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TRUTH AND LIBERTY.

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melt 305,364,000 cubical miles of solid ice every second. In other words, if all the waters of our lakes and oceans were frozen into solid ice and thrown into the sun, it would be melted in one second; and if the same amount of ice should be thrown into the sun every second, the amount of heat which is radiated into the surrounding spaces would be sufficient to liquify these masses without in the least diminishing his temperature.

If the total amount of heat, radiated from the sun in one second, be multiplied by the number of seconds in 6,000 years, the product will be the total amount of heat which has escaped from that luminous body since it first shone upon man. But how is this vast amount of heat supplied? This is a question not easily answered. If it existed in a latent state in the materials of the sun, there must have been very great chemical changes, to have set such an immense quantity free. It is evident, also, if heat consists of particles, radiated into the surrounding spaces, that the heat of the sun must be sensibly diminished, or in other words, that the sun must have cooled in proportion to the amount of heat escaped.

But the theory of the radiation of particles of heat and light, is now generally abandoned. The theory which is at present almost universally received, is that light and radiant heat consist of undulations or waves in an ethereal medium, extending through space; and that heat in matter consists of the vibrations of material atoms. There is an overwhelming amount of evidence constantly accumulating to establish this theory. According to this view, the chemical actions among the solar materials keep their atoms in the most intense agitation. This motion is propagated through the ethereal ocean to distant spaces and worlds. As motion, and not particles, is transmitted, the sun cannot suffer any diminutions of substance by radiation: neither can there be any decrease of intensity so long as the chemical operations remain constant. And these may be so adjusted as to work out an endless chain of decompositions and recompositions, maintaining a stable equilibrium of intensity, as endurable as the stability of the planetary orbits under the influence of gravitation.

How immense must be the solar energies to maintain, upon so grand a scale, a uniformity of heat and light, for thousands of years! Yet the solar orb is but one, among myriads of other suns, which bespangle the stellar universe. It has been very recently demonstrated that *heat*, as well as light, is emitted from those immensely distant luminaries. Up to 1869 this was only a probability: but during that year Mr. William Huggins, F. R. S., invented and constructed from bars of bismuth and antimony a Thermo-electric pile, in connection with a delicately poised magnetic needle. This instrument, as a heat measurer, far transcends all other inventions heretofore made. By the deviations of the needle on a finely graduated circle, an almost infinitessimal quantity of heat can be measured. This instrument was attached to a telescope, and pointed to a great number of stars, each of which instantly affected the needle, and the amount of stellar heat was measured. These stars in some instances were so distant as to require over a quarter of a century for their rays to traverse the immense journey, though traveling 192,000 miles every second. Who could have supposed that after a twenty-six years' journey, these rays could have produced any mechanical effect! But such are the wonders of modern discovery!

The stars, therefore, are suns, self-luminous, and radiating heat the same as our sun. Independent of the solar heat the celestial regions and planetary worlds, by the combined influence of millions of suns, shining from almost every point of space, must be maintained at a temperature of approximate measurement. Pouillet, a learned Frenchman, attempted a few years ago to determine approximately the quantity of stellar heat which annually falls on the earth, which he represents to be sufficient to melt a shell of ice enveloping the globe eighty-six feet in thickness. While the annual heat of the sun alone is sufficient to melt such a shell one hundred and three feet thick. From these results it will be perceived that the annual solar heat, received on the earth, exceeds the stellar heat by a quantity sufficient to melt such a shell seventeen feet in thickness.

If these results can be depended upon, the amount of heat from the stars dispersed through our system is equivalent to another sun of the same size and temperature of ours, and situated about 100,000,000 miles distant. By these two great sources of heat, combined with the heat of planetary origin, our system derives its temperature.

When the wonderful heat detector of Huggins shall have been applied to all the stars within the sphere of fifty or a hundred years' journey of light, and the measured temperature of each for any given time, say one second, shall have been accurately noted, the sum of all these temperatures on a given surface, called the face of the Thermo-electric pile, multiplied into the area of the earth's surface exposed to the stellar rays, will give the aggregate temperature received from the stellar regions in the same time, or in one second; this product multiplied by the number of seconds in a year, will give the annual amount of stellar heat, arriving at our globe. The results of such accurate measurements will undoubtedly differ from Pouillet's computations, founded on more imperfect data.

During total eclipses of the Sun, by the interposition of the dark body of the moon, observers have noticed bright jets of flame thrown out from the sun extending tens of thousands of miles in height above his luminous disc. They have also seen a brightish ring or corona of light, encircling the disc, having somewhat the appearance of twilight, and gradually fading away as the distance from the disc increased. This is evidence of another atmosphere, still more rarified, enveloping the spherical luminous stratum beneath. This external envelope appears to be imperfectly transparent, absorbing and decreasing the intensity of the solar rays in proportion to the obliquity of their passage through it. This will be clearly seen by the diminution of brightness near the edge of the solar disc. The luminous rays in such localities, have a much greater distance to pass over in traversing obliquely the exterior gaseous envelope, than when transmitted in a radial direction perpendicular from the sun's surface.

The jets or mountains of flame are often elevated more than 40,000 miles above the general level of the luminous disc; the faintness of their illumination proves them to be excessively rarified, cloudy, incandescent matter, in a gaseous form.

These immense mountains of gas are sometimes formed or elevated in a few minutes, and disappear with the same rapidity. They often alter their location, or travel upon the solar disc, with a velocity of planetary motion.

Of what materials does our great central orb consist? Are the solar elements of the same kind as our terrestrial elements? These questions are definitely answered by the spectroscope. This is an instrument of late invention and of most astonishing powers, connecting chemistry optics, and astronomy as branches of one grand science, each rendering important aid to the thers. An image of light, after passing through, a prism, in a dark room and dispersed upon a white screen or canvass, is called a *spectrum*. When viewed through a telescope, the spectrum is noticed to contain, not only the colored rays of light, but also narrow, well-defined, black lines, crossing the spectrum at right angles to its length. The positions of these lines vary in the spectrum, according to the nature of the element which, burning in a flame, emits the light. Each element, thus burning or glowing, has its own peculiar dark lines, so situated in the spectrum, as to distinguish it from all others. By this means, each element is identified by its spectrum: hence, the spectroscope is an element detector infinitely superior to any tests before known.

The spectroscope, combined with the telescope, has been pointed to our great central orb, and the elements of its luminous atmosphere detected. And thus sixteen of the solar elements are proved to be of the same kind as those existing on the earth; namely, "sodium, calcium, barium, magnesium, iron, chromium, nickel, copper, zinc, strontium, cadmium, cobalt, hydrogen, manganese, aluminum, titanium."

The white-hot matter in the atmosphere of the star Aldebaran also proclaims, through the spectroscope, its constitution, consisting of sodium, magnesium, hydrogen, bismuth, tellurium, antimony and mercury. The star "Sirius contains sodium, magnesium, iron and hydrogen. About sixty other stars have been examined, and all seem to have some chemical element known on earth."

Another grand question may arise in the minds of this audience, namely: Is the sun moving in space, carrying with him his attendant planets? The solution of this question has been eagerly sought after by many eminent astronomers of this century. But their investigations have been limited to the angular movements of the stars, having a proper angular motion, and from the average of these movements, to deduce, as near as the imperfect data will admit, the direction and velocity of the sun. From the observations and computations of many able astronomers, results have been obtained which approximate each other, and point out one region in the celestial vault, towards which our great luminary seems to be progressing.

It is impossible, however, from the angular movement of any particular star, to determine the direction of its actual motion. It may be receding obliquely from us; it may be moving at right angles to our line of vision; it may be moving obliquely towards us: while a star apparently at rest, may be moving with great velocity directly from us, or directly towards us, having no angular velocity.

But when angular velocity fails, the spectroscope steps in to our aid; this wonderful instrument will tell us, whether a star is moving towards us or from us, and with what absolute velocity.

This may be illustrated by sound. If a bell were to be struck every second, while moving away from us at the rate of nearly 1,200 feet per second, its successive beats or soundings would be heard at intervals of two seconds; for every decreased rate of the sounding body the intervals of time between each successive sound would be decreased; but, still, while there was any receding movement, however small, of the sounding body, the intervals between each successive sound would be greater than one second. On the other hand, if the bell were approaching us, beating seconds, the intervals of successive sounds as they fall upon the ear would be less than one second, owing to the constantly diminishing distance. When distinct sounds rapidly follow each other they finally generate into one continuous sound called a tone; this tone will be low or high in proportion to the rapidity of the successive vibrations.

The whistle of a steam car, when at rest, has a certain tone; when in motion from you, the tone or pitch becomes lower in proportion to the increased velocity; on the other hand, when approaching you, its tone becomes higher in proportion to the velocity. This may be better understood, by passengers on two trains approaching each other on a double track railroad, each having a velocity, say, of forty miles per hour. While approaching, the steam whistle will emit a tone very high and shrill; at the moment of passing the tone will have lowered down to the same pitch as when at rest; after passing, the tone still falls below its natural state in proportion to the rate in which the two trains separate asunder.

It is evident, that by carefully experimenting upon the tones accompanying different velocities, we could, from the tones alone, determine the absolute velocity of the approachment or recession of a sounding body.

Light is transmitted by vibrations or undulations in a very similar manner to that of sound. The variations and intensities of color depend upon the rapidity and size of the undulations or vibrations in the ethereal medium. If these undulations or waves be transmitted in space with a slower movement than the natural velocity of light, the spectroscope would immediately detect it, by an alteration of the refrangibility of light in forming the spectrum, and a corresponding change of the dark lines. On the other hand, if the waves be transmitted in space with a velocity exceeding the natural velocity, the changes in the spectrum would be reversed. By these changes, the apparent decreased or increased velocity can be detected. But as light moves with an invariable velocity, all such apparent fluctuations of the luminous waves must arise from an increased or decreased velocity affecting the interval between us and the luminous body. For instance, when the earth is traveling in its orbit directly from a star, at the rate of nineteen miles per second, the phases of the spectroscope reveal the fact. When traveling at the same rate towards a star another set of phases also reveals the phenomenon; when traveling obliquely from or towards a star, proportional phases, indicate the absolute velocity with which we may be receding or approaching.

These curious and most astonishing results will soon reveal wonders in regard to the motions, directions, and velocities of the starry worlds.

It matters not how distant the luminous body, if it is sufficiently distinct to produce a spectral image, the phases exhibited will inform us whether the interval between us is increasing or diminishing, and with what velocity. Having determined these data, if we next observe carefully the angular velocity arising from the proper motion, we can easily calculate its exact direction in space, and consequently its absolute velocity. A few hundred such calculations will soon reveal the velocity and direction of our own system. The spectroscope will inform us of the constellations or clusters from which we are receding, and of the clusters towards which we are moving, by an average of greater fluctuations in its spectral phases, than will occur from stars at or nearly at right angles to our line of motion. The spectroscope, therefore, may be most properly called, not only an *Element Detector* but a *Revelator of Stellar Velocity and Direction.*

Future generations, by taking the advantage of our spectroscopic measurements, in regard to velocity and direction among the starry worlds, and comparing them with their own similar measurements, will have the requisite data for determining the direction and magnitude of their orbits, and the periodic times of their respective revolutions, and, in some cases, the intensity of the forces around which they move. Thus our field of knowledge is rapidly enlarging, grasping within its expansive boundaries, worlds, systems, universes, until the mind is overwhelmed with the grandeur, magnificence, and sublimity of the celestial scenery!

THE more Judge McKean's "opinion" on naturalization is examined the more ridiculous does it appear. Such rulings give the people a proper estimate of the legal acquirements of those sent out to this Territory as Judges. There are but few of our citizens within the confines of Utah, besides thousands outside of its limits, who will fail to read Judge McKean's "opinion," and the comments made upon it, besides making their own comments; and it is easy to imagine what conclusions they will arrive at, respecting it and its author.

Judge McKean rules that any alien who either *believes* or practices polygamy must not be admitted to citizenship, because he, the said Judge, cannot be *satisfied* that said alien has behaved as a man of good moral character, attached to the principles of the Constitution. This ruling is founded on the civil and common law, or on either in the absence any statute of making it a crime. The Judge claims to be honest in thus ruling; but do facts warrant the public in believing that he is? Does an examination of the entire case admit of any other conclusion than that his professions of honesty and fairness are a sham, and that he is prompted by low bigotry and a disposition to persecute in taking the course he has? He says the belief in and practice of polygamy are condemned by the civil and common law; but are these practices the only ones which those laws condemn? If believing or practicing anything that *was* a crime by the civil or common law, disqualifies an alien for citizenship, then how is it with adultery, fornication, seduction, abortion, fœticide, gambling, swindling, larceny, robbery, murder and the whole catalogue of crimes once known both to the common and civil laws, not excluding the old crime of hunting in the king's forest? Would *believing in* or practicing any of these great crimes prove that, under the common and civil laws, an alien would be unworthy to be admitted to the rights of citizenship? If so, why not catechise applicants upon these points? Does not Judge McKean's failure to do so show that his pretensions to morality, in refusing "Mormon" aliens the rights of citizenship, are a transparent sham, and that his assigned reasons are miserable excuses to gloss over his outrageous attempt to exclude men, because of their religious faith, from the rights of citizenship guaranteed by the laws? Is not this the conclusion that every fair-minded man, who understands the circumstances, is forced to? Would a truly just man, one who was acting conscientiously in criticising the moral qualifications of aliens before admitting them to the rights of citizenship, question them on one or two points, and maintain silence on all other points, more especially when these latter are crimes which have statutory law against them? If Judge McKean must "rule," let us by all means have a ruling against these crimes. Have we not a right to demand a ruling from him upon these? Why not have a catechism ruled into existence, and have no one admitted but the truly well-behaved and those whose conduct does not conflict with any of those time-honored laws which our forefathers, perforce, brought along with them to this country.

Now, Judge, be consistent and give us the catechism.

AGRICULTURAL.

To have fresh eggs in frosty weather a large hen-producer says that his secret is to give his hens bones. He says: Give them bones with meat or without meat. Cut up or break the bones as soon as the family has done with them, and instead of throwing them to the dogs, or in the soap-fat keg, give them to your hens, and with the proceeds of the increased number of eggs you can buy at the store a better article of soap than you make, then you have the ashes for your apple-trees and grape-vines. In addition to bones (but they are paramount) on cold mornings we give them hot mashes, with a small quantity of Cayenne pepper stirred through it. Give all the fresh water they want, also plenty of dry dirt to wallow in. Keep them well secured from the cold: have window lights on the sunny side, and my word for it you will be rewarded for your trouble.

A CORRESPONDENT of the American Institute Farmers' Club says, tell every man that keeps a cow to give each a few nubbins of corn twice a day for ten days before calving, and there will be no trouble about her "cleaning." If that rule was strictly adhered to it would not only save a wonderful amount of suffering, but would save the lives of hundreds of valuable cows this coming Spring.

A BEE-KEEPER writes to the same club that he has always found the so-called moth traps the greatest curse a bee-keeper can introduce to his apiary. Moths, he says, certainly do congregate in them, and a very little neglect makes the congregation too large for ordinary apiaries to survive. It is impossible to keep moth-worms from the hive. The moth will lay its eggs upon the alighting-board, and upon the blossoms daily visited by the bees. The eggs stick to the bee and are carried into the very centre of the hive. The only safety and the very best moth-trap is to keep the swarm strong. The weak swarm, or one without a queen, is the one that falls an easy prey to the moth. The moveable-comb hive is admirably adapted to keep a swarm strong.

THE virtues of the carrot are not sufficiently known whether for contributing to the strength and endurance of the sound horse, or the rapid recovery of the sick one. To the healthy they should be sliced in chaff. Half a bushel will be a fair daily allowance. There is little provender of which the horse is fonder. The following account of the value of the carrot is not exaggerated: "This root is held in much esteem. There is none better nor perhaps so good. When first given it is slightly diuretic and laxative, but, as the horse becomes accustomed to it, these effects cease to be produced. They improve the state of the skin. They form a good substitute for grass, and an excellent alterative for horses out of condition. To sick and idle horses they render grain unnecessary. They are beneficial in all chronic diseases connected with breathing, and have a marked influence upon chronic cough and broken wind. They are serviceable in diseases of the skin, and, in combination with oats, they restore a worn horse sooner than oats alone."

THE potato is an exhaustive crop, much more so than is generally supposed. It is not a good practice to raise more than two crops of potatoes on the same piece of ground in succession, and then not again for several seasons, although new land does not show the signs of exhaustion as quickly as land which has been cultivated.

THOSE persons who take pleasure in comparing the condition of different countries may be interested by the following statement of the number of farms throughout the United States, taken from the returns of the late census:

Beginning with the smallest, there are 52,642 farms of three acres and under ten acres; 157,810 of ten acres and under twenty acres; 612,245 of twenty acres and under fifty acres; 609,668 of fifty acres and under one hundred acres; 486,249 of one hundred acres and under five hundred acres; 20,289 of five hundred acres and under one thousand acres; and 5,348 of one thousand acres and upward. The total number of farms is 1,942,241.

DIED.

At his residence in Paragoonah, Feb. 16, 1871, JOHN PROTHERO, born in Breconshire, South Wales, May 14th, 1808.