54
    23°Vi06'54 - 0°06'21
    Ascending North Node Pallas to ecliptic
SS 180 11'08
    00°Li11'08 -88°35'58
    South Pole of Neptune
SS 181 21'29
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    01°Li21'29 + 1°30'48
    Descending South Node Uranus to equator
SS 182 53'16
    02°Li53'16 + 1°32'04
    Descending South Node Jupiter to equator
SS 02°Li56'09 + 1°39'23
    Descending South Node Mars to equator
SS 183 01'18
    03°Li01'18 + 1°52'23
    Descending South North Neptune to equator
SS 183 12'10
    03°Li12'10 + 2°19'51
    Descending South Node Invariable Plane to equator
SS 185 05'45
    05°Li05'45 + 3°15'49
    Descending South Node Saturn to equator
SS 05°Li25'10 -82°43'43
    South Pole of Vesta
SS 06°Li56'29 + 4°04'08
    Descending South Node Venus to equator
SS 09°Li38'48 + 5°05'53
    Descending South North Mercury to equator
SS 10°Li12'51 + 4°36'34
    Descending South Node Juno to equator
SS 12°Li49'08 -87°36'29
    South Pole of Saturn
SS 13°Li26'35 + 1°28'45
    Aphelion Jupiter
SS 14°Li45'08 + 6°19'48
    Descending South Node Sun Equator to equator
SS 15°Li51'56 -72°15'38
    South Pole of Pluto
SS 16°Li41'45 + 7°17'40
    Des South Node Vesta to equator
SS 21°Li32'41 + 9°33'33
    Descending South Node Ceres to equator
SS 11°Sc35'53 +16°09'17
    Descending South Node Pluto to equator
SS 14°Sc04'03 + 1°09'23
    Aphelion Neptune
SS 14°Sc38'51 +16°51'33
    Perihelion Pluto
SS 17°Sc30'01 + 0°49'08
    Descending South Node Mercury to ecliptic
SS 18°Sc57'09 + 0°46'33
    Descending South Node Mars to ecliptic
SS 25°Sc49'04 +13°00'17
    Aphelion Juno
SS 13°Sa16'19 + 4°56'10
    Perihelion Vesta
SS 13°Sa36'52 + 1°04'51
    Descending South Node Uranus to ecliptic
SS 14°Sa58'32 + 0°48'57
    Descending South Node Sun Equator to ecliptic
SS 16°Sa03'22 + 1°40'59
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    Descending South Node Venus to ecliptic
SS 16°Sa34'27 - 2°23'32
    Aphelion Mercury
SS 19°Sa03'16 -77°55'32
    South Pole of Juno
SS 21°Sa43'04 + 0°11'33
    Descending South Node Ceres to ecliptic
SS 22°Sa45'31 -54°25'47
    South Pole of Pallas
SS 02°Cp05'20 + 2°11'33
    Aphelion Saturn
SS 09°Cp57'44 + 0°15'25
    Descending South Node Jupiter to ecliptic
SS 12°Cp14'24 + 1°45'37
    Aphelion Earth
SS 13°Cp52'10 + 0°44'59
    Descending South Node Vesta to ecliptic
SS 17°Cp10'17 + 0°51'14
    Descending South Node Invariable Plane to ecliptic
SS 20°Cp42'06 + 1°46'18
    Descending South Node Pluto to ecliptic
SS 23°Cp27'13 + 1°22'06
    Descending South Node Saturn to ecliptic
SS 03°Aq05'10 +27°23'48
    Aphelion Pallas
SS 11°Aq09'27 - 1°45'47
    Aphelion Venus
SS 11°Aq25'43 + 0°41'52
    Descending South Node Neptune to ecliptic
SS 20°Aq14'29 +88°10'56
    North Pole of Mars
SS 20°Aq14'36 +83°21'37
    North Pole of Merc Orbit
SS 02°Pi03'40 - 9°36'34
    Aphelion Ceres
SS 05°Pi22'42 - 1°10'21
    Perihelion Mars
SS 10°Pi05'44 +82°20'49
    North Pole of Sun
SS 12°Pi02'27 + 8°01'57
    Descending South Node Pallas to equator
SS 18°Pi51'49 +88°39'47
    North Pole of Jupiter
SS 18°Pi55'21 +79°11'17
    North Pole of Ceres
SS 20°Pi08'41 - 0°04'28
    Aphelion Uranus
SS 21°Pi11'22 + 1°07'09
    Descending South Node Juno to ecliptic
SS 23°Pi30'38 + 1°01'27
    Descending South Node Pallas to ecliptic
SS 23°Pi36'01 +86°44'23
    North Pole of Venus
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T T-Associations

T	00°Ar49'39	-46°20'49	Phe T1	-	SY Phe (?)
T	16°Ar55'06	+60°49'02	Cep T3	-	DI Cep (?)
T	18°Ar28'31	+46°11'53	And T1	-	BM And (?)
T	25°Ar27'56	+72°56'37	Cep T1	-	NGC 7023
T	27°Ar51'29	+56°23'36	Cas T2	-	NGC 7635 (?)
T	08°Ta48'53	+52°45'13	Cas T1	-	VX Cas
T	13°Ta26'01	+68°28'03	Cep T2	-	BO Cep (?)
T	22°Ta39'28	+38°03'48	Per T1	-	EO Per
T	29°Ta42'27	+11°46'47	Per T2	-	IC 348
T	06°Ge14'51	+ 6°47'57	Tau T1	-	RY Tau
T	07°Ge47'56	- 3°06'36	Tau T2	-	T Tau
T	09°Ge10'25	+ 4°00'53	Tau T3	-	UZ Tau
T	10°Ge08'19	+14°10'25	Per T3	-	NGC 1579 (?)
T	15°Ge22'37	+ 8°27'42	Aur T1	-	RW Aur
T	21°Ge32'35	-11°39'14	Ori T1	-	CO Ori
T	21°Ge35'23	-27°46'17	Ori T2	-	T Ori
T	22°Ge56'16	-23°49'56	Ori T3	-	sigma Ori
T	24°Ge35'34	-13°40'39	Ori T4	-	FU Ori
T	26°Ge26'59	+ 2°39'09	Tau T4	-	RR Tau
T	09°Cn01'43	-13°14'53	Mon T1	-	NGC 2264, S Mon
T	11°Cn09'09	- 9°42'52	Gem T1	-	FY Gem
T	13°Cn05'34	-25°42'19	Mon T2	-	WX Mon (?)
T	28°Cn11'07	-34°42'39	Pup T1	-	UY Pup (?)
T	19°Li02'12	-58°14'13	Car T1	-	eta Car (?)
T	25°Li12'46	-39°44'18	Cen T1	-	V 654 Cen (?)
T	07°Sa01'02	- 1°27'22	Sco T1	-	alpha Sco (Antares)
T	29°Sa11'45	+ 0°19'13	Sgr T1	-	NGC 6514 (M20)
T	29°Sa29'47	- 0°00'14	Sgr T2	-	NGC 6530 (M8)
T	00°Cp53'54	+ 0°28'09	Sgr T3	-	S 188, IC 1274b
T	03°Cp19'54	+11°03'44	Ser T1	-	NGC 6611 (M16)
T	06°Cp55'11	+56°52'12	Lyr T1	-	LT Lyr
T	07°Cp37'01	+31°48'55	Oph T1	-	V 426 Oph
T	11°Cp21'07	-13°54'03	CrA T1	-	R CrA
T	23°Cp03'59	+22°03'06	Aql T1	-	V 374 Aql
T	06°Aq04'01	+34°48'01	Del T1	-	V 536 Aql
T	14°Aq09'48	+53°58'13	Cyg T4	-	NO Cyg (?)
T	06°Pi44'57	+59°00'47	Cyg T1	-	lC 5070
T	09°Pi52'40	+59°04'33	Cyg T2	-	CE Cyg
T	18°Pi45'22	+71°56'53	Cyg T5	-	V 561 Cyg (?)
T	25°Pi53'06	+55°08'26	Cyg T3	-	IC 5146 (?)

VB Visual Binaries

VB	10°Ar26'21	+24°13'56	85 Pegasus
VB	14°Ar41'12	-25°17'24	L 726-8
VB	14°Ar41'45	+59°02'38	Kru 60
VB	01°Ta54'29	+50°24'43	eta Cassiopeis
VB	29°Ta12'49	-27°19'53	omicron Eridanus B,C
VB	06°Cn35'07	-24°18'40	Ross 614 A,B
VB	12°Cn37'38	-38°14'59	Sirius
VB	24°Cn23'06	-15°58'49	Procyon
VB	02°Sc06'05	+34°00'50	epsilon Beetes

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VB 27°Sc35'11 -41°29'22    Alpha Centaurus A,B
VB 00°Sa21'36 +52°51'31    zeta Hercules
VB 05°Sa54'03 +67°38'02    Fu 46
VB 00°Cp00'00 +25°26'53    70 Ophiuchus
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WD White Dwarfs

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WD 10°Ar29'13 +30°38'37    L1512-34 B
WD 12°Ar43'17 + 0°30'49    v. Maanen 2
WD 19°Ar47'38 -14°33'31    L870-2
WD 29°Ta38'49 -27°55'19    40 (=O2) Eridanus B
WD 09°Cn01'54 +13°53'46    He 3 = Ci20 398
WD 13°Cn25'22 -39°41'54    Sirius B
WD 25°Cn11'41 -16°06'05    Procyon B
WD 24°Le45'30 -48°07'49    L532-81
WD 12°Vi38'55 +15°58'11    R 627
WD 04°Sa41'06 + 5°25'13    L770-3
WD 18°Aq26'37 +41°16'11    W1326
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WR Wolf Rayet

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WR 27°Le00'09 -65°02'44    gamma two Vela
WR 20°Li30'11 -59°25'16    Wolf-Rayet star
WR 21°Li58'42 -59°10'04    eta Carina
WR 19°Sc20'38 -51°50'43    Theta Musca
WR 16°Sa19'29 -19°50'17    Wolf-Rayet star
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X X-Ray

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X  08°Ar09'32 +25°33'05
    3U2346+26, cluster: abell 2666
X  13°Ar14'07 +83°37'24    3U1904+67,
X  17°Ar22'26 +18°55'24    3U0032+24,
X  22°Ar31'54 -10°01'41    3U0138-01,
X  23°Ar26'22 +25°41'30    3U0042+32,
X  24°Ar05'10 -86°49'14    3U0532-66, LMC LMC X-4
X  24°Ar22'43 +36°15'04
    3U0021+42, M31 Andromeda Galaxy
X  26°Ar25'35 +54°39'59
    3U2321+58, Cas A = 3C 461
X  11°Ta56'22 +53°35'10
    3U0022+63, 3C 10 (Tycho's SN) Cep XR-1
X  19°Ta01'51 -86°32'03    3U0539-64, LMC X-3
X  19°Ta30'02 +50°05'02    3U0115+63,
X  21°Ta45'44 +46°37'19    3U0143+61,
X  27°Ta52'15 +22°08'52
    3U0316+41, Per X-1 Perseus Cluster Abell 426
X  02°Ge21'40 + 9°39'18    3U0352+30,
X  03°Ge05'19 +35°49'09    3U0318+55,
X  05°Ge32'08 +63°16'04
    strong source not disc. by UHURU, perhaps variable
X  09°Ge17'04 -16°00'47    3U0440+06,
X  11°Ge49'58 +15°38'54    3U0430+37,
X  16°Ge01'12 +22°05'48    3U0446+44, 3C 129.1
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X  20°Ge22'16 +43°31'09    3U0449+66,
X  20°Ge50'37 -28°05'27    3U0527-05, M42 in Orion Nebula
X  23°Ge25'32 - 0°25'22
    3U0531+21, Tau X-1 Crab Pulsar NPO531 (intense)
X  04°Cn41'25 - 0°15'54
    3U0620+23, IC 443 (SNR) 3C157 Pulsar 0611+22
X  22°Le01'22 -67°07'38    3U0750-49, Star V pup
X  25°Le33'29 -58°12'26    3U0821-42, Pup A Vel XR-2?
X  02°Vi04'10 -59°50'51
    3U0838-45, Vela X Pulsar 0833-45 Vel XR-1?
X  05°Vi20'07 -52°47'03
    3U0900-40, Star HD 77581 Vel X-R 1
X  11°Vi27'22 -40°02'24    3U0946-30,
X  13°Vi10'11 +36°45'34
    3U1207+39, NGC 4151 Seyfert galaxy intense X-rays
X  27°Vi36'46 -63°49'22
    3U0918-55, Star K Vel?
X  00°Li45'27 +31°31'22
    3U1257+28, Coma cluster Abell 1656 Coma X-1
X  01°Li34'54 +13°48'23
    3U1228+12, M87 Virgo A Vir X-ray 1 Virgo Cluster
X  03°Li55'17 +33°58'37
    Very compact source in Coma
    Discovered June 15, 1974 MX1313+29
X  04°Li05'35 +10°23'07    3U1231+07, IC 3576
X  04°Li49'59 + 4°31'16    3U1224+02, 3 C 273 QSO
X  11°Li16'48 -57°28'11    3U1022-55,
X  27°Li46'19 -55°54'14
    3U1118-60, Cen X-3;disc. 1971 binary
    1973 summer optical I.D.
    2nd or 3rd brightest source
X  28°Li31'16 -32°33'14
    3U1247-41, NGC 4696 PKS1245-41 Rich Southern cluster
X  01°Sc18'11 -55°11'33    3U1134-61
X  02°Sc44'59 -54°05'27    3U1145-61,
X  05°Sc46'30 -30°15'46    3U1322-42, NGC 5128 Cen A
X  10°Sc09'10 -54°27'26    3U1210-64,
X  10°Sc15'37 -52°12'50
    3U1223-62, GX3Ol+O very flat spectrum
X  13°Sc57'36 -48°32'49
    3U1258-61, GX 304-1 Very flat spectrum
X  17°Sc06'42 -46°41'23
    3U1320-61, Cen XR-2 increased  4/4/67 NGC 5189?
X  18°Sc02'11 +46°53'07
    3U1555+27, Star 13 epsilon CrB
X  21°Sc41'41 -55°05'01    3U1254-69,
X  02°Sa42'05 -35°32'18
    3U1516-56, Cir X-1 Large intensity changes in seconds
X  03°Sa28'44 -39°55'54
    3U1510-59, MSH 15-52A,B ? SNR?
X  04°Sa44'17 -26°27'09
    3U1543-47, Increased 1000x late 1971; died away
X  04°Sa55'54 + 6°57'28
    3U1617-15, Sco X-1 Sco-1 (largest X-ray source)
X  05°Sa05'28 -31°07'55    3U1538-52, Nor XR-2 Nor 2
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X  09°Sa25'11 -40°43'40    3U1543-62,
X  10°Sa38'33 -37°49'43    3U1556-60, Nor XR-2? Nor 2 ?
X  12°Sa26'46 -26°04'44    3U1624-49, Nor 1 ? Nor XR-1 ?
X  12°Sa29'53 + 2°00'39    3U1645+21,
X  13°Sa14'06 -24°23'47    3U1630-47, Nor XR-1 ? Nor 1 ?
X  15°Sa08'15 -22°04'37    3U1642-45, GX 340+0 Ara 1 ?
X  15°Sa29'49 -29°49'05    3U1636-53,
X  15°Sa58'20 -11°39'43
    3U1653+35, Star HZ Her, Her X-1
    1971 discovered binary; Jan 9, 1972
X  17°Sa14'15 -40°42'53    3U1632-64,
X  17°Sa21'16 -44°14'39    3U1626-67,
X  17°Sa40'54 -13°17'42    3U1700-37, Star HD 153919
    Binary system
X  18°Sa00'55 -12°43'45    3U1702-36, GX 349+2 Sco 2
    Sco XR-2
X  18°Sa01'56 - 8°15'20    3U1704-32, L8
X  18°Sa19'19 + 0°34'43    3U1709-23, Oph XR-2 Oph 2
X  18°Sa39'27 -18°41'51    3U1702-42, Ara XR-1, GX-14.1
X  18°Sa44'59 -24°53'16    3U1658-48, GX 339-4
X  19°Sa13'34 +66°19'39    3U1736+43, Glo cluster M92
    NGC 6341?
X  19°Sa27'01 -20°24'02    3U1705-44,
X  20°Sa53'24 -15°38'13    3U1714-39, Sco XR-2, GX-1O.7
    Sco 2
X  22°Sa24'28 + 8°02'05    3U1728-16, Oph 3 GX9+9
X  22°Sa50'32 + 0°02'47    3U1728-24, GXl+4 Sgr 6 ?
X  23°Sa03'18 - 9°35'24    3U1727-33, GX 354+0
X  24°Sa32'51 - 4°31'06    3U1735-28,
X  25°Sa13'40 -20°27'16    3U1735-44,
X  26°Sa23'41 - 5°30'11    3U1743-29, Sgr 1? SNR 1742-28?
X  26°Sa32'42 - 1°46'51    3U1744-26, Sgr XR-1 GX+3
X  27°Sa16'55 -13°16'59    3U1746-37, NGC 6441
    Globular cluster
X  29°Sa03'24 - 9°26'50    3U1755-33, Sco XR-6 GX-2.5
X  29°Sa34'18 - 1°04'54    3U1758-25, Sgr 5, GX5-1
    Sgr XR-3
X  29°Sa39'42 + 3°48'22    3U1758-20, GX9+l, SGR 3
X  02°Cp48'59 + 6°29'40    3U1811-17, SGR 2, GX+13.5, SGR
XR-2
X  03°Cp02'09 +12°23'44    3U1812-12, Ser XR-2
X  03°Cp15'15 +10°07'09    3U1813-14, GX 17+2, Ser 2
X  04°Cp29'03 - 5°44'23
    3U1820-30, glob cluster NGC 6624, SGR XR-4, Sgr 4
X  04°Cp35'01 -13°11'55    3U1822-37, SGR 7
X  05°Cp21'59 +73°45'16    3U1809+50,
X  06°Cp15'40 +24°02'26    3U1822-00,
X  07°Cp24'57 + 1°14'33    3U1832-23,
X  08°Cp29'45 +19°10'10    3U1832-05,
X  10°Cp29'38 +27°26'17    3U1837+04,
X  17°Cp10'12 +25°57'15    3U1901+03,
X  18°Cp27'57 +22°23'31    3U1908+00, AQL XR-1, Aql 1
X  19°Cp23'10 +31°56'14    3U1906+09,
X  19°Cp45'08 +17°15'40    3U1915-05, Star 26 f AQL ?
X  20°Cp45'29 +29°17'57    3U1912+07,
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X  00°Aq58'32 -84°04'04    3U0521-72, LMC X-2
    In Large Magellanic Cloud
X  04°Aq02'43 +31°15'38    3U1956+11
    March-April 1971= radio increase
X  05°Aq49'58 +64°20'55    3U1921+43, cluster Abell 2319?
X  10°Aq16'32 +51°01'10    3U1953+31,
X  12°Aq57'36 +54°17'04    3U1956+35, Cyg X-1
    Star HDE 226868;disc. 1966;
X  13°Aq39'50 -66°07'37    3U0115-73, SMC X-1
X  15°Aq05'01 -87°30'40    3U0540-69, LMC X-1
X  16°Aq36'43 +59°05'48    3U1957+40, Cyg A = 3C 405
X  27°Aq46'16 +56°47'01    3U2030+40, Cyg X-3
    Short period binary
    With enormous increase in radio output Fall 1972
X  10°Pi31'22 +60°26'20    3U2052+47,
X  16°Pi24'46 +48°26'39    3U2142+38, Cyg X-2, Cyg 2
X  21°Pi04'57 +57°08'30    3U2129+47,
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Chapter 19: Catalog of Stellar Objects

Aries

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CS 00°Ar00'00 - 0°00'00|Equinox, Spring
FS 00°Ar00'00 - 0°00'00|
FS 00°Ar00'00 - 0°00'00|
OA 00°Ar04'17 +42°57'39|Lacerta OB 1, (Sch) I
   Lac, (Ru) Lac I
FS 00°Ar05'60 -31°59'58|alpha Sculptor
FS 00°Ar07'39 +46°52'26|6 Lacerta
FS 00°Ar10'04 -10°07'51|iota Cetus
FS 00°Ar21'45 -58°56'15|phi Eridanus
FS 00°Ar23'44 +25°38'06|tau Pegasus, (62),Kerb
T  00°Ar49'39 -46°20'49|Phe T1  -  SY Phe (?)
P  00°Ar51'12 +33°39'34|AP2303+30
FL 00°Ar52'53 +20°40'43|EQ Pegasus B
Q  01°Ar15'18 + 0°29'45|3C 2
FS 01°Ar43'24 + 5°59'49|omega Pisces, (28)
   Spectroscopic double
FS 01°Ar44'30 -63°40'24|zeta Horologium
   Spectroscopic double
G  01°Ar49'59 -22°50'49|NGC 247, Sculptor
   Group, Cetus, Em
FS 01°Ar52'27 -20°47'31|beta Cetus, Deneb
   Kaitos, Diphcla
R  01°Ar57'02 +43°29'43|4C 39.71 elliptical galaxy
FS 01°Ar59'03 +51°40'20|2 Lacerta
   Spectroscopic double
SS 02°Ar01'58 + 0°02'34|Ascending North Node
   Uranus to equator
FS 02°Ar13'02 +73°36'25|theta Cepheus, (2)
   Spectroscopic double
P  02°Ar23'03 +52°21'39|PSR2217+47
FS 02°Ar27'42 +71°27'06|eta Cepheus, (3)
FS 02°Ar37'01 -88°59'46|epsilon Dorado
SS 03°Ar05'38 - 1°03'30|Ascending  North Node
   Jupiter to equator
SS 03°Ar12'57 - 1°00'36|Asc North Node Mars to equator
OC 03°Ar13'46 +54°18'12|NGC 7243, loose and
   Poor, Lacerta
SS 03°Ar25'57 - 0°55'28|Ascending North Node
   Neptune to equator
FS 03°Ar39'23 -61°59'02|eta Horologium
SS 03°Ar53'25 - 0°44'35|Ascending North Node
   Invariable Plane to equator
Q  04°Ar45'24 +13°58'07|2354+14
FS 04°Ar55'34 +51°44'19|5 Lacerta
   Spectroscopic double
Q  05°Ar04'14 +30°09'36|4C 29.68
FL 05°Ar35'37 +47°02'11|EV Lacerta
FS 05°Ar35'38 +53°38'13|4 Lacerta
P  05°Ar44'11 -65°03'49|MPO 254
PL 05°Ar45'39 -14°38'58|NGC:  246, Cet
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SS 05°Ar51'56 - 1°28'51|Ascending North Node
   Saturn to equator
R  06°Ar06'08 +26°57'41|dumbell galaxy
OC 06°Ar07'32 +63°50'53|IC 1396, Cepheus, TR 37
FS 06°Ar30'13 -75°52'52|delta Reticulum
Q  07°Ar13'24 +14°10'42|4C 15.1
FS 07°Ar15'06 -61°10'12|iota Horologium
FS 07°Ar17'59 +55°06'59|beta Lacerta, (3)
R  07°Ar21'16 +67°43'48|elliptical galaxy
FS 07°Ar23'57 -77°57'43|alpha Reticulum
R  07°Ar26'49 - 5°19'59|4C-02.3
SS 07°Ar43'03 - 2°15'56|Ascending North Node
   Venus to equator
FS 07°Ar43'13 +44°27'51|omicron Andromeda, (1)
FS 07°Ar44'41 +53°30'42|alpha Lacerta, (7)
NS 07°Ar45'53 -35°45'31|Eggen's star in Sculptor
FS 07°Ar54'21 -56°29'43|kappa Eridanus
X  08°Ar09'32 +25°33'05|3U2346+26, cluster:
   Abell 2666
OA 08°Ar16'17 +58°01'12|Cepheus-Lacerta OB 1
   (Ma) Cep-Lac
FS 08°Ar21'31 +12°22'40|88 gamma Pegasus
   Algenib, variable
CG 08°Ar33'49 -21°54'29|Cluster A
FS 08°Ar55'45 +64°09'20|eta Cepheus, ERAKIS
IF 08°Ar55'45 +64°09'20|mu Cepheus, M
   Supergiant, Late-Type star
G  09°Ar00'13 -20°59'45|Cluster A, 400 galaxies
Q  10°Ar17'59 +12°23'41|3C 9 1965, red shift
   Discovered, early quasar
SS 10°Ar19'37 - 3°30'19|Ascending  North Node
   Mercury to equator
SS 10°Ar22'01 - 4°15'06|Ascending  North Node
   Juno to equator
SN 10°Ar23'01 -10°43'14|1939 D (Nov) M 16.00
VB 10°Ar26'21 +24°13'56|85 Pegasus
WD 10°Ar29'13 +30°38'37|L1512-34 B
N  10°Ar37'33 +58°55'28|Nova 1936 Lacerta CP
N  10°Ar59'32 +54°43'44|Nova 1910 Lacerta No. 1
FS 11°Ar02'05 -16°10'60|eta Cetus
OA 11°Ar23'27 +57°29'19|Cepheus OB 1, (Ma) Cep
   I, (Mo) II Cep
FS 11°Ar39'35 +59°35'33|epsilon Cepheus, (23)
FS 12°Ar00'09 +64°55'37|nu Cepheus, (10)
FS 12°Ar02'06 +68°53'54|alpha Cepheus
   ALDERAMIN, (5)
DN 12°Ar12'18 +62°07'58|Cepheus
CS 12°Ar12'28 - 5°02'05|Ascending Supergalactic
   Node to Equator
FS 12°Ar16'21 +60°40'45|zeta Cepheus, (21)
   Spectroscopic double
FL 12°Ar30'31 -23°51'57|UV Ceti
WD 12°Ar43'17 + 0°30'49|v. Maanen 2
PL 12°Ar46'47 +42°06'09|NGC: 7662, And
IF 12°Ar55'19 -60°35'52|R Horologium, OH source
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   With IF excess
FS 13°Ar00'07 +82°52'11|delta Draco, ALDIB, (57)
Q  13°Ar03'07 - 5°27'22|4C-0O.6
X  13°Ar14'07 +83°37'24|3U1904+67,
SS 13°Ar19'51 +82°51'24|North Pole of Vesta
SS 13°Ar21'02 +88°26'25|North Pole of
   Invariable Plane of Solar System
FS 13°Ar26'05 +25°21'10|21 alpha Andromeda
   Spectroscopic double, Alpheratz
FS 13°Ar31'47 + 2°21'60|delta Pisces
OA 13°Ar32'53 +65°04'01|Cepheus OB 2, (Ma) Cep
   II, (Mo) I Cep
SS 13°Ar49'51 - 0°33'27|Perihelion Jupiter
VB 14°Ar41'12 -25°17'24|L 726-8
VB 14°Ar41'45 +59°02'38|Kru 60
SS 14°Ar46'19 - 6°17'00|Ascending North Node
   Sun Equator to equator
G  14°Ar57'12 - 4°40'47|IC 1613, Local Group
LG 14°Ar57'12 - 4°40'47|IC 1613
N  15°Ar22'58 +54°30'30|Nova 1950 Lacerta
NS 15°Ar26'39 -25°09'16|UV Cet A, UV Cet B
FS 15°Ar33'06 -15°42'46|45 theta Cetus
FS 15°Ar37'21 -38°56'55|nu Fornax
FS 15°Ar44'40 +62°04'58|lamda Cepheus, (22)
FL 15°Ar45'31 +59°12'15|DO Cepheus
Q  15°Ar49'30 - 5°05'09|0106+01
Q  16°Ar01'43 - 1°10'41|4C 4.6
MS 16°Ar10'40 +56°14'26|215 441
CS 16°Ar29'47 + 0°32'36|Ascending Supergalactic
   Node to Ecliptic
FS 16°Ar37'21 + 0°35'45|epsilon Pisces
NS 16°Ar47'46 +41°24'45|Ross 248
SS 16°Ar49'55 - 6°58'01|Asc North Node Vesta to equator
Q  16°Ar54'57 -11°30'04|0119-04
T  16°Ar55'06 +60°49'02|Cep T3  -  DI Cep (?)
FS 17°Ar01'56 -25°03'23|tau Cetus (52)
FS 17°Ar20'22 -76°38'23|epsilon Reticulum
X  17°Ar22'26 +18°55'24|3U0032+24,
FS 17°Ar34'19 -52°14'28|iota Eridanus
FS 17°Ar53'20 +59°59'52|delta Cepheus, (27), double
FS 18°Ar02'58 +44°16'17|lamda Andromeda, (16)
   Spectroscopic variable
G  18°Ar08'39 -14°23'31|NGC 584, Cetus
PL 18°Ar19'20 +66°43'33|NGC: 7139, Cep
G  18°Ar27'50 +36°08'10|NGC 221, Local Group
   M.32, And.,G3
T  18°Ar28'31 +46°11'53|And T1  -  BM And (?)
FS 18°Ar40'44 -31°07'17|upsilon Cetus (59)
OC 18°Ar49'29 +57°12'51|NGC 7380, loose and
   Poor, Cepheus
SS 18°Ar54'53 +72°39'18|North Pole of Pluto
P  18°Ar59'30 +66°21'06|PSR2148+63
Q  19°Ar25'24 - 7°25'15|0122-00
WD 19°Ar47'38 -14°33'31|L870-2
OA 20°Ar02'54 +54°54'06|Cepheus OB 5, (Sch) IV Cep
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P  20°Ar06'15 +53°52'21|PSR2305+55
Q  20°Ar14'58 -13°47'23|4C-05.6
G  20°Ar26'08 - 2°23'09|NGC 488, Pisces
R  20°Ar26'39 + 6°00'55|Elliptical galaxy
FS 20°Ar54'58 +23°57'52|delta Andromeda
IF 21°Ar01'29 -79°18'53|R Dorado, 2nd strongest
   At 2 microns
G  21°Ar03'23 -19°17'08|NGC 681, Cetus
FS 21°Ar22'56 -20°01'42|(55) zeta Cetus, BATEN
   KAITOS, spectroscopic double.
LG 21°Ar52'31 -46°41'14|Fornax system
SS 21°Ar54'09 - 8°40'43|Ascending North Node
   Ceres to equator
FS 22°Ar02'16 +27°14'26|29 pi Andromeda
   Spectroscopic double
G  22°Ar31'03 -45°47'29|Fornax system, Local
   Group, A0237-34
G  22°Ar31'36 + 0°48'53|NGC 524, Pisces
X  22°Ar31'54 -10°01'41|3U0138-01,
FS 22°Ar53'54 -53°22'59|theta Eridanus, ACAMAR
   Spectroscopic double
SS 22°Ar55'15 +89°12'40|North Pole of Uranus
P  22°Ar57'05 +57°25'30|PSR2225+58
Q  23°Ar02'22 - 8°11'29|4C 1.4
X  23°Ar26'22 +25°41'30|3U0042+32,
DI 23°Ar28'03 +72°37'20|NGC 7023, Cepheus
Q  23°Ar41'21 -21°33'55|3C 57
Q  23°Ar41'39 -21°34'33|0159-11
SN 23°Ar58'14 + 6°47'07|1936 B (Aug) M 14.00
NS 24°Ar01'06 +38°03'31|Grb 34 A, Grb 34 B
X  24°Ar05'10 -86°49'14|3U0532-66, LMC LMC X-4
X  24°Ar22'43 +36°15'04|3U0021+42, M31
   Andromeda Galaxy
FS 24°Ar58'45 - 4°15'34|nu Pisces, 106
PL 25°Ar19'08 +57°21'09|NGC:  *  , Cep * I 1470
FS 25°Ar26'34 -45°58'59|beta Fornax
T  25°Ar27'56 +72°56'37|Cep T1  -  NGC 7023
FS 26°Ar09'34 + 5°28'39|eta Pisces, double
FS 26°Ar13'34 -58°17'57|e Eridanus
FS 26°Ar16'57 +22°36'20|sigma Pisces
   Spectroscopic double
R  26°Ar25'24 +54°39'57|SN II Remnant
   Cassiopeia A, 3C 461 (strongest source)
SN 26°Ar25'24 +54°39'57|SN Cas A (Our Galaxy) 1667
X  26°Ar25'35 +54°39'59|3U2321+58, Cas A = 3C 461
LG 26°Ar36'08 +32°27'52|M.32 galaxy
N  26°Ar36'08 +32°27'52|885 Andromeda (S)
FS 26°Ar44'56 - 8°06'50|xi Pisces (111)
G  26°Ar54'22 +33°54'51|NGC 205, Local Group
   Andromeda, A8
LG 26°Ar54'22 +33°54'51|near galaxy, part of
   Local Group
FS 26°Ar57'53 - 1°49'48|omicron Pisces (110)
MS 27°Ar03'58 - 1°47'03|10 783
CS 27°Ar09'29 +33°20'55|Center of Local Group Galaxies
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G  27°Ar09'29 +33°20'55|NGC 224, M.31, Local
   Group, G5, And.
LG 27°Ar09'29 +33°20'55|M.31 Andromeda galaxy
R  27°Ar09'29 +33°20'55|M 31 Andromeda galaxy
   (*out of sequence)
FS 27°Ar21'41 +20°11'14|tau Pisces
G  27°Ar26'24 + 5°17'39|NGC 628, Pisces
G  27°Ar47'40 -55°47'37|INGC 1291, Eridanus
T  27°Ar51'29 +56°23'36|Cas T2  -  NGC 7635 (?)
Q  27°Ar52'11 -36°24'12|0237-23
FS 28°Ar09'53 +17°37'23|upsilon Pisces
OA 28°Ar10'16 +56°27'06|Cassiopeia OB 2, (Ma)
   Cas II, (Sch) V Cas
EB 28°Ar13'27 +54°32'57|AR Cassiopeia
CS 28°Ar19'04 +56°28'44|Intersect Local System
   & Galactic Equator
FS 28°Ar36'51 +29°53'27|mu Andromeda
FS 28°Ar47'57 - 8°44'45|alpha Pisces
   ALRISHA,(113), spectroscopic double
PL 28°Ar50'30 +56°34'34|NGC: 7635, Cas
P  28°Ar55'15 +55°39'10|PSR2324+60
OA 29°Ar10'09 +53°46'24|Cassiopeia OB 9, (Sch)
   IV Cas, (Ru) Cas IX
Q  29°Ar11'39 + 9°53'41|3C 47 discovered 1964
P  29°Ar21'58 +64°39'27|PSR2223+65
P  29°Ar25'01 +56°40'57|JP 2319
DI 29°Ar26'17 +58°02'53|NGC 7538, Cepheus
CG 29°Ar28'12 +23°59'01|Pisces
G  29°Ar28'12 +23°59'01|Pisces cluster, 100 galaxies
G  29°Ar46'51 +26°14'06|NGC 404, Local Group?
   Andromeda, F8
LG 29°Ar46'51 +26°14'06|Andromeda NGC 404
FS 29°Ar53'11 +26°16'51|beta Andromeda, Mirach, double
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Taurus

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G  00°Ta01'03 +40°47'45|NGC 147, Local Group, Cassiopeia
LG 00°Ta01'03 +40°47'45|galaxy in Local Group
OA 00°Ta03'37 +60°18'41|Cepheus OB 3, (Mo) III
   Cep, (Ru) Cep IlI
OC 00°Ta12'29 +50°28'41|NGC 7789, intermediate
   Rich, Cassiopeia
G  00°Ta24'16 -72°50'16|NGC 1553, Dorado Cloud
G  00°Ta27'34 -72°41'39|NGC 1549, Dorado Cloud
ME 00°Ta30'44 +16°28'49|Andromedids
OC 00°Ta31'16 +56°53'09|NGC 7654, M.52
   Intermediate rich, Cassiopeia
G  00°Ta38'29 -62°32'28|NGC 1433, Dorado Cloud
   Of galaxies
G  00°Ta41'33 +39°48'50|NGC 185, Local Group, Cassiopeia,GO
LG 00°Ta41'33 +39°48'50|galaxy in Local Group
FS 00°Ta49'19 -15°56'21|omicron Cetus, MIRA
   Double, (68)
IF 01°Ta10'35 -14°59'57|omicron Cetus, MIRA
   Late-Type star, 6th strongest  at 2 microns
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FS 01°Ta26'19 -32°40'05|Tau Eridanus (1)
FS 01°Ta44'44 +79°29'32|epsilon Draco, TYL
   (63), double
VB 01°Ta54'29 +50°24'43|eta Cassiopeis
FS 01°Ta56'23 -35°30'32|tau Eridanus (2) T5
G  02°Ta01'36 -73°05'31|NGC 1566, Dorado Cloud
FS 02°Ta37'30 +62°37'54|iota Cepheus, (32)
G  02°Ta42'29 +19°41'54|NGC 598, M.33, Local
   Group, A7, Tri.
LG 02°Ta42'29 +19°41'54|M.33 Tri nebula
FS 02°Ta43'06 + 7°45'45|(5) gamma Aries
   MESARTHIM, double
G  02°Ta51'20 -52°01'03|NGC 1316, Fornax Group
   For A
R  02°Ta51'20 -52°01'03|Fornax A, spiral galaxy
   NGC 1316
Q  03°Ta22'18 -16°09'55|4C-03.7
FS 03°Ta25'01 + 8°51'40|beta Aries (6)
   SHERATAN, spectroscopic double
R  03°Ta34'24 +42°04'14|galaxy
G  03°Ta41'29 -51°30'36|NGC 1326, Fornax Group
FS 03°Ta51'55 +71°03'49|beta Cepheus, ALPHIRK
   (8), variable, double, spectroscopic
FS 03°Ta54'35 -57°26'22|y Eridanus
OA 04°Ta02'19 +52°57'32|Cassiopeia OB 5, (Ma)
   Cas V, (Mo) I Cas
FS 04°Ta10'06 +51°01'21|11 beta Cassiopeia, Caph
FS 04°Ta11'19 -38°11'26|tau Eridanus (11)
   Double    T3
Q  04°Ta17'36 +21°10'08|3C 48 discovered
   December 1960, very bright in optical spectrum
FS 04°Ta18'43 +44°38'56|zeta Cassiopeia
SS 04°Ta18'54 +87°17'33|North Pole of Saturn
OC 04°Ta24'54 +53°31'42|NGC 7790, loose & poor, Cassiopeia
G  04°Ta38'25 -21°56'56|NGC 1052, Cetus
G  05°Ta05'60 -78°02'40|NGC 1672, Dorado Cloud
FS 05°Ta32'09 +36°04'28|phi Andromeda
   Spectroscopic double
FS 05°Ta43'07 -70°12'22|gamma Dorado
FS 06°Ta15'00 +17°00'08|(2) alpha Triangulum
   METALLAH, spectroscopic double.
G  06°Ta21'51 -52°43'14|NGC 1365, Fornax Group
SS 06°Ta43'45 +88°19'22|North Pole of Neptune
G  06°Ta44'17 +50°44'09|IC 10, Local Group Member?
LG 06°Ta44'17 +50°44'09|IC 10
FS 06°Ta48'53 - 5°43'52|xi Cetus (73)
FS 06°Ta54'32 -14°21'29|delta Cetus (82), variable
FS 06°Ta54'50 + 9°49'51|alpha Aries (13), HAMAL
FS 06°Ta56'08 -74°39'15|alpha Dorado,
FS 07°Ta13'02 +46°44'26|alpha Cassiopeia,Schedir
G  07°Ta37'19 -14°48'14|NGC 1068 , Cetus Group, M.77
SG 07°Ta37'19 -14°48'14|NGC 1068, M.77
G  07°Ta39'13 -13°59'51|NGC 1055, Cetus Group
   Of galaxies
R  07°Ta45'12 +56°31'16|4C 64.25
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FS 07°Ta54'31 -24°55'43|eta Eridanus, AZHA, (3)
G  08°Ta02'53 -51°44'40|NGC 1380
   Brightest,Fornax Group
G  08°Ta18'15 -13°40'46|NGC 1073, Cetus Group
FS 08°Ta21'44 -54°38'12|h Eridanus
OC 08°Ta30'29 +50°15'31|NGC 129, fairly rich
   Cluster in Cassiopeia
G  08°Ta34'21 -15°07'58|NGC 1090, Cetus
FS 08°Ta47'00 -11°51'28|gamma Cetus (86)
   Double, KAFFALIJIDHMA
T  08°Ta48'53 +52°45'13|Cas T1  -  VX Cas
G  08°Ta51'39 -14°11'54|NGC 1087, Cetus Group
FS 08°Ta51'54 +47°17'46|eta Cassiopeia, Achird, double
G  08°Ta58'00 -51°26'14|NGC 1399, Fornax Group
G  08°Ta59'14 -73°08'38|NGC 1617, Dorado Cloud
G  09°Ta01'48 -51°33'39|NGC 1404, Fornax Group
Q  09°Ta13'02 - 1°22'19|0229+13
DI 09°Ta28'09 +45°53'59|NGC 281, Cassiopeia
FS 09°Ta39'28 -87°54'44|delta Dorado
FS 09°Ta39'51 -37°55'52|tau Eridanus (16), double
FS 09°Ta54'14 -55°29'24|f Eridanus, double
OA 10°Ta17'19 +53°08'45|(Amb) Cassiopeia III
OC 10°Ta25'49 +24°10'44|NGC 752, very old loose
   & poor cluster, Andromeda
FS 10°Ta42'01 -54°49'15|g Eridanus
SB 10°Ta50'20 +20°03'59|4 beta Triangulum
OA 10°Ta59'06 +52°25'02|Cassiopeia OB 4,(Mo)
   IICas,(Ru) CAS IV
FS 11°Ta08'00 - 5°54'01|mu Cetus (87)
G  11°Ta22'12 -37°36'09|NGC 1325, Holmberg VI, Eridanus
FS 11°Ta36'41 +20°28'17|beta Triangulum (4)
   Spectroscopic double
SS 11°Ta39'06 -15°59'23|Ascending North Node
   Pluto to equator
N  11°Ta40'24 +53°30'54|Nova Cassiopeia (8) 1572
OC 11°Ta53'11 +50°18'59|NGC 225, Cassiopeia
R  11°Ta55'56 +53°35'03|Tycho's SN I remnant
   Supernova year 1572
X  11°Ta56'22 +53°35'10|3U0022+63, 3C 10
   (Tycho's SN) Cep XR-1
G  12°Ta05'36 -37°12'52|NGC 1332, Eridanus
OA 12°Ta13'59 +53°13'09|Cassiopeia OB 14, (Sch)
   VI Cas
FS 12°Ta48'32 +18°54'40|gamma Triangulum (9)
FS 13°Ta00'46 -26°15'35|zeta Eridanus, ZIBAL
   Spectroscopic double, (13)
DI 13°Ta06'13 +57°36'28|
OA 13°Ta08'14 +58°00'05|Cepheus OB 4, (Ru) Cep IV
FS 13°Ta12'50 +48°47'09|gamma Cassiopeia
   Variable double
DI 13°Ta13'27 +48°47'22|IC 59, gamma Cassiopeia
FS 13°Ta15'24 -53°18'15|sigma Eridanus
T  13°Ta26'01 +68°28'03|Cep T2  -  BO Cep (?)
FS 13°Ta27'46 -39°32'11|tau Eridanus (19)
   Spectroscopic double
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FS 13°Ta34'48 +27°54'21|gamma Andromeda (50)
   ALAMAK, double
FS 13°Ta37'38 -12°34'16|alpha Cetus, MEKAB, (92)
FS 14°Ta15'47 - 8°13'29|lamda Cetus (91)
SS 14°Ta21'48 - 0°12'04|Perihelion Neptune
PL 14°Ta25'00 +38°08'11|NGC:  650, Per M76 NGC 650-1
OA 14°Ta43'21 +49°18'39|Cassiopeia OB 1, (Ma)
   Cas I, (Sch) VII Cas
SS 14°Ta56'31 -15°53'59|Aphelion Pluto
FS 15°Ta22'44 -61°25'42|alpha Horologium
OC 15°Ta25'41 +46°00'45|NGC 457, intermediate
   rich, Cassiopeia
OA 15°Ta45'54 +51°05'42|Cassiopeia OB 7, (Mo)
   LII Cas, (Ru) Cas VII
FS 16°Ta45'06 -41°40'34|tau 6 Eridanus, (27)
G  16°Ta55'14 -35°45'37|NGC 1407, G3
FS 16°Ta57'52 +46°06'32|37 delta Cassiopeia
   KSORA, eclipsing binary.
OA 17°Ta11'44 +40°39'05|Cassiopeia OB 10, (Sch)
   IX Cas, (Ru) Cas X
SN 17°Ta21'22 +18°29'29|1938 A (Nov) M 15.2
G  17°Ta23'59 +27°11'28|NGC 891, Andromeda
FS 17°Ta28'33 -27°44'35|epsilon Eridanus (18)
R  17°Ta35'39 +27°18'01|Elliptical galaxy
FS 17°Ta43'20 +11°06'53|41 Aries
SS 17°Ta46'49 + 0°08'27|Asc North Node Merc to ecliptic
NS 17°Ta47'12 -26°47'20|epsilon Eridanus
FS 18°Ta06'22 -43°47'04|tau eight Eridanus, (33)
ME 18°Ta15'32 + 5°58'15|Daytime Arietids
P  18°Ta32'04 + 2°10'29|PSRO3Ol+19
OC 18°Ta44'25 +46°19'46|NGC 581, M. 103, loose
   & poor, Cassiopeia
FS 18°Ta54'25 -78°37'12|zeta Dorado
X  19°Ta01'51 -86°32'03|3U0539-64, LMC X-3
FS 19°Ta02'15 -65°34'46|delta Caelum
R  19°Ta02'58 - 0°43'08|4C 16.7
SS 19°Ta13'31 + 0°11'11|Ascending North Node
   Mars to ecliptic
P  19°Ta14'52 +44°58'09|PSR0138+59
P  19°Ta23'39 +51°51'45|PSROlO5+65
X  19°Ta30'02 +50°05'02|3U0115+63,
SN 19°Ta34'12 +23°27'45|1937 D (Sep. 16) M 12.8
   NGC 1003
FS 20°Ta03'08 -31°47'22|pi Eridanus, (26)
FS 20°Ta03'32 + 1°28'58|delta Aries, BOTEIN, (57)
SN 20°Ta09'19 -39°14'13|1937 E (Dec) M 15.00
   NGC 1482
FS 20°Ta09'20 -43°45'35|tau nine Eridanus
   (36), spectroscopic double
R  20°Ta16'24 -19°24'02|4C-01.12
FS 20°Ta22'12 -27°59'60|delta Eridanus, rana (23)
FS 20°Ta22'52 - 9°39'16|omicron Taurus, (1)
N  20°Ta34'50 +41°08'29|Nova 1887 Persei No. 1 (V)
OC 20°Ta40'34 +49°07'25|NGC 559, intermediate
   Rich, Cassiopeia
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R  21°Ta00'35 +54°52'49|4C 68.2
OC 21°Ta05'26 +25°48'29|NGC 1039, M. 34, loose
   & poor, Perseus
FS 21°Ta05'52 - 9°14'12|xi Taurus, (2)
   Spectroscopic double
SB 21°Ta20'08 -53°26'52|41 nu Eridanus
Q  21°Ta26'18 -32°27'26|3C 95
OC 21°Ta31'57 +46°31'06|NGC 663, intermediate
   Rich, Cassiopeia
OA 21°Ta33'58 +46°32'01|Cassiopeia OB 8, (Sch)
   VIII Cas, (Ru) Cas VIII
X  21°Ta45'44 +46°37'19|3U0143+61,
ME 22°Ta13'47 - 4°28'48|S. Taurids
FS 22°Ta15'00 -53°05'36|upsilon Eridanus(u4)
   (41), Spectroscopic double
PL 22°Ta36'04 +60°26'46|NGC:   40, Cep
T  22°Ta39'28 +38°03'48|Per T1  -  EO Per
FS 22°Ta43'05 -84°51'38|beta Dorado
P  22°Ta46'35 +45°32'23|PSR0153+61
FS 23°Ta02'04 +82°53'20|upsilon Draco, (52)
FS 23°Ta05'05 -33°28'26|gamma Eridanus, (34)
OA 23°Ta15'59 +41°22'40|Perseus OB 1, (Ma) Per
   I, (Mo) I Per
FS 23°Ta28'46 +40°19'29|h Perseus (cluster)
OC 23°Ta28'46 +40°19'29|NGC 869, rich member of
   Double cluster, h Persei
FS 23°Ta34'43 -54°56'10|upsilon three Eridanus,(43)
Q  23°Ta36'04 -25°57'15|3C 94
FS 23°Ta45'46 +41°03'55|chi Perseus, double (7)
FS 23°Ta54'09 +65°42'55|pi Cepheus, (33)
   Double, spectroscopic
OC 23°Ta56'41 +39°59'21|NGC 884, intermed. rich
   Member od double cluster,
FS 24°Ta16'42 +47°46'12|(45) epsilon
   Cassiopeia, SEGIN
R  24°Ta21'27 +45°15'37|Mult H II region OH
ME 24°Ta53'25 + 2°03'55|N. Taurids
IF 25°Ta12'39 +41°51'34|s Perseus, M
   Supergiant, IF excess 40% total Luminosity
EB 25°Ta17'48 +21°54'22|beta Perseus, ALGOL
FS 25°Ta17'54 +21°54'26|beta Perseus, ALGOL
   (26) eclipsing binary
Q  25°Ta31'46 -32°49'41|0403-13
FS 25°Ta35'32 -62°47'05|alpha Caelum, double
SS 26°Ta02'52 -12°01'49|Perihelion Juno
R  26°Ta25'20 +47°48'23|Supernova Remnant
Q  26°Ta32'29 -31°32'36|0405-12
FS 26°Ta56'43 +25°56'36|kappa Perseus, MISAM, (27)
CG 27°Ta12'31 +23°11'11|Perseus
G  27°Ta12'31 +23°11'11|Perseus cluster of 500 galaxies
IF 27°Ta12'47 +44°05'10|W3, l0th strongest at
   20 microns
FS 27°Ta15'57 +34°28'16|tau Perseus
   Spectroscopic double
G  27°Ta28'07 +41°25'11|Maffei I, Local Group
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   IC 1805
IF 27°Ta28'07 +41°25'11|Maffei I, near galaxy
   At 2 microns = M.31 in brightness
LG 27°Ta28'07 +41°25'11|Maffei I
G  27°Ta42'46 +22°02'19|s-Perseus near
   Irregular cloud
SG 27°Ta42'46 +22°02'19|NGC 1275
R  27°Ta43'60 +22°48'04|Elliptical galaxy NGC 1265
R  27°Ta50'43 +22°07'48|Per A, Sefert galaxy
   NGC 1275
X  27°Ta52'15 +22°08'52|3U0316+41, Per X-1
   Perseus Cluster Abell 426
DI 27°Ta53'46 +43°22'19|IC 1805, Cassiopeia
FS 28°Ta02'21 +37°32'17|eta Perseus (15) MIRAM, double
OC 28°Ta02'46 +43°27'29|IC 1805, loose & poor, Cassiopeia
IF 28°Ta17'19 - 8°06'20|NML Taurus, Mira-Type
   IF star, variable, OH radio emission
FS 28°Ta31'56 +30°34'17|iota Perseus
G  28°Ta32'20 +41°28'42|Maffei II, Local Group?
LG 28°Ta32'20 +41°28'42|Maffei II IC 1805
EB 28°Ta36'06 +59°52'38|YZ Cassiopeia
FS 28°Ta36'17 + 3°42'47|17 Taurus, ELECTRA
FS 28°Ta45'26 -58°22'38|beta Caelum
FS 28°Ta47'11 -50°57'54|upsilon one Eridanus, (50)
FS 28°Ta48'36 + 4°40'20|16 Taurus, CALAENO
SB 28°Ta51'58 +34°51'37|gamma Perseus
FS 28°Ta52'28 -26°51'54|omicron one Eridanus
   BEID, (38)
FS 28°Ta55'19 + 4°44'58|19 Taurus, TAYGETA
DI 28°Ta58'05 + 3°57'44|IC 349, 23 Taurus, MEROPE
FS 29°Ta00'39 + 3°59'30|23 Taurus, MEROPE
OC 29°Ta00'44 +28°47'28|NGC 1245, intermediate
   Rich, Perseus
R  29°Ta01'53 -10°08'21|Ellipical galaxy
OC 29°Ta03'44 +17°38'08|NGC 1342, very loose
   Irregular, Perseus
FS 29°Ta05'41 + 4°52'07|20 Taurus, MAIA
FS 29°Ta06'37 + 3°14'20|eta Taurus, ALCYONE
   (25), the Pleiades
FS 29°Ta06'58 + 4°53'00|21 Taurus, ASTEROPE
OC 29°Ta09'49 + 4°05'49|Mel 22, M. 45
   Pleiades, very loose, Taurus
VB 29°Ta12'49 -27°19'53|omicron Eridanus B,C
FS 29°Ta16'59 -51°34'13|upsilon Eridanus, THEEMIN,(52),(u2)
FS 29°Ta18'60 +34°30'05|gamma Perseus
   Spectroscopic double
FS 29°Ta19'33 +64°38'50|gamma Cepheus, ALRAI, (35)
CS 29°Ta27'50 +40°52'32|Intersect Galactic
   Supergalactic Equators
FS 29°Ta34'44 + 3°33'46|27 Taurus, ATLAS, double
FS 29°Ta35'08 + 3°34'02|28 BU Taurus, PLEIONE
   Spectroscopic double
SB 29°Ta37'26 +11°43'14|omicron Perseus
FS 29°Ta38'25 -27°54'48|omicron two Eridanus
   (40), double
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WD 29°Ta38'49 -27°55'19|40 (=O2) Eridanus B
SS 29°Ta41'58 + 1°59'48|Ascending North Node
   Venus to ecliptic
T  29°Ta42'27 +11°46'47|Per T2  -  IC 348
EB 29°Ta57'35 - 7°50'44|lamda Taurus
FS 29°Ta57'42 - 7°50'39|lamda Taurus
   Spectroscopic eclipsing binary
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Gemini

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OA 00°Ge00'15 +43°30'09|Cassiopeia OB 6, (Ma)
   Cas VI, (Sch) X Cas, (Ru) Ca
OA 00°Ge22'44 +13°51'25|Perseus OB 2, (Ma) Per
   II, (Mo) II Per
FS 00°Ge25'57 +13°53'45|omicron Perseus, (40)
   ATIKS, double
DI 00°Ge39'58 +42°12'53|IC 1848, Cassiopeia
DI 00°Ge42'22 +12°29'41|IC 8, omicron Perseus
N  00°Ge52'15 +24°16'31|Nova 1901 Persei No. 2 (GK)
FS 01°Ge12'53 +29°38'24|alpha Perseus, ALGENIB, (33)
OA 01°Ge47'32 +29°20'48|Persues OB 3, (Sch) III
   Per, (Ru) Per III, alpha P
ME 01°Ge49'20 +38°46'48|Pereids
X  02°Ge21'40 + 9°39'18|3U0352+30,
FS 02°Ge25'41 +11°20'03|zeta Perseus, MENKHIB
   Spectroscopic double
R  02°Ge58'09 - 9°11'44|4C 11.18
X  03°Ge05'19 +35°49'09|3U0318+55,
FS 03°Ge07'58 +22°10'09|nu Perseus, (41)
R  04°Ge06'43 +35°54'38|
FS 04°Ge09'58 +27°29'47|delta Perseus, (39)
FS 04°Ge20'13 +15°12'32|xi Perseus, (46)
   Spectroscopic double
ME 04°Ge22'44 + 2°00'32|Daytime Perseids
FS 04°Ge25'47 -36°34'18|53 Eridanus, SCEPTRUM, double
P  04°Ge27'11 +34°08'33|CP 0329
FS 04°Ge55'25 +18°52'05|epsilon Perseus, (45), double
OC 04°Ge59'20 - 6°03'29|Mel 25, Hyades, very
   Loose and irregular cluster,  Taurus
FS 05°Ge03'30 - 6°00'29|gamma Taurus, (54)
OC 05°Ge08'25 +44°02'05|H 1, intermediate rich, Cassiopeia
DI 05°Ge15'23 +15°07'02|IC 1499, Perseus
   California Nebula
X  05°Ge32'08 +63°16'04|strong source not disc.
   By UHURU, perhaps variable
EB 05°Ge43'19 +49°59'36|RZ Cassiopeia
OA 05°Ge56'02 +38°35'42|Camelopardalis OB
   1,(Mo) I Cam,(Ru) Cam I,(Sch) XI
FS 06°Ge06'03 - 4°23'10|delta Taurus, (61)
FS 06°Ge06'53 -25°08'00|nu Eridanus, (48), variable
T  06°Ge14'51 + 6°47'57|Tau T1  -  RY Tau
R  06°Ge47'21 -16°02'06|3C 120, Superluminal object
SG 06°Ge47'21 -16°02'06|Radio source 3C 120
FS 07°Ge11'14 - 6°10'17|theta one Taurus, (77)
DN 07°Ge25'08 + 6°01'47|Taurus
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R  07°Ge28'36 +20°55'46|4C 42.11
FS 07°Ge40'17 -57°59'32|gamma Caelum, double star
T  07°Ge47'56 - 3°06'36|Tau T2  -  T Tau
FS 07°Ge49'17 - 2°13'38|epsilon Taurus, AIN, (74)
P  08°Ge13'57 -39°43'58|NP O450
FS 08°Ge34'18 -25°46'37|mu Eridanus,(57)
   Spectroscopic double
R  08°Ge38'55 +16°14'10|
FS 08°Ge43'22 +25°54'32|upsion Perseus, (48)
IF 08°Ge43'22 +25°54'32|48 Perseus, nu Perseus
   Variable IF excess
R  08°Ge45'08 +29°44'33|NRAO 1560
P  08°Ge56'30 +33°33'50|PSR0355+54
FS 09°Ge04'05 - 5°37'11|alpha Taurus
   ALDEBAREN, double
IF 09°Ge04'05 - 5°37'11|Aldeberan, l0th
   Strongest at 2 microns
T  09°Ge10'25 + 4°00'53|Tau T3  -  UZ Tau
FS 09°Ge10'50 +29°21'36|lamda Perseus, (47)
X  09°Ge17'04 -16°00'47|3U0440+06,
OC 09°Ge29'17 +28°06'31|NGC 1513, loose & poor, Perseus
R  09°Ge57'26 +29°16'51|NRAO 1650
OA 10°Ge03'31 +35°14'17|Camelopardalis OB 3
   (Sch) II Cam, (Ru) Cam III
T  10°Ge08'19 +14°10'25|Per T3  -  NGC 1579 (?)
FS 10°Ge12'59 +27°12'27|mu Perseus, (51)
   Spectroscopic double
GC 10°Ge14'60 -61°44'04|NGC 1851, Columba
FS 10°Ge20'08 -27°52'39|omega Eridanus,(6l)
FS 10°Ge21'25 +42°08'00|Camelopardalis
R  10°Ge22'24 -67°14'02|Pic A, dumbell galaxy
CS 10°Ge28'28 + 0°44'00|Desc. Node Local System
   To Ecliptic
FS 10°Ge40'45 +84°48'59|theta Draco, (43)
   Double, spectroscopic
OC 10°Ge58'07 +30°10'52|NGC 1528, intermediate
   Rich, Perseus
G  11°Ge06'13 -56°07'51|a, Local Group?
   Discovered 1964
LG 11°Ge06'13 -56°07'51|Dwarf galaxy in
   Columba, discovered in 1964
FS 11°Ge12'23 -15°29'10|pi3 Orion, TABIT,(1)
R  11°Ge12'57 + 7°25'35|galaxy Per
FS 11°Ge16'36 -45°22'02|epsilon Lepus,(2)
EB 11°Ge20'16 +63°10'28|U Cecheus
FS 11°Ge21'00 -17°09'49|pi4 Orion,(3)
   Spectroscopic double
OC 11°Ge36'26 +28°27'26|NGC 1545, Perseus
FS 11°Ge41'19 -13°20'16|pi2 Orion,(2)
G  11°Ge43'50 +46°13'09|IC 342, Local Group?, obscured
LG 11°Ge43'50 +46°13'09|IC 342
OC 11°Ge49'38 - 3°26'41|NGC 1647, very loose
   And irregular, Taurus
X  11°Ge49'58 +15°38'54|3U0430+37,
FS 11°Ge51'52 -19°28'01|pi5 Orion
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   Spectroscopic eclipsing binary
FS 12°Ge52'60 -20°30'45|pi6 Orion,(10)
SS 13°Ge14'44 +57°51'24|North Pole of Pallas
SS 13°Ge23'32 - 3°56'36|Aphelion Vesta
SS 13°Ge44'06 - 0°05'17|Ascending North Node
   Uranus to ecliptic
MS 13°Ge51'60 + 7°06'22|32 633
FS 14°Ge33'16 -28°03'59|beta Eridanus, CURSA,(67)
FS 14°Ge37'48 +83°45'56|chi Draco, (44)
   Spectroscopic double
FS 14°Ge38'09 -39°27'48|mu Lepus,(5)
R  14°Ge51'42 -58°14'37|N galaxy (bright
   Nucleus) NRAO 2068
SS 15°Ge05'12 + 0°10'41|Ascending North Node
   Sun Equator to ecliptic
T  15°Ge22'37 + 8°27'42|Aur T1  -  RW Aur
R  15°Ge43'47 +21°48'40|galaxy
FS 15°Ge58'54 +10°47'17|iota Auriga, MASSALEH,(3)
X  16°Ge01'12 +22°05'48|3U0446+44, 3C 129.1
FS 16°Ge02'15 - 1°41'57|iota Taurus, (102)
FS 16°Ge09'20 -30°54'29|beta Orion, RIGEL, (19)
   Spectroscopic double
OC 16°Ge22'10 + 0°24'07|NGC 1746, intermediate
   Rich, Taurus
R  16°Ge30'06 + 3°13'43|4C 25.16
SS 16°Ge40'35 + 3°23'13|Perihelion Mercury
FS 17°Ge09'31 -29°44'38|tau Orion,(20)
GC 17°Ge21'00 -46°35'02|NGC 1904, M.79, Lepus
OC 17°Ge27'29 - 5°55'54|NGC 1807, intermediate
   Rich, Taurus
OC 17°Ge44'09 - 6°36'32|NGC 1817, loose & poor, Taurus
MS 17°Ge56'04 +10°51'40|32 633
FS 18°Ge01'17 +18°55'44|zeta Auriga, HOEDUS I
   (8), spectroscopic eclipsing binary
FS 18°Ge01'32 -58°29'24|epsilon Columba
R  18°Ge05'55 +15°28'52|
FS 18°Ge07'29 +20°46'45|epsilon Auriga,(7)
   Spectroscopic eclipsing binary
DI 18°Ge21'38 -25°31'29|Orion
R  18°Ge24'46 +23°40'25|SN II, Supernovae in
   Galactic nebula
FS 18°Ge30'57 +30°31'57|7 Camelopardalis
   Spectroscopic double
DN 18°Ge41'44 -28°03'23|Orion
FS 18°Ge48'40 +18°51'17|eta Auriga, HOEDUS II, (10)
FS 19°Ge00'14 -43°39'02|beta Lepus, NIHAL,(9), double
FS 19°Ge27'18 -25°35'28|eta Orion,(28)
   Spectroscopic double
   eclipsing binary
N  19°Ge28'48 - 6°55'36|Nova 1927 (XX Tau)
   Rapid development
G  19°Ge34'37 +82°03'31|NGC 6643, Draco
IF 19°Ge41'39 -34°29'21|IC 418 Planetary
   Nebula, Large IF excess
Q  19°Ge56'09 - 6°31'13|3C 138
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OC 20°Ge05'34 +65°31'04|NGC 188, loose, oldest
   Cluster, attention in 1959-
FS 20°Ge16'12 -16°31'09|gamma Orion, (24), BELLATRIX
FS 20°Ge16'59 +43°24'54|alpha Camelopardalis,(9)
X  20°Ge22'16 +43°31'09|3U0449+66,
EB 20°Ge29'56 +10°40'20|AR Auriga
FS 20°Ge37'54 +37°47'15|beta Camelopardalis,(10)
SS 20°Ge41'42 +76°59'28|North Pole of Juno
FS 20°Ge42'06 -40°50'29|alpha Lepus, ARNEB, (11)
X  20°Ge50'37 -28°05'27|3U0527-05, M42 in Orion Nebula
MC 20°Ge52'45 -66°17'23|Pleiades Moving Cluster
R  20°Ge54'03 +76°42'53|3C 39O.3 N galaxy
   (contains bright nucleus)
FS 21°Ge05'34 +22°09'46|alpha Auriga
   ALHAJOTH,(13), spectroscopic double
OA 21°Ge12'17 +10°28'08|Auriga OB 1, (Ma) Aur
   (Mo) I Aur, (Ru) Aur I
FS 21°Ge12'35 -30°35'36|nu Orion, (36)
CS 21°Ge13'31 -22°18'54|Descending Node Local
   System  Equator to Equator
OC 21°Ge15'50 +16°01'50|NGC 1857, loose & poor, Auriga
DI 21°Ge24'40 +10°40'47|IC 410, Auriga
FS 21°Ge25'18 -57°44'33|alpha Columba,PHAKT, double
R  21°Ge25'22 +10°41'30|Emission nebula
FS 21°Ge26'36 -79°35'42|gamma Pictor
OA 21°Ge27'22 -24°26'34|Orion OB 1, (Ma) Ori
   (Mo) I Ori, (Ru) Ori I
T  21°Ge32'35 -11°39'14|Ori T1  -  CO Ori
SB 21°Ge32'48 -27°43'42|i Orion
DI 21°Ge34'17 +10°50'39|IC 417, Auriga
T  21°Ge35'23 -27°46'17|Ori T2  -  T Ori
FS 21°Ge41'26 -74°52'21|beta Pictor
FS 21°Ge42'25 -22°51'57|delta Orion
   MINTAKA,(34), double, spectr. eclipsing binary
FS 21°Ge45'09 - 2°02'16|omicron Taurus, (114)
SS 21°Ge46'48 + 0°48'20|Ascending North Node
   Ceres to ecliptic
FS 21°Ge53'26 + 5°35'37|beta Taurus, NATH, (112)
OC 22°Ge02'59 +10°24'40|NGC 1893, loose & poor, Auriga
P  22°Ge03'32 - 1°44'47|NP 0525
EB 22°Ge03'38 -23°59'55|VV Orion
FS 22°Ge17'45 -28°28'14|theta Orion,(41)
   Spectroscopic double
FS 22°Ge20'29 -28°30'55|iota Orion
   HATYSA,(44), spectroscopic double
IF 22°Ge20'51 -27°27'48|Kleinmann-Low Nebula in
   Orion, 3rd brightest IF at 20 microns, OH
   "infrared nebula"
IF 22°Ge21'39 -27°28'35|trapezium source in Orion
R  22°Ge21'55 -27°28'51|Orion A, M 42= NGC
   1976, emission nebula
DN 22°Ge22'16 -25°22'19|Orion dark nebulae
DI 22°Ge22'42 -27°29'38|NGC 1976, Great Nebula
   In Orion, M.42
DI 22°Ge24'18 -27°31'13|NGC 1980, Orion
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DI 22°Ge25'54 -27°32'48|NGC 1982, Orion, M.43
OC 22°Ge38'08 +11°57'08|NGC 1907, fairly rich, Auriga
OA 22°Ge38'23 +11°01'31|Auriga OB 2, (Sch) II
   Aur, (Ru) Aur II
FS 22°Ge45'18 -24°42'06|epsilon Orion, ALNILAM, (46)
OC 22°Ge46'12 +12°05'40|NGC 1912, M. 38
   Intermediate rich, Auriga
DI 22°Ge48'58 -23°42'33|NGC 1990, epsilon Orion
T  22°Ge56'16 -23°49'56|Ori T3  -  sigma Ori
FS 22°Ge58'01 -14°11'04|lamda Orion,HEKA,(39), double
N  23°Ge12'51 + 6°56'08|Nova 1891 Auriga (T)
PL 23°Ge23'18 - 1°24'35|NGC: 1952, Tau Ml Crab Nebula
P  23°Ge23'33 - 1°24'21|NP 0531
R  23°Ge23'36 - 1°24'18|Tau A, SN Rem in Crab
   Nebula, Taurus A
X  23°Ge25'32 - 0°25'22|3U0531+21, Tau X-1 Crab
   Pulsar NPO531 (intense)
FS 23°Ge25'35 -25°22'17|sigma Orion,(48)
   Spectroscopic double
MC 23°Ge39'42 -41°20'17|Orion Moving Cluster
   100x70x60 parsecs diameter
FS 24°Ge00'07 -24°53'38|zeta Orion
   ALNITAK,(5O), double
DI 24°Ge05'53 -24°59'19|IC 434, zeta Orion
   Horsehead Nebula
OC 24°Ge05'54 +10°41'43|NGC 1960, M.36, fairly
   Rich, Auriga
FS 24°Ge06'38 - 1°39'17|zeta Taurus,(123)
   Spectroscopic double
FS 24°Ge08'44 -45°57'12|gamma Lepus,(13), double
R  24°Ge17'39 -24°08'21|Orion B, NGC 2024
   Emission nebula
DI 24°Ge21'11 -24°11'50|NGC 2024, zeta Orion
T  24°Ge35'34 -13°40'39|Ori T4  -  FU Ori
FS 25°Ge18'59 -37°33'28|zeta Lepus, (14)
P  25°Ge26'17 - 0°19'41|PSR0540+23
DI 25°Ge41'50 -23°20'21|NGC 2068, Orion, M.78
FS 25°Ge42'44 -32°44'23|kappa Orion, SAIPH, (53)
FS 25°Ge45'12 -58°42'26|beta Columba
Q  26°Ge09'56 +26°18'22|3C 147 March 30 , 1964
   Discovered, one of first
ME 26°Ge12'25 - 4°23'44|beta Taruids-Day
T  26°Ge26'59 + 2°39'09|Tau T4  -  RR Tau
FS 26°Ge29'10 -43°42'27|delta Lepus, (15)
GA 27°Ge02'56 +45°48'41|NGC 1961
   Contains 3 superassociations
ME 27°Ge11'49 - 2°25'08|chi Orionids
FS 27°Ge28'49 +14°29'11|upsilon Auriga, (31)
OC 27°Ge38'48 + 8°49'28|NGC 2099, M.37, fairly
   Rich, Auriga
FS 27°Ge59'37 - 2°34'42|chi Orion, (54)
FS 28°Ge03'07 -16°19'10|alpha Orion
   Betelgeuse, (58), spectroscopic double
IF 28°Ge03'07 -16°19'10|Betelgeuse, alpha
   Orion, Brightest at 2 microns, M supergiant, var cM2
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FS 28°Ge11'49 -37°58'14|eta Lepus, (16)
FS 28°Ge14'33 +66°10'37|(1) alpha Ursa Minor
   CYNOSURA, var. spectr. double.
FS 28°Ge18'58 -59°22'58|gamma Colomba
IF 28°Ge19'55 - 3°12'46|U Orion, OH source with
   IF excess
SB 28°Ge27'49 +20°33'45|beta Aurigao
FS 28°Ge55'27 -65°50'59|eta Columba
OA 28°Ge55'56 - 1°35'38|Orion OB 2, (Sch) II
   Ori, (Ru) Ori II
FS 29°Ge12'46 +21°31'11|beta Auriga
   MENKALINAN,(34), Spec. Eclip. binary
FS 29°Ge13'34 +31°24'27|delta Auriga, (33)
FS 29°Ge14'35 +13°37'56|theta Auriga, (37), double
CS 29°Ge19'12 - 0°11'12|Descending Node of Gal
   Equator to Ecliptic
OC 29°Ge33'52 + 0°04'39|NGC 2129, loose & poor, Gemini
FS 29°Ge54'25 -13°32'24|mu Orion, (61)
   Spectroscopic double
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Cancer

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CS 00°Cn00'00 +66°33'07|North Celestial Pole
CS 00°Cn00'00 -23°26'53|Solstice, Summer
CS 00°Cn00'00 -88°26'53|South Pole Ecliptic
FS 00°Cn13'23 - 3°12'38|chi2 Orion, (62)
OC 00°Cn24'35 + 1°00'09|IC 2157, loose & poor, Gemini
FS 00°Cn35'52 +70°28'07|delta Ursa Minor
   PHERKARD, (23)
OC 00°Cn58'54 + 0°37'50|NGC 2158, quite rich
   And concentrated, Gemini
FS 01°Cn04'48 +42°30'48|36 Camelopardalis
   Spectroscopic double
FS 01°Cn09'30 - 9°15'51|mu Orion,(67
   Spectroscopic double
OC 01°Cn17'51 + 0°58'60|NGC 2168, M.35
   Intermediate rich, Gemini
OC 01°Cn24'27 -10°00'58|NGC 2169, loose & poor, Orion
R  01°Cn33'46 - 2°46'15|emission nebula
DI 01°Cn34'08 - 2°45'50|NGC 2174-5, Orion
OA 01°Cn34'49 - 1°44'20|Gemini OB 1, (Ma) Gem
   (Mo) I Gem
SS 02°Cn04'24 - 1°11'33|Perihelion Saturn
FS 02°Cn13'57 - 9°09'23|xi Orion, (70)
FS 02°Cn22'31 +36°23'12|2 Lynx
R  02°Cn23'58 + 3°15'20|
P  02°Cn35'33 - 0°36'37|PSR0611+22
OC 02°Cn43'46 -10°40'20|NGC 2194, intermediate
   Rich, Orion
FS 02°Cn43'47 - 0°27'19|eta Gemini, TEJAT
   PRIOR,(7), spectroscopic double
GA 02°Cn48'08 +62°28'31|NGC 2276
   Contains 3 superassociations
MC 02°Cn59'37 -11°25'01|Hyades Moving Cluster
   250 parsecs diameter
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R  03°Cn27'29 - 0°39'11|IC 443, SN II, supernova
FS 03°Cn32'50 -29°30'51|gamma Monoceros,(5)
ME 03°Cn52'38 - 7°23'40|Orionids
FS 04°Cn35'15 - 0°23'06|mu Gemini, TEJAT
   POSTERIOR,(l3), double
G  04°Cn39'08 -43°57'55|NGC 2207, Canis Major
X  04°Cn41'25 - 0°15'54|3U0620+23, IC 443 (SNR)
   3C157 Pulsar 0611+22
MC 05°Cn17'15 -19°21'23|Praesepe Moving
   Cluster, about 10 parsecs diameter
FS 06°Cn05'35 - 2°48'43|nu Gemini, (18)
EB 06°Cn14'35 + 9°00'36|WW Auriga
FS 06°Cn26'27 -40°27'28|beta Canes Major, MIRZAM,(2)
VB 06°Cn35'07 -24°18'40|Ross 614 A,B
G  06°Cn38'23 - 8°29'57|Local Group, disc.
   1975, 55,000 1.y.
LG 06°Cn38'23 - 8°29'57|nearest dwarf galaxy
   Found 1975, 55,000 L.Y.
FS 06°Cn43'56 -53°56'21|zeta Canes Major
   FURUD,(1), spectroscopic double
R  06°Cn57'03 -27°28'45|
FS 07°Cn29'41 +73°20'26|epsilon Ursa Minor
   (22), spectroscopic double
FS 07°Cn37'31 -30°52'18|beta Monoceros, (11), double
R  07°Cn38'57 -19°00'21|Rosette nebula in Mon
FS 07°Cn41'22 -56°23'03|delta Columba= 3 C Maj
   Spectroscopic double
OA 07°Cn46'04 -14°38'36|Monoceros OB 1, (Ma)
   Mon I, (Sch) II Mon
DI 07°Cn47'55 -18°50'53|NGC 2237-9, Monoceros
   Rosette Nebula
OC 07°Cn49'25 -18°49'18|NGC 2244, Rosette, very
   Young cluster, very loose,  Monoceros
DN 08°Cn05'37 -13°13'25|S Monoceros
Q  08°Cn10'07 +21°34'18|OH 471
FS 08°Cn23'23 - 6°29'21|gamma Gemini, ALHENA,(24)
FS 08°Cn28'52 +35°10'46|5 Lynx, double
R  08°Cn37'57 +31°43'41|4C 54.11
N  08°Cn54'41 + 7°07'07|Nova 1903 Gemini No. 1
OC 09°Cn01'11 +18°21'35|NGC 2281, intermediate
   Rich, Auriga
T  09°Cn01'43 -13°14'53|Mon T1  -  NGC 2264, S Mon
WD 09°Cn01'54 +13°53'46|He 3 = Ci20 398
OA 09°Cn04'18 -18°33'07|Monoceros OB 2, (Ma)
   Mon II, (Mo) I Mon
FS 09°Cn14'18 + 2°05'35|epsilon Gemini,MEBSUTA, (27)
DI 09°Cn19'53 -15°03'14|NGC 2261, R Monoceros
   Hubble's Var
IF 09°Cn20'01 -15°03'05|R Monoceros, large IF
   Excess, 90% L emitted beyond 1 micron, like T-Tauri
stars
DI 09°Cn41'23 -13°34'39|NGC 2264, S Monoceros
   Cone Nebula
OC 09°Cn44'13 -13°31'27|NGC 2264, very loose
   Irregular, S Monoceros
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SS 09°Cn53'15 + 0°44'25|Ascending North Node
   Jupiter to ecliptic
P  10°Cn05'24 -50°24'30|PSR0628-28
FS 10°Cn23'37 +11°22'17|theta Gemini, (34)
G  10°Cn23'47 +47°12'19|NGC 2366, M81 Group, Camelopardalis
FS 10°Cn32'16 -10°26'22|xi Gemini, (31)
N  10°Cn59'22 + 9°58'08|Nova 1912 Gemini No. 2
GA 11°Cn02'33 +80°34'09|NGC 6412 -- 1 superassociation
T  11°Cn09'09 - 9°42'52|Gem T1  -  FY Gem
N  11°Cn13'48 -23°20'51|Nova 1939(8T) Monoceros
   Rapid early development
FS 11°Cn38'33 +83°40'11|psi Draco, DZIBAN
   (31), double
SS 12°Cn08'59 - 0°45'52|Perihelion Earth
VB 12°Cn37'38 -38°14'59|Sirius
G  12°Cn57'37 +42°35'01|NGC 2403, M81 Group, Camelopardalis
SN 12°Cn57'37 +42°35'01|1954 J (Oct) M 16.0 NGC 2403
T  13°Cn05'34 -25°42'19|Mon T2  -  WX Mon (?)
NS 13°Cn15'56 -38°40'49|Sirius A, Sirius B
ME 13°Cn19'26 -14°50'55|Monocerotids
FS 13°Cn24'16 -39°41'10|alpha Canis Major
   SIRIUS,CANICULA,(9), double
WD 13°Cn25'22 -39°41'54|Sirius B
MS 13°Cn33'43 -23°18'06|50 169
P  13°Cn42'40 +52°21'03|CP 0809
SS 13°Cn45'60 + 0°14'42|Ascending North Node
   Vesta to ecliptic
CG 13°Cn57'09 +13°11'41|Gemini
G  13°Cn57'09 +13°11'41|Gemini Cluster of 200 galaxies
FS 14°Cn18'02 -75°52'29|alpha Carina, CANOPUS
FS 14°Cn19'48 - 2°24'15|zeta Gemini, MEKBUDA, (43)
OC 14°Cn20'48 -42°06'56|NGC 2287, M.41
   Intermediate rich, Canis Major
FS 14°Cn55'52 +27°21'31|21 Lynx
R  15°Cn31'38 -75°25'55|PKS 0625-53
CS 16°Cn03'35 -36°54'18|Supergalactic South Pole
G  16°Cn17'31 +48°52'02|Holmberg II = DDO 50 = A0813+70
FS 16°Cn25'15 -65°59'24|nu Puppis
CS 16°Cn31'11 -22°19'39|Descending Node of Gal
   Equator to Equator
P  16°Cn56'44 +56°16'35|PSR0904+77
SS 17°Cn02'43 + 0°08'18|Ascending North Node
   Invariable Plane to ecliptic
OC 17°Cn20'09 -29°40'02|NGC 2323, M.50
   Intermediate rich, Monoceros
MC 17°Cn25'28 -46°39'53|Perseus Moving Cluster
Q  17°Cn31'03 -10°49'20|3C 175
GA 17°Cn43'23 +76°28'41|NGC 6217 -- 4 superassociations
FS 17°Cn47'38 + 0°01'12|delta Gemini, WASAT
   (55), double
FS 18°Cn03'32 - 5°28'18|lamda Gemini, (54), double
MS 18°Cn06'49 +38°44'54|53
FS 18°Cn17'46 + 5°30'47|iota Gemini, (60)
FS 18°Cn26'58 + 9°23'31|rho Gemini, (62), double
FS 18°Cn44'12 -22°00'01|delta Monoceros, (22)
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OA 18°Cn47'56 -31°32'59|Canis Major OB 1, (Ma)
   CMa, (Sch) I CMa, (Ru) CMa
FS 18°Cn52'53 -37°49'11|gamma Canes Major
   MULIPHEIN, (23)
GC 18°Cn57'14 +17°47'57|NGC 2419, Lynx
FS 19°Cn24'27 +10°55'56|alpha Gemini, CASTOR
   (66), double, spectr.double
ME 19°Cn40'08 +10°06'34|Geminids
G  19°Cn47'18 +54°12'28|Holmberg III, A0909+74
FS 19°Cn53'15 -50°38'22|epsilon Canis Major, ADARA
PL 19°Cn58'38 - 0°24'56|NGC: 2392, Gem
FS 20°Cn11'43 -45°37'11|omicron2 Canes Major, (24)
Q  20°Cn26'38 +16°33'12|3C 186
SS 20°Cn33'06 - 0°46'58|Ascending North Node
   Pluto to ecliptic
FS 20°Cn36'50 + 5°24'33|upsilon Gemini, (69)
Q  20°Cn49'41 - 7°35'10|3C 181
OC 20°Cn59'32 -31°12'54|NGC 2353, loose & poor, Monoceros
Q  21°Cn21'30 +44°42'48|3C 204
FS 21°Cn32'16 -13°46'23|beta Canis Minor
   GOMEISA, (3)
FS 21°Cn53'15 +44°27'11|pi2 Ursa Major
   MUSCIDA, (4)
FS 21°Cn55'09 + 7°29'10|sigma Gemini, (75)
   Spectroscopic double
OC 22°Cn02'34 + 0°12'33|NGC 2420, intermediate
   Rich, Gemini
FS 22°Cn26'23 +39°53'58|omicron Ursa Major, (1),double
FS 22°Cn27'11 + 7°05'19|beta Gemini, POLLUX, (78)
FS 22°Cn46'27 -48°44'02|delta Canes Major
   WEZEN, (25)
OC 22°Cn57'29 -36°48'26|NGC 2360, quite rich
   And concentrated, Canis Major
FS 22°Cn59'43 + 2°54'44|kappa Gemini, (77), double
SS 23°Cn17'06 - 0°22'57|Asc North Node Saturn
   To ecliptic
N  23°Cn39'37 -26°48'29|Nova 1918 (GI)
   Monoceros Rapid early development
Q  23°Cn42'27 +27°41'26|3C 196 One of the first
IF 24°Cn05'25 -17°35'35|Z Canis Major, extreme
   IF excess
VB 24°Cn23'06 -15°58'49|Procyon
FS 25°Cn07'42 -16°11'32|alpha Canis Minor
   ELGOMAISA, (10),doub1e
NS 25°Cn07'53 -16°11'17|Procyon A, Procyon B
WD 25°Cn11'41 -16°06'05|Procyon B
OC 25°Cn13'10 -44°56'06|NGC 2362, very young
   Cluster, loose & poor, tau Canis Major
G  25°Cn30'52 +52°18'41|Holmberg I = DDO 63 = A0936+71
Q  25°Cn50'08 -20°09'11|0736+01
ME 25°Cn51'25 +69°01'51|Ursids
FS 26°Cn40'51 -72°29'43|tau Puppis
   Spectroscopic double
FS 26°Cn43'23 +23°35'18|31 Lynx
FL 26°Cn47'48 -17°36'24|YZ Canis Minor
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IF 26°Cn53'49 -45°48'27|VY Canis Major, M
   Supergiant, 5th strongest at 20 microns
   Bright at 10 microns
Q  27°Cn19'05 +53°00'52|A 0952+17
T  28°Cn11'07 -34°42'39|Pup T1  -  UY Pup (?)
G  28°Cn12'52 +50°45'19|NGC 2976, M81 Group, UMa
OC 28°Cn14'11 -34°44'24|NGC 2422, M.47, loose
   Poor, Puppis
G  28°Cn14'37 +52°09'27|NGC 3034, M.82, UMa
R  28°Cn15'33 +52°07'13|NGC 3034 I galaxy
G  28°Cn17'10 +52°03'18|NGC 3031, M81 Group, UMa
FS 28°Cn23'00 +75°21'59|zeta Ursa Minor, (16)
NG 28°Cn26'24 +51°40'11|M.81
G  28°Cn33'28 +42°04'31|NGC 2768, Ursa Major
FS 28°Cn38'60 -30°44'12|alpha Monoceros, (26)
SN 28°Cn50'33 + 4°45'19|1901 A (Jan) M 14.7 NGC 2535
FS 28°Cn57'27 -50°55'59|eta Canes Major
   ALUDRA, (31)
G  28°Cn58'08 +51°43'27|Holmberg IX = DDO 66 = A0953+69
MS 29°Cn08'35 +21°11'13|71 866
FS 29°Cn43'24 +45°42'56|h Ursa Major, (23), double
OC 29°Cn51'02 -34°48'09|NGC 2437, M.46, fairly
   Rich, Puppis
PL 29°Cn51'02 -34°48'09|NGC: 2438, Pup
Q  29°Cn57'41 +18°18'10|4C 37.24
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Leo

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FS 00°Le00'55 -59°20'36|pi Puppis
FS 00°Le07'43 +77°54'21|eta Ursa Minor, (21)
Q  00°Le26'15 - 9°45'51|3C 191 disc. 1966
   First to exhibit strange absorption lines
PL 01°Le00'21 -38°46'19|NGC: 2440, Pup
FS 01°Le50'37 +30°14'45|iota Ursa Major
   TALITHA, (9), double
P  01°Le51'31 + 7°24'21|AP0823+26
CG 01°Le54'44 + 1°56'39|Cancer
G  01°Le54'44 + 1°56'39|Cancer Cluster of 150 galaxies
FS 02°Le20'14 -65°26'31|L2 Puppis
Q  02°Le20'29 -14°41'15|4C 5.34
FS 02°Le35'17 -46°56'25|K Puppis, MARKEB, double
SS 02°Le50'30 -26°25'15|Perihelion Pallas
OC 03°Le08'36 -43°08'46|NGC 2447, M.93, quite
   Rich and concentrated, Puppis
FS 03°Le20'45 +28°41'21|kappa Ursa Major, (12),double
SN 03°Le24'28 + 8°54'32|1920 A (Jan) M 11.8 NGC 2608
FS 03°Le32'08 -10°11'10|beta Cancer, (17)
OC 03°Le49'51 -29°28'53|NGC 2506, quite rich
   Concentrated, Monoceros
SS 03°Le52'26 -87°23'50|South Pole of Mars
FS 04°Le02'30 -22°05'53|zeta Monoceros, (29)
P  04°Le14'20 -47°41'45|PSR0740-28
SN 04°Le47'00 +34°00'02|1912 A (Feb) M 13.0 NGC 2841
G  04°Le47'23 +34°01'46|NGC 2841 Ursa Major
OA 04°Le51'13 -47°10'25|Puppis OB 2, (Sch) I
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   Pup, (Ru) Pup II
Q  04°Le58'37 -17°17'33|0812+02
FS 05°Le12'09 +43°10'22|upsilon Ursa Major, (29)
FS 05°Le22'19 -45°00'31|xi Puppis, AZMIDISKE
   Spectroscopic, double
FS 05°Le39'14 +10°23'46|iota Cancer, (48) double
G  05°Le39'28 +15°03'09|NGC 2683, Lynx
R  05°Le44'21 +25°44'03|4C 43.17
OC 06°Le17'21 -24°12'34|NGC 2548, M.48, fairly
   Rich, Hydra
MC 06°Le27'14 -68°03'24|Sco-Cen
   Scorpio-Centuarus Moving Cluster, 90x300
FS 06°Le31'32 +26°02'29|36 Lynx
R  06°Le34'21 +61°26'24|4C 73.11
FS 06°Le45'52 + 0°48'45|epsilon Cancer, PRAESEPE
OC 06°Le45'52 + 0°48'45|NGC 2632, M.44, loose
   Poor, Cancer, Praesepe or Beehive Cluster
FS 06°Le49'04 +34°24'58|theta Ursa Major, (25), double
FS 06°Le58'57 + 2°39'08|gamma Cancer, ASELLUS
   BOREALIS, (43) spectroscopic
R  07°Le12'53 +28°11'45|dumbell galaxy
OA 07°Le12'60 -45°02'55|Puppis OB 1, (Ma) Pup
   (Sch) II Pup, (Ru) Pup I
OC 07°Le14'21 -30°29'28|NGC 2539, fairly rich, Puppis
FS 07°Le59'30 + 0°11'31|delta Cancer, ASELLUS
   AUSTRALIS, (47), double
Q  08°Le22'26 - 4°49'54|3C 207
FS 08°Le33'45 -64°27'09|sigma Puppis
   Spectroscopic double
PL 08°Le38'26 +89°48'36|NGC: 6543, Dra
P  08°Le41'36 -59°26'58|MP 0736
FS 08°Le42'38 +38°08'46|phi Ursa Major, (30), double
P  09°Le16'37 -11°43'48|CP 0834
G  09°Le22'23 -26°42'07|NGC 2574, M81 Group
FS 09°Le33'20 +20°58'02|38 Lynx, double
R  09°Le36'56 + 3°15'26|VRO 20.08.01,disc.
   1968, rapid radio variations
FS 09°Le38'29 -12°31'17|delta Hydra, (4)
OC 09°Le40'47 -56°50'01|NGC 2451, c Puppis
FS 10°Le16'59 +56°53'46|lamda Draco, GIANFAR, (1)
P  10°Le20'11 -31°15'53|MP 0818
Q  10°Le27'02 +23°25'18|4C 39.25
FS 10°Le38'34 -15°04'23|sigma Hydra, (5)
FS 10°Le46'27 -43°27'47|rho Puppis, (15)
SS 10°Le52'48 + 2°43'25|Perihelion  Venus
Q  10°Le59'35 - 2°59'03|3C 208
SS 11°Le09'13 + 0°15'49|Ascending North Node
   Neptune to ecliptic
OC 11°Le10'34 - 5°33'41|NGC 2682, M.67, fairly
   Rich, Cancer
FS 11°Le10'45 +17°51'45|alpha Lynx, (40)
FS 11°Le24'58 +72°57'49|beta Ursa Minor
   KOCHAB, (7)
FS 11°Le43'27 -14°40'05|eta Hydra, (7)
FS 11°Le48'20 -11°39'33|epsilon Hydra, 11
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   Double, spectroscopic double
FS 12°Le05'49 -11°09'01|rho Hydra, (13)
   Spectroscopic double
CS 12°Le22'31 -45°42'27|South Pole  of Galaxy
OC 12°Le29'40 -57°04'02|NGC 2477, quite
   Concentrated & rich, globular?, Puppis
N  12°Le41'47 -83°53'33|Nova 1925 Pictoris (RR)
FS 12°Le41'50 - 4°14'04|alpha Cancer, ACUBENS
   (65), double
R  12°Le42'49 +44°44'10|4C 58.21
N  13°Le18'28 -44°32'47|Nova 1902 DY Puppis
Q  13°Le25'38 + 0°08'55|3C 215
FS 13°Le51'56 -10°55'35|zeta Hydra, (16)
G  14°Le05'16 -66°37'10|NGC 2427, Local Group?, Puppis
ME 14°Le08'41 +42°20'53|Whipple II
FS 14°Le09'40 +62°10'47|kappa Draco, (5)
   Spectroscopic double
FS 14°Le21'38 +49°47'27|alpha Ursa Major
   DUBHE, (50), double
G  14°Le37'16 +60°16'24|NGC 4236, M81 Group, Draoc
Q  14°Le55'44 +55°30'03|3C 263
LG 15°Le08'43 -67°31'51|Puppis NGC 2427
SS 15°Le13'11 -82°34'16|South Pole of Merc Orb
Q  15°Le13'17 -28°50'24|0837-12
CG 15°Le57'39 -13°04'04|Hydra
G  15°Le57'39 -13°04'04|Hydra Cluster of galaxies
G  16°Le35'30 +17°00'50|NGC 2964, Leo
FS 17°Le09'55 + 7°54'39|lamda Leo, (4)
CG 17°Le14'54 +45°47'47|UMa II
G  17°Le14'54 +45°47'47|Ursa Major II Cluster
   Of 200 galaxies
SS 17°Le19'52 -88°08'44|South Pole of Jupiter
SS 17°Le31'21 -88°58'29|South Pole of Uranus
FS 17°Le34'17 -57°58'45|zeta Puppis, NAOS
G  17°Le51'53 + 6°08'49|NGC 2903, Leo
Q  18°Le23'57 - 0°45'52|0922+14
OC 18°Le33'18 -54°43'46|NGC 2546, Puppis
FS 18°Le33'34 +87°11'54|omega Draco, (28)
   Spectroscopic double
FS 18°Le40'47 +30°12'26|lamda Ursa Major, TANIA
   BOREALIS, (33)
FS 18°Le40'59 +45°10'34|beta Ursa Major, MERAK, (48)
OA 18°Le44'21 -51°53'31|Puppis OB 3
FS 19°Le27'35 -12°39'32|theta Hydra, (22)
   Spectroscopic double
Q  19°Le28'45 +18°57'04|3C 232
G  19°Le42'14 +28°43'10|NGC 3184, Ursa Major
SN 19°Le42'42 +28°44'60|1937F, 1921C, 1921B
   (Dec.12, Mar, Apr) NGC 3184
FS 19°Le45'06 +10°24'58|epsilon Leo, (17)
NG 19°Le51'50 +46°40'29|UMa groups
FS 20°Le08'45 +75°13'47|gamma Ursa Minor
   PHERKAD,(l3), spectroscopic double.
FS 20°Le27'22 +21°45'14|21 Leo Minor
FS 20°Le29'33 +29°04'23|mu Ursa Major, TANIA
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   AUSTRALIS, (34)
FS 20°Le38'56 +12°34'06|mu Leo, RAS ELASED
   BOREALIS, (24)
G  20°Le44'10 +16°29'52|Leo A = DDO 69 = A0956+30
LG 20°Le44'10 +16°29'52|Leo A = DDO 69 = A0956+30
R  21°Le23'38 +16°19'01|4C 29.35
PL 21°Le24'33 +45°33'30|NGC: 3587, UMa M97 Owl Nebula
G  21°Le29'54 +44°38'30|NGC 3556, M.108, Ursa Major
OC 21°Le37'24 -45°32'20|NGC 2627, fairly rich, Pyxis
Q  21°Le39'33 +73°32'31|3C 309.1
X  22°Le01'22 -67°07'38|3U0750-49, Star V pup
Q  22°Le07'08 -29°39'14|0859-14
EB 22°Le59'18 +34°15'47|TX Ursa Major
SB 23°Le00'37 - 4°04'23|omicron Leo
FS 23°Le23'16 - 3°17'16|omicron Leo, (14), SUBRA
EB 23°Le53'50 -66°16'04|V Puppis
IF 24°Le04'34 - 0°11'12|IRC+1021G, at 5 microns
   Is brightest known source outside Solar System
   18th mag star
FS 24°Le09'15 +24°24'29|beta Leo Minor, (31), double
P  24°Le26'44 - 2°41'50|P O943
FS 24°Le34'06 -42°54'16|gamma Pyxis
WD 24°Le45'30 -48°07'49|L532-81
CG 25°Le00'53 +49°21'55|UMa I
G  25°Le00'53 +49°21'55|UMa I Cluster of 300 galaxies
MC 25°Le04'20 -64°37'56|Coma Berenices Moving Cluster
G  25°Le05'19 -25°30'06|Hya A, A09
R  25°Le05'19 -25°30'06|Hya A, peculiar galaxy
   Dumbell galaxy
R  25°Le15'34 -58°07'34|Pup A
X  25°Le33'29 -58°12'26|3U0821-42, Pup A Vel XR-2?
P  25°Le48'05 +40°45'16|PSR1112+5O
FS 26°Le02'46 -49°17'10|alpha Pyxis
ME 26°Le10'57 + 9°48'53|Leonids
FS 26°Le22'34 -51°31'53|beta Pyxis
SN 26°Le30'30 +57°30'49|1940 D (Jul) M 15.0 NGC 4545
FS 26°Le31'11 -13°06'39|iota Hydra, (35)
FS 26°Le31'37 -22°14'16|alpha Hydra, ALFARD, (30)
P  26°Le51'12 - 4°11'08|CP O950
FS 26°Le56'07 +11°41'05|zeta Leo, ADHAFERA, (36)
WR 27°Le00'09 -65°02'44|gamma two Vela
FS 27°Le09'19 + 4°59'51|eta Leo, (30)
SN 27°Le15'27 +18°26'14|1941 B (Mar) M 15.1 NGC 3254
G  27°Le26'07 +16°53'02|NGC 3245, Leo Minor
G  27°Le29'36 +11°13'26|NGC 3190, Leo
FS 27°Le34'56 -65°09'56|gamma Vela
   Spectroscopic double
SN 27°Le39'31 + 9°47'05|1946 A (May) M 18.0 NGC 3177
FL 27°Le57'11 +34°18'32|WX Ursa Major
FS 28°Le08'31 +35°29'09|psi Ursa Major, (52)
FL 28°Le48'19 + 8°56'13|AD Leo
FS 28°Le50'00 + 9°00'22|gamma Leo, ALGIEBA
   (41), double
G  28°Le56'31 +31°57'01|Mayall's Nebula, A1101+41
FS 29°Le03'31 + 0°39'50|alpha Leo, KALB, (32), double
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G  29°Le04'01 + 0°40'57|Local Group, Leo I =
   Regulus System
LG 29°Le04'01 + 0°40'57|Leo I system
P  29°Le31'28 -56°35'05|MP 0835
G  29°Le35'15 - 6°41'22|Sextans B, Local
   Group?, DDO 199
LG 29°Le35'15 - 6°41'22|Sextans B = DD0 199=A0957+05
G  29°Le39'05 + 9°10'60|NGC 3227, Seyfert
   Galaxy in Leo
SG 29°Le39'05 + 9°10'60|NGC 3227
G  29°Le47'55 +24°01'17|NGC 3396, Leo Minor
FS 29°Le54'52 +46°59'54|gamma Ursa Major, (64)
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Virgo

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FS 00°Vi06'14 -70°21'16|chi Carina
FS 00°Vi06'17 +25°03'45|46 Leo Minor, omicron
   Leo Minor
FS 00°Vi25'38 +51°35'52|delta Ursa Major
   KAFEA, (69)
R  00°Vi29'37 +29°14'10|B2 1101+38, new BL
   Lacertai object, rapid radio variable
G  00°Vi37'39 +47°16'60|NGC 3992, M.109, UMa
R  00°Vi45'31 - 4°07'51|4C 07.30
CG 00°Vi51'59 +40°56'15|UMa III
G  00°Vi51'59 +40°56'15|UMa III Cluster of 90 galaxies
N  01°Vi01'16 -45°54'18|Novae 1890, 1902, 1920
   1941 T Pyxis
R  01°Vi14'30 +32°36'29|4C 40.28
Q  01°Vi14'36 +32°37'01|3C 254 early quasar
Q  01°Vi23'23 -11°16'47|0957+00
NS 01°Vi27'44 +27°20'37|Lal 21185
SS 01°Vi40'53 +10°32'13|Perihelion Ceres
X  02°Vi04'10 -59°50'51|3U0838-45, Vela X
   Pulsar 0833-45 Vel XR-1?
FS 02°Vi23'09 +42°12'56|chi Ursa Major, (63)
FS 02°Vi25'51 -19°22'40|gamma Sextans, (8), double
P  03°Vi06'13 -60°43'14|PSR0833-45
R  03°Vi24'19 -60°09'19|Vela X
G  03°Vi27'08 - 6°46'14|NGC 3169, Sextans, G5
FS 03°Vi51'46 -12°15'25|alpha Sextans, (15)
G  04°Vi01'46 +65°06'55|NGC 5322, Ursa Major
G  04°Vi11'20 + 1°57'26|Leo Cluster of 300 galaxies
CG 04°Vi11'53 + 1°58'43|Leo
SS 04°Vi20'40 -81°44'25|South Pole of Sun
FS 04°Vi51'16 -25°45'42|upsilon Hydra,(39)
SS 05°Vi00'36 + 2°06'09|Aphelion Mars
G  05°Vi07'15 +20°01'19|NGC 3504, Leo Minor
OA 05°Vi11'49 -57°22'19|Vela OB 1, (Ma) Vela
   (Sch) 1 Vel, (Ru) Vel I
G  05°Vi14'22 -17°29'03|NGC 3115, Sextans
G  05°Vi17'23 -13°38'51|Sextans A, Local
   Group?, DDO 75
X  05°Vi20'07 -52°47'03|3U0900-40, Star HD
   77581 Vel X-R 1
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LG 05°Vi39'49 -14°34'46|Sextans A= DD0
   75=A1008-04, IR I, 2 Mpc.
FS 05°Vi40'12 +26°40'47|nu Ursa Major, ALULA
   BOREALE, (54), double
FS 05°Vi41'52 + 0°07'43|rho Leo, (47)
G  05°Vi49'55 + 5°55'22|NGC 3338, Leo Group of galaxies
G  06°Vi01'39 + 6°24'23|NGC 3346, Leo Group
SN 06°Vi07'25 +45°33'09|1937 A (Aug) M 15.3 NGC 4157
FS 06°Vi25'59 +66°26'04|alpha Draco, THUBAN
   (11), spectroscopic double
FS 06°Vi36'33 +24°47'39|xi Ursa Major, ALULA
   AUSTRALE, (53), double, spect.
Q  07°Vi02'15 + 3°19'45|3C 245
G  07°Vi10'39 + 5°31'22|NGC 3367, Leo Group, F5
FS 07°Vi22'50 +54°51'22|epsilon Ursa Major
   ALIOTH, (77), spec. variable
Q  07°Vi33'19 +54°25'54|3C 277.1
G  07°Vi34'33 + 2°47'48|NGC 3351, Leo Group, M.95
G  07°Vi57'41 + 3°44'08|NGC 3368, Leo Group, M.96
GA 07°Vi57'46 + 5°35'59|NGC 3395
   Contains 4 superassociations
SS 08°Vi00'07 -88°17'48|South Pole of
   Invariable Plane of Solar System
SS 08°Vi03'53 -86°22'14|South Pole of Venus
NG 08°Vi04'02 + 3°59'40|near groups
G  08°Vi05'37 + 4°03'33|NGC 3379, Leo Group, M.105
G  08°Vi10'22 + 4°15'13|NGC 3389, Leo Group, Leo
G  08°Vi30'48 +73°24'35|UMi dwarf, Local Group
   DDO 199
LG 08°Vi30'48 +73°24'35|UMi dwarf system
FS 08°Vi38'47 -21°57'03|lamda Hydra, (41)
   Spectroscopic double
G  08°Vi59'56 +39°46'28|NGC 4051, UMa Group
   Fo, UMa
SG 08°Vi59'56 +39°46'28|NGC 4051
FS 09°Vi23'25 -10°45'52|beta Sextans, (30)
G  09°Vi40'45 +16°01'17|Leo II, Local Group
   Leo B = DDO 93
LG 09°Vi40'45 +16°01'17|Leo II system
OC 09°Vi57'26 -62°43'55|IC 2395, intermediate
   Rich, Vela
G  10°Vi01'19 +43°46'21|NGC 4258 UMa Group
   M.106, Cvn
CS 10°Vi06'37 +24°06'24|Local System North Pole
FS 10°Vi21'27 -47°24'33|epsilon Antlia
Q  10°Vi32'39 +39°56'35|3C 268.4
FS 10°Vi35'11 +14°23'30|delta Leo, ZOSMA, (68)
FS 10°Vi47'17 -56°08'16|lamda Vela, ALSUHAIL
G  10°Vi56'06 -40°34'57|NGC 2997, Antlia
Q  11°Vi02'22 +24°43'22|3C 261
G  11°Vi12'39 - 1°17'04|NGC 3423, Leo Group, Sextans
G  11°Vi18'20 +34°51'53|Zwicky No. 2, DDO 105, A1155+38
Q  11°Vi27'21 +61°38'13|3C 288.1
X  11°Vi27'22 -40°02'24|3U0946-30,
SS 11°Vi44'51 - 7°19'16|Ascending North Node
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   Pallas to equator
NS 11°Vi56'14 + 0°28'25|Wolf 359
G  12°Vi09'38 +12°33'49|NGC 3607, Leo
G  12°Vi17'25 -33°48'38|NGC 3109, Hydra
G  12°Vi24'18 +59°03'47|NGC 5204, CVn Group, UMa
OC 12°Vi27'02 -65°28'00|IC 2391, very loose
   Irregular, O Vela
FS 12°Vi38'34 + 9°51'32|theta Leo, COXA, (70)
WD 12°Vi38'55 +15°58'11|R 627
X  13°Vi10'11 +36°45'34|3U1207+39, NGC 4151
   Seyfert galaxy intense X-rays
G  13°Vi48'26 +36°01'31|NGC 4151, Seyfert
   9alaxy, CVn
SG 13°Vi48'26 +36°01'31|NGC 4151
G  13°Vi52'27 +42°24'18|NGC 4449, UMa Group, CVn
FS 14°Vi00'12 -51°06'32|psi Vela, double
CS 14°Vi11'59 -61°44'30|Centroid of Local System
FS 14°Vi28'09 +56°57'30|80 Ursa Major, ALCOR
   Spectroscopic double
PL 14°Vi29'16 -25°43'38|NGC: 3242, Hya
FS 14°Vi29'31 -24°58'50|mu Hydra, (42)
GA 14°Vi34'08 +29°16'30|NGC 3991
   Contains 2 superassociations
FS 14°Vi37'40 +56°35'34|zeta Ursa Major, MIZAR
   (79) spectroscopic double
SS 14°Vi38'09 -78°37'20|South Pole of Ceres
G  14°Vi49'22 +17°53'45|NGC 3745-54, Copeland Septet
G  14°Vi49'34 + 7°42'21|NGC 3623, M.65, Leo Group
SB 14°Vi50'43 +56°03'16|zeta two Ursa Major
Q  14°Vi58'37 +27°58'54|4C 31.38
G  14°Vi59'24 + 8°07'45|NGC 3627, Leo Group
   M.66, Bright
G  15°Vi00'10 + 8°09'42|NGC 3628, Leo Group
   Bright member
Q  15°Vi13'23 + 6°47'11|1116+12
G  15°Vi25'49 +36°28'45|NGC 4244, UMa Group, CVn
NG 15°Vi41'30 + 7°59'34|M.66, M.96 Leo
SN 16°Vi30'13 +34°08'02|1954 A (Apr 19) M 9.8
   NGC 4214
R  16°Vi30'18 +18°24'40|4C 22.30
G  16°Vi44'31 +39°46'19|NGC 4490, UMa Group, CVn
Q  16°Vi48'13 - 7°41'18|3C 249.1
Q  16°Vi51'60 -14°34'23|3C 246, 1049-09
FS 16°Vi52'02 +40°43'37|beta Canes Venatici
   ASTERION, (8)
R  17°Vi14'26 +47°52'05|4C 47.36
P  17°Vi21'20 +12°22'51|CP 1133
OC 17°Vi47'15 -75°10'47|NGC 2516, quite rich
   Concentrated, Carina
SN 18°Vi11'14 +28°35'23|1941 C (Apr) M 16.8 NGC 4136
R  18°Vi30'28 +79°00'53|4C 66.17
G  18°Vi32'52 +41°27'04|NGC 4618, UMa Group, CVn
Q  18°Vi34'40 +33°04'10|3C 27O.1
FS 18°Vi48'10 -67°25'27|delta Vela, double
G  18°Vi52'50 +57°38'31|Holmberg V, A1338+54
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FS 19°Vi36'32 -21°40'19|gamma Hydra
SS 19°Vi45'06 + 0°59'39|Perihelion Uranus
NG 19°Vi57'23 +29°26'06|NGC 4274 group
R  19°Vi59'14 +29°32'50|BZ 1215+30 rapid radio variable
G  20°Vi00'48 +36°00'29|NGC 4214, UMa Group, CVn
G  20°Vi06'48 +33°00'16|NGC 4395, UMa Group, Cvn
G  20°Vi25'14 + 8°29'56|NGC 3810, Leo Group, Leo
SS 20°Vi47'45 - 0°11'59|Ascending North Node
   Juno to ecliptic
G  21°Vi00'39 +41°49'02|NGC 4736, UMa Group
   M.94, CVn
FS 21°Vi00'58 +12°03'56|beta Leo, DENEBOLA, (94)
NG 21°Vi06'54 +42°40'03|M.101 CVn
G  21°Vi12'38 +28°25'22|NGC 4274, Coma Berenices
FS 21°Vi24'30 -36°53'48|alpha Antlia
IF 21°Vi39'53 -24°40'14|V Hydra, Late-Type
   Carbon star
R  21°Vi52'24 +28°02'60|VRO 28.12.02 (omega
   Com) rapid radio variable
G  22°Vi20'41 +58°41'53|Holmberg IV = DDO 185 = A1352+54
PL 22°Vi24'07 -46°45'41|NGC: 3132, Ant
FS 22°Vi31'28 -72°41'45|epsilon Carina
   Spectroscopic double
SS 23°Vi06'54 - 0°06'21|Ascending North Node
   Pallas to ecliptic
FS 23°Vi08'18 -22°59'25|alpha Crater, (7)
GA 23°Vi17'27 +65°31'23|NGC 5678 -- 2 superassociations
FS 23°Vi24'31 +28°00'43|gamma Coma, (15)
FS 23°Vi27'16 + 4°36'01|nu Virgo, (3)
Q  23°Vi31'07 +42°15'24|3C 28O.1
OC 23°Vi43'40 +26°31'13|Mel 111, sparse, very
   Loose, Coma Berenices
FS 23°Vi52'01 +26°58'13|Coma 12, double
   Spectroscopic double
G  23°Vi57'09 +51°22'11|NGC 5195, CnV Group, CVn
SN 23°Vi57'09 +51°22'11|1945 A (Feb) SN I M
   14.0 NGC 5195
N  23°Vi57'10 +59°38'47|Nova 1970G NGC 5457
SN 23°Vi57'10 +59°38'47|1909 A (Feb) Peculiar
   SN M 12.1 NGC 5457
G  23°Vi57'16 +51°20'23|NGC 5194, CVn Group
   M.51, CVn
GC 23°Vi57'22 +18°02'17|NGC 4147, Coma Berenices
G  23°Vi57'55 +59°37'05|NGC 5457, CVn Group
   M.101, UMa
FS 23°Vi58'27 +39°58'46|alpha Canes Venatici
   CHARA, COR CAR0LI,(12), variable
G  24°Vi14'15 +33°49'37|NGC 4631, UMa Group
   Cvn, Em
G  24°Vi20'54 +62°48'02|NGC 5585, CVn Group, UMa
G  24°Vi50'26 -11°38'04|NGC 3672, Crater
G  24°Vi57'00 +33°31'12|NGC 4656, UMa Group, CVn
G  25°Vi04'51 +59°23'26|NGC 5474, CVn Group, UMa
SN 25°Vi17'32 +29°06'38|1941 A (feb 26) M 13.2
   NGC 4559
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FS 25°Vi31'30 -13°24'41|epsilon Crater, (14)
G  25°Vi33'06 +45°18'56|NGC 5055, UMa Group
   M.63, CVn, F8
SN 25°Vi33'06 +45°18'56|1971 I (June) SN I M
   11.8 NGC 5055
FS 25°Vi44'39 -47°39'07|q Vela, spectroscopic double
FS 25°Vi51'59 -17°18'09|delta Crater, (12)
Q  26°Vi05'15 +21°56'41|4C 21.35
NS 26°Vi06'05 - 0°14'44|Ross 128
G  26°Vi07'47 +15°36'28|NGC 4192, M.98, Virgo Cluster
G  26°Vi21'26 +27°28'59|NGC 4565, Coma Berences
FS 26°Vi24'07 +54°15'19|eta Ursa Major, ALKAID, (85)
FS 26°Vi27'51 + 0°40'18|beta Virgo, ALARAPH,(5)
G  27°Vi08'05 - 3°25'47|Wild Triplet, A1144-03
FS 27°Vi12'30 -63°14'36|kappa Vela
   Spectroscopic double
Q  27°Vi16'08 - 1°08'19|1148-00
G  27°Vi29'34 +19°21'51|NGC 4382, Virgo
   Cluster, M.85, Com
X  27°Vi36'46 -63°49'22|3U0918-55, Star K Vel?
P  27°Vi41'18 +26°45'24|AP1237+25
FS 27°Vi44'20 -25°24'26|beta Crater, (11)
FS 27°Vi53'59 -11°18'46|theta Crater, (21)
G  28°Vi00'54 +14°30'34|NGC 4254 Virgo Cluster
   M.99, Com
G  28°Vi05'07 +16°45'44|NGC 4321, Virgo
   Cluster, M.100, Vir
SN 28°Vi05'07 +16°45'44|1914 A (Feb-Mar) M12.3
   NGC 4486
FS 28°Vi05'33 +59°34'46|kappa Bootes, (17)
   Double, spectroscopic double
Q  28°Vi13'07 -15°57'04|1127-14
R  28°Vi17'53 +58°58'02|Dumbell galaxy
FS 28°Vi37'20 -19°50'05|gamma Crater, (15), double
G  28°Vi56'54 +40°14'24|Holmberg VIII, A1310+36
CS 29°Vi23'49 +29°40'40|North Pole of Galaxy
Q  29°Vi33'35 -13°27'46|1136-13
G  29°Vi38'11 +14°44'53|NGC 4374, Virgo
   Cluster, M.84, Vir
G  29°Vi46'19 +15°06'31|NGC 4406, Virgo
   Cluster, M.86, Vir
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Libra

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CS 00°Li00'00 - 0°00'00|Equinox, Fall
CG 00°Li00'26 +31°41'15|Coma
G  00°Li00'26 +31°41'15|Coma Cluster of 800 galaxies
G  00°Li06'57 +16°01'31|NGC 4459, UMa Group, Com
SS 00°Li11'08 -88°35'58|South Pole of Neptune
SN 00°Li18'14 +27°33'41|1940 B (May 8) M 12.8
   NGC 4725
NG 00°Li21'22 +14°37'19|Virgo Cluster
GC 00°Li24'06 -51°18'35|NGC 3201, Vela
G  00°Li43'48 +31°25'53|NGC 4874, Coma Cluster
X  00°Li45'27 +31°31'22|3U1257+28, Coma cluster
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   Abell 1656 Coma X-1
G  00°Li46'43 +31°35'33|NGC 4889, Coma Cluster
FS 00°Li50'47 +60°42'57|theta Bootes, (23)
SN 00°Li51'23 +31°51'02|1950 A (feb) M 17.70 I 4051
G  00°Li54'42 +16°05'45|NGC 4501, Virgo
   Cluster, M.88, Com
CG 01°Li08'32 +14°40'09|Virgo
G  01°Li08'32 +14°40'09|Virgo Cluster Centroid
ME 01°Li09'29 + 4°51'46|Virginids
CS 01°Li10'02 +14°44'08|Center of Local Supergalaxy
SS 01°Li21'29 + 1°30'48|Descending South Node
   Uranus to equator
R  01°Li22'55 + 7°22'17|elliptical galaxy
X  01°Li34'54 +13°48'23|3U1228+12, M87 Virgo A
   Vir X-ray 1 Virgo Cluster
G  01°Li36'32 +13°52'38|NGC 4486, M.87, Virgo
   Cluster, Vir
R  01°Li36'32 +13°52'38|Virga A, M 87 peculiar
   Jet galaxy
SN 01°Li36'32 +13°52'38|1919 A (Feb-Mar) M 12.3
   NGC 4486
SN 01°Li51'24 + 6°38'16|1936 A (Jan 13) M 14.4
   NGC 4273
P  01°Li53'10 -61°15'47|MP O940
SN 01°Li58'57 +10°52'03|1895 A (Mar) M 12.5 NGC 4424
FS 02°Li10'20 -39°34'49|iota Antlia
FS 02°Li14'03 +71°35'57|iota Draco, (12)
G  02°Li21'27 +15°50'36|NGC 4569, Virgo
   Cluster, M.90, Vir
SN 02°Li30'15 + 6°20'43|1926 A (May) M 14.3 NGC 4303
G  02°Li31'01 + 6°22'41|NGC 4303 M.61, Virgo Cluster
G  02°Li37'49 +14°32'14|NGC 4552, Virgo
   Cluster, M.89, Vir
G  02°Li43'27 +10°48'20|NGC 4472, Virgo
   Cluster, M.49, Vir
Q  02°Li48'17 +19°05'40|3C 275.1
G  02°Li52'51 +15°11'33|NGC 4579, Virgo
   Cluster, M.58, Vir
SS 02°Li53'16 + 1°32'04|Descending South Node
   Jupiter to equator
SS 02°Li56'09 + 1°39'23|Descending South Node
   Mars to equator
SS 03°Li01'18 + 1°52'23|Descending South North
   Neptune to equator
Q  03°Li05'31 + 3°58'26|1217+02
SB 03°Li08'35 + 2°10'46|eta Virgo
G  03°Li09'45 +13°55'06|NGC 4567, Virgo
   Cluster, M.91, Vir
SS 03°Li12'10 + 2°19'51|Descending South Node
   Invariable Plane to equator
G  03°Li24'50 +25°06'02|NGC 4826, M.64
   Blackeye Neb., Com
FS 03°Li32'38 +32°44'04|beta Coma Berenices, (43)
FS 03°Li35'13 -18°44'05|zeta Crater, (27)
FS 03°Li50'46 + 2°01'60|eta Virgo, (15)
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X  03°Li55'17 +33°58'37|Very compact source in
   Coma; discovered June 15, 1974 MX1313+29
G  04°Li05'35 +10°23'07|NGC 4526, Virgo
   Cluster, G4, Vir
X  04°Li05'35 +10°23'07|3U1231+07, IC 3576
G  04°Li16'34 +14°48'26|NGC 4621, Virgo
   Cluster, M.59, Vir
SN 04°Li16'34 +14°48'26|1939 B (May 2) M 11.9 4621
SB 04°Li39'37 -49°52'42|p Vela
SN 04°Li46'60 +68°13'12|1954 C (Oct 4) SN II M
   14.9 NGC 5879
X  04°Li49'59 + 4°31'16|3U1224+02, 3 C 273 QSO
G  04°Li53'51 +14°25'02|NGC 4649, VIrgo
   Cluster, M.60, Vir
GA 04°Li58'47 + 6°48'48|NGC 4496
   Contains 1 superassociation
G  04°Li58'52 + 8°44'56|Holmberg VIII = DDO 137
   = A1232+06
Q  05°Li02'32 + 5°02'50|3C 273 1st real quasar
   (1963), Optical var. 1961,double source, infrared source
   bright quasar
SS 05°Li05'45 + 3°15'49|Descending South Node
   Saturn to equator
FS 05°Li11'03 -15°37'40|eta Crater, (30)
SS 05°Li25'10 -82°43'43|South Pole of Vesta
SN 05°Li25'19 +67°27'32|1940 C (Apr) M 16.3 I 1099
P  05°Li47'06 -59°12'32|MP O950
R  05°Li51'34 +62°05'54|3C 303, radio, two
   Optical objects, different red
FS 05°Li52'36 -60°16'32|phi Vela
FS 05°Li57'22 +54°53'52|lamda Bootes, (19)
SN 06°Li06'17 + 5°47'56|1915 A (mar) M 15.5 NGC 4527
G  06°Li21'56 -16°04'58|NGC 4027, Corvus
FS 06°Li32'60 -50°55'17|P Vela, double
   Spectroscopic double
G  06°Li33'29 + 3°06'29|NGC 4517, Reinmuth 80
   Virgo Cluster
G  06°Li36'34 +59°02'57|NGC 5676, Bootes
SS 06°Li56'29 + 4°04'08|Descending South Node
   Venus to equator
Q  07°Li05'10 +36°16'08|3C 286 One of the first
G  07°Li08'00 -16°22'44|NGC 4038, Corvus
G  07°Li13'50 +18°26'15|GR8 = DDO 155 = A1256+14
G  07°Li15'08 +68°31'23|NGC 5907, CVn Group, Dra
SN 07°Li15'08 +68°31'23|1940 A (Feb 16) SN II M
   14.3 NGC 5907
Q  07°Li17'56 + 1°40'16|inf1229-02
G  07°Li19'31 +66°36'39|NGC 5866, M.102, Draco
FS 07°Li19'37 -31°38'33|xi Hydra
Q  07°Li33'38 +15°17'13|1252+11
SN 07°Li34'04 -17°17'18|1921 A (Mar) NGC 4038
FS 08°Li12'42 +23°04'04|alpha Coma Berenices
   DIADEM,(42), double
SN 08°Li26'20 + 5°53'58|1939 A (Jan 2) M 12.2
   NGC 4636
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P  08°Li32'60 +66°42'58|MP 1508
FS 08°Li33'13 -68°15'40|iota Carina, TUREIS
GC 08°Li34'22 +24°01'39|NGC 5024, Coma Berenices
FS 08°Li55'38 +84°34'37|zeta Draco, NODUS I, (22)
FS 08°Li57'09 +16°50'39|epsilon
   Virgo,VINDEMIATRIX, (47)
G  08°Li58'48 -25°51'07|NGC 3923, Hydra
SS 09°Li38'48 + 5°05'53|Descending South North
   Mercury to equator
FS 09°Li41'17 + 2°14'17|gamma Virgo, ARICH
   (29), double
FS 09°Li49'26 -51°05'02|mu Vela, double
FS 10°Li03'01 -14°32'16|gamma Corvus, (4)
SS 10°Li12'51 + 4°36'34|Descending South Node
   Juno to equator
GC 10°Li26'21 +36°15'24|NGC 5272, M.3, old
   Cluster, Canes Venatici
FS 10°Li55'28 + 8°15'10|delta Virgo, (43), AUVA
FS 11°Li12'58 -20°09'54|epsilon Corvus, MINKAR, (2)
X  11°Li16'48 -57°28'11|3U1022-55,
FS 11°Li33'05 -21°45'13|alpha Corvus (1), ALCHITA
FS 11°Li59'35 -75°21'02|beta Volens
CS 12°Li03'36 + 5°23'02|Descending
   Supergalactic Node to Equator
OC 12°Li15'49 -62°08'24|NGC 3114, intermediate
   Rich, Carina
Q  12°Li33'51 +12°16'12|3C 281
G  12°Li37'54 - 5°47'48|NGC 4594, Virgo
   Cluster, M104,Vit
FS 12°Li44'07 -31°26'05|beta Hydra, double
SS 12°Li49'08 -87°36'29|South Pole of Saturn
FS 12°Li55'52 +78°33'31|eta Draco, (14), double
FS 12°Li59'52 -12°43'20|delta Corvus,
   ALGORAB,   (7),  double
SN 13°Li26'14 - 3°50'57|1907 A (May 10) M 13.5
   NGC 4674
SS 13°Li26'35 + 1°28'45|Aphelion Jupiter
FS 13°Li49'33 -82°27'27|delta Volens
P  13°Li51'12 -51°25'30|MP 1055-51
Q  14°Li01'59 + 1°14'15|3C 279 fluctuates in
   Radio spectrum
SN 14°Li03'20 - 3°20'33|1948 A (Mar) M 17.0 NGC 4699
FS 14°Li08'10 +58°20'50|38 h Bootes, MERGA
GC 14°Li19'10 -70°14'30|NGC 2808, Carina
SS 14°Li45'08 + 6°19'48|Descending South Node
   Sun Equator to equator
SS 15°Li51'56 -72°15'38|South Pole of Pluto
CS 16°Li06'43 + 0°22'47|Descending
   Supergalactic Node to Ecliptic
GC 16°Li17'21 +38°21'15|NGC 5466, Bootes
SS 16°Li41'45 + 7°17'40|Des South Node Vesta to equator
FS 16°Li57'60 +49°32'43|gamma Bootes, HARIS, (27)
Q  17°Li00'27 -18°02'33|1233-24
FS 17°Li01'49 -18°47'08|beta Corvus, KRAZ, (9)
FS 17°Li12'11 +74°07'28|theta Draco, (13)
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   Spectroscopic double
DN 17°Li28'05 -11°32'58|Coal sack
R  17°Li31'38 - 5°32'25|
FS 17°Li45'17 + 1°13'21|theta Virgo, (51), double
DN 18°Li35'58 -59°08'27|eta Carina
GC 18°Li41'22 -19°27'15|NGC 4590, M.68, Hydra
OA 18°Li43'28 -57°11'49|Carina OB 1, (Ma) Car
   (Sch) I Car, (Ru) Car I
Q  18°Li46'04 +29°16'49|1354+19
FS 18°Li50'52 -40°47'20|beta Centaurus
FS 18°Li53'21 +27°33'38|eta Bootes, MUFRID, (8)
   Spectroscopic double
T  19°Li02'12 -58°14'13|Car T1  -  eta Car (?)
Q  19°Li54'36 +11°11'38|3C 287 early quasar
   1959 radio source, 1968 bridge connection disc.
WR 20°Li30'11 -59°25'16|Wolf-Rayet star
R  20°Li30'58 -58°28'14|Carina nebula
DI 20°Li34'04 -58°28'43|NGC 3372, eta Carina
   Keyhole Nebula
N  20°Li34'04 -58°28'43|Nova eta Carina
IF 20°Li34'33 -58°28'48|eta Carina, brightest
   At 20 microns..outside solar
FS 20°Li35'07 -72°16'42|alpha Volens
   Spectroscopic double
G  21°Li00'15 +36°55'44|NGC 5548, Seyfert
   Galaxy, Boo
SG 21°Li00'15 +36°55'44|NGC 5548
FS 21°Li21'46 -67°18'16|upsilon Carina, double
SS 21°Li32'41 + 9°33'33|Descending South Node
   Ceres to equator
FS 21°Li41'54 + 7°59'44|zeta Virgo, HEZE, (79)
SB 21°Li50'60 - 0°31'16|alpha Virgo
WR 21°Li58'42 -59°10'04|eta Carina
FS 21°Li59'14 -52°09'50|pi Centaurus, double
ME 22°Li05'17 +62°20'35|Quadrantids
FS 22°Li10'59 +42°18'09|rho Bootes, (25), variable
CG 22°Li35'45 +43°24'40|Bootes
G  22°Li35'45 +43°24'40|Bootes Cluster of
OC 22°Li51'42 -55°56'44|NGC 3532, fairly rich, Carina
FS 23°Li02'45 - 1°48'24|alpha Virgo, AZIMECH
   SPICA,(67), spec. eclipsing binary
FS 23°Li34'41 +30°40'57|alpha Bootes, ARCTURUS, (16)
IF 23°Li34'41 +30°40'57|ARCTURUS, alpha Bootes
   8th strongest source at 2 microns
FS 24°Li00'18 +53°39'13|beta Bootes, MEREZ, (42)
OA 24°Li21'33 -56°42'27|Carina OB 2(?), (Ru)
   Car II
T  25°Li12'46 -39°44'18|Cen T1  -  V 654 Cen (?)
Q  25°Li20'19 +32°43'38|4C 2O.33
FS 25°Li44'31 -77°49'01|epsilon Volens
   Double, spectroscopic
FS 25°Li58'46 -12°56'45|gamma Hydra, (46)
N  26°Li42'17 -57°35'20|Nova 1895 Carina (RS)
FS 26°Li47'17 -44°30'03|delta Centaurus
OC 26°Li59'41 -61°36'48|IC 2602, very loose
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   Irregular, theta Carina
FS 27°Li03'08 +13°03'27|tau Virgo, (93), double
CS 27°Li03'33 -55°45'59|Intersect Local System
   & Galactic Equator
FS 27°Li10'59 +41°00'42|epsilon Bootes, IZAR
   (36), spectroscopic, double
Q  27°Li20'60 - 1°25'28|MSH 13-011
X  27°Li46'19 -55°54'14|3U1118-60, Cen
   X-3;disc. 1971 binary ; 1973 summer optical I.D
   2nd or 3rd brightest source
Q  27°Li58'12 -10°50'29|1327-21
R  28°Li12'03 -44°56'31|PKS 1209-52
PL 28°Li24'13 -50°31'56|NGC: 3918, Cen
X  28°Li31'16 -32°33'14|3U1247-41, NGC 4696
   PKS1245-41 Rich Southern cluster
G  28°Li38'09 -22°11'22|Hardcastle Nebula, A1310-32
FS 28°Li50'14 -45°42'53|rho Centaurus
R  29°Li11'20 +19°18'60|4C 06.49
Q  29°Li42'43 +18°42'02|3C 298
R  29°Li43'03 +18°42'45|PKS 1416106
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Scorpio

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FS 00°Sc12'18 -72°08'37|beta Carina, MIAPLACIDUS
G  00°Sc37'00 +17°11'37|NGC 5566, Vir III Cloud
OC 01°Sc11'46 -55°10'13|NGC 3766, concentrated
   And quite rich, Centaurus
X  01°Sc18'11 -55°11'33|3U1134-61
G  01°Sc36'51 -18°27'34|Centaurus Cluster of
   300 galaxies
FS 01°Sc37'42 -40°09'25|gamma Centaurus, double
OA 01°Sc52'22 -55°46'26|Centaurus OB 2, (Ru) IC 2944
CG 02°Sc01'33 -19°22'50|Centaurus
VB 02°Sc06'05 +34°00'50|epsilon Beetes
DI 02°Sc06'19 -55°49'14|IC 2944, lamda Centaurus
EB 02°Sc07'55 +76°24'06|CM Draconis, dwarf
   Eclipsing binary
FS 02°Sc24'12 +53°30'57|mu Bootes, ALKALUROPS
   (51), double
FS 02°Sc25'59 +27°38'51|zeta Bootes, (30), double
FS 02°Sc26'10 -26°00'14|iota Centaurus
G  02°Sc29'20 -17°24'02|NGC 5236, M.83, Hydra
N  02°Sc29'20 -17°24'02|1968 NGC 5236
FS 02°Sc31'37 +48°51'13|delta Bootes, (49)
X  02°Sc44'59 -54°05'27|3U1145-61,
SN 02°Sc53'29 -18°19'27|1923 A (May Peculiar SN
   M 14.0 NGC 5236
FS 02°Sc57'18 + 7°36'08|iota Virgo, (99)
R  03°Sc10'10 +41°48'46|dumbell galaxy
FS 03°Sc21'52 -56°31'17|lamda Centaurus
N  03°Sc44'04 -18°43'23|Nova 1895 Centaurus No. 2
NG 03°Sc44'04 -18°43'23|M.83
G  03°Sc45'56 -18°44'16|NGC 5253, Centaurus
FS 03°Sc58'20 + 2°25'49|kappa Virgo, (98)
IF 04°Sc33'42 -46°24'24|gamma crux, at 2
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   Microns the 7th strongest source.
Q  04°Sc36'40 +25°11'09|OQ 172 red shift over 3!
IF 04°Sc37'25 -15°27'51|W Hydra, 5th strongest
   Source at 2 microns
FS 04°Sc37'59 -50°08'17|delta Crux
FS 04°Sc47'24 +56°45'44|theta Bootes, CEGINUS, (54)
FS 05°Sc12'42 -67°07'03|omega Carina
FS 05°Sc24'17 -47°13'24|gamma Crux, double
P  05°Sc40'15 -54°17'29|MP 1154
X  05°Sc46'30 -30°15'46|3U1322-42, NGC 5128 Cen A
G  05°Sc50'20 -30°17'31|NGC 5128, Centuarus A
R  05°Sc52'54 -30°18'40|Centaurus A, elliptical
   Galaxy NGC 5128
G  05°Sc55'59 -38°07'36|NGC 4945, Centaurus
FS 05°Sc57'52 -38°45'28|xi Centaurus
OA 06°Sc08'01 -54°23'55|Crux OB 1, (Ko) Cru
   (Ru) Cru I
CS 06°Sc47'29 -28°41'13|The Great Attractor
   Center of Mega-SuperGalaxy
G  06°Sc52'09 +15°00'32|NGC 5713, Vir III
   Cloud, Vir
FS 07°Sc23'56 +60°25'36|chi Hercules, (1)
FS 07°Sc32'41 +17°53'33|109 Virgo
MS 07°Sc43'34 - 4°06'03|125 248
FS 08°Sc04'60 -13°27'05|49 Hydra
FS 08°Sc16'09 -82°39'55|gamma Volens
   Spectroscopic double
FS 08°Sc19'50 +46°12'49|beta Corona Borealis
   NUSAKAN, (3), spectroscopic
FS 08°Sc38'01 +48°44'43|theta Corona Borealis, (4)
CG 08°Sc45'16 +43°16'38|Corona Borealis
G  08°Sc45'16 +43°16'38|Corona Borealis Cluster
   Of 400 gal.
GC 08°Sc54'59 -34°58'48|NGC 5139, omega
   Centaurus, one of brightest, 1964
FS 09°Sc19'23 +10°00'07|mu Virgo, (107)
Q  09°Sc39'54 +80°59'31|3C 351
X  10°Sc09'10 -54°27'26|3U1210-64,
FS 10°Sc11'57 +64°26'45|theta Hercules, (11)
X  10°Sc15'37 -52°12'50|3U1223-62, GX3Ol+O very
   Flat spectrum
P  10°Sc26'03 -52°43'35|PSR1221-63
FS 10°Sc32'40 -28°25'49|nu Centaurus
   Spectroscopic double
FS 10°Sc45'36 -48°27'17|beta Crux, variable
FS 11°Sc02'21 -29°21'33|mu Centaurus, variable
FS 11°Sc19'09 -52°58'07|alpha Crux
   Spectroscopic double
SS 11°Sc35'53 +16°09'17|Descending South Node
   Pluto to equator
FS 11°Sc55'46 +43°37'59|alpha Corona Borealis
   ALPHECCA,(5),var. spec. eclipsing
EB 11°Sc56'05 +43°38'32|alpha Corona Borealis
FS 11°Sc56'23 -22°48'54|theta Centaurus, (5)
OC 12°Sc03'48 -48°23'18|NGC 4755, 'Jewel Box'
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   Concentrated, rich, kappa Crux
SB 12°Sc44'19 -31°33'07|zeta Centaurus
Q  12°Sc44'28 +10°38'01|1454-06
G  13°Sc13'45 +17°35'25|NGC 5846, Vir III
   Cloud, Vir
FS 13°Sc32'35 +65°57'06|tau Hercules, (22), double
Q  13°Sc39'13 + 6°57'11|MSH 14-121
P  13°Sc48'27 -51°51'33|MP 1240
R  13°Sc49'10 +24°37'17|4C07.40
X  13°Sc57'36 -48°32'49|3U1258-61, GX 304-1
   Very flat spectrum
SS 14°Sc04'03 + 1°09'23|Aphelion Neptune
G  14°Sc08'01 +54°50'57|NGC 6207, Hercules Supergalaxy
FS 14°Sc08'48 + 1°06'47|alpha' Libra, ZUBEN
   ELGENUBI, KIFFA AUSTRALIS, (9)
FS 14°Sc17'08 -32°59'22|zeta Centaurus
   Spectroscopic, double
FS 14°Sc18'06 +44°14'10|gamma Corona Borealis
   (8), double, spectroscopic
EB 14°Sc22'07 + 8°58'09|delta Libra
OA 14°Sc26'10 -48°12'55|Centaurus OB 1, (Ma)
   Cen, (Sch) I Cru, (Ru) Cen I
G  14°Sc35'43 +22°57'34|''Shane' Cloud of galaxies
SS 14°Sc38'51 +16°51'33|Perihelion Pluto
FS 14°Sc39'26 + 8°00'42|delta Libra, ZUBEN
   ELAKRIBI, (19), spec. eclipsing binary
GC 14°Sc40'42 - 9°22'04|NGC 5694, Hydra
   Perhaps escaping galaxy towards LMC
   SMC
FS 14°Sc50'21 -39°32'48|epsilon Centaurus
IF 14°Sc56'21 +46°59'12|R Corona Borealis, 'R
   CrB variable , 40% IF excess
FS 15°Sc43'52 -79°20'06|zeta Volens
GC 15°Sc57'47 +19°23'57|NGC 5904, M.5, old
   Cluster in Serpens
FS 16°Sc02'19 +45°23'39|delta Corona Borealis, (10)
FS 16°Sc28'29 +38°06'45|iota Serpens. (21), double
FS 16°Sc36'15 -56°49'12|zeta2 Musca
X  17°Sc06'42 -46°41'23|3U1320-61, Cen XR-2
   Increased  67 NGC 5189?
Q  17°Sc12'57 + 9°49'37|1510-08
SS 17°Sc30'01 + 0°49'08|Descending South Node
   Mercury to ecliptic
P  17°Sc33'48 -35°57'11|MP 1359
Q  17°Sc41'02 +40°00'49|3C 323.1
FS 17°Sc49'39 +28°18'29|delta Serpens, double
FS 17°Sc58'51 -57°30'30|zeta1 Musca
X  18°Sc02'11 +46°53'07|3U1555+27, Star 13
   Epsilon CrB
FS 18°Sc02'34 +46°53'42|epsilon Corona
   Borealis, (13), double
FS 18°Sc19'12 + 0°20'40|nu Libra, ZUBEN
   HAKRABI, (21)
FS 18°Sc22'09 +49°02'33|iota Corona Borealis, (14)
SB 18°Sc22'21 +45°47'00|T Corona Borealis
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FS 18°Sc45'45 +40°08'33|rho Serpens, (38)
R  18°Sc46'29 -46°20'38|Centaurus B
FS 18°Sc46'31 + 8°08'20|beta Libra, ZUBEN
   ELSCHEMALI, KIFFA BOREALIS, (27)
SS 18°Sc57'09 + 0°46'33|Descending South Node
   Mars to ecliptic
FS 18°Sc57'38 +37°25'60|kappa Serpens, (35)
P  18°Sc58'41 -47°57'08|PSR1323-62
FS 19°Sc06'59 +34°42'44|beta Serpens, (28)
FS 19°Sc13'29 -24°41'57|eta Centaurus, double
N  19°Sc16'29 +45°33'29|Nova 1866 Coronae (T)
   Also 1946
FS 19°Sc16'42 -56°19'40|alpha Musca
N  19°Sc19'37 +33°34'20|Nova 1948 (CT) Serpens
   Rapid early development
WR 19°Sc20'38 -51°50'43|Theta Musca
G  19°Sc22'52 + 2°56'12|Fath 703, A1511-15
FS 19°Sc25'10 -55°12'30|beta Musca, double
FS 20°Sc02'48 - 7°49'34|sigma Libra, (20)
FS 20°Sc14'10 - 1°35'21|iota Libra, (24)
   Double, spectroscopic
P  20°Sc26'43 +28°06'58|AP1541+09
FS 21°Sc24'31 +25°23'15|alpha Serpens, COR
   SERPENTIS, (24)
G  21°Sc27'02 +39°40'16|NGC 6027 A-D, Sefert Sextet
GC 21°Sc28'41 - 1°32'24|NGC 5897, Libra
X  21°Sc41'41 -55°05'01|3U1254-69,
FS 22°Sc09'30 +34°56'27|gamma Serpens, (41)
R  22°Sc21'08 +60°10'29|4C 39.45
R  22°Sc22'01 +60°11'44|3C 338 four galaxies
   NGC 6161
FS 22°Sc36'24 -58°32'29|gamma Musca
R  22°Sc36'41 - 5°26'48|OR-225, PKS 1514-24
   Rapid radio variable, N galaxy
FS 22°Sc50'03 +62°46'30|sigma Hercules, (35)
FS 23°Sc00'08 -30°27'37|alpha Lupus
FS 23°Sc03'22 -44°04'25|beta Centaurus, double
   Spectroscopic double
P  23°Sc09'29 -45°43'20|PSR1354-62
FS 23°Sc46'12 +23°28'56|epsilon Serpens, (37)
FS 24°Sc17'12 -24°55'19|beta Lupus
FS 24°Sc19'56 + 4°49'23|gamma Libra, ZUBEN
   ELAKRAB, (38)
FS 24°Sc28'06 -25°02'19|kappa Centaurus, double
CG 24°Sc37'36 +37°03'47|Hercules
G  24°Sc37'36 +37°03'47|Hercules Cluster of 300 galaxies
FS 24°Sc48'27 +75°48'54|mu Draco, ARRAKIS, (21) double
FS 24°Sc56'02 +37°29'25|kappa Hercules, MARSIK
   Double
FS 25°Sc21'08 +15°47'07|mu Serpens, (32)
SS 25°Sc49'04 +13°00'17|Aphelion Juno
FS 26°Sc02'11 -57°04'05|delta Musca
   Spectroscopic double
CS 26°Sc07'48 -21°42'49|Centroid of Sco-Cen
   (Southern Stream)
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G  26°Sc50'32 +80°04'06|Draco dwarf, Local
   Group, DDO 208
LG 26°Sc50'32 +80°04'06|Draco dwarf system
FS 26°Sc57'38 -17°43'22|theta Lupus
FS 27°Sc06'35 -26°46'35|lamda Lupus, double
R  27°Sc06'37 +23°03'56|3C 327.0 Dumbell galaxy
G  27°Sc20'25 -47°16'40|Circinus galaxy, A1409-65
VB 27°Sc35'11 -41°29'22|Alpha Centaurus A,B
FS 27°Sc47'49 - 8°02'18|upsilon Libra, (39), double
FL 27°Sc50'31 -43°53'32|alpha Centaurus C
G  27°Sc50'54 +67°33'03|Zwicky Triplet, A1648+45
FS 27°Sc55'36 +60°34'01|eta Hercules, (44)
NS 27°Sc55'57 -43°56'37|Proxima Centaurus
Q  27°Sc57'28 +60°36'18|3C 345 radio variable
   Summer-fall 1965 discovery
NS 27°Sc58'24 -41°08'15|alpha Centaurus, beta Centaur.
FS 27°Sc58'33 -21°28'05|delta Lupus
R  28°Sc02'39 +21°47'33|4C 01.48
Q  28°Sc03'04 +44°24'53|3C 336
FS 28°Sc19'21 +40°39'29|gamma Hercules, (20)
FS 28°Sc31'19 -42°02'45|alpha Centaurus
   TOLIMAN, double
Q  28°Sc31'56 +38°14'22|3C 334
GC 28°Sc39'46 +58°15'48|NGC 6205, M.13,'perhaps
   Finest', very old, Hercules cluster
FS 28°Sc43'15 -10°17'03|tau Libra, (40)
CS 28°Sc53'27 -39°55'13|Intersect Galactic
   Supergalactic Equators
P  28°Sc59'25 +20°33'15|MP 1604
N  29°Sc04'52 +27°08'59|Nova 1866 Scorpio (U)
   1906, 1936
FS 29°Sc20'19 -75°18'57|alpha Chamaeleon
FS 29°Sc31'21 -25°31'54|epsilon Lupus, double,
spectroscopic
FS 29°Sc46'54 -32°07'14|zeta Lupus
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Sagittarius

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VB 00°Sa21'36 +52°51'31|zeta Hercules
FS 00°Sa33'23 +42°08'38|beta Hercules
   KORNEPHOROS, (27), spect. double
P  00°Sa38'30 -47°32'42|MP 1426
FS 00°Sa42'31 +53°16'03|zeta Hercules, (40)
   Double, spectroscopic
FS 00°Sa43'06 +35°47'38|omega Hercules, KAJAM
   (24), double
FS 00°Sa44'02 -68°06'60|gamma Chamaeleon
FS 01°Sa03'53 -22°09'11|gamma Lupus, double
FS 01°Sa34'27 -46°03'24|alpha Circinus, double
SB 01°Sa34'33 + 2°32'09|beta Scorpio
SN 01°Sa35'14 +40°46'52|1926 B (Jun) M 14.8 NGC 6181
FS 01°Sa40'23 +16°53'44|delta Ophiuchus, YED
   PRIOR, (1)
FS 01°Sa50'41 - 1°50'32|delta Scorpio
   DSCHUBBA. (7)
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N  02°Sa12'41 -29°39'18|Nova 1893 Norma (R)
FS 02°Sa14'19 - 5°27'04|pi Scorpio, (6)
   Spectroscopic double
FS 02°Sa15'01 -13°37'36|chi Lupus, (5)
   Spectroscopic double
N  02°Sa16'10 -46°58'50|Nova 1926 X Circinus.
   Slow development
FS 02°Sa29'02 + 1°03'15|beta Scorpio, ACRAB
   (8), spectroscopic double
FS 02°Sa31'45 - 8°57'38|rho Scorpio, (5)
X  02°Sa42'05 -35°32'18|3U1516-56, Cir X-1
   Large intensity changes in seconds
FS 02°Sa52'31 +16°06'24|epsilon Ophiuchus, YED
   POSTERIOR, (2)
X  03°Sa28'44 -39°55'54|3U1510-59, MSH 15-52A,B
   SNR?
FS 03°Sa30'59 -38°42'49|beta Circinus
P  03°Sa32'04 -46°12'55|MP 1449
DI 03°Sa45'09 + 2°40'54|IC 4592, nu Scorpio
FS 03°Sa56'02 + 1°42'06|nu Scorpio, LESATH
   (14), double, spectroscopic
P  04°Sa04'03 -32°27'49|MP 1530
PL 04°Sa22'03 +45°21'48|NGC: 6210, Her
WD 04°Sa41'06 + 5°25'13|L770-3
X  04°Sa44'17 -26°27'09|3U1543-47, Increased
   1000x late 1971; died away
FS 04°Sa53'36 +23°34'15|lamda Ophiuchus, (10), double
X  04°Sa55'54 + 6°57'28|3U1617-15, Sco X-1
   Sco-1 (largest X-ray source)
FS 05°Sa03'00 -39°49'39|gamma Circinus, double
FS 05°Sa03'41 -17°22'54|eta Lupus, double
X  05°Sa05'28 -31°07'55|3U1538-52, Nor XR-2 Nor 2
P  05°Sa25'34 -48°24'19|PSR1451-68
GC 05°Sa29'54 - 0°18'05|NGC 6093, M80, Scorpio
N  05°Sa29'54 - 0°18'05|Nova 1860 Scorpio (T)
DN 05°Sa33'20 - 2°02'39|rho Ophiuchus
OA 05°Sa37'11 - 3°47'10|Scorpius OB 2, (Mo) lI
   Sco, (Ru) Sco II
VB 05°Sa54'03 +67°38'02|Fu 46
P  06°Sa03'45 -22°08'27|MP 1556
FS 06°Sa04'47 -15°46'11|theta Lupus
FS 06°Sa23'19 -63°56'26|beta Chamaeleon
PL 06°Sa29'14 -30°04'26|NGC:     , Nor
SB 06°Sa47'22 +53°09'58|epsilon Hercules
T  07°Sa01'02 - 1°27'22|Sco T1  -  alpha Sco (Antares)
FS 07°Sa06'44 - 4°05'23|sigma Scorpio
FS 07°Sa26'53 +53°50'31|epsilon Hercules, (58)
   Spectroscopic double
GC 07°Sa30'58 +10°16'40|NGC 6171, M.107, Ophiuchus
DI 07°Sa32'60 - 1°00'40|IC 4603-4. rho Ophiuchus
GC 07°Sa35'39 - 3°36'53|NGC 6121, M.4, Scorpio
P  07°Sa46'41 -28°10'01|PSR1557-50
FS 07°Sa58'47 -24°30'06|delta Norma
P  08°Sa11'25 -28°30'50|PSR1558-50
FS 08°Sa22'33 -28°40'16|eta Norma
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FS 08°Sa32'60 +11°16'04|zeta Ophiuchus, (13)
OA 08°Sa35'57 -32°33'13|Norma OB 1
FS 08°Sa43'55 -48°08'41|gamma Triangulum Australe
FS 08°Sa53'15 +78°42'58|nu Draco, KUMA, (24), double
IF 08°Sa56'47 - 3°49'55|alpha Scorpio, Antares
DI 08°Sa57'47 - 2°59'04|IC 4605, 22 Scorpio
DI 08°Sa57'47 - 3°50'43|IC 4606, alpha Scorpio, ANTARES
FS 09°Sa06'20 - 4°49'09|alpha Scorpio, ANTARES
   (21), dbl,variable, spect.
P  09°Sa13'39 -30°09'03|PSR 1601-52
Q  09°Sa21'50 +51°57'44|4C 29.50
P  09°Sa23'55 +19°28'01|PSR 1642-03
X  09°Sa25'11 -40°43'40|3U1543-62,
GC 09°Sa35'15 +66°33'47|NGC 6341, M.92. Hercules
GC 09°Sa36'38 +21°58'24|NGC 6218, M.12, Ophiuchus
FS 09°Sa43'29 -45°09'54|epsilon Triangulum Australe
R  09°Sa54'43 +27°22'50|3C 348.0, dumbell
   Galaxy, Her A
CS 10°Sa19'48 + 0°15'22|Asc. Node Local System
   Equator to Ecliptic
X  10°Sa38'33 -37°49'43|3U1556-60, Nor XR-2?
   Nor 2 ?
FS 10°Sa42'11 -27°38'25|gamma Norma
FS 10°Sa46'13 - 6°11'17|tau Scorpio, (23)
OC 10°Sa58'22 -31°41'25|NGC 6067, fairly rich
   G & K Supergiants, Norma
FS 11°Sa04'07 +32°12'57|kappa Ophiuchus, (27)
FS 11°Sa16'15 +75°16'28|beta Draco, ALWAID
   (23), double
FS 11°Sa18'04 -42°18'54|beta Triangulum Australe
FS 11°Sa22'12 -28°14'28|gamma2 Norma
IF 11°Sa27'20 -26°45'19|G333.6-O.2, 6th
   Strongest source at 20 microns
PL 11°Sa29'04 -17°01'09|NGC: 6153, Sco
FS 11°Sa31'55 +59°01'39|pi Hercules, (67)
FS 12°Sa15'27 -25°54'17|epsilon Norma, double
   Spectroscopic double
X  12°Sa26'46 -26°04'44|3U1624-49, Nor 1 ? Nor
   XR-1 ?
X  12°Sa29'53 + 2°00'39|3U1645+21,
GC 12°Sa42'17 +18°50'42|NGC 6254 M.10m Ophiuchus
R  12°Sa46'27 -37°41'10|PKS 1610-60
EB 13°Sa02'56 +56°40'12|u Hercules
X  13°Sa14'06 -24°23'47|3U1630-47, Nor XR-1 ?
   Nor 1 ?
FS 13°Sa15'03 -57°51'34|alpha Apus
SS 13°Sa16'19 + 4°56'10|Perihelion Vesta
N  13°Sa20'03 -62°19'51|Nova 1953 RR Chamaeleon
SS 13°Sa36'52 + 1°04'51|Descending South Node
   Uranus to ecliptic
GC 13°Sa51'17 + 0°52'40|NGC 6235 Ophiuchus
ME 14°Sa00'26 +77°06'53|Draconids
FS 14°Sa10'43 +47°02'55|delta Hercules,SARIN
   (65), double, spectroscopic
OA 14°Sa10'44 -23°39'06|Ara OB 1, (ma) Ara-Nor
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   (Sch) I Ara
N  14°Sa14'42 +11°20'26|Nova 1848, Ophiuchus
   No. 2
SB 14°Sa31'05 -13°48'16|mu (one) Scorpio
FS 14°Sa35'35 +60°25'46|rho Hercules, (75), double
FS 14°Sa42'49 -12°14'48|epsilon Scorpio, (26)
P  14°Sa55'11 -21°51'59|PSR1641-45
SS 14°Sa58'32 + 0°48'57|Descending South Node
   Sun Equator to ecliptic
N  14°Sa59'20 - 6°20'20|Nova 1917 Ophiuchus No.5
X  15°Sa08'15 -22°04'37|3U1642-45, GX 340+0 Ara
   1 ?
N  15°Sa18'41 -28°49'53|Nova 1910 Ara
FS 15°Sa20'49 -14°34'36|eta Scorpio
   Spectroscopic eclipsing binary
X  15°Sa29'49 -29°49'05|3U1636-53,
FS 15°Sa29'58 +36°56'36|alpha2 Hercules
   Spectroscopic double, RAS ALGETHI
IF 15°Sa29'58 +36°56'36|alpha Hercules, 4th
   Strongest source at 2 microns
P  15°Sa56'46 + 4°29'49|MP1700-18
X  15°Sa58'20 -11°39'43|3U1653+35, Star HZ Her
   Her X-1; 1971 discovered binary; Jan 9, 1972
SS 16°Sa03'22 + 1°40'59|Descending South Node
   Venus to ecliptic
OA 16°Sa05'49 -17°53'35|Scorpius OB 1, (Ma)
   Sco, (mo) I Sco, (Ru) Sco I
OC 16°Sa15'31 -18°03'00|NGC 6231, 0
   Supergiants, Wolf-Rayet stars, Scorpio
   Intermediate.  rich
WR 16°Sa19'29 -19°50'17|Wolf-Rayet star
GC 16°Sa24'05 - 3°08'18|NGC 6273, M.19, Ophiuchus
GC 16°Sa28'42 - 6°48'02|NGC 6266 M.62, Ophiuchus
GC 16°Sa33'03 + 1°14'59|NGC 6287, Ophiuchus
SS 16°Sa34'27 - 2°23'32|Aphelion Mercury
GC 16°Sa35'53 - 0°36'18|NGC 6284, Ophiuchus
FS 16°Sa36'21 -20°06'55|zeta2 Scorpio, GRAFIAS
P  17°Sa02'11 + 7°12'40|MP 1706
P  17°Sa02'48 - 8°13'27|PSR1700-32
X  17°Sa14'15 -40°42'53|3U1632-64,
FS 17°Sa17'25 + 6°59'37|eta Ophiuchus, SABIK
   (35), double
EB 17°Sa21'15 +24°26'40|U Ophiuchus
X  17°Sa21'16 -44°14'39|3U1626-67,
X  17°Sa40'54 -13°17'42|3U1700-37, Star HD
   153919 binary system
PL 17°Sa49'45 +11°08'02|NGC: 6309, Oph
X  18°Sa00'55 -12°43'45|3U1702-36, GX 349+2 Sco
   2, Sco XR-2
X  18°Sa01'56 - 8°15'20|3U1704-32, L8
FS 18°Sa05'28 -35°41'03|eta Ara
GC 18°Sa05'45 - 2°52'19|NGC 6293, Ophiuchus
X  18°Sa19'19 + 0°34'43|3U1709-23, Oph XR-2 Oph 2
R  18°Sa30'54 +23°30'31|dumbell galaxy
X  18°Sa39'27 -18°41'51|3U1702-42, Ara XR-1, GX-14.1
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FS 18°Sa40'15 -62°28'44|delta Octans
X  18°Sa44'59 -24°53'16|3U1658-48, GX 339-4
FS 19°Sa00'05 -31°03'46|epsilon Ara, double
FS 19°Sa02'18 +69°45'08|iota Hercules, (85)
SS 19°Sa03'16 -77°55'32|South Pole of Juno
FS 19°Sa04'45 -32°47'23|zeta Ara
FS 19°Sa11'56 +49°20'04|lamda Hercules, MAASYM, (76)
X  19°Sa13'34 +66°19'39|3U1736+43, Glo cluster
   M92 NGC 6341?
GC 19°Sa19'14 - 5°51'05|NGC 6304, Ophiuchus
X  19°Sa27'01 -20°24'02|3U1705-44,
GC 19°Sa28'43 + 5°59'56|NGC 6333, M.9, Ophiuchus
OA 19°Sa39'43 - 9°50'13|Scorpius OB 4, (Ru) Sco IV
R  20°Sa00'38 -14°43'33|
FS 20°Sa02'26 -20°08'14|eta Scorpio
FS 20°Sa10'13 -46°02'33|alpha Triangulum Australe
OC 20°Sa17'40 +28°36'38|IC 4665, very loose
   Irregular, Ophiuchus
EB 20°Sa20'13 -10°30'34|RS Sagittarius
GC 20°Sa29'50 + 6°56'58|NGC 6356, Ophiuchus
P  20°Sa32'39 - 5°11'40|PSR1717-29
FS 20°Sa40'52 - 1°37'03|theta Ophiuchus, (42)
X  20°Sa53'24 -15°38'13|3U1714-39, Sco XR-2
   GX-1O.7 Sco 2
CS 21°Sa06'27 +24°05'03|Ascending Node Local
   System  Equator to Equator
P  21°Sa07'09 - 8°32'12|PSR 1718-32
DN 21°Sa25'32 - 2°20'03|theta Ophiuchus
N  21°Sa35'52 -11°47'41|Nova 1944 V 696 Scorpio
SS 21°Sa43'04 + 0°11'33|Descending South Node
   Ceres to ecliptic
FS 21°Sa46'45 +35°24'21|alpha Ophiuchus, RAS
   ALHAGUE, (55)
RH 21°Sa47'54 -10°09'07|at 85.7 Mc in direction
   Of the nebula NGC 6357
FS 21°Sa49'36 -55°39'03|gamma Apus
R  21°Sa57'30 -10°19'00|
PL 22°Sa13'27 + 0°38'45|NGC: 6369, Oph
X  22°Sa24'28 + 8°02'05|3U1728-16, Oph 3 GX9+9
R  22°Sa27'02 + 2°18'57|SN REM Kepler's
   Supernova 1604 AD
FS 22°Sa29'42 -55°04'20|beta Apus
G  22°Sa43'16 -37°55'41|NGC 6300, Ara
SS 22°Sa45'31 -54°25'47|South Pole of Pallas
X  22°Sa50'32 + 0°02'47|3U1728-24, GXl+4 Sgr 6 ?
X  23°Sa03'18 - 9°35'24|3U1727-33, GX 354+0
P  23°Sa04'57 + 1°42'26|PSR 1730-22
GC 23°Sa19'51 +20°33'13|NGC 6402, M.14, Ophiuchus
FS 23°Sa20'58 -14°34'50|upsilon Scorpio, (34)
   Spectroscopic double
FS 23°Sa29'19 -32°03'20|beta Ara
FS 23°Sa35'27 -33°03'44|gamma Ara
FS 23°Sa51'42 + 7°37'60|xi Serpens, (55)
   Spectroscopic double
OC 23°Sa51'45 - 8°33'15|NGC 6383, intermediate
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   Rich, Scorpio
FS 23°Sa54'49 -14°15'42|lamda Scorpio, SHAULA, (35)
P  24°Sa00'56 -23°40'38|MP 1727
FS 24°Sa20'41 +79°34'39|xi Draco, GRUMIUM, (32)
X  24°Sa32'51 - 4°31'06|3U1735-28,
FS 24°Sa34'27 +50°30'01|mu Hercules, (86), double
FS 24°Sa39'10 +27°36'36|beta Ophiuchus, KELB
   ALRAI, (60)
FS 24°Sa41'17 +10°41'56|omicron Serpens, (56)
   Spectroscopic double
FS 24°Sa47'48 -81°33'55|alpha Mensa
FS 24°Sa51'32 -37°20'43|delta Ara
FS 24°Sa52'24 -19°05'58|theta Scorpio
FS 24°Sa57'54 -26°40'01|alpha Ara
   Spectroscopic double
OC 24°Sa59'39 - 7°51'09|NGC 6405, M.6
   Intermediate rich, Scorpio
X  25°Sa13'40 -20°27'16|3U1735-44,
FS 25°Sa48'01 -16°23'05|kappa Scorpio
GC 25°Sa56'44 -28°50'01|NGC 6397, Ara
FS 25°Sa56'46 +25°44'33|gamma Ophiuchus, (62)
CS 26°Sa05'27 - 4°12'42|Center of our Galaxy
IF 26°Sa06'50 - 4°14'09|Galactic Center, 7th
   Strongest source at 20 micron
R  26°Sa13'43 - 4°21'27|major component on
   Galactic Nucleus, Sagittarius A
P  26°Sa13'54 - 6°17'45|PSR 1742-30
X  26°Sa23'41 - 5°30'11|3U1743-29, Sgr 1? SNR 1742-28?
X  26°Sa32'42 - 1°46'51|3U1744-26, Sgr XR-1 GX+3
N  26°Sa44'23 +17°32'16|Nova 1898, 1933, 1958
   RS Ophiuchus
FS 26°Sa49'17 -16°37'02|iota Scorpio
FS 27°Sa13'60 -14°11'52|G Scorpio
FS 27°Sa14'44 -40°48'10|eta Pavo
X  27°Sa16'55 -13°16'59|3U1746-37, NGC 6441?
   Globular cluster
OA 27°Sa17'47 - 5°30'21|Sagittarius OB 5, (Sch)
   V Sgr, (Ru) Sgr V
R  27°Sa21'37 - 5°34'31|Compact OH source
   Approaching at 341 Km
   sec
N  27°Sa35'59 -10°43'32|Nova 1950 V 720 Scorpio
OC 27°Sa38'56 + 1°57'09|NGC 6469, intermediate
   Rich, Scorpio
IF 27°Sa42'35 +49°47'06|89 Hercules, IF excess
P  27°Sa43'50 -22°33'32|MP 1747
P  27°Sa44'08 - 4°01'34|PSR1749-28
FS 27°Sa45'49 +61°04'18|theta Hercules, (89)
   Spectroscopic variable
SM 27°Sa47'30 +48°49'36|The basic solar motion
   Or solar apex
OC 28°Sa02'02 -10°14'34|NGC 6475, M.7
   Intermediate rich, Scorpio
N  28°Sa24'21 - 2°47'12|Nova 1936 V 732
   Sagittarius rapid early development
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OC 28°Sa31'39 -10°48'39|H 18, loose & poor, Scorpio
OC 28°Sa34'20 + 4°56'27|NGC 6494, M.23
   Intermediate rich, Scorpio
NS 28°Sa41'55 +28°17'35|Barnard's star
FS 29°Sa02'60 +14°22'37|nu Ophiuchus, (64)
X  29°Sa03'24 - 9°26'50|3U1755-33, Sco XR-6 GX-2.5
N  29°Sa06'30 -12°28'49|Nova 1954 V 1275 Sagittarius
T  29°Sa11'45 + 0°19'13|Sgr T1  -  NGC 6514 (M20)
N  29°Sa17'53 - 5°45'14|Nova 1937 V 787 Sagittarius
N  29°Sa18'14 - 2°46'43|Nova 1910 Sagittarius
   No. 2
CS 29°Sa18'53 + 1°11'12|Ascending Node of
   Galactic Equator to Ecliptic
T  29°Sa29'47 - 0°00'14|Sgr T2  -  NGC 6530 (M8)
R  29°Sa32'17 + 0°56'50|Triffid nebula, M 20
   Galactic nebula
X  29°Sa34'18 - 1°04'54|3U1758-25, Sgr 5
   GX5-1, Sgr XR-3
X  29°Sa39'42 + 3°48'22|3U1758-20, GX9+l, SGR 3
DI 29°Sa54'28 + 0°32'53|NGC 6514, M.20, Trifid
   Nebula, Sagittarius
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Capricorn

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CS 00°Cp00'00 +23°26'53|Solstice, Winter
CS 00°Cp00'00 +89°26'53|North Pole Ecliptic
CS 00°Cp00'00 -66°33'07|South Celestial Pole
ME 00°Cp00'00 +56°26'53|Lyrids
VB 00°Cp00'00 +25°26'53|70 Ophiuchus
GC 00°Cp05'16 - 5°39'07|NGC 6522, Sagittarius
DI 00°Cp09'39 + 0°16'23|NGC 6523, M.8, Lagoon
   Nebula, Sagittarius
R  00°Cp13'47 + 0°11'53|Lagoon nebula, M 8
SM 00°Cp14'29 +52°36'57|The standard solar
   Motion or solar apex
OC 00°Cp16'47 + 2°08'52|NGC 6531, M.21, loose
   Poor, Sagittarius
IF 00°Cp22'02 + 0°02'51|M.8, NGC 6523, H II
   Region, 13' east of 07 star Herschel 36
OC 00°Cp22'02 + 0°02'51|NGC 6530
   Intermediate rich,Sagittarius
R  00°Cp28'08 + 2°56'50|
FS 00°Cp32'38 -40°29'42|pi Pavo, spectroscopic double
FS 00°Cp33'46 - 7°12'07|gamma Sagittarius
   NASH, (10), spectroscopic double
GC 00°Cp51'41 -18°39'19|NGC 6541, Corona Australis
T  00°Cp53'54 + 0°28'09|Sgr T3  -  S 188, IC 1274b
OA 01°Cp09'05 + 3°13'06|Sagittarius OB 1, (Ma)
   Sgr I, (Mo) I Sgr,(Mo) II S
N  01°Cp09'56 - 9°55'57|Nova 1936 Sagittarius
N  01°Cp14'57 - 8°00'29|Nova 1905 V 1015
   Sagittarius, early rapid development
SM 01°Cp27'15 +53°26'35|Solar apex (most quoted value)
OA 01°Cp58'37 + 8°24'33|Sagittarius OB 6, (Mo)
   LV Sgr
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FS 01°Cp59'23 +51°50'10|omicron Hercules
N  02°Cp04'43 -11°02'41|Nova 1942 Puppis
SS 02°Cp05'20 + 2°11'33|Aphelion Saturn
R  02°Cp11'37 -39°17'03|PKS 1814-63
N  02°Cp22'57 - 7°19'29|Nova 1952 V 1175 Sagittarius
PL 02°Cp33'58 + 4°43'27|NGC: 6567, Sgr
OA 02°Cp45'18 + 3°29'43|Sagittarius OB 7(?)
   (Sch) VII Sgr, (Ru) Sgr VI
IF 02°Cp46'43 +29°50'59|NGC 6572, planetary nebula
PL 02°Cp46'43 +29°50'59|NGC: 6572, Oph
FS 02°Cp48'45 -38°15'08|xi Pavo, double, spectroscopic
X  02°Cp48'59 + 6°29'40|3U1811-17, SGR 2
   GX+13.5, SGR XR-2
OA 02°Cp57'33 + 5°18'59|Sagittarius OB 4, (Mo)
   III Sgr, (Ru) Sgr IV
N  02°Cp58'36 +68°57'27|Nova 1934 Hercules DQ
P  02°Cp58'39 - 1°52'39|PSR1813-26
X  03°Cp02'09 +12°23'44|3U1812-12, Ser XR-2
X  03°Cp15'15 +10°07'09|3U1813-14, GX 17+2, Ser 2
R  03°Cp17'32 +20°19'16|weak, broad source (30' arc)
T  03°Cp19'54 +11°03'44|Ser T1  -  NGC 6611 (M16)
N  03°Cp32'23 +35°21'43|Nova 1919 Ophiuchus
OC 03°Cp42'18 + 5°31'24|NGC 6603, M.24, Milky
   Way Patch, concentrated, rich, Sagittarius
N  03°Cp51'10 - 0°50'00|Nova 1899 Sagittarius
   No. 3
FS 03°Cp53'40 - 6°03'37|delta Sagittarius, KAUS
   MEDIUS, (19), double
OA 03°Cp58'17 +12°26'37|Serpens OB 2, (Ma) Sgr
   III, (Mo) II Ser, (Sch) III
OC 03°Cp59'28 +11°23'34|NGC 6611, M.16, very
   Loose, irregular, Serpens
OC 04°Cp06'43 + 7°08'15|NGC 6613, M.18, loose
   Poor, Sagittarius
FS 04°Cp20'08 -23°27'21|alpha Telescopium
DI 04°Cp21'14 + 7°54'20|NGC 6618, M.17
   Omega
   Horseshoe Nebula, Sgr
OC 04°Cp21'14 + 7°54'20|NGC 6618, M.17, loose
   Irregular, Sagittarius
IF 04°Cp22'39 + 7°52'47|M.17, Omega Nebula, H
   II region, 2nd strongest at 20 microns, strong IF excess
R  04°Cp22'39 + 7°52'47|M 17 Omega nebula
   (galactic nebula)
FS 04°Cp23'16 -10°50'41|epsilon Sagittarius
   KAUS AUSTRALIS, (20)
OA 04°Cp25'03 + 9°54'16|Serpens OB 1, (Ma) Sgr
   II, (Mo) I Ser,(Ru) Ser
FS 04°Cp26'27 -47°59'46|zeta Pavo
N  04°Cp28'01 - 1°33'12|Nova 1924 GR Sagittarius
X  04°Cp29'03 - 5°44'23|3U1820-30, glob cluster
   NGC 6624, SGR XR-4, Sgr 4
FS 04°Cp31'40 -25°53'42|zeta Telescopium
X  04°Cp35'01 -13°11'55|3U1822-37, SGR 7
P  04°Cp35'57 + 1°24'38|PSR1819-22
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N  04°Cp43'03 -11°16'08|Nova 1941 V 909 Sagittarius
SN 04°Cp47'29 -32°55'21|1934 A (Oct 11) M 13.6
   I 4719
P  04°Cp50'11 +19°48'48|MP 1818
GC 04°Cp55'58 - 0°01'08|NGC 6626, M.28, Sagittarius
FS 04°Cp59'54 +20°41'11|eta Serpens, (58)
X  05°Cp21'59 +73°45'16|3U1809+50,
OA 05°Cp35'36 + 9°39'47|Scutum OB 3, (Sch) I Sct
FS 05°Cp37'44 - 1°53'39|lamda Sagittarius, KAUS
   BOREALIS, (22)
N  05°Cp42'36 +64°38'01|Nova 1963 Hercules
P  05°Cp47'28 +14°40'03|PSR 1822-09
FS 05°Cp50'12 -19°11'11|theta Corona Australis
FS 06°Cp03'53 -15°11'37|kappa Corona Australis, double
GC 06°Cp04'17 - 7°43'29|NGC 6637, M.69, Sagittarius
X  06°Cp15'40 +24°02'26|3U1822-00,
P  06°Cp19'59 + 6°44'29|PSR1826-17
N  06°Cp23'09 - 4°56'13|Nova 1901, 1919, V1017 Sagittarius
FS 06°Cp26'54 + 8°42'51|gamma Scutum
FS 06°Cp48'39 -44°48'34|kappa Pavo
OC 06°Cp51'54 + 5°04'36|IC 4725, M.25, loose
   Poor, Sagittarius
T  06°Cp55'11 +56°52'12|Lyr T1  -  LT Lyr
FS 07°Cp00'57 -39°44'20|lamda Pavo
OC 07°Cp10'32 +29°34'01|NGC 6633, loose and
   Poor, Ophiuchus
X  07°Cp24'57 + 1°14'33|3U1832-23,
T  07°Cp37'01 +31°48'55|Oph T1  -  V 426 Oph
GC 07°Cp41'53 + 0°54'03|NGC 6656, M.22, Sagittarius
N  07°Cp44'23 +25°15'37|Nova 1970 Serpens
R  07°Cp47'07 +22°02'18|NRAO 5670
FS 08°Cp12'11 -14°55'38|lamda Corona Australis, double
P  08°Cp15'60 +20°28'33|PSR1831-03
FS 08°Cp19'43 +15°05'32|alpha Scutum= 1 Aquila
P  08°Cp22'18 +19°18'06|PSR1831-04
OA 08°Cp24'15 +15°00'33|Scutum OB 2, (Sch) II Sct
X  08°Cp29'45 +19°10'10|3U1832-05,
R  08°Cp29'55 +17°02'11|NRAO 5690
OA 08°Cp32'11 + 7°23'16|(Ko) Serpens-Scutum I
GC 08°Cp38'30 - 7°51'05|NGC 6681, M.70, Sagittarius
FS 08°Cp43'46 -79°53'19|gamma Mensa
FS 08°Cp52'26 -20°24'08|eta Corona Australis
IF 09°Cp10'14 +44°14'59|AC Hercules, an RV
   Tauri star
R  09°Cp15'39 +17°16'33|NRAO 5720
FS 09°Cp26'19 - 4°31'59|theta Sagittarius, (27)
SS 09°Cp57'44 + 0°15'25|Descending South Node
   Jupiter to ecliptic
R  10°Cp08'27 +18°27'48|
OC 10°Cp21'35 +28°16'10|IC 4756, loose and
   Poor, Sagittarius
GC 10°Cp23'41 -36°44'59|NGC 6752, Pavo
DN 10°Cp29'06 +18°05'05|Scutum
X  10°Cp29'38 +27°26'17|3U1837+04,
NS 10°Cp45'42 + 0°20'16|Ross 154
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OC 10°Cp50'58 +14°25'25|NGC 6694, M.26, fairly
   Rich, Scutum
FS 11°Cp16'24 -14°55'48|Corona Australis
   Epsilon, variable
R  11°Cp20'39 +40°08'29|4C 17.81
T  11°Cp21'07 -13°54'03|CrA T1  -  R CrA
GC 11°Cp24'41 - 6°03'56|NGC 6715, M.54, Sagittarius
FS 11°Cp33'46 -20°02'31|zeta Corona Australis
R  11°Cp39'51 +21°07'59|NRAO 5790
FS 11°Cp42'55 - 3°07'20|sigma Sagittarius
   NUNKI, (34)
GC 11°Cp43'51 -12°10'21|NGC 6723, Sagittarius
FS 11°Cp44'23 +18°51'56|beta Scutum = 6 Aquila
   Spectroscopic double
R  11°Cp58'35 +21°53'00|
P  11°Cp58'58 +19°41'16|JP 1845
P  12°Cp02'08 +17°26'18|PSR 1846-06
R  12°Cp07'12 +21°43'33|
P  12°Cp12'38 +22°43'21|JP1845-01
SS 12°Cp14'24 + 1°45'37|Aphelion Earth
OA 12°Cp30'07 +18°00'25|3 (Amb) Scutum I
FS 12°Cp30'11 -51°30'34|epsilon Pavo
OC 12°Cp40'06 +17°49'03|NGC 6705, M.11
   Concentrated, quite rich, Scutum
R  12°Cp42'05 +32°47'05|4C 09.68
R  12°Cp47'10 +23°37'46|
N  12°Cp49'00 +23°39'10|Nova 1918 Aquila No. 3
FS 12°Cp50'42 -15°00'44|gamma Corona Australis, double
FS 12°Cp50'45 - 8°04'13|zeta Sagittarius
   ASCELLA, (38), double
FS 12°Cp55'15 -17°29'39|delta Corona Australis
GC 12°Cp55'48 +15°18'37|NGC 6712, Scutum
P  13°Cp01'21 - 2°38'08|MP 1857
FS 13°Cp20'03 -16°58'04|Corona Australis beta
CS 13°Cp20'23 +23°07'57|Ascending Node of
   Galactic Equator to Equator
FS 13°Cp29'28 -14°50'27|alpha Corona Australis
SS 13°Cp52'10 + 0°44'59|Descending South Node
   Vesta to ecliptic
R  14°Cp00'02 +24°33'01|NRAO 5840
R  14°Cp00'20 -40°23'12|PKS 1934-63 non thermal source
FS 14°Cp06'49 - 5°17'08|tau Sagittarius, (40)
   Spectroscopic binary
N  14°Cp15'11 +20°26'23|Nova 1927 EL Aquila
OC 14°Cp27'45 +33°06'31|NGC 6709, loose & poor, Aquila
N  14°Cp36'11 + 9°57'12|Nova 1898 V1059
   Sagittarius, rapid early development
FS 14°Cp38'13 +61°48'45|alpha Lyra, VEGA, (3)
Q  14°Cp42'30 +71°08'26|3C 380
R  14°Cp43'13 +24°10'25|SN REM, supernova remnant
R  14°Cp47'20 +24°13'28|NRAO 5890
FS 15°Cp02'37 -22°20'26|beta1 Sagittarius
   ARKAB PRIOR, double
FS 15°Cp05'31 +27°10'49|theta Serpens, ALYA
   (63), double
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FS 15°Cp07'41 -22°29'40|beta2 Sagittarius
   ARKAB POSTERIOR
FS 15°Cp21'21 +16°54'45|Aquila 12, (i)
N  15°Cp41'39 +18°45'58|Nova 1905 Aquila No. 2
P  15°Cp48'45 +17°29'47|PSR1900-06
FS 16°Cp01'40 -17°46'15|alpha Sagittarius
   ALRAMI, spectroscopic double
CS 16°Cp12'12 +37°53'53|Supergalactic North Pole
G  16°Cp17'43 -48°42'14|NGC 6876, Pavo
P  16°Cp22'07 +26°17'06|JP 1858
OA 16°Cp28'17 +26°21'30|3 Aquila OB 1, (Ko) Aql I
FS 16°Cp37'49 -45°17'29|delta Pavo
FS 16°Cp38'33 +17°38'06|lamda Aquila, (16)
P  16°Cp39'18 +23°46'52|PSR1900+01
N  16°Cp40'12 +36°24'20|Nova 1960 Hercules
X  17°Cp10'12 +25°57'15|3U1901+03,
SS 17°Cp10'17 + 0°51'14|Descending South Node
   Invariable Plane to ecliptic
R  17°Cp10'25 +20°25'10|
SB 17°Cp24'52 +56°15'17|Beta Lyra
R  17°Cp25'25 +27°55'53|
FS 17°Cp28'38 +60°33'31|zeta Lyra, (6)
   Spectroscopic double
R  17°Cp30'21 -23°01'43|NRAO 6107
FS 17°Cp37'14 +37°54'46|epsilon Aquila, (13)
FS 17°Cp57'02 +62°27'18|epsilon Lyra, (4), double
FS 17°Cp58'40 -62°25'27|beta Octans
   Spectroscopic double
FS 18°Cp07'32 +55°44'60|beta Lyra, SHELIAK
   Dbl, spectroscopic eclipsing binary
IF 18°Cp10'20 + 9°58'27|RY Sagittarius, 'R CrB variable'
P  18°Cp11'16 +23°05'16|PSR1906+00
X  18°Cp27'57 +22°23'31|3U1908+00, AQL XR-1
   Aql 1
N  18°Cp30'17 +52°29'56|Nova 1919 Lyra
R  18°Cp36'36 +29°38'27|
P  18°Cp38'31 +25°11'54|PSR1907+02
P  18°Cp46'24 +18°28'55|MP 1911
FS 18°Cp51'32 -58°12'08|nu Octans
   Spectroscopic double
IF 19°Cp04'30 + 6°26'09|upsilon Sagittarius, 'R
   CrB variable', 20% total luminosity is IF
FS 19°Cp05'57 +36°11'08|zeta Aquila, (17), double
X  19°Cp23'10 +31°56'14|3U1906+09,
PL 19°Cp24'20 +55°31'44|NGC: 6720, Lyr M57 Ring Nebula
R  19°Cp43'22 +31°16'17|NRAO 5980
X  19°Cp45'08 +17°15'40|3U1915-05, Star 26 f
   AQL ?
P  19°Cp54'36 +33°09'49|PSR1907+10
R  20°Cp08'50 +32°25'58|SN II, region OH emission
N  20°Cp28'36 +23°48'18|Nova 1936 Aquila
R  20°Cp28'52 +68°20'19|4C 45.39
SS 20°Cp42'06 + 1°46'18|Descending South Node
   Pluto to ecliptic
X  20°Cp45'29 +29°17'57|3U1912+07,
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N  20°Cp48'59 +22°16'15|Nova 1945 V 528 Aquila
   Rapid early development
P  20°Cp57'15 +22°21'59|PSR1917+00
CS 20°Cp58'01 -34°13'33|Centroid Local Triplet
GC 21°Cp00'30 - 8°31'38|NGC 6809, M.55, Sagittarius
FS 21°Cp07'29 +54°40'27|gamma Lyra, SULAPHAT
   (14), double
N  21°Cp25'46 +22°41'38|Nova 1899 Aquila No. 1
R  21°Cp29'59 +32°25'08|NRAO 6020
FS 21°Cp55'57 -45°41'60|beta Pavo
FS 22°Cp16'29 +59°21'54|delta Lyra, (11)
   Spectroscopic double
P  22°Cp31'13 +38°16'54|PSR1913+16
R  22°Cp34'31 +33°57'60|NRAO 6010
P  22°Cp37'01 +42°39'37|PSR1910+20
R  22°Cp41'51 +34°54'45|NRAO 6070
G  22°Cp42'47 -26°53'13|NGC 6861, Telescopium
P  22°Cp45'57 +35°49'25|0P1915+13
FS 23°Cp03'45 +25°32'46|delta Aquila, DENEB
   OKAB, (30), spectroscopic double
T  23°Cp03'59 +22°03'06|Aql T1  -  V 374 Aql
FS 23°Cp16'56 -35°48'24|alpha Pavo
   Spectroscopic double
SS 23°Cp27'13 + 1°22'06|Descending South Node
   Saturn to ecliptic
FS 23°Cp49'33 -80°01'26|eta Mensa
N  23°Cp57'39 +28°44'25|Nova 1936 Aquila
FS 24°Cp00'27 +43°25'59|1 Vulpecula
R  24°Cp22'45 +35°55'23|3C 400
PL 24°Cp48'47 + 8°01'18|NGC: 6818, Sgr
LG 24°Cp50'14 + 6°44'55|NGC 6822
G  25°Cp00'42 + 7°44'01|NGC 6822, Local Group, Sagittarius
P  25°Cp03'45 +41°27'23|PSR 1918+19
FS 25°Cp06'58 +19°53'06|iota Aquila, (41), double
P  25°Cp50'45 +43°34'42|CP 1919
P  25°Cp58'01 +42°47'53|PSR1920+21
P  26°Cp16'07 +31°53'17|PSR1929+10
GC 26°Cp47'10 +52°22'38|NGC 6779, M.56, Lyra
EB 26°Cp58'48 + 7°19'37|V 505 Sagittarius
FS 27°Cp02'42 -39°13'43|beta Indus
N  27°Cp52'30 +42°07'51|Nova Vulpecula 1976
   Mag. 6.5, 1800 pcs
FS 27°Cp54'02 -46°57'53|gamma Pavo
N  28°Cp06'09 +38°53'26|Nova 1783, WY Sagittarius
FS 28°Cp23'13 -27°47'31|alpha Indus
GC 28°Cp23'44 - 1°20'16|NGC 6864, M.75, Sagittarius
MC 28°Cp36'54 -16°57'56|Ursa Major-Sirius Group
   Moving Clusters
P  28°Cp41'40 +37°31'48|JP 1933+16
FS 28°Cp50'42 +45°57'29|alpha Vulpecula, (6)
IF 29°Cp01'19 -16°19'09|BC Cygnus, OH source
   Late-Type star
FS 29°Cp39'12 +21°08'38|eta Aquila, (55)
FS 29°Cp40'25 -64°50'37|beta Hydrus
R  29°Cp52'50 -50°45'10|PKS 2152-69, MSH 21-64
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Aquarius

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FS 00°Aq15'35 +38°22'37|alpha Sagitta, SHAM, (5)
N  00°Aq15'56 +39°12'51|Nova Sagittae 1977
   Jan. 7,1977
FS 00°Aq19'32 +48°18'55|beta Cygnus, ALBIREO
   (6), double
FS 00°Aq21'30 +31°43'17|gamma Aquila, REDA, (50)
SN 00°Aq31'06 -85°55'39|Supernova 1987A
   Brightest since 1885
FS 00°Aq36'12 +38°33'35|beta Sagitta, (6)
FS 00°Aq55'02 +28°40'20|alpha Aquila, (53)
X  00°Aq58'32 -84°04'04|3U0521-72, LMC X-2 in
   Large Magellanic Cloud
N  01°Aq28'24 +28°59'31|Nova V 500 Aquila, 1943
FS 01°Aq42'47 +26°36'29|beta Aquila, ALSHAIN
   (60), double
P  02°Aq10'49 +37°43'42|MP 1944
DI 02°Aq24'30 +42°47'11|NGC 6820, Vulpecula
SB 02°Aq38'04 + 4°57'19|beta Capricorn
FS 02°Aq39'27 +38°48'09|delta Sagitta, (7)
   Spectroscopic double
FS 03°Aq03'32 + 6°56'31|alpha Capricorn, GREDI
   (5) double
SS 03°Aq05'10 +27°23'48|Aphelion Pallas
OA 03°Aq15'16 +44°49'30|Vulpecula Ob 4, (Sch)
   II Vul
FS 03°Aq26'14 + 4°58'32|beta Capricorn, DABIH
   (9), spectroscopic doubles
OA 03°Aq36'42 +44°59'39|Vulpecula OB 1, (Mo) 1 Vul
SB 03°Aq37'27 +19°20'44|theta Aquila
FS 03°Aq45'29 -35°13'48|theta Indus, double
X  04°Aq02'43 +31°15'38|3U1956+11, March-April
   1971= radio increase
FS 04°Aq10'00 +18°31'47|theta Aquila, ANCHA
   (65), spectroscopic double
GC 04°Aq42'42 +39°01'20|NGC 6838 M.71, Sagitta
FS 04°Aq59'53 -15°11'41|alpha Microscopium, double
N  05°Aq48'13 +47°35'48|Nova 1670 Vulpecula (11)
DI 05°Aq49'03 -86°55'18|NGC 2070, Dorado
   Tarantula Nebula, 30 Dor
X  05°Aq49'58 +64°20'55|3U1921+43, cluster
   Abell 2319?
N  06°Aq00'40 +47°41'17|Nova 1968 Vulpecula LV
T  06°Aq04'01 +34°48'01|Del T1  -  V 536 Aql
OA 06°Aq14'30 +48°34'46|Vulpecula OB 2, (Sch)
   III Vul
FS 06°Aq16'36 +38°58'54|gamma Sagitta, (12)
FS 06°Aq18'19 +43°50'08|13 Vulpecula, double
FS 06°Aq22'23 - 7°20'27|psi Capricorn, (16)
R  06°Aq24'19 -78°03'13|PKS 0410-75
FS 06°Aq51'36 -76°46'50|gamma Hydrus
FS 07°Aq06'30 -82°44'16|beta Mensa
FS 07°Aq13'55 - 9°03'19|omega Capricorn, (18)
PL 07°Aq39'24 +42°03'29|NGC: 6853, Vul M27
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   Dumbell Nebula
FS 07°Aq42'03 -14°45'27|gamma Microscopium =1
   Pisces Austrinus
N  08°Aq08'10 +36°39'03|Nova 1913 Sagitta
N  08°Aq14'48 +36°42'18|Nova 1913, 1946 WZ Sagitta
NS 08°Aq19'35 -42°09'13|epsilon Indus
OA 08°Aq30'39 +50°18'48|Cygnus OB 5, (Sch) VII
   Cyg, (Ru) Cyg V, (Ru) Vul I
FS 08°Aq46'36 -45°37'27|alpha Tucana
   Spectroscopic double
ME 08°Aq47'06 + 8°21'03|alpha Caricornids
FS 08°Aq52'05 -39°49'03|delta Indus, double
FS 08°Aq52'60 +52°00'14|chi Cygnus
IF 08°Aq52'60 +52°00'14|chi Cygnus, 9th
   Strongest at 2 microns
RH 08°Aq52'60 +52°00'14|at low frequencies in
   The vicinity of star Cygnus
P  08°Aq57'42 +48°56'49|JP 1953
NS 09°Aq07'60 +81°32'44|sigma 2398 A, sigma
   2398 B
P  09°Aq41'15 + 2°28'26|PSR2045-16
P  09°Aq59'31 +55°27'13|JP 1946
R  10°Aq02'47 +51°41'38|
G  10°Aq13'03 -26°54'27|NGC 7079, Grus
X  10°Aq16'32 +51°01'10|3U1953+31,
G  10°Aq27'29 -64°42'09|Small Magellanic Cloud
   SMC, Tucana
LG 10°Aq27'29 -64°42'09|Small Magellanic cloud
R  10°Aq43'57 -64°57'41|Small Magellanic Cloud
FS 11°Aq07'18 -15°58'23|epsilon Microscopium =
   4 Pisces Austrinus
FS 11°Aq08'32 + 8°30'34|epsilon Aquarius
   ALBALI, (2)
SS 11°Aq09'27 - 1°45'47|Aphelion Venus
SS 11°Aq25'43 + 0°41'52|Descending South Node
   Neptune to ecliptic
R  11°Aq30'46 - 7°03'20|NRAO 6435
LG 11°Aq48'04 -36°47'06|Indus IC 5152
GC 11°Aq51'09 + 5°47'18|NGC 6981, M.72, Aquarius
FS 12°Aq02'56 +53°57'25|eta Cygnus, (21), double
Q  12°Aq06'33 -13°11'16|2115-30
GC 12°Aq08'36 -61°52'41|NGC 104,47 Tucana, one
   Of two brightest
R  12°Aq19'23 +41°47'02|
G  12°Aq19'54 -35°52'51|IC 5152, Local Group?, Indus
GC 12°Aq36'19 +25°56'12|NGC 6934, Delphinus
P  12°Aq38'28 +49°39'20|JP 2002
X  12°Aq57'36 +54°17'04|3U1956+35, Cyg X-1,Star
   HDE 226868;disc. 1966;
FS 13°Aq02'38 - 0°54'57|theta Capricorn, (23)
PL 13°Aq06'09 +37°23'55|NGC: 6905, Del
G  13°Aq17'03 -85°40'12|Large Magellanic Cloud
   Local Group
LG 13°Aq17'03 -85°40'12|Large Magellanic cloud
OC 13°Aq19'42 + 6°01'08|NGC 6994, M.73
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R  13°Aq27'28 +52°58'34|NRAO 6210
X  13°Aq39'50 -66°07'37|3U0115-73, SMC X-1
T  14°Aq09'48 +53°58'13|Cyg T4  -  NO Cyg (?)
IF 14°Aq45'34 + 6°19'52|NGC 7009, planetary nebula
PL 14°Aq45'34 + 6°19'52|NGC: 7009, Aqr Saturn Nebula
X  15°Aq05'01 -87°30'40|3U0540-69, LMC X-1
FS 15°Aq10'08 -32°58'01|alpha Grus, ALNAIR
OA 15°Aq25'53 +54°24'38|Cygnus OB 3, (Ma) Cy9
   (MO) I Cyg, (Ru) Cyg III
P  15°Aq31'37 +46°13'05|AP2016+28
G  15°Aq43'49 -32°23'18|NGC 7213, Grus
FS 15°Aq46'40 +32°17'19|beta Delphinus
   ROTANEV, (6), double, spectroscopic
FS 16°Aq08'07 - 7°17'39|zeta Capricorn, (34)
FS 16°Aq22'17 +65°11'27|delta Cygnus, (18), double
FS 16°Aq27'45 -18°33'32|iota Pisces Austrinus
   (9), spectroscopic double
FS 16°Aq32'27 +32°38'28|alpha Delphinus
   SUALOCIN (9)
X  16°Aq36'43 +59°05'48|3U1957+40, Cyg A = 3C 405
FS 16°Aq39'59 -23°09'39|gamma Grus
FS 16°Aq44'03 - 2°08'25|iota Capricorn, (32)
R  16°Aq53'06 +47°30'17|
R  16°Aq54'16 +59°11'04|first localized source
   1946 Cygnus A, Dumbell Galaxy
P  16°Aq57'39 +46°01'16|PSR2020+28
FS 17°Aq12'17 +31°21'54|delta Delphinus, (11)
CG 17°Aq46'39 -36°21'30|Cluster B
FS 18°Aq14'31 -25°57'19|lamda Grus
N  18°Aq15'39 +34°59'16|Nova 1967 Delphinus HR
G  18°Aq19'60 -35°27'56|Cluster B of 300 galaxies
FS 18°Aq21'27 +31°53'30|gamma Delphinus, (12), double
WD 18°Aq26'37 +41°16'11|W1326
R  19°Aq12'41 -85°27'17|Centroid LMC Large
   Magellanic Cloud
GC 19°Aq20'22 - 7°45'11|NGC 7099, M.30, Capricorn
FS 19°Aq29'50 -27°55'52|mu Grus, spectroscopic double
ME 19°Aq33'26 +76°09'35|Kappa Cygnids
FS 19°Aq37'41 -47°56'38|gamma Tucana
FS 20°Aq08'53 -39°36'43|epsilon Grus
SS 20°Aq14'29 +88°10'56|North Pole of Mars
SS 20°Aq14'36 +83°21'37|North Pole of Merc Orbit
G  20°Aq17'07 -28°15'47|NGC 7599, Grus
N  20°Aq30'53 +54°38'41|Nova 1600, Cygnus No. 1 (P)
FS 20°Aq54'26 -42°22'32|zeta Grus
   Spectroscopic double
DN 20°Aq58'22 +47°31'49|52 Cygnus
FS 20°Aq59'19 -31°10'46|delta Grus
OA 21°Aq08'43 +55°33'02|Cygnus OB 1, (Ma) Cyg
   (Mo) II Cyg, (Mo) III Cyg,
FS 21°Aq10'51 -36°06'53|beta Grus
FS 21°Aq16'13 - 2°01'22|gamma Capricorn
   NASHIRA, (40)
FS 21°Aq19'41 -57°50'32|zeta Tucana
FS 21°Aq21'36 -20°12'12|mu Pisces Austrinus, (14)
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Q  21°Aq34'24 + 0°35'45|2135-14
OA 21°Aq39'22 +58°29'14|Cygnus OB 8, (Sch) VIII Cyg
SB 21°Aq44'19 +20°02'07|alpha equuleus
FS 21°Aq56'43 -19°49'04|tau Pisces Austrinus, (15)
PL 22°Aq18'40 +69°38'36|NGC: 6826, Cyg
FS 22°Aq31'08 +20°24'14|alpha Equuleus, (8)
   Spectroscopic double
FS 22°Aq52'40 + 9°09'05|beta Aquarius
   SADALSUD, (22)
FS 22°Aq56'08 - 2°19'24|delta Capricorn, DENEB
   ALGIEDI, (49), spectroscopic
GC 22°Aq58'15 +32°21'35|NGC 7006, Delphinus
FS 23°Aq28'05 +23°59'31|delta Equuleus, (7)
   Double, spectroscopic
OC 23°Aq33'24 +55°34'52|NGC 6913, M.29, loose
   Poor, Cygnus
OA 23°Aq56'37 +56°23'20|Cygnus OB 9, (Sch) IX Cyg
FS 24°Aq09'51 +57°08'25|gamma Cygnus, SADOR
   (37), double
R  24°Aq27'22 +57°13'23|
Q  24°Aq37'24 + 0°39'56|2146-13
R  24°Aq45'32 -52°23'27|PKS 2356-61
GC 24°Aq49'56 +13°15'36|NGC 7089, M.2, Aquarius
DI 25°Aq11'11 +46°49'13|NGC 6960, 52 Cygnus
   Veil Nebula
FS 25°Aq46'04 -57°24'03|beta Tucana, double
DI 25°Aq48'40 +56°14'16|IC 1318, gamma Cygnus
N  26°Aq10'10 - 9°46'59|Nova 1937b 220723 anon
DI 26°Aq13'09 +47°10'37|Cygnus, Veil Nebula
R  26°Aq22'54 +45°46'32|Cygnus loop SN II
SB 26°Aq35'22 +63°41'60|31 omicron (one) Cygnus
FS 26°Aq35'54 +48°45'01|epsilon Cygnus, GIENAH
   (53), double, spectroscopic
FS 26°Aq39'46 -20°57'37|beta Pisces Austrinus
   (17), double
X  27°Aq46'16 +56°47'01|3U2030+40, Cyg X-3
   Short period binary  with enormous increase
   In radio output Fall 1972
SB 27°Aq49'16 +63°58'09|32 omicron (two) Cygnus
Q  28°Aq19'60 +29°59'11|3C 432
GC 28°Aq30'01 +25°25'53|NGC 7078, M.15, Pegasus
OA 28°Aq37'37 +57°41'03|Cygnus OB 2, (Sch) VI
   Cyg, (Ru) Cyg II
DI 28°Aq38'26 +46°33'01|NGC 6992-5, Veil Nebula
   In Cygnus
R  28°Aq49'38 - 5°22'50|dumbell galaxy
R  29°Aq33'06 +57°15'37|gamma Cygnus complex
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Pisces

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FS 00°Pi16'21 -69°33'44|delta Hydrus
FS 00°Pi29'31 -23°54'42|gamma Pisces Austrinus
   (22), double
FS 00°Pi31'54 -71°16'46|epsilon Hydrus
FS 00°Pi33'30 -17°25'28|epsilon Pisces
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   Austrinus, (18)
PL 00°Pi49'41 -10°15'43|NGC: 7293, Aqr
FS 01°Pi06'27 +21°54'17|epsilon Pegasus, ENIT, (8)
IF 01°Pi09'14 +54°19'56|NML Cygnus, M
   Supergiant, 8th brightest at 20
   Also bright at 10 microns
R  01°Pi14'29 +57°41'47|NRAO 6365 emission nebula
ME 01°Pi15'44 + 6°26'36|N. iota Aquarids
G  01°Pi20'23 -33°06'32|Grus Cluster, Gru
N  01°Pi22'31 +70°32'29|Nova 1920 Cygnus No. 3
G  01°Pi28'21 -33°49'05|Grus Cluster, Gru
N  01°Pi33'06 +49°37'18|Nova 1942 V 450 Cygnus
FS 01°Pi43'26 -23°10'18|delta Pisces Austrinus, double
SS 02°Pi03'40 - 9°36'34|Aphelion Ceres
G  02°Pi03'46 -33°05'19|Grus Cluster, Gru
NS 02°Pi06'28 -27°02'13|Lacerta 9352
FS 02°Pi12'38 + 9°30'17|alpha Aquarius, ALTAIR, (34)
R  02°Pi16'50 +37°34'32|dumbell galaxy
FS 02°Pi44'19 +44°19'12|zeta Cygnus, (64)
FS 03°Pi13'38 -20°58'41|alpha Pisces Austrinus
   FORMALHAUT, (24)
SM 03°Pi16'43 +70°15'19|solar motion (to RR
   Lyrae stars)
ME 04°Pi14'38 - 7°34'37|S. delta Aquarids
ME 04°Pi28'04 - 4°26'02|S. iota Aquarids
NS 04°Pi57'27 - 5°37'32|L 789-6
Q  05°Pi11'54 + 8°05'44|2216-03
SS 05°Pi22'42 - 1°10'21|Perihelion Mars
FS 05°Pi30'26 +60°37'17|alpha Cygnus, ARIDED, (50)
Q  05°Pi49'15 + 4°55'31|3C 446 found late 1964
   Erupts fall 1965
NS 05°Pi55'11 +51°35'41|61 Cygnus A, 61 Cygnus B
FS 05°Pi58'04 + 8°07'09|gamma Aquarius
   SADALACHBIA, spectroscopic double
FS 06°Pi07'15 +16°18'54|theta Pegasus, (26)
R  06°Pi15'49 +56°59'02|galactic nebula, America
FS 06°Pi16'08 -32°07'44|beta Sculptor
MS 06°Pi19'35 +69°01'24|192 678
DI 06°Pi24'46 +58°56'13|IC 5067-0, alpha
   Cygnus, Pelican Nebula
Q  06°Pi33'46 + 4°59'45|4C-5.93
P  06°Pi35'01 +66°48'34|JP 2021
R  06°Pi38'51 + 8°20'42|4C-02.83
FS 06°Pi39'55 -24°59'13|gamma Sculptor
T  06°Pi44'57 +59°00'47|Cyg T1  -  lC 5070
DN 07°Pi00'45 +59°04'19|North America
FS 07°Pi18'56 - 5°51'53|tau Aquarius, (69)
   Double, spectroscopic
OA 07°Pi24'19 +50°39'21|Cygnus OB 4, (Mo) IV
   Cyg, (Ru) Cyg IV
FS 07°Pi43'45 + 7°39'12|zeta Aquarius, (55), double
ME 07°Pi46'55 + 9°18'51|eta Aquarids
FS 08°Pi06'37 +10°59'39|pi Aquarius, (52)
FS 08°Pi19'60 +36°48'21|kappa Pegasus, (10)
   Double, spectroscopic
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FS 08°Pi26'10 -42°32'16|epsilon Phoenix
FS 08°Pi36'21 + 3°49'52|kappa Aquarius, SITULA, (63)
FS 08°Pi42'45 - 9°24'00|delta Aquarius, SKAT, (76)
ME 08°Pi43'17 + 3°33'37|N. delta Aquarids
DI 08°Pi52'53 +57°36'03|NGC 7000, North America
   Nebula, alpha Cygnus
OA 08°Pi53'12 +58°51'37|Cygnus OB 6, (Sch) X
   Cyg, (Ru) Cyg VI
FS 09°Pi12'43 -14°43'06|88 Aquarius
IF 09°Pi20'59 +55°08'59|NGC 7027, planetary nebula
PL 09°Pi20'59 +55°08'59|NGC: 7027, Cyg
FS 09°Pi23'45 + 7°23'20|eta Aquarius, (62)
T  09°Pi52'40 +59°04'33|Cyg T2  -  CE Cyg
SS 10°Pi05'44 +82°20'49|North Pole of Sun
X  10°Pi31'22 +60°26'20|3U2052+47,
CS 10°Pi34'47 -23°12'14|Local System South Pole
FS 11°Pi00'28 - 0°03'58|lamda Aquarius, (73)
FS 11°Pi35'54 -55°10'25|zeta Phoenix, variable
   Spectroscopic double
R  11°Pi36'22 +63°36'51|SN II
GC 11°Pi54'06 - 7°56'14|NGC 7492, Aquarius
P  11°Pi55'08 +57°01'47|PSR2106+44
SS 12°Pi02'27 + 8°01'57|Descending South Node
   Pallas to equator
FS 12°Pi19'45 -63°55'30|alpha Hydrus
FS 12°Pi52'42 -14°31'17|98 b1 Aquarius
SB 12°Pi56'58 -53°46'21|zeta Phoenix
FS 13°Pi14'11 -15°30'60|99 b2 Aquarius
Q  13°Pi44'42 +19°24'53|CTA 102
FS 13°Pi44'48 +34°19'20|iota Pegasus, (24)
   Spectroscopic double
FS 13°Pi49'24 -41°46'30|kappa Phoenix
FS 13°Pi55'38 -59°42'17|alpha Eridanus, ACHERNAR
G  14°Pi12'11 -25°16'57|NGC 7755, Sculptor
   Group, Scl
R  14°Pi28'09 +77°43'45|4C 6O.29
FS 14°Pi31'41 -40°56'47|alpha Phoenix
   Spectroscopic double
FS 14°Pi47'05 -24°42'42|delta Sculptor, double
G  15°Pi06'48 -28°28'47|NGC 7793, Sculptor Group,
G  15°Pi16'58 -35°41'40|NGC 55, Sculptor Group
FS 15°Pi31'32 +17°50'23|zeta Pegasus, HOMAM, (42)
OA 15°Pi31'40 +61°23'49|Cygnus ON 7, (Sch) XI
   Cyg, (Ru) Cyg VI
FS 15°Pi37'17 - 3°57'31|psi Aquarius, (), (91), double
P  15°Pi39'59 +58°26'58|JP 2111
FS 15°Pi53'05 - 4°37'21|psi2 Aquarius, (95), double
FS 16°Pi12'04 - 1°36'51|theta Aquarius, (90)
X  16°Pi24'46 +48°26'39|3U2142+38, Cyg X-2, Cyg 2
FS G  00°Ta38'29 -62°32'28    NGC 1433, 16°Pi24'50 -
4°02'49|psi3 Aquarius, (95), double
SM 17°Pi10'37 +59°56'27|circular motion around
   The Galactic Center
FS 17°Pi36'55 -15°08'58|103 A2 Aquarius
FS 17°Pi48'08 + 8°51'15|beta Pisces, (4)
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FS 18°Pi19'38 -15°01'52|106 i1 Aquarius
FS 18°Pi32'23 -15°37'15|107 i2 Aquarius, double
FS 18°Pi33'43 +40°53'54|pi Pegasus, (24)
   Spectroscopic double
T  18°Pi45'22 +71°56'53|Cyg T5  -  V 561 Cyg (?)
SS 18°Pi51'49 +88°39'47|North Pole of Jupiter
SS 18°Pi55'21 +79°11'17|North Pole of Ceres
Q  19°Pi01'18 +17°41'20|2251+11 1971 discovered
FS 19°Pi02'51 -10°51'05|omega1 Aquarius, (102)
   Spectroscopic double
N  19°Pi10'51 +52°24'24|Nova 1876 Cygnus No. 2 (Q)
G  19°Pi35'29 +13°22'11|NGC 7469, Seyfert
   Galaxy, Pegasus
SG 19°Pi35'29 +13°22'11|NGC 7469
FS 19°Pi35'35 -16°27'06|108 i3 Aquarius
FS 19°Pi44'60 -48°10'51|beta Phoenix, double
FS 19°Pi49'12 -10°53'44|omega2 Aquarius, (105)
   Double, spectroscopic
R  19°Pi50'11 +59°50'55|4C 49.38
SS 20°Pi08'41 - 0°04'28|Aphelion Uranus
CG 20°Pi40'05 +12°16'32|Pegasus II
G  20°Pi40'05 +12°16'32|Pegasus II Cluster of galaxy
Q  20°Pi40'08 +21°19'25|3C 454.3
DN 20°Pi43'58 +63°56'25|Cygnus
R  20°Pi48'54 + 7°46'20|4C 03.57
FS 20°Pi55'43 -76°03'23|beta Reticulum
   Spectroscopic double
FS 20°Pi59'52 + 7°50'42|gamma Pisces, (6)
X  21°Pi04'57 +57°08'30|3U2129+47,
P  21°Pi07'24 +49°02'19|PSR2154+40
Q  21°Pi10'43 +23°44'60|3C 454
SS 21°Pi11'22 + 1°07'09|Descending South Node
   Juno to ecliptic
G  21°Pi35'23 -32°40'28|NGC 134, Sculptor
G  21°Pi49'17 +17°15'35|NGC 7479, Pegasus
FS 21°Pi51'12 + 3°37'02|kappa Pisces, (8)
GA 21°Pi53'54 +20°17'29|NGC 7448
   Superassociations
FL 22°Pi00'52 + 0°57'33|Jun 7, 1976, unusual flare
CG 22°Pi07'08 +11°19'40|Pegasus I
G  22°Pi07'08 +11°19'40|Pegasus I Cluster of
   100 galaxies
FS 22°Pi13'40 +28°33'06|lamda Pegasus, (47)
OC 22°Pi24'33 +57°59'40|NGC 7092, M.39
   Intermediate rich, Cygnus
FS 22°Pi37'48 +19°04'14|alpha Pegasus, MARKAB, (54)
R  22°Pi51'30 +63°09'42|NRAO 6500
G  23°Pi01'56 -21°59'33|NGC 45, Cetus, SP=Em
G  23°Pi16'26 +11°01'21|NGC 7619, Pegasus Cluster
FS 23°Pi16'55 +44°20'59|1 Lacerta
G  23°Pi24'26 +11°04'29|NGC 7626, Pegasus Cluster
LG 23°Pi25'07 -14°27'06|Wolf-Lundmark-Melotte Nebula
G  23°Pi26'45 +11°05'23|NGC 7611, Pegasus, Cluster
SS 23°Pi30'38 + 1°01'27|Descending South Node
   Pallas to ecliptic
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SS 23°Pi36'01 +86°44'23|North Pole of Venus
G  23°Pi37'27 +11°55'02|Pegasus Cluster, NGC 7617
IF 23°Pi40'10 +49°41'18|BL Lacerta, at 3
   Microns= large portion of emitted energy
R  23°Pi40'10 +49°41'18|OY 401,VR042.22.01
   (optical 1929) type for rapid radio variables
G  23°Pi44'44 +11°12'26|NGC 7623, Pegasus Cluster
G  23°Pi50'28 -13°32'23|Wolf-Lundmark-Melotte Nebula
   A2359-15
FS 23°Pi58'15 +29°53'33|mu Pegasus, (48)
R  24°Pi29'55 +60°05'53|NRAO 6620
FS 24°Pi34'48 +34°24'02|eta Pegasus, MATAR
   (44), spectroscopic double
FS 24°Pi35'46 + 9°15'57|theta Pisces, (10)
R  24°Pi40'21 +61°14'39|
SM 24°Pi44'38 +63°26'00|solar motion (to
   Globular clusters)
G  25°Pi11'15 -37°54'00|NGC 300, Sculptor
   Group, Cetus
G  25°Pi20'59 +38°50'49|Stephan Quintet
T  25°Pi53'06 +55°08'26|Cyg T3  -  IC 5146 (?)
SN 25°Pi55'33 +71°31'34|1917 A (Jul) M 14.6 NGC 6946
FS 25°Pi55'53 -56°44'33|chi Eridanus, double
G  26°Pi00'45 +71°31'55|NGC 6946m Cepheus
FS 26°Pi02'21 + 3°45'26|lamda Pisces, (18)
FS 26°Pi32'13 +58°11'14|pi Cygnus, AZELFAFAGE
   (80), spectroscopic double
DI 26°Pi39'59 +55°18'07|IC 5146, Cygnus, Cocoon Nebula
FS 26°Pi56'25 + 7°09'05|iota Pisces, (17)
FS 27°Pi27'29 -47°33'43|gamma Phoenix
   Spectroscopic double
LG 27°Pi58'34 -35°59'22|Sculptor system
G  28°Pi07'25 +16°39'49|Pegasus dwarf = DDO 216
   = A2326+14
EB 28°Pi11'08 +52°01'14|AR Lacerta
FS 28°Pi25'45 +30°42'56|beta Pegasus, SCHEAT
   (53), variable
G  28°Pi33'31 -35°06'32|A0057-33, Sculptor
   System, Local Gp.
NG 28°Pi59'32 -28°23'05|Sculptor (S. Pole)
SN 29°Pi30'10 -27°31'12|SN I 1940E (Nov) NGC
   253 M 14.00
Q  29°Pi58'58 + 9°51'26|2344+09
G  29°Pi59'42 -26°37'16|NGC 253, Sculptor
   Group, Em, Sculptor
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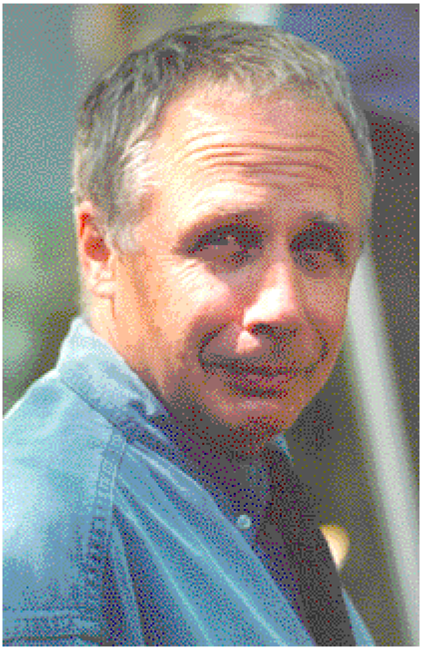

Michael Erlewine

Internationally known astrologer and author Noel Tyl (author of 34 books on astrology) has this to say about Michael Erlewine:

Michael Erlewine

"Michael Erlewine is the giant influence whose creativity is forever imprinted on all astrologers' work since the beginning of the Computer era! He is the man who single-handedly applied computer technology to astrological measurement, research, and interpretation, and has been the formative and leading light of astrology's modern growth. Erlewine humanized it all, adding perception and incisive practical analyses to modern, computerized astrology. Now, for a second generation of astrologers and their public, Erlewine's genius continues with StarTypes … and it's simply amazing!"

A Brief Bio of Michael Erlewine

Michael Erlewine has studied and practiced astrology for over 40 years, as an author, teacher, lecturer, personal consultant, programmer, and conference producer.

Erlewine was the first astrologer to program astrology, on microcomputers and make those programs available to his fellow astrologers. This was in 1977. He founded Matrix Astrology in 1978, and his company and Microsoft are the two oldest software companies still on the Internet.

Michael, soon joined by his astrologer-brother Stephen Erlewine, went on to revolutionize astrology by producing, for the new microcomputers, the first written astrological reports, first research system, first high resolution chart wheels, geographic and star maps, and on and on.

Along the way Matrix produced programs that spoke astrology (audio), personal astrological videos, infomercials, and many other pioneering feats.

Michael Erlewine has received major awards from UAC (United Astrological Conferences), AFA (American Federation of Astrologers), and the PIA (Professional Astrologers Incorporated), and scores of on online awards.

Michael and Stephen Erlewine have published a yearly calendar for almost 30 years, since 1969. Michael Erlewine has produced and put on more than 36 conferences in the areas of astrology and Buddhism.

Example Astro*Image Card

Aside from his current work as a consultant for NBC's iVillage and Astrology.com, Erlewine has personally designed over 6,000 tarot-like astrology cards, making authentic astrology available to people with little or no experience in the topic. These Astro*Image™ cards are available through a variety of small astrological programs and in eBooks. Some examples can be found at WWW.StarTypes.com, where there is also a link to his astrological software.

Personal Astrology Readings

Michael Erlewine has been doing personal astrology readings for almost forty years and enjoys sharing his knowledge with others. However, his busy schedule makes it difficult to honor all requests. However, feel free to email (Michael@Erlewine.net) him if you wish a personal chart reading. He will let you know if his current schedule will allow him to work with you.

The sections that follow will give you more details about Michael Erlewine and his very active center.

The Heart Center House

In 1972, Michael and Margaret Erlewine established the Heart Center, a center for community studies. Today, the Heart Center continues to be a center for astrological and spiritual work. Over the years, hundreds of invited guests have stayed at the Heart Center, some for just a night, others for many years. Astrologers, authors, musicians, Sanskrit scholars, swamis - you name it, the Heart Center has been a home for a wide group of individuals, all united by their interest in spiritual or cultural ideas.

Heart Center Library

Erlewine also founded and directs The Heart Center Astrological Library, the largest astrological library in the United States, and probably the world, that is open to researchers. Meticulously catalogued, the current library project is the scanning of the Table of Contents for all major books and periodicals on astrology.

The library does not have regular hours, so contact ahead of time if you wish to visit. Michael@erlewine.net.

The All-Music Guide / All-Movie Guide

Michael Erlewine's devotion to studying and playing the music of Black Americans, in particular blues, led to his traveling to small blues clubs of Chicago and hearing live, blues greats like Little Walter, Magic Sam, Big Walter Horton, and many others. He went on to interview many dozens of performers. Much of this interviewing took place at the Ann Arbor Blues Festivals, in 1969 and 1970, the first electric blues festivals of any size ever held in North America, and than later at the Ann Arbor Blues & Jazz Festivals.

With their extensive knowledge of the blues music, Erlewine and his brother Daniel were asked to play host to the score or so of professional blues musicians and their bands. They were in charge of serving them food and (of course) drink. Michael went on to interview most of the performers in these early festivals, with an audio recorder, and later on with video.

The interviewing led to more study and ultimately resulted in Michael founding and developing AMG, the All-Music Guide, today the largest single database of music reviews and documentation on the planet.

Erlewine started from a one-room office, and the reviewers and music aficionados of the time laughed at his attempt to cover all music. But he persisted, and the all-Music Guide appeared as a Gopher Site, before the World Wide Web even existed-a database of popular music for all music lovers.

Over the years AMG grew, and the All-Movie Guide and All Game Guide were born, and also flourished. Later, Erlewine would create ClassicPosters.com, devoted to the history and documentation of rock n' roll posters, some 35,000 of them.

These guides changed the way music was reviewed and rated. Previous to AMG, review guides like the "Rolling Stones Record Guide" were run by a few sophisticated reviewers, and the emphasis was on the expertise of the reviewer, and their point of view. Erlewine insisted on treating all artists equally, and not comparing artist to artist, what can be important, Michael points out, is to find the best music any artist has produced, not if the artist is better or worse than Jimmie Hendrix or Bob Dylan.

Erlewine sold AMG in 1996, at which time he had 150 fulltime employees, and 500 free-lance writers. He had edited and published any number of books and CD-ROMs on music and film. During the time he owned and ran AMG, there were no advertisements on the site and nothing for sale. As Erlewine writes, "All of us deserve to have access to our own popular culture. That is what AMG and ClassicPosters.com are all about." Today, AMG reviews can be found everywhere across the Internet. Erlewine's music collection is housed in an AMG warehouse, numbering almost 500,000 CDs.

Heart Center Meditation Room

Michael Erlewine has been active in Buddhism since the 1950s. Here are his own words:

“Back in the late 1950s, and early 1960, Buddhism was one of many ideas we stayed up late, smoked cigarettes, drank lots of coffee, and talked about, along with existentialism, poetry, and the like.

“It was not until I met the Tibetan lama, Chogyam Trungpa Rinpoche, in 1974 that I understood Buddhism as not just Philosophy, but also as path, a way to get through life. Having been raised Catholic, serving as an altar boy, learning church Latin, and all that, I had not been given any kind of a path, other than the path of faith. I hung onto that faith as long as I could, but it told me very little about how to live and work in this world.

"I had been trying to learn the basics of Tibetan Buddhism before I met Trungpa Rinpoche, but the spark that welded all of that together was missing. Trungpa provided that spark. I got to be his chauffer for a weekend, and to design a poster for his public talk.

"More important: only about an hour after we met, Trungpa took me into a small room for a couple of hours and taught me to meditate. I didn't even understand what I was learning. All that I know was that I was learning about myself.

"After that meeting, I begin to understand a lot more of what I had read, but it was almost ten years later that I met my teacher, Khenpo Karthar Rinpoche, the abbot of Karma Triyana Dharmachakra Monastery in the mountains above Woodstock, NY. Meeting Rinpoche was life-changing.

Heart Center Symbol

"It was not long after that we started the Heart Center Meditation Center here in Big Rapids, which is still going today. My wife and I became more and more involved with the monastery in New York, and we ended up serving on several boards, and even as fundraisers for the monastery. We helped to raise the funds to build a 3-year retreat in upstate New York, one for men and one for women.

“We also established KTD Dharma Goods, a mail-order dharma goods business that helped practitioners find the meditation materials they might need. We published many sadhanas, the traditional Buddhist practice texts, plus other teachings, in print and on audio tape.

Years have gone by, and I am still working with Khenpo Rinpoche and the sangha at the Woodstock monastery. Some years ago, Rinpoche surprised my wife and I by telling us we should go to Tibet and meet His Holiness the 17th Karmapa, and that we should go right away, that summer, and I hate to leave the house!

That trip, and a second trip that followed some years later, turned out to be pilgrimages that were also life changing. Our center in Big Rapids has a separate building as a shrine room and even a small Stupa.

I can never repay the kindness that Khenpo Rinpoche and the other rinpoches that I have taken teachings from have shown me.

Music Career

Michael Erlewine's career in music started early on, when he dropped out of high school and hitchhiked to Venice West, in Santa Monica, California, in an attempt to catch a ride on the tail end of the Beatnik era. This was 1960, and he was a little late for that, but right on time for the folk music revival that was just beginning to bloom at that time. Like many other people his age, Erlewine traveled from college center to center across the nation: Ann Arbor, Berkeley, Cambridge, and Greenwich Village. There was a well-beaten track on which traveled the young folk musicians of the future.

Erlewine, who also played folk guitar, hitchhiked for a stint with a young Bob Dylan, and then more extensively with guitar virtuoso and instrumentalist Perry Lederman. Erlewine helped to put on Dylan's first concert in Ann Arbor. He hung out with people like Ramblin' Jack Elliot, Joan Baez, The New Lost City Ramblers, and the County Gentlemen.

In 1965, the same year that the Grateful Dead were forming, Michael Erlewine, his brother Daniel, and a few others formed the first new-style band in the Midwest, the Prime Movers Blues Band. Iggy Pop was their drummer, and his stint in the band was how he got the name Iggy. This was the beginning of the hippie era. Michael was the band's lead singer, and played amplified Chicago-style blues harmonica. He still plays.

Erlewine was also the manager of the band, and personally designed and silkscreened the band's posters.

The Prime Movers became a seminal band throughout the Midwest, and even traveled as far as the West Coast, where the band spent 1967, the "summer of Love," playing at all of the famous clubs, for example, opening for Eric Clapton and Cream at the Filmore Auditorium.

As the 60s wound down, and bands began to break up, Erlewine was still studying the music of American Blacks, in particular blues. Because of their knowledge of blues and the players, Michael and his brother Dan were invited to help host the first major electric blues festival in the United States, the 1969 Ann Arbor Blues Festival. They got to wine and dine the performers, and generally look after them.

Michael interviewed (audio and video) most of the players at the first two Ann Arbor Blues Festivals, they included: Big Joe Turner, Luther Allison, Carey Bell, Bobby Bland, Clifton Chenier, James Cotton, Pee Wee Crayton, Arthur Crudup, Jimmy Dawkins, Doctor Ross, Sleepy John Estes, Lowell Fulson, Buddy Guy, John Lee Hooker, Howlin' Wolf, J.B. Hutto, Albert King, B.B King, Freddie King, Sam Lay, Light-nin'

Hopkins, Manse Lipscomb, Robert Lockwood, Magic Sam, Fred McDowell, Muddy Waters, Charlie Musslewhite, Louis Myers , Junior Parker, Brewer Phillips, Otis Rush, Johnnie Shines, George Smith, Son House, Victoria Spivey, Hubert Sumlin, Sunnyland Slim, Roosevelt Sykes, Eddie Taylor, Hound Dog Taylor, Big Mama Thornton, Eddie Vinson, Sippie Wallace, Junior Wells, Big Joe Williams, Robert Pete Williams, Johnny Young, and Mighty Joe Young.

Email:

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