vent in the south of France, cherished a hatred, perhaps justifiably, against his Superior. One night he rose while sleeping, took a poinard which he had in his cell and crossing the cloister entered the Prior's room. The latter, instead of retiring at his usual hour, had seated himself to write at a table on which were two lamps. The monk passed before him without perceiving the light, walked stealthily to the bed and struck several blows with his poniard upon the pillow. He then stole out of the room, regained his cell and went to bed again. The next day when questioned by the Chapter of the convent, he could recollect nothing. This man although unconscious, would have been condemned unhesitatingly as an assassin.

A lady whom M. Mesner had long occasion to observe presented one of the most extraordinary cases of natural Somnambulism ever known.

With her, a sad and melancholy idea always was the starting point of her dream. She would rise from her bed in the night and endeavor to throw herself out of the window. She never saw the persons who surrounded her or paid any attention to them in any way. On the following day, all was a blank to her.

One night, she carefully steeped some *sous* in a glass of water, then seating herself at a table began to write to her family; "I wish to die," she wrote, "I shall never recover my health, my head is out of order. Farewell, by the time you receive this letter I shall have but little time to live. By to-morrow I shall have taken the fatal poison which this glass contains. Once more, farewell."

This done, she concealed the glass in a closet, as the poison, she thought, was not yet strong enough. Just as she accomplished this act, she was seized with a hysterical attack and awoke. On the following day she remembered nothing of what had occurred, and asked for her glass, which she said, some one had taken. Another was given her in its place. The next night, she rose from her bed while asleep, walked straight to the closet, opened it, and seized the glass of poison. During the day it had been replaced by a tumbler of pure water by a member of the family. As she removed the glass from the closet, the entire household, summoned by the lady's maid entered the room. Mme., however, did not perceive any of them. She was sleeping, dreaming. She threw herself on her knees before a crucifix and placed the glass to her lips. At this moment, as though seized with a sudden resolution, she put it aside, rose, and wrote the following letter to her family:

"Just as I was on the point of swallowing the deadly poison, an angel appeared to me just as he did to Abraham when the latter was about to sacrifice his son. He caught me by the arm, saying; "Think what you are about to do; you have a husband and children." When I heard these words my heart beat quickly and I felt overcome with conjugal and maternal love. Still, I am very ill, and my head is weak. Pardon me this fault, so great in your eyes and in mine."

This she wrote, still sleeping.

Mme. X. did many other things on various occasions just as curious, and the most wonderful thing of all was that while in her normal condition during the day, she remembered nothing she had done while asleep. She always continued any dream she may have had in previous nights, and completed it.

This leads me, gentlemen, to speak of a singular state constituted by Somnambulism. This is called *double consciousness*. The first physician to give a good description of this nervous affection was M. Azam, professor of the medical faculty at Bordeaux.

The person observed by M. Azam was named Félida X, a seamstress living in Bordeaux, whose health was moderately good, if we except the periodical attacks she was subject to.

On certain days, in the midst of her work, she would suddenly become dull and melancholy. Her head would drop upon her breast and she would sleep so soundly that it was impossible to rouse her. Finally Félida would wake in the best of spirits, Her manner was lively and she would run about in the most exalted of moods. Several hours later, all this left her. Félida relapsed once more into gloom and silence, and gradually fell again into a sound sleep. When she awoke from this sleep she remembered absolutely nothing that had taken place during the *second state*. The next time, however, that she relapsed into this condition she recollected all that occurred on a former occasion, but could recall nothing pertaining to her normal state. She was unable to recognize persons that she had then seen. Félida consequently has two personalties—two lives—in one she is sad and gloomy, in the other gay and cheerful. While in the first state she can recollect nothing of the second state, and while in the latter condition she continues her existence, so to speak, from the point she stopped at during the previous attack. This state of double consciousness, as it is termed, seems really to be merely a species of natural Somnambulism. Modern science appears to be considerably advanced upon all these points. But you will ask, gentlemen, what antiquity thought of these phenomena, and how they were received and understood throughout the middle ages and even later times. Ancient history gives us but little information on the subject, but in my next lecture I will endeavor to tell you what was known on the subject, in spite of the imprudence I shall thereby commit by attempting retrospective science from such a distance.

THE PHYSICAL BASIS OF GRAVIC FORCE AND LIGHT.

BY SAMUEL J. WALLACE.

If we suppose, that:

(1) Gravitation is the *work of some kinetic* or live *force*, because it is a first mover to do work, which we may call Gravic force; and that (2), there is an interstellar medium to convey light, called Ether, then, *is this medium capable of conveying the necessary gravic force* to produce the known acts of gravitation? And, if so, what must be the terms of its action?

To solve this, let a' be the the force of light for one square foot at the earth in one second, say 100-foot pounds; let d be the distance of the sun in its semi-diameters, say 47,000, and $a = a' d$, the force of light from one square foot of the sun in one second, say 4,700,000 ft. lbs.; let b be one pound of matter, as in the Ether; let c be the distance of fall from gravitation, to measure foot pounds in velocity, say $16\frac{1}{12}$ ft., and $2c$ be the velocity gained thereby, say 32 1-6 ft.; and let e be the velocity of light, say 950,000,000 ft., in one second.

Then, $(e \div 2c)^2 c \div a' d = y$; and, $b \div y = x$, the amount of matter which would, at the velocity of light, transmit its force from one square foot at the sun, for one second; say, 1-3,000,000,000 part of one pound.

This would be at the rate of about one grain of matter in five days from one square foot of the sun; and would produce a medium at the rate of one grain in three thousand cubic miles.

The Ether may be thousands of times so dense, depending on the distance between contacts of particles; but this weight it must have.

Then, with this effective density, *what must be the velocity* to produce the action of gravitation?

Let h be the earth's orbit, say 3,070,000,000,000 ft.; let i be one-fourth of a year, say 7,889,400 seconds, and $k = h \div 4\, i$, say 97,250 ft. velocity in one second; let l be the weight of the earth, say 13,000,000,000,000,000,000,000,000 lbs., and let m be its cross section, say 1,200,000,000,000,000 sq. ft.

Then, $(k \div 2c)^2\, c\, l\, d \div i\, m = w$; the force for one sec-

ond from one square foot, as at the sun which would equal that required to change the course of the earth as it occurs in its orbit, as measured by the earth's cross section.

But, as the density increases greatly toward the centre of the earth, the full force may be much greater; say 2 *w*, or 19,000,000,000,000,000 feet, pounds, for one square foot each second; or about 4,000,000,000 times as much as the force of light.

And, then, $2c\sqrt{2w, y \div d}\, c = v$; the velocity of a medium having the same quantity of matter as light put in motion in one second to transmit gravic force; say about 280,000,000,000 feet velocity in one second.

This is nearly three hundred times the velocity of light, or one and three-fourth seconds from the sun to the earth.

It may be noticed that though this would require as much weight of matter to pass one point in one second, as light, yet, as its velocity is greater, it would only take a medium of about one three-hundredth the weight to the cubic mile.

This leads to the enquiry whether there may not be two separate media, one for light and one for gravic force: which differ in *capacity for speed and the kind of effect they can produce.*

It is clear that gravic force though three or four thousand million times as great as light in actual power, yet can have no such crude medium, or at least, *mode of action*, or it would reduce the earth to vapor in the flash of a second.

Light, itself, if its force was transmitted by as crude a medium as sand, would cut away the face of the hardest rock as the sand blast does.

This indicates that *gentleness of touch increases with tenuity of medium;* and that it may co-exist with increase of speed and of power.

So we are led to suppose that gravic force *may be still greater in its velocity.* And that its medium may be still lighter in weight, while still acting as simple ponderable matter in transmitting force by motion.

The speed of gravic force may be due to *its medium having particles smaller and more simple* than those of light.

Particles in the medium of light may have a *complex structure* which takes just a little longer to communicate motion from particle to particle in the innummerable contracts taking place in the flight of force through space. In the same way we know sound takes longer in passing through a heavier or more complex gas.

Gravic force and light seem to *have a generic difference* in their nature as forms of force.

Gravic force seems to have a direct relation to the *number of primary particles in matter,* as shown by its weight; and *not to the chemical atoms aud molecules,* and to the structure and condition of substance, as light does, as shown by the spectroscope. This seems to indicate a difference in the mediums, as having in light a relation to a more complex order of structure in its particles.

Heat, electricity and magnetism seem to belong to the family of light, in this respect; while mass motion as related to simple weight and to gravic force seems to belong to the family of the latter.

The forces change from one form to another under definite conditions; but seem to do so more freely each within its own family, and by some regular order or rank among the forms. Certain forms *tend to sink to lower forms by becoming weaker* or diffused through more matter; while *lower forms tend to rise to higher forms by becoming stronger,* or concentrated into less matter.

Gravic force changes into mass motion, and possibly into cohesion and its family of forces. Mass motion changes into vibration by collisions, and this changes into heat, as a sort of meeting ground of the forces, about which there is a plexus of forms reaching up into electricity, magnetism and light.

But the general laws of action are very indistinctly made out.

How can a simple forward projection of a pulsation, or of *particles,* from contact to contact among themselves, *convey the complex actions of light in polarisation?*

Can it be by means something like this?

I. *The particles conveying light have* FLAT FACES *which in the first start of light are set square across their line of flight.*

II. *In each successive contact the particles are turned with their faces into parallellism with those behind, in receiving their motion.*

III. *In striking heavier bodies at peculiar angles the particles while changing their courses have* THEIR FACES TURNED TO ONE SIDE *from square across their line of flight, so as to be repeated in the successive contacts,* ; and,

IV. *This sidewise inclination of faces disposes the particles to peculiar actions in striking heavy matter having faces inclined peculiarly to that of their own planes of inclination.*

Some such mechanism certainly has a very singular analogy to the action of light in polarisation, and does not do great violence to well-known laws of action as former ideas do.

But, *how can simple forward projections of particles produce all the wonderful complexity of colors?*

Could there be actions something like this?

V. *Light at its start is without colors, as* SIMPLE FORWARD PROJECTIONS OF PARTICLES *following each other in a continuous stream; the momenta going forward through contacts after contacts of particles.*

VI. *The continuous stream of particles in passing through media having particles of greater weight* IS BROKEN UP INTO PULSES *having times in which the new particles could move or receive and deliver their motion, forming an intermittent stream.*

VII. *The continuous pulsing stream of particles on striking reflecting or refracting matter is separated into parts following each other in relation to the times of movement of the particles of such matter; so that,*

VIII. *The peculiarly vibrating particles of such bodies* DIFFERENTLY *reflect, refract, absorb, or act on, successive portions of the pulsing or continuous stream of particles of light which strike them* DURING DIFFERENT PARTS OF THEIR VIBRATORY PATHS; *or, according to* DIFFERENT CAPACITIES OF THE VARIOUS PARTICLES FOR VIBRATION; *and that,*

IX. *The particles of bodies or mediums having different periods of vibration for transmission* HAVE DIFFERENT RANGES OF MOVEMENT *so as to refract the lines of force transmitted to different extents and so separate portions of the stream having* DIFFERENT PERIODS OF INTERMISSION INTO DIFFERENT PATHS; *as in refraction of colors.*

Something like this very singularly coincides with the peculiarities of light with respect to spectra, absorption, reflection, refraction, vision, color, chemical action and heat; and also with the conclusions already reached in regard to the mysteries of polarization; while only following out the consistency of mechanics.

But, more singular still, after these propositions are worked out as simple resultants of a mechanical problem, when we come to look at them in relation to previous ideas, is to find in them, altogether unexpectedly, the antagonistic ideas of Newton and of Euler become "evolved" into each other, as "waves" of "corpuscles." And that, at the same time it is very analogous to the modern theory of gases and of the "fourth state" of matter. While over all is the unseen majesty of Gravic Force carrying on the hosts of heaven in their never ending cycles of action, waiting for it, if possible, to throw some LIGHT upon his ways.

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