Exam. Oriented Series-2

PRATIYOGITA DARPAN

PRICE ₹ 270.00

EXTRA ISSUE

WHERE EXCELLENCE GUIDES THE SUCCESS

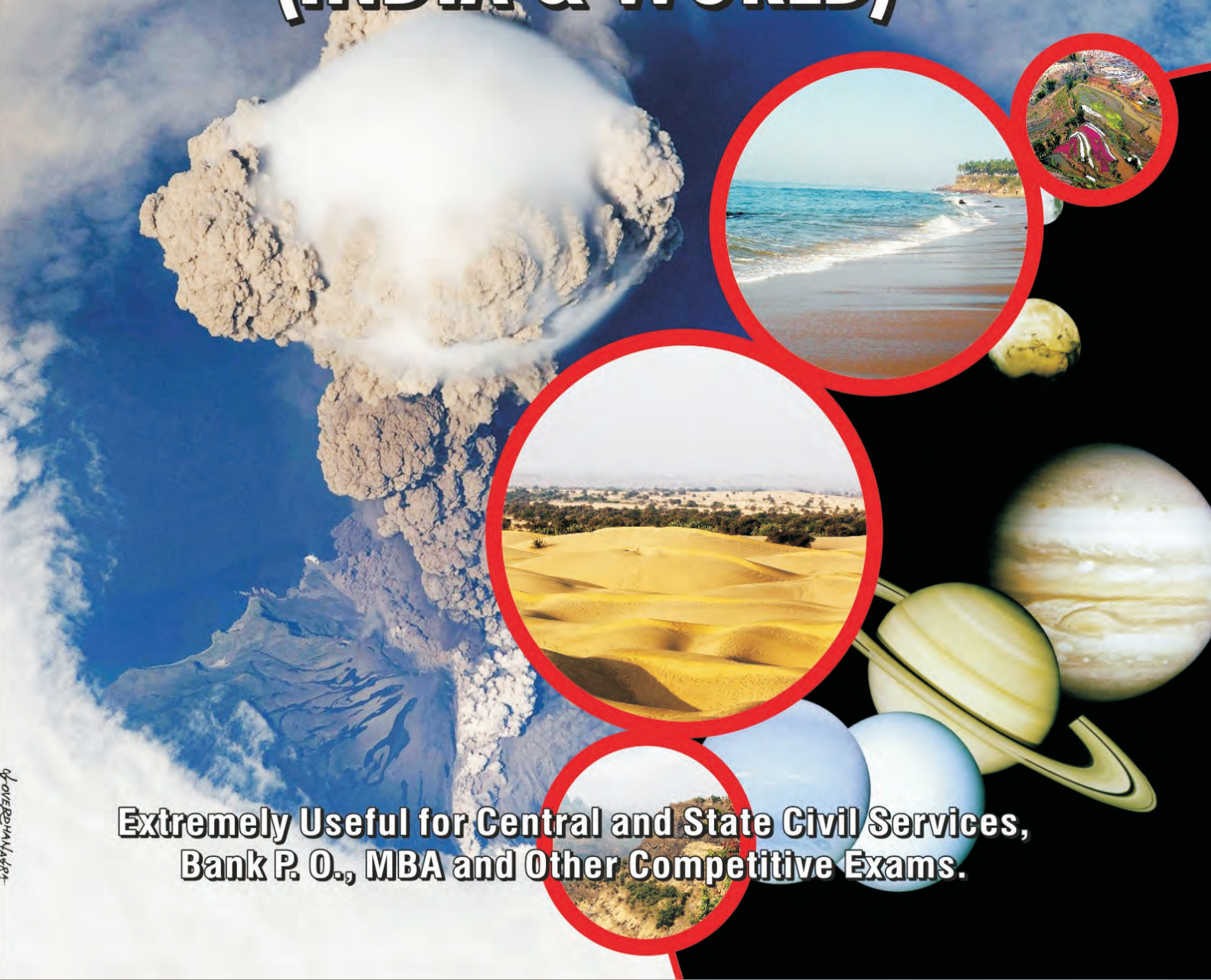
Revised & Enlarged Edition

A Series, Most Appreciated by the TOPPERS, for the Last Many Years

GENERAL STUDIES

GEOGRAPHY

(INDIA & WORLD)



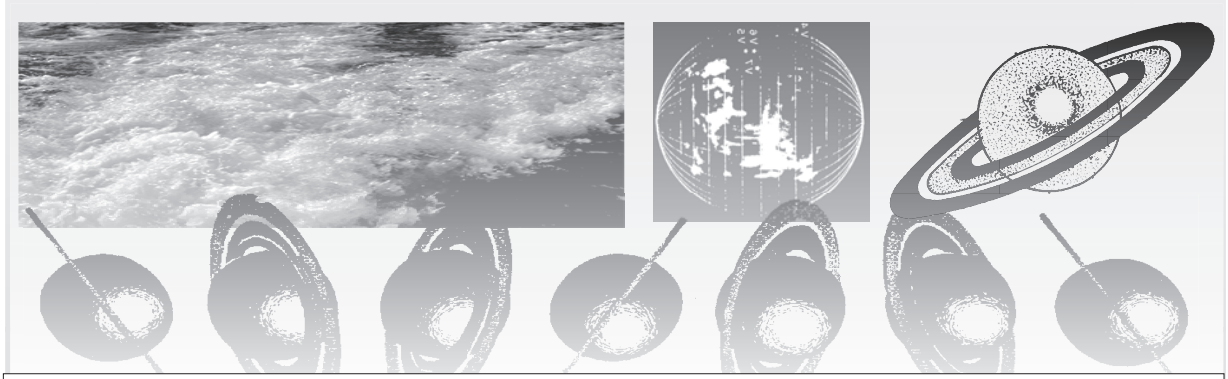
Extremely Useful for Central and State Civil Services, Bank P. O., MBA and Other Competitive Exams.

Geography 2014

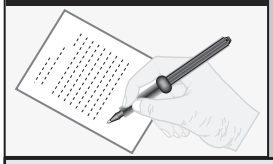
PRATIYOGITA DARPAN

Extra Issue

Contents



Editorial



GO THROUGH LIFE WITH A RECEPTIVE MIND

A man of personality goes through life with an open mind, without being hampered by prejudices, preconceptions and superstitious attitudes. A receptive mind is a sensitive mind; it is a mind inhabited by prudence and a sense of discrimination. Such a mind would never be baulked by unnecessary illusions or hamstrung by petty selfish motives. It would judge things on their merits and would never be affected by hearsay. Such a mind makes for a great personality which we always aspire for. Only those who possess such a mind garner true success in life.

Ashish was considered a spoiled child. His parents lived below the poverty line. Although he was a student of class VIII, yet he had nothing to do with books. He threw stones at the passers-by. Children did not dare to play on the road in his presence. He bullied them. Almost, the whole class disliked him. For practical purposes he was branded as a terrorist.

Unfortunately, a communal riot brokeout and the rioters did all they could do against members of the other community. Ashish saw, as many others did, that one of the rioters was molesting a young girl and intended to rape her. Ashish lost no time to help the girl. The rioters were many, Ashish was alone. He was badly injured, but he freed the girl from the clutches of that goonda. In his dying statement before the police he said that he lived a useful life as he had been able to save the honour of one of his sisters. Ashish taught us a lesson in humanism and manhood. Honour of women should be the most valuable thing to us, more valuable than our own life.

We would say that good persons have always to give us a good lesson, provided we are ready to receive it. Our young men and women ! the divine spark is in everyone's heart. Try to recognize it and give expression to that within your limits.

A great teacher has said, no man is your enemy; no man is your friend; all alike are your teachers. This means that in case we are aware and receptive, we can learn something from everybody and for the matter of that, from everything and every event. Therefore, the same principle applies to all circumstances, events and situations in which we find ourselves. So, there are no hostile circumstances or situations and no congenial ones. It is because of our preconceptions and mental inclinations and desires that the circumstances or situations appear to be adverse or favourable. It is only in the absence of such mental reactions that there may be an opportunity to see the beneficial element contained in them or hear the message which they have to give. Let us be sure that there is the great plan of nature which helps everything and creature to evolve. We should, therefore, develop the necessary insight and mental attitude to learn something useful from every event and person that we have to interact with.

When the thought arises that somebody is not a friend or some circumstance is adverse, it is surely nothing but an opinion—more subjective than objective. Such opinions are associated with our selfish desires, This is a part of the darkness of ignorance. All attractions and repulsions are part of delusion, which only misguide us. There is a trap of delusion everywhere. We must, with a detached mind, try to see what good lesson we can learn from the person before us or the situation in which we have been placed. Grumbling and murmuring is against the Law of Progress. Landing oneself in pairs of opposites, such as friend and foe, victory and defeat, etc., the person concerned fails to see things in perspective. His virtue is clouded by our narrow self. The flame of the mind continues flickering ceaselessly under the impact of the wild winds of the opposites—likes and dislikes, favourable and adverse, friend and foe and so on. Teachers and scriptures of nearly all religions lay emphasis on submission to the divine will. At this point, we may tell our young readers not to get startled at the mention of divine will. We are not talking metaphysics but the ways of the worldly submission to divine will implies that we do not react. We should take things calmly and keep our minds steady. In due course, you will realise that the thought side of science is philosophy and the action side of it is religion. Therefore, we would like to advise you to look at the events such as a scientist watches minutely the outcome of his experiment with an unconditioned and objective mind. Even if the experiment does not give result as he expected, the findings in it help him when he undertakes the experiment for the next time. In case you develop this positive mental attitude, you will get light at every step in your life and go a long way in whatever you undertake to do.

We can enrich our knowledge and wisdom, if we recognize that life is teaching in the form of a friend or enemy. To receive the teachings of life we have to shed prejudices and likes and dislikes, preconceptions and prior judgements whether we are in India, England, America or some other country. Can you make up your mind to go through life with a receptive mind. All are your teachers—no friend, no enemy. Remember that it is the receptive mind where the two great attributes of a great personality dwell prudence and a sense of discrimination. ●●●

THE UNIVERSE

Man was born on this earth. During the course of evolution his life has been indebted to the soil, water, air and landscape of Mother Earth. He has had very close and intimate relations with his environment. To him, his home–the Earth has been the most important thing in the whole of the Universe.

When the Universe was first conceived of as an orderly unit, it was called **Cosmos,** and the studies relating to the cosmos were known as **Cosmogony** or **Cosmology.** Today we speak of them as Space and Space Sciences.

The Universe or the Cosmos, as perceived today, consists of millions of **Galaxies.** A galaxy is a huge congregation of stars which are held together by the forces of gravity. Most of the galaxies appear to be scattered in the space in a random manner, but there are many galaxies which remain clustered into groups.

Our own galaxy, called the **'Milky way'** or **'Akash ganga',** which appears as a river of bright light flowing through the sky, belongs to a cluster of some 24 galaxies called the **'Local group'.** The Milky Way is made up of more than a hundred billion sparkling stars, which, though quite distant from each other, seem from the Earth as having been placed close together.

The two other nearest galaxies are the **Large Magellanic Cloud** and the **Small Magellanic Cloud,** named after Magellan, who discovered them.

The Universe is infinite, both in time and space. It was around sixth century BC that men started enquiring into the mysteries of the Universe in an endeavour to rationally analyse the earthly and the heavenly phenomena. Ancient Greek astronomers and mathematicians came up with the view that the Earth was a perfect motionless sphere, surrounded by eight other crystalline spheres. The Sun, the Moon, and the five known planets, *viz.,* Mercury, Venus, Mars, Saturn and Jupiter, revolved around the Earth on seven **'inner spheres.** The stars were permanently fixed to the **'outer sphere'** that marked the edge of the Universe.

The culmination of Greeks knowledge is associated with the name of **Claudius Ptolemy** of Alexandria, AD 90 to 168. In second century (AD 140) Ptolemy, a Graeco-Egyptian astronomer, synthesised the various data gathered by the early Greek astronomers. **Ptolemy,** in his book 'Almagest', presented his system of astronomy based on a geocentric (Earth-centred) Universe. He maintained that the Earth was the centre of the universe, and the Sun and other heavenly bodies revolved around the Earth.

In 1543, Polish astronomer **Copernicus** argued that the Sun not the Earth, was the centre of the Universe. Though the Copernicus theory changed the centre of the Universe it did not change its extent which was still equated with the Solar system. It took another three and half centuries before our ideas changed further.

By 1805 telescopic studies made by the British astronomer **Herschel**, made it clear that the Universe was not confined to the Solar system. The Solar system itself was only a part of a much vaster star system called the Galaxy. The Universe thus became quite extensive comparising millions of stars scattered about the Milky Way. But our vision of the Universe did not end there.

As the 20th century opened, it seemed that the Milky Way galaxy with its cluster of over a hundred billion stars together with their attendant satellites, the Magellanic clouds, actually represented all there was to the Universe.

HUBBLE's Law :

Edwin Hubble in 1924 showed that nabulae were distant galaxies. In 1929, he found the speed a galaxy moves away from earth depends on its distance from earth. If a galaxy is 5 times as far away as another, it is moving away 5 times faster.

In 1925 American astronomer **Edwin P. Hubble** (1889–1953)—pointed out that there were other galaxies in the Universe and that the Universe actually consisted of millions of galaxies like the Milky Way. In 1929 Hubble proved that these galaxies are flying away from each other and that the farther they are, the faster they fly.

Doppler Effect :

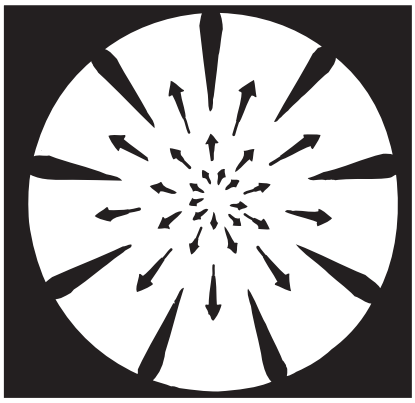
The movement of a star or a galaxy effects its light as seen by an observer. If the star is moving towards the observer, its light will be shifted towards the blue end of the spectrum, if the star or galaxy is moving away from the observer its light will be shifted to the red end of the spectrum. This is known as the Doppler Effect or Shifts The Doppler Shifts of galaxies show that they are receding and that the Universe is in a state of rapid expansion.

THEORIES OF SPACE

Modern theories of the Universe are based on this flight of galaxies, that is, on the assumption that matter is in a state of rapid expansion.

THE EXPANDING UNIVERSE

It is a general law that all material bodies are heated when compressed and cooled when expanded. The primordial Universe, being highly compressed, must have



experienced high temperatures. Heat, as we know, tends to expand matter. High temperatures, therefore, must have, at some point, started an

expansion of the Universe. It is this expansion which is continuing even now. All theories of space (Universe) seek to explain the nature and consequences of this expansion.

BIG–BANG THEORY

Opposing cosmological theories, the first credit goes to a Belgian astronomer–priest, Abbe Georges Lemaitre. He explained this process of expansion, in what is known as **'the evolutionary theory'** or **'the big-bang theory'.** He argued that billions of years ago, cosmic matter (Universe) was in an extremely compressed state, from which expansion started by a primordial explosion. This explosion broke up the superdense ball and cast its fragments far out into space, where they are still travelling at thousands of miles per second. It is from these speeding fragments of matter that our galaxies have been formed. The formation of galaxies and stars has not halted the speed of expansion. And, as it happens in all explosions, the farthest pieces are flying the fastest.

The primordial explosion is the hallmark of the big-bang theory. It also differs from other theories in two important respects : (i) it disagrees with the Seady State claim, that new matter is being continuously created in the Universe, (ii) it differs from the Pulsating theory, in that, it does not admit, that matter will revert to the original congestion point, from which the primordial explosion started.

STEADY STATE THEORY

This theory originally advanced by two astronomers, Hermann Boudi and Thomas Gold, has since received support from the British astronomer of Cambridge University. According to this theory, which is also known as the Continuous Creation Theory, galaxies recede from one antoher but their spatial density remains constant. The Universe everywhere remained relatively uniform, unchanged, without begining or end. That is to say, as old galaxies move apart new galaxies are being formed in the vacancies. These new galaxies are formed from new matter which is being continuously created to replace old matter that is being dispersed. This concept, designed to get around the philosophic hurdle of a Universe with finite begining and end, is known as the *'Steady State Theory'*.

Later the big-bang theory was defined to clear the hardle of finitenes, too : its advocates proposed a **'pulsating'** or **'oscillating'** Universe that periodically expands from the explosion of a primordial body, then contracts back and explodes again, over unmensely long cycles, ad infinitum.

PULSATING (OSCILLATING) UNIVERSE THEORY

According to this theory, advocated among others by Dr. Alan Sandage, the Universe expands and contracts alternately between periods running into tens of billions of years. Dr. Sandage thinks that some 12 billion years ago a great explosion occured in the Universe and that the Universe has been expanding eversince. It is likely to go on expanding for 29 billion years more, when gravitation will halt further expansion. From then on, all matter will begin to contract or collapse upon itself in a process known as **'implosion'.** This will go on for 41 billion years compressing matter into an extremely superdense state and then it will explode once again. This is the latest theory of the evolution of the Universe.

THE ANTI–UNIVERSE

Existence of anti-Universe, somewhere in the cosmos, with its characteristics reversed to those normally found in this Universe, is now considered a possibility. This has caused a star in the scientific world today.

Recent discoveries of particles of anti-matter have led scientists to consider the possibility of the existence of an anti-Universe somewhere in the cosmos. The highly abstruse theoretical physics dealing with the principles of **Symmetry Laws** suggested that processes, phenomena and events happening in this Universe must have their counterparts in the reverse manner in another Universe which we may call **'anti-universe'.** If a fundamental particle exists in this Universe, we must have a similar particle somewhere in the cosmos but will be like one as seen by reflecting it in a mirror. The **'time-event'** will also be in a reverse manner, that is, the reel of time will be functioning in the reverse direction to that going on in our Universe. The **'future-events'** in the anti-Universe are perhaps the **'past-events'** in this Universe.

It is still not quite clear how far this left-right symmetry of the mirror-image reflexion is being followed in the anti-Universe in some types of physical phenomena results of investigations indicate that the exact situation is much more complex and complicated. But still the scientists are becoming more and more convinced that a mirror-image-like anti-world, precisely identical to our world but as reflected in a mirror, exists somewhere in the Universe.

THE OPEN OR CLOSED UNIVERSE

That the Universe is expanding is today considered established. A question that remains unsettled is whether the expansion will continue for ever or whether the receding galaxies will some day stop and then reverse their motion, eventually falling together in a great collapse. The answer to this question determines the geometrical character of the Universe, that is, it determines the nature of space and time. If the expansion continues perpetually the Universe is *'open'* and infinite; if it will some days stop and reverse direction, the Universe is *'closed'* and of infinite extent.

THE SPACE AND OUTER SPACE

The difference between space and outer space is that (i) the term **'space'** is used to denote the entire **'Universe',** that is, the Earth and its atmosphere, the Moon, the Sun and the rest of the Solar System with its other planets and their satellites and all the stars and galaxies spread over the infinite skies; and (ii) the **'outer space'** refers to the entire space except the Earth and its atmosphere the outer space begins where the Earth's atmosphere ends, and if extends in all directions from above the atmosphere of the Earth.

Outer space is infinite. Our terrestrial units of measurements

hardly suit its dimensions. So we have evolved new units of measurement like the **'Light Year'** and the **'Astronomical Unit'.**

LIGHT YEAR

A Light Year is the distance covered by light in on year in vacuum travelling at a speed of 299,792·5 Km per second or about 186,282 miles per second. (This velocity was accepted as one of the Astronomical Constants by the International Astronomic Union in 1968). A light year is thus $5{\cdot}88 \times 10^{12}$ miles.

ASTRONOMICAL UNIT (A. U.)

A new unit in space dimensions has been evolved by radar astronomy. This unit is called **'Astronomical Unit (A. U.)'.** The symbol 'AU' is recommended by the International Bureau of weights and measures. It represents the mean distance between the Sun and the Earth, calculated on the data supplied by rdars. This distance–the Astronomical Unit–has now become a key constant in determining distances in the Solar System.

Astronomical Unit in terrestrial measurements is approximately 93 million (92,857,000) miles or 150 million (149,598,000) kilometres.In terms of space dimensions, we may say that a Light Year is made up of about 63,241·1 astronomical units.

The new technique is likely to revise our established ideas of space dimensions based on the speed of light. It is now known that the velocity of a radar pulse is accurate to one part in 100 million, whereas the velocity of light is known only to be accurate to one part in a million. This means that the error in radar reading is only one-hundredth of what it would be in light measurements.

TRACKING OUTER SPACE

Light and sound are the two principal media through which we gather our impressions of the external World. Light is something we can see (visible) and sound is something we can here (audible). This was considered an axiomatic truth till the end of the 18th century. As the 19th century broke, this simple belief was shattered. Astronomers and physicists learned that these are invisible lights and inaudible sounds. The first break came in 1800 when the British astronomer William Herschel (738–1822) discovered infrared radiation.

THE SOLAR SPECTRUM

When sunlight (white light) is passed through a prism it is broken up into rays of different colours, like those of the rainbow. Traditionally, seven colours are known, which are epitomised by the acronym VIBGYOR, that is, VIOLET, INDIGO, BLUE, GREEN, YELLOW, ORANGE and RED. This is called the Solar Spectrum, with the violet at one end and the red colour at the other end. In studying the heating effects of the Solar Spectrum, Herschel placed a thermometer in each of the colours of the spectrum and an extra thermometer outside the spectrum at the red end. The thermometer outside the spectrum (at the red end) showed a higher degree of heat than any other inside the spectrum. He called these rays **"infra-red"** (below the red) rays.

In 1801 the German physicist Johann Ritter (1776–1810) discovered that the rays outside the spectrum at the violet end, broke down silver chloride more quickly than the rays within the visible spectrum. These came to be called **'ultra-violet'** (beyond the violet) rays. It thus turned out that sunlight formed not only a visible spectrum but also an invisible one.

ANGSTROM UNIT

In 1803 Thomas Young (1773-1829), a British physicist, showed that light travelled in tiny waves of varying wavelengths. The waves were too small to be measured by conventional scales. So Anders Angstrom (1814–1874), a Swedish physicist, evolved a new scale to measure wavelengths. He chose a unit equal to ten-billionths of a metre. This has since become known as the **'Angstrom Unit'.** Ten **Angstroms** are equal to a **millimicrometre** (a thousandth of a millionth of a metre) which in terms of modern SI units is equal to a **'nanometre'.**

ELECTRO–MAGNETIC SPECTRUM

The invisible ultra–violet and infra-red radiations remained inexplicable till James Clark Maxwell (1831–1879), the British physicist, came out with his ELECTRO-MAGNETIC THESIS in 1870. Maxwell argued that electricity and magnetism were different aspects of a single dectromagnetic field. Periodical variations in the electro-magnetic field produced electro-magnetic radiations of varying lengths. The visible light is only one part and for that matter a very small part of the electro-magnetic spectrum. He also postulated that there can be other invisible radiations of much shorter wavelength than the ultraviolet at one end and for longer than the wavelength of the infra-red at the other.

The wavelengths of the electromagnetic spectrum in modern international units

10 Angstroms	*= 1 nanometer*
1000 nano	*= 1 micrometre*
1000 micro	*= 1 millimetre*
10 milli	*= 1 centimetre*
10 centi	*= 1 decimetre*
10 deci	*= 1 metre*

Visible Light	Central Wavelengths
Violet	*410 nano*
Blue	*470 "*
Green	*520 "*
Yellow	*580 "*
Orange	*600 "*
Red	*650 "*

The maxwellian theory was vindicated when the German physicist Heinrich Hertz (1857–1895) produced electro–magnetic radiations with wavelengths much longer than that of the infra-red rays. These radiations were at first called **'Hertzian Waves'** but eventually came to be know as **'Radio Waves'.** Then in 1895, another German physicist Wilhelm Rontgen (1845–1923) discovered what be called **'X-ray radiation'**. The **'X-ray'** was later found to be much shorter in wavelength than the ultraviolet rays.

In 1896, the French physicist Henri Becquerel (1852–1905) discovered the phenomenon of **'Radio Activity'.** Becquerel did not at that time know why or in what manner this radio activity took place. Subsequently it was found that this radio activity was caused by the atoms of the heavy metal **'Uranium'** giving off a constant emission of radiation and particles. It was further shown that this radio activity was also electromagnetic in nature. Rutherford named it the **'Gama Ray'.** The gama ray had

a wavelength even shorter than that of the X-ray.

PHOTONS

In 1905 Einstein showed that all forms of radiation travelled in wave packets, which acted like particles in some ways. He called these packets **'Photons'.** The energy of the photons increases as the wavelength decreases. The wavelength is related to frequency, that is to say, the number of vibrations or waves or cycles per seconds. The shorter the wavelength, the higher is the frequency and the greater the energy. Thus "gamma rays" with the shortest wavelength (below 0·01 nanometre) are the most energetic. The energy decreases as the wavelength increases, through X-ray (1 to 0·01 nanometre), ultra-violet (1 to 400 nanos) visible light in all the colours of the spectrum (400 nanos to 700 nanos) infra-red (700 nanos to 1 milimetre) micro-waves (1 millimetre to 500 millimetres or 50 centimetres) to radio waves which have the longest wavelengths (50 centimetres to 3000 centimetres or 30 metres) and the lowest energy content.

THERMAL RADIATION

Every object which is at a temperature above *'Absolute Zero'* (–273·16°C) radiates photons of all kinds. The average energy of the photons emitted increases with the temperature. We experience this heat during the peak period (noon) in visible light radiation. But even objects which are not hot enough to glow like the sun still radiate quantities of infra–red radiation, for instance, our own bodies. The body temperature, that is, cool bodies, radiate micro waves and longer radio waves. These radions, called **'thermal radiations',** can indicate the temperature levels of the objects emitting them.

RADIO WAVES

Radio waves are the radiations with the longest wavelengths, that is from 50 centimetres to as much as 30 metres. Objects in outer space that emit such radiations are called **'Radio Sources'.**

WINDOWS ON OUTER SPACE

The atmosphere of the earth is like a sieve which allows only some wavelengths from outer space to reach us. Sunlight forms one group of wavelengths which come down through the atmosphere. This includes not only the visible light but also a port of the invisible light, namely, the near ultraviolet (400 to 300 nanos) and the near infrared (700 to 2500 nanos). This is one of the windows that opens out on outer space.

MICRO–WAVE WINDOW

The other window is called the **"micro-wave window".** This window covers all wavelengths from one millimetre to 30 metres. The existence of the microwave window was not particularly noticed or studied till 1932 when Karl Jansky of the Bell Telephones announced that he had received radio messages from outer space.

MODERN ASTRONOMY

Modern astronomy began with the Italian astronomer GALILEO 1564–1642. In 1609 Galileo heard of the telescope made by the Duchaman Hans Lippershey. Galileo improved upon it and constructed a similar instrument that could magnify upto thirty diameters.

OPTICAL ASTRONOMY

It was this thirty diameter instrument, known as 'REFRACTOR TELESCOPE', that opened the field of optical astronomy. Galileo made several stasting discoveries. He found the Moon's surface to be rugged and the Pleiades to contain over 40 stars. He discovered four of Jupiter's moons and observed the sunspots.

In 1668 NEWTON invented a new instrument 'The REFLECTOR TELESCOPE'. In a refractor telescope light is gathered by a large objective lens. In a reflector telescope, a large curved mirror is used for this purpose. Both these types of optical telescopes are still in use.

GROWTH OF MODERN ASTRONOMY

The invention of the optical telescope was an epochal event in the history of astronomy. The instrument so caught the fancy of the astronomer and the layman alike, that all advanced countries vied with one another in building bigger and bigger telescopes.

RADIO ASTRONOMY

Radio Astronomy came into being in the most unexpected manner. In 1931, *Karl Jansky*, an US radio engineer working with Bell Laboratory, noticed a steady stream of radiation coming in from outer space. It also attracted the attention of an amateur radio operator in US, *Grote Reber,* worked single, handed for nearly ten years, studying the sky and analysing radiations. In 1937, he built the world's first *Radio Telescope*–a 31 feet 5 inches parabolic dish–and set it up in his backward at Wheaton Illinois. In 1940 be produced a radio map of the sky,the first, of its kind in the world. Thus a new branch of astronomy was opened, known as Radio Astronomy.

OTHER ASTRONOMIES

Satellite technology took astronomical investigations farther afield in the sixties. Untill then astronomical studies were entirely ground based. Now satellites made it possible to study astral phenomena from above the atmosphere. Thus astronomy is studied from two levels, from the ground and from above the atmosphere. This has led to the emergence of many specialised fields in astronomy, like–x-rays, Ultraviolet, Gamma ray and Infra-red ray astronomy.

ULTRAVIOLET ASTRONOMY

Ultraviolet astronomy is confined to wavelengths between 912A and about 3000 A. The first successful observation in the ultraviolet region of the spectrum was made in 1946, when the Naval Research Laboratory, USA, flew a captured German V-2 rocket. The first successful dectection of far ultraviolt radiation outside the solar system was also made by the Naval Research Laboratory in 1955 with the help of an AEROBEE 25 rocket. Ultraviolet astronomy is specially useful in very cases where other techniques have failed to bring in any worthwhile information. Thus there are many young massive stars with effective surface temperature of 10,000 K which emit mostly in the ultraviolet region. These stars can be

properly studied by Ultraviolet Astronomy Only.

GAMMA RAY ASTRONOMY

Gamma rays have the shortest wavelengths and are the most energetic rays so far known. Because of their great penetrating power, they are not absorbed by the inter-stellar matter and therefore reach us almost unchanged from all parts of the Universe.

Gamma ray astronomy was born in 1968 with the discovery of very hard gamma ray radiation from the central region of our galaxy, by a team of scientists at the Massachusetts Institute of Technology, USA, who had flown a sophisticated gamma ray detection on board the Orbiting Solar Observatory–3 satellite. Subsquent observations on celestial hard gamma rays from experiments on the US Small Astronomy Satellite–2 and European COS–B satellite have established gamma ray astronomy as an observational science.

INFRA RED ASTRONOMY

Infra red astronomy is important because it enables us to observe

ASTRONOMICAL TERMS

THE CELESTIAL SPHERE *is an imaginary sphere upon the surface of which all the stars in the sky appear to be studded to an observer stationed at its centre.*

THE ZENITH *is the intersection of a vertical line through the observer's station with the upper portion of the celestial sphere. It is the point on the celestial sphere immediately above the observer's station.*

THE NADIR *is the intersection of a vertical line through the observer's station with the lower portion of the celestial sphere. It is the point on the celestial sphere vertically below the observer's stations.*

THE CELESTIAL HORIZON *(also called TRUE or RATIONAL HORIZON) is the great circle in which a plane at right angles to the Zenith and Nadir line and passing through the centre of the earth intersects the celestial sphere. The Zenith and Nadir are the poles of the celestial horizon.*

THE SENSIBLE HORIZON *is the circle in which a plane tangent to the earth's surface (or at right angles to the Zenith and Nadir line) and passing through the point of observation intersects the celestial sphere. The line of sight of an accurately levelled telescope lies in this plane.*

THE VISIBLE HORIZON *is the circle of contact of the earth and the cone of visual rays passing through the point of observation.*

THE TERRESTRIAL EQUATOR *(or simply, EQUATOR) is the great circle of the earth, the plane of which is perpendicular to the axis of rotation (polar axis).*

THE POLAR AXIS *is the diameter about which the earth spins. The extremities of the axis of rotation (polar axis) of the earth, are known as the poles. they are distinguished as the NORTH POLE and the SOUTH POLE.*

THE CELESTIAL EQUATOR *is the great circle in which the plane of the equator cuts the celestial sphere.*

THE CELESTIAL POLES *are the points of intersection of the axis of the earth (or the polar axis) when produced with the celestial sphere.*

THE CELESTIAL MERIDIAN *is the great circle in which the plane passing through the celestial poles intersects the celestial sphere.*

THE MERIDIAN *of a place or an observer is the great circle passing through the zenith, and nadir and the poles.*

THE ECLIPTIC *is the great circle which the sun appears to trace on the celestial sphere with the earth as a centre in the course of a year. The plane of the ectiptic is not coincident with the plane of the equator, the angle between them being known as the OBLIQUITY OF THE ECLIPTIC. Its value is about 23° 27'.*

The points of intersection of the ecliptic with the equator are called the EQUINOCTIL POINTS. The point at which the sun's declination changes from South to North (i.e. the sun passing from South to North of the equator) is known as the VERNAL EQUINOX or the FIRST POINT OF ARIES; while the other is called the AUTUMNAL EQUINOX or the FIRST POINT OF LIBRA. The Vernal Equinox marks the beginning of spring, while the Autumnal Equinox marks the commencement of AUTUMN.

The points on the ecliptic at which the North or South declination of the sun is maximum are known as the SOLSTICES.

The sun is at the Vernal Equinox on March 21, and its declination and right ascension are each equal to zero. On June 21 the sun is at the ecliptic at 90° from the first point of Aries, and, its declination is maximum and equals 23°27' No and its right ascension is 6 hours (or 90°).

THE VERTICAL CIRCLE *is the great circle passing through the zenith and nadir. The meridian of a place is, therefore, also a vertical circle.*

THE PRIME VERTICAL *is the vertical circle which passes through the east and west points of the horizon. It is at right angles to the meridian of the place.*

THE LATITUDE *of a place or station is the angular distance measured from the equator towards the nearer pole, along the meridian of the place. The latitude is the declination of the zenith.*

THE CO-LATITUDE *of a place is the angular distance from the zenith to the pole. It is the complement of the latitude, and is, therefore, equal to 90°–latitude.*

THE LONGITUDE *of a place is the angular measure of the arc of the equator between some primary meridian and the meridian of place.*

THE ALTITUDE *of a heavenly body is its angular distance above the horizon, measured on the vertical circle passing through the body.*

THE CO-ALTITUDE *also called the Zenth Distance, is the angular distance of a heavenly body from the Zenith. It is the complement of the altitude and equals 90°—latitude.*

THE AZIMUTH *of a heavenly body is the angle between the observer's meridian and the vertical circle passing through the body.*

THE DECLINATION *of a heavenly body is its angular distance from the equator, measured along the meridian, generally called the declination circle, that is, the great circle passing through the body and the celestial poles.*

THE CO-DECLINATION *also termed as the Polar Distance, is the angular distance of the heavenly body from the pole. It is the complement of the declination, and is equal to 90°–declination.*

THE HOUR ANGLE *of a heavenly body is the angle between the observer's meridian and the declination circle passing through the body.*

THE RIGHT ASCENSION *of a heavenly body is its equatorial angular distance measured eastward from the First Point of Aries.*

objects at temperatures between about 10 K and 2,000 K, whether they are cool stars or dust cloud. In the solar spectrum the region nearest to the visible red is called "near infrared". A portion of this near infrared can be detected with special photographic plates. Hence this part of the infrared is called the *Photographic Infrared*. Higher wavelengths can be detected by other methods.

RADAR ASTRONOMY

Radar Astronomy was born in 1940, when a Hungarian Physicist Zoltan Bay sent out a beam of micro waves to the moon and detected the return echo. The basic principle is simple. Short pulses of high frequency radio energy are aimed at a target, from which the pulses are reflected to the earth, where they are picked up by a sensitive antenna receiver system. The time between the transmission and reception of radar pulses can be converted into a measure of distance by the speed at which these radar pulses travel.

Since micro waves can rightly be considered a part of the electromagnetic spectrum, the Radar Astronomy is really a part of radio astronomy.

In recent years, the radar techniques have substantially added to the stock of our knowledge of astronomy. The surface of Venus, for the example, is covered by a thick layer of clouds against which our optical telescopes were quite helpless. But microwaves have pierced through the clouds and have sounded the solid surface of Venus. The first readings showed a high mountain range. Subsequent readings have helped us to make a radar map of the surface. Various bits of information about other planets have been and are still being collected by radar readings.

SUPER TELESCOPE

A new generation of 'Super Telescope' is designed for mountaintops around the world ushered in a golden age of astronomy by the early nineties.

Behind the spurt in jumbo telescopes are several radical new ideas on how to build them. Ever since the dedication of the 200 inch (5·08 metre) Hale Telescope–still the world's premier optical device–atop California's Mount Palomar in 1948, astronomers thought that they had reached the technical and financial limits of big–telescope construction.

THE WORLD OF SOUND

Radio Telescopes have opened a new world to the astronomer–A World of Sound, not of sight. The two worlds are fantastically different. THE MILKY WAY, for example, is a river of light to the eyes but it is a bissing mass to the ears. Radio Telescopes, in facts help us to listen in to stars or galaxies that lie far beyond the ken of the world's largest telescopes. Radio Telescopes also enable us to study astral phenomena which are within the range of our optical telescopes but which are not visible owig to the haze of cosmic dust.

Sound is produced by the vibrations of an object or mechanism and transmitted in the from of waves —alternating increase and decrease in pressures. It radiates outward through a material medium of molecules, more or less like the ripples spreading out on water after some heavy object has been thrown into it.

Two elements of sound are important—(i) the PITCH or FREQUENCY, and (ii) INTENSITY or LOUDNESS.

(i) The PITCH or FREQUENCY refers to the rate of vibration of the sound and is measured in HERTZ (Hz) units. The frequency of sound is determined by the number of times the vibrating waves undulate per second. The slower the cycle the lower the pitch. The pitch becomes higher as the cycles increase in number or which is the same thing, as frequencies increase.

(ii) The INTENSITY or LOUDNESS is measured in **Decibels**. A decibel (db) (one-tenth of a **"Bel"**) is a physical unit based on the weakest sound that can be detected by the human ear. It is named after A. G. BELL, the inventor of the telephone.

The decibel scale is logarithmic, that is, an increase of 10 db means 10 times as much, an increase of 20 db means 100 times and 30 db 1000 times etc. A light whisper may be about 10 db, a quite conversation sound 20 db, and normal talk 30 db. In comparison the electrically amplified beat music in a disco is a billion times louder than the sound of a whisper at 10 db.

ULTRA–SONICS

The human ear cannot generally bear sounds of frequencies higher than 20,000 vibrations per second or in modren International Units 20,000 Hz. Sounds of frequencies higher than 20,000 Hz which are inaudible are called ULTRA SONIC. Bats produce very high sound when they fly but they are at ultra-sonic frequencies from 20,000 to 100,000 Hz. So we cannot bear them. Ultra-sonic waves are an important tool of research in physics. There are also many applied uses for ultra-sonic waves, like "Submarine echo sounding', 'detection of flaws in casting', 'drilling glasses and ceramic', 'emulsification' etc.

SPEED OF SOUND

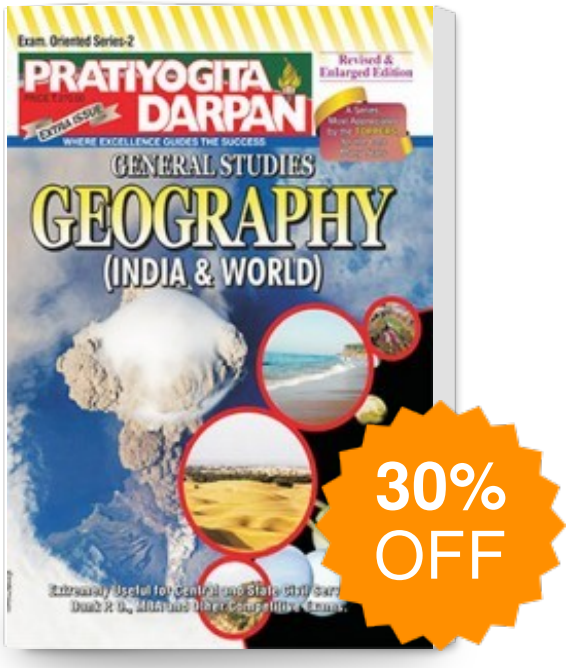
The speed of sound varies according to the nature of the carrier media. When we speak of speed of sound, we ordinarily mean the speed at which sound travels in air at sea level. This is around 1088 feet per second. In water sound travels about 5 times faster than in air. In iron and steel it is even faster, about 3 times faster than the speed of water. Speeds of sound through some selected media are indicated below :

- Ice-cold water-1505 metre (4938 feet) per second
- Brick–3542 metre (11620 feet) per second
- Granite–395 metre (1296 feet) per second
- Hardwood–3847 metre (12620 feet) per second
- Glass–5000 to 6000 metre (16410 to 19690 feet) per second

SUPER–SONICS

Supersonic speed is speed greater than the speed of sound (in air at sea level), that is to say, around 760 miles or 1216 kilometres per hour. Supersonic speed is measured in 'MACH". This unit was worked out by the Czech–born German physicist

Pratiyogita Darpan Extra Issue Series-2 General Studies Geography (India And World)



Publisher : Upkar Prakashan

Author : Pratiyogita Darpan

Type the URL : http://www.kopykitab.com/product/8953