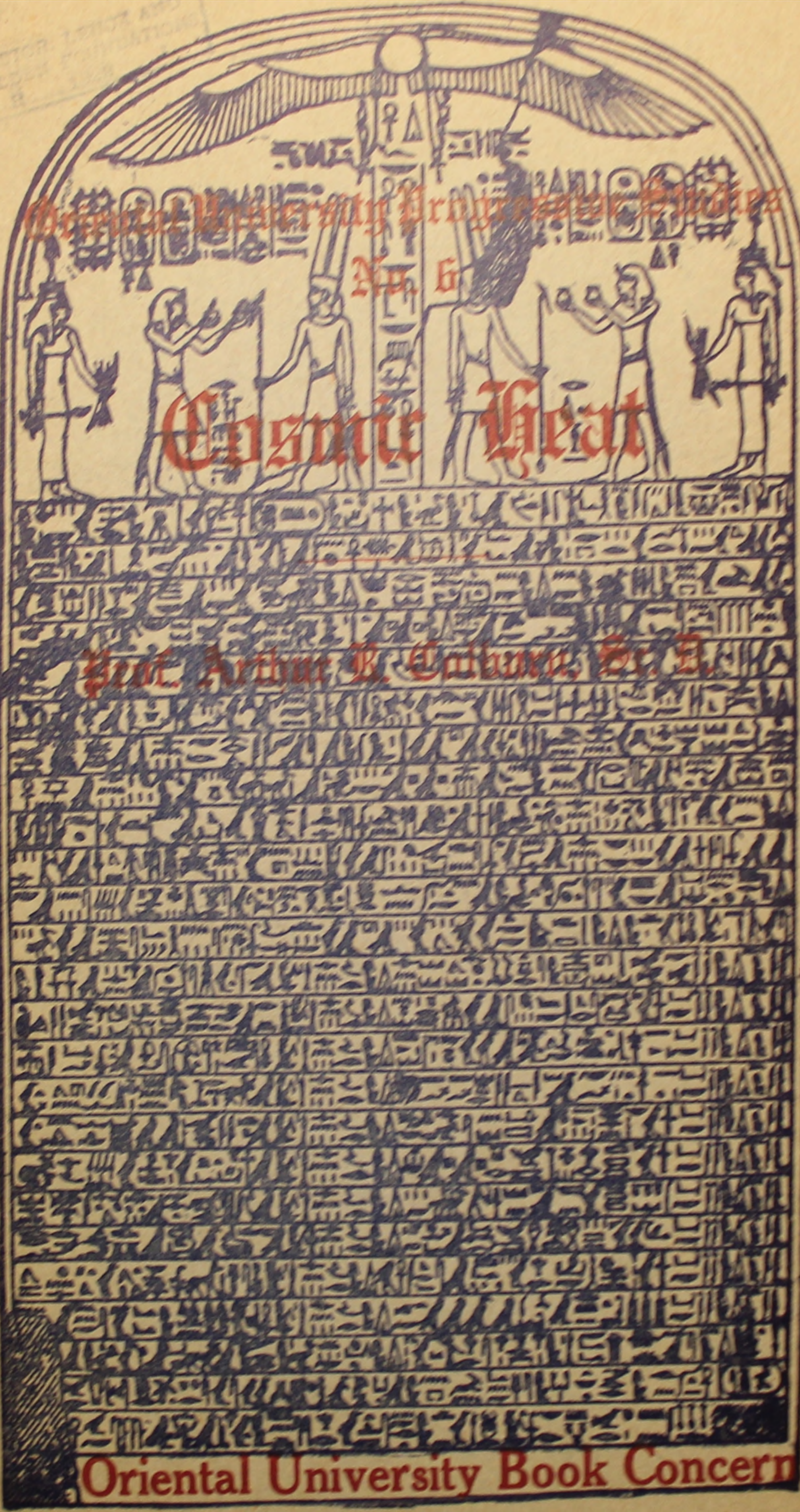

Oriental University Progressive Studies

No. 6

Cosmic Heat

Prof. Arthur R. Colburn, Sc. D.

Oriental University Book Concern

WASHINGTON, D. C.

ORIENTAL UNIVERSITY PROGRESSIVE STUDIES NO. 6

Cosmic Ural

By

PROF. ARTHUR B. COLBURN, Sc. D.

With Notes By

PROF. MORRIS LIFSHOCK, Ph. D.

Both of the Faculty of the Oriental University

A THESIS.

Price, $5.

ORIENTAL UNIVERSITY BOOK CONCERN

1702 Oregon Avenue, Washington, D. C., U. S. A.

COSMIC HEAT

Heat is a form of energy which produces a well known sensation to the nerves, varying according to its degree, and it is capable of causing bodies to expand, and of causing or preventing chemical action, and of changing the temperature of bodies. It is capable of a very great range of variation, measured in degrees; and within certain degrees it is necessary to life in the physical or material plane. It is essentially an energy of the physical plane of creation. Heat is not a force which affects the mind, as distinct from a body-sensation; it is not an element present in dreams though I have never seen this fact commented upon. Thus far considered, it would be natural to consider heat as an energy or force pertaining to the physical and not the ethereal realm. In this sense, the purely ethereal realm is that portion of the universe outside the atmosphere of heavenly bodies, supposedly filled with the ether of space.

The ether of space about which we know so little, may well be a chief object of the most profound contemplation. One of the most startling and impressive ideas, supremely vast in its scope, is that contained in a communication purporting to come from the spirit of Johann Kepler, the great astronomer, received in my presence and recorded by me stenographically, referring to that which fills space. It is this, "It has become the wonder of wonders to me—more wonderful than stars and comets, because it is so light and phantasmagorical that it stands not in the way of anything, nor can anything keep its place without it."

(Received on the night of Wednesday, May, 8, 1910, when the Earth was to pass through the tail of Halley's Comet; published May 19, 1910, in the Evening Star, of Washington, D. C.)

This ether of space is supposedly universal, occupying space also occupied by material substance, as well as the space not thus occupied; is imponderable, and incompressible; it is not matter in the sense that it is included in the physical plane of creation; but no doubt it is matter in the spiritual realm. It is the indispensable medium for transmission of those forces or vibrations which are of too high an order or frequency to affect matter in the physical plane. The forces transmitted by ether are of a class which are practically instantaneous, being little affected by vast distances.

It is a popular idea that light and heat are transmitted to this Earth

from the Sun by this ether. That the phenomena of light and heat as well as other forces have their origin, in some manner, in the Sun, so far as we are directly concerned, is beyond question; but that light and heat travel to us from the Sun, as such, is decidedly open to question. We are familiar with the fact that a certain force or vibration, for example, sound, may have a wide variance of vibration, and yet all degrees of its vibration, all tones, and high and low pitch, travel at practically the same rate of speed.

We also observe, in the physical plane, that no two forces, essentially different, have the same rate of travel. The fact that we perceive heat and light by means of different sense organs, while not proof that they are different forces entirely, yet tend toward such proof. We observe that these forces are very differently transmitted by different media. We see also that light travels easily through a degree of vacuum which is practically impervious to heat. The well-known and now common thermos bottle, which has about a sixteenth of an inch of vacuum between the inner container and the outer or protective shell, insulates very thoroughly the substance inside from loss or acquisition of heat, which probably is transmitted mostly at the neck or opening, where the inner and outer shells are joined. It is well known, also, that in ascending the earth's atmosphere, there is no loss of light, but there is a great loss of heat, the theory obtaining that outside the atmosphere the ether of space is at a temperature of absolute cold. This last difference more than any other, indicates that heat is entirely a vibration or energy residing in or transmitted by physical substance or matter. If heat will not pass through a minute space of imperfect vacuum, as in a thermos bottle, how, then, can the enormous heat we get from the Sun reach us through ninety-three million miles of perfect vacuum? The natural inference is that it does not travel as heat, but is transformed from some other energy after reaching the dense and solid matter of this Earth, affecting but little the air through which it passes.

Familiar examples are the hot-bed for promoting the growth of plants, and the quick melting of ice after skaters have shaved the surface into a snow-like state, while clear ice near by remains frozen hard, at the same time.

Yet the scientists commonly speak of the heat radiating from the surface of the Sun, through space, to other bodies. The amount of heat said to be radiated from the surface of the Sun, in all directions, has been calculated to be equal to the heat from the burning of six tons of coal per square yard per hour. There is no doubt that heat radiates in this manner, but it is entirely questionable if any of it goes beyond the atmosphere, into the ether-space. To do this, it would plainly require transformation, from a force operating on material substance, to a force of such intensely high-frequency vibration, and of such a type of vibration as would operate upon the ether.

It is understood that the ether waves are not like our sound waves, namely, condensational-rarefactional waves, moving back and forth,

but are transverse to the line of travel of the radio-force. The Hertzian waves are of this transverse type, traveling upon the ether, although of comparatively low frequency; out of these grew wireless telegraphy.

Furthermore, it is not reasonable to suppose that our experience on this planet, of approaching intense cold as we reach higher altitudes, is not also true concerning the Sun, though in different degree; but as the Sun's atmosphere extends to immense distances as shown by the phenomena of its corona, it may be that the heat becomes nil at the limit of that atmosphere.

The question, therefore, remains, what is the immediate source or cause of heat at the Earth's surface, and its internal heat?

From sunlight we get the most heat at the spot where the rays of ether-transmitted energy are arrested, as where light strikes upon solid substances. This phenomenon is so well known as not to need elaboration, but what force it is that is thus transformed into heat-energy is not clear. This heat is generally in proportion to light, and may be transformed from light; and it may even be that both light and heat are in this manner transformed from some invisible energy, which is capable of traveling through space, which is absolutely cold and dark, and is transformed into light, heat, and perhaps many other life-giving, life-sustaining energies at the point of arrival and transformation. The energy thus received is evidently proportionate to the mutual gravitation between the Sun and the planet or other heavenly body.

There is a marked difference, however, between gravitation and the radio-energy of heat and light. Gravitation is a mutual force between two bodies, determined by their relative mass and distance, and is not known to radiate forth in all directions. Gravitation is the same, in light and in darkness, and does not affect life-growth, as do light and heat. If heat is broken-down or transformed light-energy, then it would be a reasonable deduction that a heavenly body would be the more luminous, by reflected light, if it have no atmosphere to absorb heat, or take part in its production, for light would be diminished by a transformation of a part of itself into heat or other energy. The Moon, therefore, ought to be a better night-lamp for us than if it had an atmosphere.

But the chief question of this thesis remains, namely, the cause and source of the internal heat of the Earth.

This internal heat is plainly not produced in the same manner as the surface heat, namely, by the arrest of radio-energy transmitted through the ether of absolute cold. This internal heat increases, so far as we have indications, as the Earth's central region is approached. It is physically impossible for this heat to be caused in any large degree by chemical action or combustion, for were it so, drafts from the outer air would have to be supplied to the lowest points, near the Earth's center, and chimneys or vents would have to exist to carry off the products of combustion, as with ordinary fires; and, also, the sub-

stances thus going through chemical action would become chemically satisfied and cease such action, just as with us the fuel would eventually give out, and combustion cease. If the carbonic acid gas and other products of combustion from such internal fires,—if there were such fires and combustion,—were spreading into our atmosphere, it would soon render life in all forms impossible. The air would be exhausted of its life-giving powers, and smoke and gases would be our atmosphere—smoke and darkness. But this is conspicuously not the case. The atmosphere is clear, except as to some amount of water vapor; carbonic acid gas forms a very low percentage of the air; the air is practically of the same constituency in all parts of the world. Volcanoes, the nearest thing to a chimney from the Earth's interior, give forth only such products of combustion as indicate the combustible matter from the Earth's surface which entered to the heat-region through cracks in the Earth's crust, which cracks or fissures generally admit salt water, and substances which produce ashes of one kind or another. The great mass of matter ejected from volcanoes is of a non-combustible and fire-resisting nature.

Then whence this enormous heat, which melts the most refractory substances known? Why is this heat produced in the central region of the globe, and not in its crust? At the surface is the air which could supply combustion, but no such combustion occurs.

The theory is here advanced, that the internal heat of a planet is due to the gravitation or attraction of the Sun and other bodies in combination with the rotation of such planet on its own axis.

At the center of a planet its own gravitation or internal attraction of its mass is nullified—the attraction being in all directions, evenly. Theoretically, if the interior were hollow, a ball, in the exact center of gravity, would remain there in suspension—*Provided* there were no other outside attraction from some other heavenly body. There being, however, such attraction, as, for the chief example, the Sun,—such ball would then be attracted toward the Sun until stopped by the Earth's crust forming the boundary of the supposed hollow center, or until the Earth's gravitation brought such ball to a standstill. There being no such hollow, the solid interior mass of the Earth, attracted by the full power of the Sun, tends to move toward the Sun, causing immense pressure against the Earth's crust. The Earth's rotation then causes this interior mass to tend to roll, always toward the Sun, within the crust or portion so remote from the center as to be held in place firmly by the Earth's own internal gravitation. This tendency to roll produces a vast amount of friction, *and this friction is the cause of this internal heat.* The molten mass in the center no doubt actually churns by reason of this immense attractive force.

Not only does the Sun exert great attraction, but all other heavenly bodies of sufficient size and density do the same in proportion of mass and distance. Applying this theory to the Sun, itself, we see that it is

continually being churned, internally, at least, by all the planets of the Solar System. Their attraction for the Sun equals the Sun's attraction for them. It has always been a source of wonder, how the Sun's heat has always been maintained, but this theory makes it simple, indeed. *The production of heat, therefore, in a rotating heavenly body, or a body about which other bodies revolve is continuous.* The old theory of science, that such internal heat is due to original causes, of chemical action, combustion, and the friction of original condensation of mass, when the planet is forming from a nebulous attenuation, is, therefore, seen to be untenable. * We can now see that the production of heat is as continuous as the rotation and other motion of heavenly bodies.

Applying this theory to our Moon, what do we find? We know that the Moon always presents the same side or face to the Earth, due to the fact that its rotation upon its axis is synchronous with its revolution round the Earth. The attraction of the nearby Earth for the Moon is manifestly far greater than the attraction of the distant Sun for the Moon—otherwise we would lose our Moon. This predominant attraction by the Earth for the Moon, not only does not churn the interior of the Moon, but prevents such cause of internal friction, and consequent heat, to a very great degree. But some degree of heat is necessarily produced, as long as heavenly bodies attract one another, and are in motion of any kind. The coldness of the Moon, therefore, is in harmony with this theory here advanced. *E converso,* were the Moon to rotate otherwise, it would generate internal heat, and if such rotation were rapid, the Moon might volatilize, and be practically lost to us. The interesting query thus arises—Do the Moons of other planets rotate as ours does, presenting always the same, or practically the same side to their planets? Does this theory throw any light upon the unsolved problem of the cause of Saturn's rings? I may be bold enough to suggest that such rings were formed by volatilized moons.

The continuity of the source of Cosmic Heat, as here revealed is in interesting harmony, also, with St. Paul's statement, repudiated by the old theory of original heat, that in the latter days of the human race, the Earth would be destroyed with fervent heat. The old theory of science, that radiation of original heat would, in the course of time, bring the Earth's heat to absolute cold, caused many scientists to consider St. Paul's statement to be inherently impossible; but we now see that this is not so,—that his prediction is entirely possible from the standpoint of science.

As this internal heat of rotating planets bears a direct relation to mass and distance, as does gravitation, one ought to be as calculable as the other,—rapidity of rotation being a factor. The mass of the

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*The Nebular Hypothesis is only an inference, not provable. It was noticed that heat was always radiating from the interior of the Earth, and not surmising a continuing cause for that heat, it was assumed that the Earth was cooling. The theory that such heat is kept up by cooling, is self-refuting.

Earth is calculated at six sextillion tons, the greater portion of which, responding to the Sun's attraction, takes part in the tendency to churn and produce heat.

The application of the present theory to the Moon lends support to the opinion that the so-called craters on the Moon are not true or volcanic craters unless formed during the supposed period of that satellite's formation: for the globular form of heavenly bodies suggest heat, and more or less liquefaction during the formation, or condensation from nebulous states. . .

As heat and light are closely akin, and the light emanating from the Sun is attributed, in whole or in part, to its heat, it is noteworthy that colder heavenly bodies give forth only reflected light. Our Moon, when eclipsed by the Earth, is dark, and so are four of Jupiter's moons, when eclipsed by that planet. From this fact it may be taken as true, until otherwise shown, that these moons of Jupiter are, like our own, cold bodies, and therefore rotate synchronously with their revolution about their planet.

The hypothesis may be formed that distant stars of great magnitude do, by their luster, indicate that they are the centers of great systems of revolving planets, whose motion and attraction give rise to the heat and consequently the light by which we see them.

It seems highly probable that if the universe were dotted with motionless bodies, it would be without light—and, therefore, without the antecedent heat, and, consequently, without physical life or even chemical action of any sort.

The basis of all created light and life is motion—from the vibration of causative thought, to the motion of suns.

ADDENDA.

An interesting comparison of the relative sizes of the Earth, Moon and Sun may be stated as follows: Imagine the Sun to be a hollow sphere, and the Earth a small globe in its center; then, nearly thirty diameters of the Earth away, the Moon, revolving around the Earth at its mean distance of 238,000 miles; then, still farther away, almost an equal distance, 194,000 miles, would be the periphery of the globe representing the Sun.

Some weeks after writing the foregoing thesis on Cosmic Heat, I discovered what I had not known before, by reading an article entitled, "Solar System," in Chamber's Encyclopedia, that Sir William Herschel discovered that the then known moons of Jupiter so revolved round that planet and rotated on their axes that they always presented the same side to their primary. This was announced as a fact, but he had no reason for that condition, which reason is advanced in the foregoing Thesis. Thus, these independent discoveries tally and harmonize exactly.

SOME CONVENIENT DATA.

Moon—A transverse slice through the center of the Moon, laid upon the United States, would cover the Eastern section, having about the same diameter as our distance between Canada and the Gulf of Mexico.

SOLAR SYSTEM.

Name	Diameter in Miles	Distance from Sun in Millions of Miles	Period of Revolution in Days	Size compared with the Earth
Mercury	2,976	36	88	3x Moon
Venus	7,620	67	225	
Earth	7,926	93	365¼	1
Mars	4,316	142	687	1/7
Jupiter	86,250	484	4,332	1,400
Saturn	72,772	887	10,759	735
Uranus	32,879	1,785	30,586	96
Neptune	29,827	2,796	60,187 (165 yrs.)	84
Sun	864,000	.....	.....	1,405,000
Moon	2,160	.....	.....	1/49

THE PRESENT RECEIVED SCIENTIFIC OPINION.

On February 5th, 1921, I wrote to the Naval Observatory at Washington, D. C., for the present received scientific opinion of the cause of heat in the heavenly bodies, and received the following reply:

(COPY)
NAVY DEPARTMENT
U. S. NAVAL OBSERVATORY
Washington, D. C.

In reply refer to No.
42288
AN:SCL.

February 12, 1921. J. A. H.

Sir:

In reply to your letter, of February 5, you are informed as follows.

The internal heat of the Sun, as also of the Earth and other planets, is still generally believed to have come from the contraction and condensation of the primeval nebula.

On the subject of the maintenance of the Sun's heat, Professor Charles A. Young has this to say:

"We can say positively, that the solar radiation can be accounted for on the hypothesis first proposed by Helmholtz,—that the Sun is mainly gaseous, and shrinking slowly but continuously. While we cannot see any such shrinkage, because it is too slow, it is a matter of demonstration that, if the Sun's diameter would contract about 200 feet a year heat enough would be generated to keep up its radiation without any lowering of its temperature. We can only say that while no other theory meets the conditions of the problem this appears to do so perfectly, and therefore, has probability in its favor. It seems to be only a continuation of the process of condensation by which the Sun itself and the solar system has been formed from the original cloud or nebula."

Within very recent years, the discoveries of radio-activity have shown that under certain circumstances, it is not impossible to draw upon the energy within the atoms of the elements. For all we know, such energy may be large. The amount of heat actually derived by the Sun and planets from this source is still a matter of vague conjecture.

By direction of the Superintendent, U. S. Naval Observatory.

Very respectfully,
(Signed) W. S. EICHELBERGER,
Captain (Math) U. S. Navy,
Director Nautical Almanac.

The foregoing letter shows the melancholy theory of the scientific world which holds that the universe is slowly but inevitably shrinking

and dying—ignoring original power to create and continue. This theory does not admit of a satisfactory theory for how things first started.

COMMENTARY NOTES ON THE THESIS OF PROF. A. R. COLBURN ENTITLED "COSMIC HEAT" BY PROFESSOR LIFEROCK, Ph. D.

THE NATURE OF HEAT.

Until very recently two rival hypotheses regarding the nature of heat were generally entertained, neither of them, however, being founded on any sufficiently established basis. According to one theory known as the *Caloric Theory*, heat was supposed to be subtle elastic fluid which permeated the pores of bodies, and filled the interstices between the molecules of matter. The other theory supposed heat to be due to a rapid vibration of the molecules of a body, and consequently attributed heat to motion.—The *Kinetic Theory*.

The first experimental investigation into the true nature of heat was made by Count Rumford, in 1798; Those investigations were followed up by Humphrey Davy, whose experiments have led him to the conclusion that heat is produced by friction; the heat developed being the result of the work done by the agent producing the rubbing.

The modern theory of heat, called the Wave Theory, supposes that heat and light are due to a wave motion in a hypothetical medium filling all space,—that medium known by the name of ether.

THE ETHER

As to Prof. Colburn's statement that ether is "imponderable" and "incompressible".....In connection with ether we do not postulate density or compressibility, or molecular structure for it, except that it can contain and propagate energy.

When we endeavor to explain the phenomena of light and heat, we assume that all space is filled with a fundamental medium which we call Ether. This hypothesis is made necessary by the fact that heat and light travel through space with a definite velocity, and we can conceive only either of the two methods by which an influence, traveling in time may be propagated from one body to another situated at a distance. One method is explained by the *emission theory* of heat and light, while the other is explained by the *wave theory*. According to the emission theory, a hot or luminous body emits a fluid or a shower of fine particles, traveling through space with the velocity of light (186,000 miles per second); the wave theory of heat and light supposes that the light and heat which we receive from the Sun are due to the wave motion in an hypothetical medium filling all space.

HEAT AND LIGHT REDUCIBLE TO THE SAME AGENCY.

As to Professor Colburn's query whether there are two distinct sets of waves in the ether—heat waves, and light waves—or are they waves of the same nature and type, the answer must be that there is no essential difference in the character between the wave motion which affects our sense of heat and that which affects our sense of vision.

If an ethereal wave lies between certain limits of frequency it affects the eye, and we call it light. The same wave falling upon our bodies may also set up commotions among our molecules, and give rise to a feeling of warmth. Waves which are too slow to affect the eye can warm our bodies; the two senses—sight and feeling—overlap, and extend each other; the sense of heat may be regarded as an extension of the sense of sight, and vice versa.

Certain waves undoubtedly exist in the ether which are too short or too long to be detected by either the sense of sight or the sense of heat, being beyond the limits of those two senses.

RADIANT HEAT.

As long as the waves which constitute radiant heat are traveling through free space or transparent bodies, they obey the same laws as those of light. When, however, they fall on bodies which are opaque to them, both heat and light waves are absorbed, a conversion of ethereal into molecular energy takes place, and the bodies are warmed.

HEAT AT THE EARTH'S SURFACE.

Nearly all the heat of the Earth's Surface comes directly from the Sun's rays.

Dr. C. G. Abbott in his book "The Sun" says the following: "Occasionally a person is met with whose mind works so curiously as to lead him to deny that the Sun is hot. Such an one almost invariably calls attention to the fact that as we ascend a mountain, or are carried up by a baloon, the temperature falls. Thus, although we may be actually approaching the Sun, the heating effect of the solar rays becomes less obvious." As Dr. Abbott explains, the secret of this paradox lies in the fact that the Sun's rays heat only objects which absorb them. Highly transparent objects, like glass, or the air, derive little heat by being shone upon; for the rays pass through them almost unchanged. Absorbing substances like lamp-black, on the other hand, almost entirely destroy the rays, and convert their energy of vibration into heat.

Upon the surface of the earth, the air is in contact with such an absorbing substance, namely the ground, and is warmed by contact with it. At high altitudes the free air has contact with no absorbing substance to warm it, and as it transmits sun-rays with great freedom it derives only a little heat from them directly. The free air at those

high altitudes contains, moreover, ozone, carbon dioxide, and water vapor which all radiate freely long-wave rays and thus dissipate into space the heat gained. Consequently the high air is cold, and cools whatever it blows upon. Its cooling action on the surfaces of mountains is greater on account of the high winds which prevail."

INTERNAL HEAT OF THE EARTH.

The heat received from the Sun does not penetrate far into the earth's crust, and consequently the diurnal or even seasonal changes of the temperature at the surface produce less and less effect with every increase of the depth; all such variations of temperature are confined to within 100 feet of the surface. At the depth of about 100 feet a fixed temperature of 52° Fahrenheit, is reached, and this is true all over the earth.

Thus the study of the internal heat of the earth may be said to begin below the level of 100 feet; the rate of the increase of the temperature being one degree per 66 feet of descent.

Those important facts relative to the Earth's internal heat were obtained as the result of an experiment near Leipzig, Germany, where a boring was made one mile deep, the work of boring having been primarily undertaken in making a search for coal. There were obtained fifty-eight measurements at equal distances from the surface to the greatest depth of the hole; the results of that series of measurements proving the fact of the increase of temperature with depth.

THE CAUSE OF THE EARTH'S INTERNAL HEAT.

Tides of any kind will generate friction, and friction produces heat. The question arises as to whether the internal heat of the earth may not receive an adequate explanation from this tidal action, which is more than enough as to quantity. The heat of the earth's interior might also have come from the primeval nebula.

Lord Kelvin suggested a test for deciding as to which of these two sources the earth's internal heat was to be attributed to. Professor G. H. Darwin applied that test and decided the issue. He reasoned that the distribution of heat, if it had come from tidal action would be quite different from the distribution which could result from the gradual efflux of heat from the center in the process of cooling. The heat produced by the tidal friction would be distributed rather more toward the exterior of the earth than at its center. It has also been proved that if the internal heat had its origin from the tidal friction, the rate of increase with the depth would be totally different from what it is actually found to be. It would be necessary to go down 2,000 feet to obtain an increase of one degree, instead of only 66 feet, as is actually the case. So the accepted theory is that the origin of the earth's internal heat is from the cooling of the primeval nebula. The earth

is continually cooling, suffering a loss of heat by radiation, by the passage of the heat from the interior. This loss of heat is incessant, although the process of cooling is excessively slow.

THE RINGS OF SATURN.

It is now universally admitted that the rings of the planet are not continuous sheets, either solid or liquid, but a flock or swarm of separate particles, each pursuing its own independent circular orbit around the planet, though all moving in nearly the same plane; the structure of those rings, then being a swarm of independent "moonlets."

There are several positions in which Saturn's rings vanish from sight, or so nearly vanish as to be only visible with the most powerful modern telescopes. When the plane of the rings passes through the sun, only its very thin edge is illuminated. If the plane of the rings passes through the earth, we have only a very thin edge to look at. When the sun and the earth are on opposite sides of the rings, the face of the rings which is presented to us is in shadow, and therefore, invisible.

As to origin and earliest history of the rings, various hypotheses have been advanced mostly highly speculative. With our present meagre knowledge it seems fruitless to formulate exact theories on the subject, as sufficiently exact data are wanting.

THE MOONS OF JUPITER.

Professor Young, in his "General Astronomy," says the following in regard to the satellites of Jupiter:

"In the case of the 4th satellite, the regularity in the changes of brightness indicates that it follows the example of our moon in keeping the same face towards the planet; the observations of Douglass at Flagstaff of spots upon the surface of the 3rd and 4th satellites also indicate a rotation agreeing with their orbital periods far within the limits of error to be expected in such observations. It may be considered practically certain that both these satellites behave like our moon."

Prof. G. H. Darwin, in his treatise, "The Tides and Kindred Phenomena in the Solar System," says:

"Several of the satellites of Jupiter and of Saturn present faint inequalities of coloring, and telescopic examination has led astronomers to believe that they always present the same face to their planets. The theory of tidal friction would certainly lead us to expect that these enormous planets should work out the same result for their relatively small satellites that the earth has produced in the moon."

THE PRESENT SYSTEM NOT ETERNAL.

Various hypotheses and theories are being advanced in regard to

the ultimate destiny of this world, most of the hypotheses being highly speculative. The scientific world and the various modern contingencies do not seem to offer any definite answer to this riddle.

Professor Young's "General Astronomy" states as follows:

"We have before us irrefragable evidence of continuous, unremitted progress in one direction. The hot bodies are losing their heat, and distributing it to the cold ones, so that there is a steady, unceasing tendency toward a uniform (and therefore useless) temperature throughout the world for heat does work, and is available as energy only when it can pass from hotter to colder bodies, so that this warming up of colder bodies at the expense of hotter ones always involves a loss not of energy (for that is indestructible) but of available energy. . . . This disposition of energy can have but one ultimate result—that of absolute stagnation when a uniform temperature has been everywhere attained."

FINAL NOTE OF THE EDITOR OF THE PROGRESSIVE STUDIES.

Heat is agitation caused by an expanding Universe; and the contraction of decaying or degenerating worlds will keep such agitation alone already at proper "heat." Even when full equilibrium could be accomplished, the creating energy flowing from the central universal sun or source of all needed energy and power would still supply plenty of "available" energy. Heat is caused by universal "magnetism" furnishing also light. "Magnetism" and "electricity" are terms to be changed for better ones when future investigations—assisted by that greatest of all aids to progress, namely inspiration—brings greater revelation of truth in physical science.

The foregoing studies of two of our professors, especially that of Prof. Dr. A. Colburn, are instructive and will induce many others to investigate, I am sure. The old theories are only partly true. Before proper conclusions can be made, the premises must be investigated further.

Finally, it should be observed, that "heat" pertains only to our plane of living, not to the spirit plane, as it seems. Heat on the spirit plane is "spiritual or mental agitation." But the mental plane governs the physical plane.

PRESIDENT H. P. HOLLER.