EVENING NEWS. GEORGE Q. CANNON. EDITOR AND PURLISHER. Saturday, . . . . . January 21, 1971. INIVERSITY LECTURES

BY PROF. ORSON PRATT, SEN. 200 LECTURE I.

ASTRONOMY.

Astronomical Science defined --- Viewed in all ages with the most profound interest .- Copernicus, Kepler, and Newton.-The Barth as an Astronomical body -Its Figure,-How determined. - Its dimentions - How demonstrated. -Its position in space - Up and Down only relative t-rais -Our Antipodes -Ea th' Durnal Rota on - Appar ent Dourn & Rotation of the Storry Sphers.-Rotation of the Earth demonstrated on mechanical principles. -A so demonstrated by falling budies

ASTRONOMY is that selence which treat of the figures, magnitudes, distances, mo tions, relative positions, appearances, and physical constitutions of the great bodies which compose the visible universe or. In other words, it is that department of science which has for its object to investigate the phenomena of worlds, which exist in countless numbers in the immonsity of space. It is that science which lifts the veil of obscurity, and exhibits the grand scenery of the universe as it existed in ages past, as it now exists, and, if not futerfored with by causes unknown, as it will exist in ages to come. It is that science which shove all others, is calculated to give us the most profound, sublime and exalted views, of the power, wisdom and goodness of that Being who formed those magnificent systems from the eternal elements, and devised laws, calculated to maintain their stability through all their complicated and infinite variety of movements, for indefinite ages to come.

This is a science which has engaged the attention of individuals, nations, and generations from the earliest period of man; for what rational being can look upward into the blue vault of heaven, and behold

stant tendency to fall perpendicularly to the horizon a little to the we this surface. We have never seen any ex- behind which they will remain the earth itself an infinitely extended plane

without boundaries in any direction, ex-cept its apper surface. We will now suppose that an exploring company should be selected and fitted out to explore the earth in an eastern direction. When they had fravelled due east between seventeen and sighteen thousand miles al-termately over fand and sea, what would be their astonishment at finding themseives just entering the valley of the Great Salt Lake on the west? They would scarcely believe the evidences of their senses. The only just conclusion they could form in re-

only just conclusion they could form in re- brium, and cannot produce motion. ation to so strange a phenomenon would be If the forces of any two opposite hemis that the earth was round, at least from east to pheres of the earth, taken in any position, west. But a question would immediately, arise among them, whether the earth was be equal, as they are in opposite direction they cannot produce motion; therefore th earth, under such forces, existing within round or convex in all directions like a ball, or whether it might not be of a cylindrical form, like a saw-log, or like a steam engine boiler, used on our railroads. They might direction more than in another. Hence, unless it were influenced by bodies externsuppose it to be convex from east to west, al to itself, it would remain at perfect rest, but straight or flat from north to south. This question could be decided in the fol-lowing manner: If we stand on the deck The earth, under these conditions would

of a ship at ses, when out of sight of i'nd, we should be able to see hundreds of miles in all directions if the surface of the ocean in all directions if the surface of the ocean were a level plain; indeed, were our view not obstructed by mists, fogs, or clouds, we should be able to see hundreds of miles; large continents and islands thousands of miles in the distance would be rendered visible. Observation shows this not to be the grave but we find in every direction from our station, s clear and well defined boundary, only a few miles in the distance. As ables passover this boundary, we grad-ally lose sight of them, the hull disappear-ng first, they the lower sails and finally the op-s-ils seem to sink out of sight as they recede in the distance. After they have thus disappeared, the most powerful tele-scopes will not render them visible, but by ascending to the must head, they seem gradually to rise again above the horizon by habit, which we must entirely divest above the northern. and are distinctly visible to the naked are, which clearly demonstrates that it is not owing to any incapacity of the organs of vision to see further, but that the convexity

of the water intervenes between the eye and the object and thus hidgs it from our view. Since the same effects are observed from every part of the cesan; and in every pos-sible direction, north and south as well as sast and west, it follows, that the same convexity must prevail on every side; and therefore, that the earth cannot be of a cylindrical form, but must be round like a globe.

Another demonstrative proof that the earth is a globe, is given by considering the form of the earth's absuow when it falls upon the surface of the moon during a lunar eclipse. When the moon passes directly behind the earth so as to form a straight line with the earth and sun, the shallow of the earth, extending in a direcion opposite to the sun, will fail upon the Our antipodes, or the inhabitants of Des-olation and Amsterdam islands, situated The stars that now page of the stars the stars that now page of the stars the stars that now page of the stars the stars that now page of the stars the star moon, and will at all times appear circular upon the moon's disc, If the earth were insidered stationary, and if a lunar eclipse should always happen at the same hour of in the Indian Ocean, are on the opposite the night, this would be considered unsat-infactory evidence of the globular figures for there are many bodies, besides a globa which will, in certain positions, cast a cir-cular shadow. A grindstone, a sugar-loaf, or even a log of wood, when held with its side of us; their fost point towards ours; side of us, their neet point towards ours; their senith, or that portion of the sky which is over their heads, is directly un-der our feet; and yet they have ho more tendency to fall towards their sky than we have towards ours; all bodies around them have the same tendency to press towards the surface of the globe there, that they have here the Indian Ocean is no more likely to be poured out into their sky, than the south of the southern hemisphare do to us. All the heavenly bodies which we see set the here the same tendency to press towards the surface of the globe there, that they have here the indian Ocean is no more likely to be poured out into their sky, than circular end facing a light, will form a cirthe surface of the globe there, that they have here the Indian Ocean is no more likely to be poured out into their sky, than the Salt Lake is into ours. Magnets, placed cular shadow in the opposite direction. Now in order to determine the true figure of either of these bodies from its shadow, et different sides alternately face the light, and we shall soon be able to declare its true figure with mathematical certainty. Let different sides of the earth be

point never rise or set to us. In describ-ing their diurnal circles, they come to the meridian twice at equal angular distances from the pole, at which times they are due north of us. They approach the upper meridian from the east, and then gradually

descend in semi-circles and apparently apunless it were influenced by bodies extern-al to itself, it would remain at perfect rest in any part of space where it might be placed. The earth, under these conditions would have no up nor down, relative to the differ-

ent points of space with which it is sur-rounded. Up and down are relative terms, and when applied to the earth, signify /ross and to its centre. It will easily be perceived that the earth could not fall down towards its own centre, so as to alter the perceived in a parent in the series of the position of that centre in space; neither same time and in the same manner as the could it as a whole move from that centre rest. The diurnal circles of the stars seem in any possible direction. Because we see to diminish or become smaller in propor in any possible direction. Because we see to diminish or become smaller in propor-a wooden globe have an upper and an under side relatively to the earth in any given position in which it may be placed, we are apt to transfer the same property to the earth, and suppose it to have an upper and under side in relation to the space and closing it; but this is an illusion, formed

urselves of, in order to form correct ideas | Let any one who wishes to eatisfy him of the earth existing in space without foundations on which to rest. If any one of this audience wars placed alone in space where there was no attr cuve matter, and no other badies existed, he could net and no other budies existed, he could not conceive of either up or down. As he would have no mendency to move in any direction, the terms over, under, above, below, etc., would have no meaning what-ever to him. If he were to take a bushel of apples and further in every pos-sible direction, he never could lose one of the mean of the never could lose one of the mean of the never of the never of the never to have and the every pos-sible direction, he never could lose one of the never of the never of the never of the never to have one to take a bushel of apples and further in every pos-sible direction, he never could lose one of the never of the n of them; for by the power of gravity, each he arrives at the same distance south of one would return to him, having the same the equator that we are north, he will of

one would return to him, having the same velocity as when projected from him. If he were to fire a bullet directly from him, though it would be absent for many hund-reds of years, and pees over many the sands of miles in space, yet, by the force of gravity, it would return again and penetrate his body, having the same velocity as when projected from the mouth of the gun. The direction of the apples, or of the bullet would be up or down as they proceeded from or towards the body that gave them the projection. or the inhabitants of Des-

will rise and remain a few minutes above the horizon, and then set below it. All

under the earth and rise again in the east into the blue vanit of heaven, and behold the sum in its effugent glory; the moon, shining with a silvery brightness, exhibit-ing its ever-varying changes; the stars bespangling the vast concave of a noc

infitted as real, he would have a velocity mes for great for the earth a scone s the der to ge round he earth as scone as the ense the sun's diarran period, compared at of the moon's would be \$400 times the that is the moon's would be all lines shorts' than it should be, according to the Imown math-ematical principles of mechanics. But even the moon's diurnal period, if performed in one day, is about 37% times too quick to balance the cen-tripetal force of the earth's gravitation; and therefore the sun's true period, compared with the moon's true period, would be 27% times 8,000, or more eractly, 218,573 days, which, reduced to years, would be 506 years and 305 days. The in-tensity of gravitation at the earth's surface has been determined by experiment, and Knowing the earth's radius, it is a simple problem in me-chanics to calculate the period which a body must have to reveave around the carth near its surface without failing; this would be 31 minutes and 22 seconds. Now, if gravity is a force which varies by leaving it at this Office.

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seconds. Now, if gravity is a force which varies inversely as the square of the distance, (as it may easily be proved to be) then it may easily be cal-culated how far all bodies must be placed from the centre of the carth, in order to have their periods equal to the diurnal period of the stars; his distance is only 36,600 milles and none of the heavenly hodies must be placed any nearer or further off than this; if so, their periods would be less or greater than one day: and as it is known that none of them are placed at that distance, we know that their apparent diurnal periods are not vevi. This, then, is a demonstration of the diurnal rotation of the earth to all persons who lema.

diurnal rotation of the earth to all persons who are capable of solving these mechanical prob-lems. Another demonstrative evidence that the earth has a diurnal motion may be obtained from the top of a high tower or precipice; if the earth has no ro-tation, it will fall perpendicularly to the surface of the earth ; but if if has a rotation from west to east, it will fall a short distance to the east of the perpendicular line at the feet of the tower. This is occasioned by the unequal velocities of the bottom and top of the tower resulting from the carth's rotation ; for instance, the bottom of a tower or perpendicular precipice one-half of a mile high, situated on the equation, and being nearer the centre of motion than the top, would move slower than the top, which is half a mile further from the axis. The time of failing would be about 13 seconds, during which is half a mile further from the first peves the too of the tower in a readout 2% inches for preference of the bottom and top to be bottom and top precipice would describe an areabout 2% inches for the foot of the perpen-dicular line. The greater the first peves the top, will fail about 2% inches for the foot of the perpen-dicular line. The greater the being of this nature have been performed with the greatest accuracy, and the results have proved, beyond all controversy, that the cart resulty has a di-urnal rotation from west to cast. This grand fact has also been demonstrated by for the tower or how is have been demonstrated by the define the results have proved, beyond all controversy that the cart resulty has a di-urnal rotation from west to cast.

pendulum experiments in different latitudes; but time will not permit, in this lecture, to examine the curious and most remarkable phenomena re-sulting from this species of evidence.



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Sherman presented a communication from the National Labor Union Con-**NEW ADVERTISEMENTS** vention, colored, lately in session in Washington, for the passage of what is known as Senator Summer's bill, supplementary to the civil rights act now pending before the judiciary committee, the objectef which is to apply a remedy



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turnal sky, twinkling, as it were, with loy. and lighting up the dark unfathomable sbym of an unknown immensity; what rational being, we again enquire, can behold this august and sublime scenery without feeling the most intense desire to unlock the heav maly archives, and read, from the great book of creation, the grand science of the origin of worlds, the laws by which they are governed, and their sternal destinies? Klugs upon their thrones, and the humble shepherd in the field, have alke participated in this sublime emotion. The post enraptured with the magnificant glories of the heavens, has poured forth his sublimest effusions in the most melting harmonious strains of glowing eloquence. While the man of God, with loftier views and higher aspirations, has soared aloft from nature up to nature's Author, and, overpowered with the infinite greatness and respieadent glories which surround him on every side, he bows in humble adoration before the Great Elternal, and exclaims, "What is man that thou art mindful of him, or the son of man that thon visitast him."

teenth century, broke through, in a meas-ure, the superstition and ignorance of his predecessors, by transfering the centre of the planetary system from the earth to the sun, and thus forming the beliecentris the-ory to account for the phenomena observed, dis-covered the alliptical theory of the planets, and overturned the favorite hypothesis of circular orbits, which had, up to that time, been universally received. He also discov-ered the law of motion in elliptical orbits, and unfolded the relation existing between their periodic times and distances.

These grand improvements in the sci-ence of astronomy laid the foundation for the great discoveries of the immortal New-ton, who revealed to the astoniahed naons that great law of universal gravita-on, or the law of tores, by which the reat bodies of the universe are bound toother in their respective orbits. During he last century and a half, the Newtonian system has been studied with unwearied ligence, and astronomy has been rescued rom the errors and absurdities of the dark ges, and established upon the firm foun-tation of mathematical certainty, which can

never be overthrown. It is the Newtonian system which we shall endeavor to illustrate in the present series of lectures, and to which we earnestly solicit your undivided attention. We shall

other figure is capable of producing a circular shadow when its different sides are exposed to the sun in a variety of positions. For instance, if a lunar collipse were to happen at six o'clock in the evening about the first of January, and another should wish to make any progress in astronomy, must familiarise their minds with the happen at some future period, about the same time of year, but at twelve o'clock at right conception of up and down, ascendnight; then the side of the earth presented to the sun during the former of these eclipses would be stright angles to the side presented during the ister; yet in both instances its shadow upon the mood are terms which relate only to the centre of forces, and that they change their direction would be circular. This, then, is a conclusive demonstration of the globular figure

of the earth independent of its diarnal and annual revolution. But if the diurnal rotation of the earth be admitted, then we shall have almost every side of the earth successively turned towards the sun; and cilpses happening within a comparatively short period of time, under all these conat rest or in motion

By such observations as these, the earth s proved to be of a globular form by the nost incontrovertible evidence.

ceive nothing in the constitution of the earth which disqualifies it for motion.. Its When we come to speak of the diarnal rotation of the earth upon its axis, we shall again rafer to its figure, and show that there is a alight deviation from the globular shape and magnitude can be no obstacle; the qualities and proportions of its various elements and compounds do not render it form, arising from causes connected with that motion. But for all practical purposimmovable the stenosphere by which it is es, wherein great nicety or precision is not required, the errors which arise by assumog the earth to be a perfect sphere, will be spaces surrounding the earth on all sides a half. The inhabitants upon the surfaces

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This subfirm science is said to have been for the service of the

measure the whole circumference of the earth with a chain, or line, or any other accurate measure, would be altogether in-precticable on account of mountains, oceans, swamps, and other opposing obsta-cies. But if we can accurately measure a portion of this circamference, for instance, one degree of latitude, and find how many miles it contains, all that would be neces-sary would be to multiply the number of miles in one degree by 300, which is the number of degrees in the whole dreamfer-ence of the surface, and the product would be

As a man passing down a river, carried by a swiftsmooth current, would be obliged by a swiftsmo by a swift smooth current, would be obliged to refer to the shore to determine whether he were in motion, so a man who would satisfy himself whether the earth be in motion, must refer to objects in the heavens, upconnected with the earth; if the heavens, upconnected with the earth; if the heavens, bodies constantly shift their position in re-gard to the earth, he is forced to conclude that either the heavenly bodies themselves are in real wotion or else if they are station. once of the earth, and the product would be the number of miles around the earth. Now a degree may be measured as follows: let the latitude of this tabernacle be accurately taken by some estronomical instru-ment of great perfection, then measure due.

ment of great perfection, then measure due south, until you reach the southern ex-tremity of the valley, being careful to select a measuring rod whose length has been determined with the greatest possi-ble scenracy. When this measuring rod is used, it must, each time, be carefully ad-justed to a perfect level, and its tempera-ture noted; for the length of any metallic bar varies with its temperature. When the measurement is finished, at the south-

ora extremity, erect your astronomical instrument, and by a series of observations of the heavenly bodies, determine the latitude of this second station, which we will saw is one-half of a degree south of the first station, and the distance measured we will also as the distance measured

wards upon the surface of the globe of the earth. All directions towards the centre of brought to his view. The precise time in an iron globe, are down to the magnet; all which every star performs its apparent directions from its centre are up. All who diurnal revolution around the earth is 23 hours, 56 minutes, and four seconds. This is called a sidereal day, and is 3 minutes and 56 seconds shorter than a mean solar ing and descending, above, below, and such day. The cause of this difference we shall like terms, always remembering that they bereafter explain.

Our earth seems to be at rest, while the starry sphere, enclosing us, seems to rotate as often as we change the position of objects in relation to that centre. We have now demonstrated that the earth is of a globular form, and of a determinate magnitude; that it exists without any exterthe same time. These phenomena, there-fore, when considered alone, do not deter-mine, whether it is dur globe or the starry nal supports or foundations, surrounded on all sides by space; and that bodies can exist on all sides of its surface without any danger of falling away from it. Next we sphere that is in rotation. One or the other shall proceed to investigate the grand and it must be, important question, whether the earth be The gran

The grand object which the Almighty had in view in producing these diarnal move-ments, was the alternate succession of day It is evident that we can never make any considerable advance in astronomy, until this question is determined. We perand night. This important end could be obtained by a simple rotation of the earth upon its axis, instead of causing the son and innumerable other worlds to revolve around us. The planet jupiter, though fourteen hundred times larger than the earth, moves around its own axis in a little less than ten hours. Saturn is nearly a thousand times larger than the earth, yet it enveloped, and the internal forces within, thousand times larger than the earth, yet it do not affect its mobility in the least. If the turns on its own axis once in ten hours and

NEW YORK.

ALBANY, 20.4 The examination of Filkins was continued; and the testimony was strong against him. The young man who sold the pistol identi-fied him as the purchaser. Filkins maintains a calm, and apparently, un-embarrased demeaner.

H. VAN DYRE

and night. No wisdom would be displayed in such an arrangement of things. When we stand before a fire and wish to warm different sides of ourselves, how shall we the most easily accomplish if? It can be done in two ways: by attaching a piece of machinery to the chimney and moving the firs place, fire and all, around us, we may be equally and alternately warmed on dif-ferent sides: but how much more simple would it be to merely turn round our-selves, and let the chimney and fire-place remain stationary? The rotation of the earth, therefore, in order to experience the benefits of the hest and light of the sum on its different sides, is infinitely more simple, and displays infinitely more wisdom than to suppose a revolution of that wast, hody around us.

heavens that are really in motion. By referring to the marry heavens above us, we see them apparently in motion from east to west. Let any one who wishes to behold this magnificent scenery and be-come acquainted with the apparent motions of the stars, station himself on some clear evening in a convenient position facing the south; let him fix his attention upon those HESER SMITH.



