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ON THE FUNDAMENTAL CONCEPTS OF ELECTROSTATICS (QUANTITY, POTENTIAL, CAPACITY, ETC.).[1]

BY PROF. ERNST MACH.

[CONCLUDED.]

On being connected, every two conductors assume at once the same potential. With this the means is given of determining the potential of a conductor through the agency of a second conductor especially adapted to this purpose called an electrometer, just as we determine the temperature of a body with a thermometer. The values of the potentials of bodies obtained in this way simplify vastly our analysis of their electrical behavior, as will be evident from what has been said.

Think of a positively charged conductor. Double all the electrical forces exerted by this conductor on a point charged with unit quantity, that is, double the quantity at each point, or what is the same thing, double the total charge. Plainly, equilibrium still subsists. But carry, now, the positive electrostatic unit towards the conductor. Everywhere we shall have to overcome double the force of repulsion we did before, everywhere we shall have to expend double the work. By doubling the charge of the conductor a double potential has been produced. Charge and potential go hand in hand, are proportional. Consequently, calling the total quantity of electricity of a conductor Q and its potential V, we can write: $Q = CV$, where C stands for a constant, the import of which will be understood simply from noting that $C = Q/V$.[2] But the division of a number representing the units of quantity of a conductor by the number representing its units of potential tells us the quantity which falls to the share of the unit of potential. Now the number C here we call the capacity of a conductor, and have substituted, thus, in the place of the old relative determination of capacity, an absolute determination.[3]

In simple cases the connexion between charge, potential, and capacity may be easily ascertained. Our conductor, let us say, is a sphere of radius r, hung up free in a large body of air. There being no other conductors in the vicinity, the charge q will then distribute itself uniformly upon the surface of the sphere, and simple geometrical considerations yield for its potential the expression $V = q/r$. Hence, $q/V = r$; that is, the capacity of a sphere is measured by its radius, and in the C. G. S. system in centimetres.[1] It is clear also, since a potential is a quantity divided by a length, that a quantity divided by a potential must be a length.

Imagine (Fig. 10) a jar composed of two concentric conductive spherical shells of the radii r and r_1, having only air between them. Connecting the outside sphere with the earth, and charging the inside sphere by means of a thin, insulated wire passing through the first, with the quantity Q, we shall have $V = (r_1 - r)/(r_1 r)\, Q$, and for the capacity in this case $(r_1 r)/(r_1 - r)$, or, to take a specific example, if $r = 16$ and $r_1 = 19$, a capacity of approximately 100 centimetres.

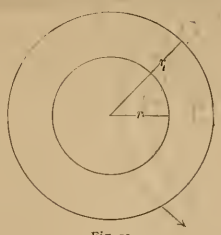

Fig. 10.

We shall now use these simple cases for illustrating the principle by which capacity and potential are determined. First, it is clear that we can use the jar composed of concentric spheres with its known capacity as our unit jar and by means of this ascertain, in the manner above laid down, the capacity of any given jar F. We find, for example, that 37 discharges of this unit jar of the capacity 100, just charges the jar investigated at the same striking distance, that is,

[1] A lecture delivered at the International Electrical Exhibition, in Vienna, on September 4, 1883.

[2] In this article the solidus or slant stroke is used for the usual fractional sign of division. Where plus or minus signs occur in the numerator or denominator, brackets or a vinculum is used.—*Tr.*

[3] A sort of agreement exists between the notions of thermal and electrical capacity, but the difference between the two ideas also should be carefully kept in mind. The thermal capacity of a body depends solely upon that body itself. The electrical capacity of a body K is influenced by all bodies in its vicinity, inasmuch as the charge of these bodies is able to alter the potential of K. To give, therefore, an unequivocal significance to the notion of the capacity (C) of a body K, C is defined as the relation Q/V for the body K in a certain given position of all neighboring bodies, and during connexion of all neighboring conductors with the earth. In practice the situation is much simpler. The capacity, for example, of a jar, the inner coating of which is almost enveloped by its outer coating, communicating with the ground, is not sensibly affected by charged or uncharged adjacent conductors.

[1] These formulæ easily follow from Newton's theorem that a homogeneous spherical shell, whose elements obey the law of the inverse squares, exerts no force whatever on points within it but acts on points without as if the whole mass were concentrated at its centre. The formulæ next adduced also flow from this proposition.

at the same potential. Hence, the capacity of the jar investigated is 3700 centimetres. The large battery of the Prague physical laboratory, which consists of sixteen such jars, all of nearly equal size, has a capacity, therefore, of something like 50,000 centimetres, or the capacity of a sphere, a kilometre in diameter, freely suspended in atmospheric space. This remark distinctly shows us the great superiority which Leyden jars possess for the storage of electricity as compared with common conductors. In fact, as Faraday pointed out, jars differ from simple conductors mainly by their great capacity.

For determining potential, imagine the inner coating of a jar F, the outer coating of which communicates with the ground, connected by a long, thin wire with a conductive sphere K placed free in a large atmospheric space, compared with whose dimensions the radius of the sphere vanishes. (Fig. 11.) The jar and the sphere assume at once the same potential. But on the surface of the sphere, if that be sufficiently far removed from all other conductors, a uniform layer of electricity will be found. If the sphere, having the

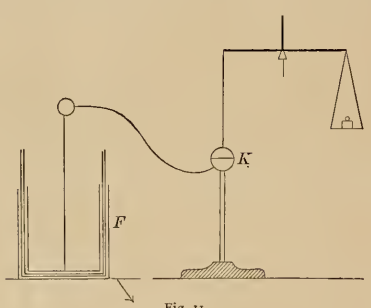

Fig. 11.

radius r, contains the charge q, its potential is $V=q/r$. If the upper half of the sphere be severed from the lower half and equilibrated on a balance with one of whose beams it is connected by silk threads, the upper half will be repelled from the lower half with the force $P=q^2/8r^2=\frac{1}{8}V^2$. This repulsion P may be counterbalanced by additional weights placed on the beam-end, and so ascertained. The potential is then $V=\sqrt{8P}$.[1]

That the potential is proportional to the square root of the force is not difficult to see. A doubling or trebling of the potential means that the charge of all the parts is doubled or trebled; hence their combined power of repulsion quadrupled or nonupled.

Let us consider a special case. I wish to produce the potential 40 on the sphere. What additional weight must I give to the half sphere in grammes that the force of repulsion shall maintain the balance in exact equilibrium? As a gramme weight is approximately equivalent to 1000 units of force, we have only the following simple example to work out: $40\times 40=8\times 1000.x$, where x stands for the number of grammes. In round numbers we get $x=0.2$ gramme. I charge the jar. The balance is deflected; I have reached, or rather passed, the potential 40, and you see when I discharge the jar the associated spark.[1]

The striking distance between the knobs of a machine increases with the difference of the potential, although not proportionately to that difference. The striking distance increases faster than the potential difference. For a distance between the knobs of one centimetre on this machine the difference of potential is 110. It can easily be increased tenfold. Of the tremendous differences of potential which occur in nature some idea may be obtained from the fact that the striking distances of lightning in thunder-storms is counted by miles. The differences of potential in galvanic batteries are considerably smaller than those of our machine, for it takes fully one hundred elements to give a spark of microscopic striking distance.

* * *

We shall now employ the ideas reached to shed some light upon another important relation between electrical and mechanical phenomena. We shall investigate what is the potential *energy*, or the *store of work*, contained in a charged conductor, for example, in a jar.

If we bring a quantity of electricity up to a conductor, or, to speak less pictorially, if we generate by work electrical force in a conductor, this force is able to produce anew the work by which it was generated. How great, now, is the energy or capacity for work of a conductor of known charge Q and known potential V?

Imagine the given charge Q divided into very small parts q, q_1, q_2 . . . ., and these little parts successively carried up to the conductor. The first very small quantity q is brought up without any appreciable work and produces by its presence a small potential $V_,$. To bring up the second quantity, accordingly, we must do the work $q_,V_,$, and similarly for the quantities which follow the work $q_{,,}V_{,,}$, $q_{,,,}V_{,,,}$, and so forth. Now, as the potential rises proportionately to the quantities

[1] The energy of a sphere of radius r charged with the quantity q is $\frac{1}{2}(q^2/r)$. If the radius increase the amount dr a loss of energy occurs, and the work done is $\frac{1}{2}(q^2/r^2)dr$. Letting p denote the uniform electrical pressure on unit of surface of the sphere, the work done is also $4r^2\pi p\,dr$. Hence $p=(1/8r^2\pi)(q^2/r^2)$. Subjected to the same superficial pressure on all sides, say in a fluid, our half sphere would be an equilibrium. Hence we must make the pressure p act on the surface of the great circle to obtain the effect on the balance, which is $r^2\pi p=\frac{1}{8}(q^2/r^2)=\frac{1}{8}V^2$.

[1] The arrangement described is for several reasons not fitted for the actual measurement of potential. Thomson's absolute electrometer is based upon an ingenious modification of the electrical balance of Harris and Volta. Of two large plane parallel plates, one communicates with the earth, while the other is brought to the potential to be measured. A small movable superficial portion f of this last hangs from the balance for the determination of the attraction P. The distance of the plates from each other being D we get $V=D\sqrt{8\pi P/f}$.

added until the value V is reached, we have, agreeably to the graphical representation of Fig. 12, for the total work performed,

$$W = \tfrac{1}{2} Q V,$$

which corresponds to the total energy of the charged conductor. Using the equation $Q = C V$, where C stands for capacity, we also have,

$$W = \tfrac{1}{2} C V^2, \text{ or } W = Q^2/2C.$$

It will be helpful, perhaps, to elucidate this idea by an analogy from the province of mechanics. If we pump a quantity of liquid, Q, gradually into a cylindrical vessel (Fig. 13), the level of the liquid in the vessel will gradually rise. The more we have pumped in, the greater the pressure we must overcome, or the higher the level to which we must lift the liquid. The stored-up work is again rendered available when the heavy liquid Q, which reaches up to the level h, flows out. This work W corresponds to the fall of the whole liquid weight Q, through the distance $h/2$ or through the altitude of its centre of gravity. We have

$$W = \tfrac{1}{2} Q h.$$

Fig. 12.

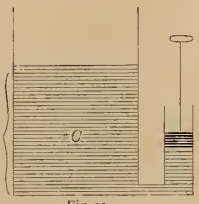

Fig. 13.

Further, since $Q = K h$, or since the weight of the liquid and the height h are proportional, we get also

$$W = \tfrac{1}{2} K h^2 \text{ and } W = Q^2/2K.$$

As a special case let us consider our jar. Its capacity is $C = 3700$, its potential $V = 110$; accordingly, its quantity $Q = CV = 407{,}000$ electrostatic units and its energy $W = \tfrac{1}{2} QV = 22{,}385{,}000$ C. G. S. units of work.

The unit of work of the C. G. S. system is not readily appreciable by the senses, nor does it well admit of representation, as we are accustomed to work with weights. Let us adopt, therefore, as our unit of work the gramme-centimetre, or the gravitational pressure of a gramme-weight through the distance of a centimetre, which in round numbers is 1000 times greater than the unit assumed above; in this case, our numerical result will be approximately 1000 times smaller. Again, if we pass, as more familiar in practice, to the kilogramme-metre as our unit of work, our unit, the distance being increased a hundred fold, and the weight a thousand fold, will be 100,000 times larger. The numerical result expressing the work done is in this case 100,000 times less, being in round numbers 0.22 kilogramme-metre. We can obtain a clear idea of the work done here by letting a kilogramme-weight fall 22 centimetres.

This amount of work, accordingly, is performed on the charging of the jar, and on its discharge appears again, according to the circumstances, partly as sound, partly as a mechanical disruption of insulators, partly as light and heat, and so forth.

The large battery of the Prague physical laboratory, with its sixteen jars charged to equal potentials, furnishes, although the effect of the discharge is imposing, a total amount of work of only three kilogramme-metres.

* * *

In the development of the ideas above laid down we are not restricted to the method there pursued; in fact, that method was selected only as one especially fitted to familiarise us with the phenomena. On the contrary, the connexion of the physical processes is so multifarious that we can come at the same event from very different directions. Particularly are electrical phenomena connected with all other physical events; and so intimate is this connexion that we might justly call the study of electricity the theory of the general connexion of physical processes.

With respect to the principle of the conservation of energy which unites electrical with mechanical phenomena, I should like to point out briefly two ways of following up the study of this connexion.

A few years ago Professor Rosetti, taking an influence machine, which he set in motion by means of weights alternately in the electrical and non-electrical condition with the same velocities, determined the mechanical work expended in the two cases and was thus enabled, after deducting the work of friction, to ascertain the mechanical work consumed in the development of the electricity.

I myself have made this experiment in a modified, and, as I think, more advantageous form. Instead of determining the work of friction by special trial, I arranged my apparatus so that it was eliminated of itself in the measurement and could accordingly be neglected. The so-called fixed disk of the machine, the axis of which is placed vertically, is suspended somewhat like a chandelier by three vertical threads of equal lengths l at a distance r from the axis. Only when the machine is excited does this fixed disk, which represents a Prony's brake, receive, through its reciprocal action with the rotating disk, a deflexion α and a moment of torsion which is expressed by $D = (Pr^2/l)\alpha$, where P is the weight of the disk.[1] The angle α is determined by a mirror set in the disk. The work expended in n rotations is given by $2n\pi D$.

[1] This moment of torsion needs a supplementary correction, on account of the electric attraction of the excited disks. This is accomplished by changing the weight of the disk by means of additional weights and by making a second reading of the angles of deflexion.

If we close the machine, as Rosetti did, we obtain a continuous current which has all the properties of a very weak galvanic current, for example, it produces a deflexion in a multiplier which we interpose, and so forth. We can directly ascertain now the mechanical work expended in the maintenance of this current.

If we charge a jar by means of a machine, the energy of the jar employed in the production of sparks, in the disruption of the insulators, etc., corresponds to a part only of the mechanical work expended, a second part of it being consumed in the arc which forms the circuit. This machine, with the interposed jar, affords in miniature a picture of the transference of force, or more properly of work. And in fact nearly the same laws hold here for the economical coefficient as obtain for large dynamo-machines.[1]

Another means of investigating electrical energy is by its transformation into heat. A long time ago (1838), before the mechanical theory of heat had attained its present popularity, Riess performed experiments in this field with the help of his electrical air-thermometer or thermo-electrometer.

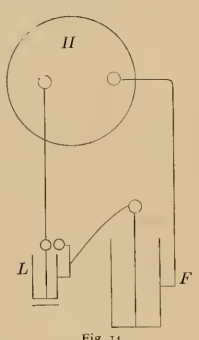

Fig. 14.

If the discharge be conducted through a fine wire passing through the globe of the air-thermometer, a development of heat is observed proportional to the expression above-discussed $W = \frac{1}{2} Q V$. Although the total energy has not yet been transformed into measurable heat by this means, inasmuch as a portion is left behind in the spark in the air outside the thermometer, still everything tends to show that the total heat developed in all parts of the conductor and along all the paths of discharge is the equivalent of the work $\frac{1}{2} Q V$.

It is not important here whether the electrical energy is transformed all at once or partly, by degrees. For example, if of two equal jars one is charged with the quantity Q at the potential V the energy present is $\frac{1}{2} Q V$. If the first jar be discharged into the second, V, since the capacity is now doubled, falls to $V/2$. Accordingly, the energy $\frac{1}{4} Q V$ remains, while $\frac{1}{4} Q V$ is transformed in the spark of discharge into heat. The remainder, however, is equally distributed between the two jars so that each on discharge is still able to transform $\frac{1}{8} Q V$ into heat.

* * *

We have here discussed electricity in the limited phenomenal form in which it was known to the inquirers before Volta, and which has been called, perhaps not very felicitously, "statical electricity." It is evident, however, that the nature of electricity is everywhere one and the same; that a substantial difference between statical and galvanic electricity does not exist. Only the quantitative circumstances in the two provinces are so widely different that totally new aspects of phenomena may appear in the second, for example, magnetic effects, which in the first remained unnoticed, whilst, *vice versa*, in the second field statical attraction and repulsions are almost wholly absent. As a fact, we can easily show the magnetic effect of the current of discharge of an influence machine on the galvanoscope although we could hardly have made the original discovery of the magnetic effects with this current. The statical, distant action of the wire poles of a galvanic element also would hardly have been noticed had not the phenomenon been known from a different quarter in a striking form.

If we wished to characterise the two fields in their chief and most general features, we should say that in the first, high potentials and small quantities come into play, in the second small potentials and large quantities. A jar which is discharging and a galvanic element deport themselves somewhat like an air-gun and the bellows of an organ. The first gives forth suddenly under a very high pressure a small quantity of air; the latter liberates gradually under a very slight pressure a large quantity of air.

In point of principle, too, nothing prevents our retaining the electrostatical units in the domain of galvanic electricity and in measuring, for example, the strength of a current by the number of electrostatic units which flow per second through its cross-section; but this would be in a double aspect impractical. In the first place, we should totally neglect the magnetic facilities for measurement so conveniently offered by the current, and substitute for this easy means a method which can be applied only with difficulty and is not capable of great exactness. In the second place our units would be much too small, and we should find ourselves in the predicament of the astronomer who attempted to measure celestial distances in metres instead of in radii of the earth and the earth's orbit; for the current which by the magnetic C. G. S. standard represents the unit, would require a flow of some

[1] The jar in our experiment acts like an accumulator, being charged by a dynamo machine. The relation which obtains between the expended and the available work may be gathered from the following simple exposition. A Holtz machine H (Fig. 14) is charging a unit jar L, which after n discharges of quantity q and potential v, charges the jar F with the quantity Q at the potential V. The energy of the unit jar discharges is lost and that of the jar F alone is left. Hence the ratio of the available work to the total work expended is

$$\frac{\frac{1}{2} Q V}{\frac{1}{2} Q V + (n/2) q v} \text{ and as } Q = n q, \text{ also } \frac{V}{V + v}.$$

If, now, we interpose no unit jar, still the parts of the machine and the wires of conduction are themselves virtually such unit jars and the formula still subsists $V/V + \Sigma v$, in which Σv represents the sum of all the successively introduced differences of potential in the circuit of connexion.

30,000,000,000 electrostatic units per second through its cross-section. Accordingly, different units must be adopted here. The development of this point, however, lies beyond my present task.

IMMORTALITY AND THE BUDDHIST SOUL-CONCEPTION.

We have published of late several articles on Buddhism, among them contributions of Japanese Buddhists. Also the present number of *The Monist* which has just appeared, contains an exposition of the similarities that obtain between Buddhism and Christianity. The article presents a number of quotations from the sacred books of the Buddhists and draws a lesson from their agreement with the Christian Gospels. The sympathy we have with Buddhism is based upon an important agreement which is the denial of the existence of the âtman, or the self of the soul, and the emphasis placed upon the indestructibility of the karma. The law of cause and effect, according to the Abidharma or Buddhist philosophy, is irrefragable not only in the physical but also in the moral world. Every evil deed has its evil effects, every good deed has its good consequences and neither upon earth nor in heaven or hell can we escape from reaping what we have sown. Death is the solution of our present existence, but our karma, consisting of the deeds done by us, continues, and this our karma, that continues, is our very soul, this our karma is the spiritual essence of our being, it is we ourselves.

For us Western people who are products of a Christian civilisation, trained in the schools of Christian education, Christian dogmatics, and Christian modes of thought, it is very hard to understand that a denial of the existence of a hypothetical ego-soul is not a denial of the actual soul; and we are always confronted with the complaint that this anti-metaphysical psychology is a poorly disguised nihilism and a desolate resignation of all our hopes and cherished ideals of a life beyond the grave. Mrs. Alice Bodington gave expression to this sentiment in a very sympathetic article which appeared some time ago in *The Open Court* together with an editorial reply. She said of those who offer her an immortality of the soul which is not at the same time an ego-immortality:

> "For the 'palpitating deathlessness' of the immortality promised by religion, they bid us be satisfied with the excellent effect our good words and actions are likely to have on future generations. . . . To me this is not immortality, nor anything remotely like immortality."

We fully understand that Mrs. Bodington is not satisfied with an immortality, not of the soul, but only of the effects of our good words and actions. This prospect might be unsatisfactory to Buddhists also. However, Mrs. Bodington should remember that not merely the effects, but our good words and actions themselves continue to exist, and she should know that our words and actions *are* our soul. As soon as we learn to understand the nature of the soul, as soon as we find that our words and actions are the essence of our being, and that there is no ego-entity that does the speaking of our words, or does the doing of our acts, we shall see at once that not merely the effects of our soul continues, but our soul itself.

The current misconception of Buddhism has originated in the same way that Mrs. Bodington's pessimistic attitude toward the apparently negative results of modern science has. Some Brahman philosophers had declared that the soul is the âtman, the self, or the ego, which was represented as a certain metaphysical and mysterious entity. Not the eye sees, they said, but the seer in the eye; not the nose smells, but the smeller in the nose; not the thoughts think, but the thinker in the thoughts, etc. And who is the seer, the smeller, the thinker? It is the self, the âtman, that something which says "I," the ego.

Now Buddha came and said: "This âtman is a fiction; it does not exist; there is no self." At the same time he preached the four noble truths and the eightfold path of righteousness, rejecting ceremonial rites, sacrifices, miracles, and the reliance on external help from God or gods. When Buddha found enlightenment, he met on his way to Benares, Upaka, who was "struck with his appearance and asked him what religion it was that made him so glad and yet so calm." Buddha tells him that he had overcome ignorance and error and had freed himself from all desires. To the question whither he was going, Buddha replied in a four-lined stanza:

> "I am now going to establish the kingdom of righteousness;
> For this purpose I am going to the city of Benares,
> To give light to those enshrouded in darkness
> And to open the gate of Immortality to men."

It has given our Pâli scholars and other investigators a great deal of trouble to understand why Buddha, who teaches the non-existence of the âtman, the self, or the ego,—so often identified with the soul and even called the soul,—at the same time upholds the doctrine of immortality. The Buddhist canon is very clear and definite in its explanations of the non-existence of an âtman; but the immortality of "mind" is not only not denied, but staunchly maintained.

Buddhism is generally supposed to be pessimism and nihilism; it is often described as a religion of utter desolation, but it is neither the one nor the other; and the Buddhist blessings and glorifications of Nirvâna stand in strong contrast to such misinterpretations. Yet it appears to me natural that men who have not as yet freed themselves from the illusion of self, whose religious ideal is a faith in the preservation of self and the hope of a future gratification of selfishness,

cannot understand the grandeur of Buddhism and the bliss of the Buddhist Nirvâna, which is not annihilation, but attainment of the Truth; no gloomy self-mortification, or despondent self-surrender, but simply a deliverance from error: it is a comprehension of the world as the world actually is; a comprehension of the law of action, i. e., of the rigidity of the law of causality and retribution, declaring that what a man sows, that he will reap. In a word, it is the comprehension of truth, and above all, it is the establishment of such habits as will insure a moral conduct in agreement with truth; therefore Buddha teaches that the way to Nirvâna is the practice of righteousness in views, words, and deeds. This is not death, but life; not annihilation, but preservation; not destruction, but immortality.

Mrs. Bodington might reply that our idiosyncrasies are different; that she agrees with us as to facts and that our disagreement has reference only to our attitude toward facts, for she is well acquainted with our view of immortality, and is dissatisfied with it only because it is not that kind of ego-immortality for which she longs. I would say that this longing for the ego-immortality is just what Buddha calls "clinging" or "cleaving"; so long as we cling to the phantom of the âtman or self, we shall never find satisfaction or peace of mind.

Idiosyncrasies of the mind, and attitudes toward facts, are also a matter of truth or untruth, of illusion or correct comprehension.

Which, now, is the correct view of life? That which makes us dejected and melancholy, so as to unfit us for life and the troubles of life, or that which gives us satisfaction and peace of mind, so that we joyously and energetically grapple with the difficulties of existence, not looking for external help either in religious ceremonies or supernatural interference, but relying upon our own energy, which is to be regulated by a clear grasping of the truth.

When, on the other hand, Dr. Robert Lewins, and with him many of those who call themselves freethinkers or materialists, declare that death ends all, is not their denial of immortality still a clinging to the illusion of self? If the soul is no self-entity, how can there be a death of the soul? Death is simply a dissolution of our organisation and a discontinuance of an individual life representing a more or less valuable combination of soul-activity, but it is no annihilation of man's karma. If the essence of the soul is our karma, and if our karma is indestructible, how can the soul be destroyed in death?

It seems to me that as surely as every mathematician will come to the same conclusions regarding the properties of geometrical triangles, circles, and other figures, so every thinking man, if he is but calm and frees his mind from all fancies and gratuitous assumptions will arrive at the same conclusion of the non-existence of an ego-soul, an illusion which prevents us from recognising the true nature of our actual soul, its pre-existence ere we were born, and its continuance beyond the grave.

In my own development I have passed through the same pessimistic attitude which has been set forth in its grand pathos by Mrs. Bodington, and trust that I do not say too much in declaring that I understand her ailments and complaints in their full depth and significance. I have, however, surrendered pessimism without denying those facts upon which pessimists like Schopenhauer base their dreary conception of life, and have supplanted it by what I call meliorism; and I must confess that I have been confirmed in the position I have taken, since I had the good fortune of knowing Mr. Hegeler. Being a man of practical life, he would not be satisfied with stones when he needed bread. Formerly, I was often inclined to believe that such views as I propounded in my booklet, *Monism and Meliorism*, were for the few and select only, that they were impractical and not adapted to the needs of men who stand in actual life. My acquaintance with Mr. Hegeler has cured me for good of these doubts.

The truths which we preach are simple enough, and yet they are hard to understand. But they are hard to understand only to those who have not as yet freed themselves from the illusion of self.

We do not mean to say that we are Buddhistic, or that we endorse either the Northern or Southern Buddhism in all its tenets and excrescences, which are many. We simply state our agreement on this fundamental doctrine of the anâtman or non-existence of a metaphysical ego-entity as the basis of a correct conception of the immortality of the soul.

This view is incompatible with all dualistic religions, and overthrows what they so often and erroneously consider the corner-stone of religious faith. But this view, which abolishes the illusion of self, is after all the only true religion; it is monistic and in agreement with science. Moreover, far from being a sad truth, its recognition is the main and indispensable condition of peace of mind, and of that bliss which cannot be found in the restlessness of those whose ethical ideal is the greatest possible amount of pleasure.

This conception of the soul has conquered death; for we now understand that death does not touch the soul; that the soul continues wherever the actions and deeds of which the soul consists, are present.

We read in the "Mahâvagga," I, 11, 2, that when Mâra, the Evil One, the deity of sin and death, approached Buddha with words of spite and threat, Buddha replies;

"I am delivered from all fetters, human and divine. I am delivered from the strong fetters. Thou art struck down, O Death."

Let us conclude with another quotation from the same book, which sets the religious assurance of the Buddhist doctrine in a clear light. When Buddha sends out his disciples to preach the doctrine he says:

"Go ye now, O disciples, and wander for the gain of the many, for the welfare of the many, out of compassion for the world, for the good, for the gain, and for the welfare of gods and men. Let not two of you go the same way. Preach, O disciples, the doctrine which is glorious in the beginning, glorious in the middle, glorious at the end, in the spirit and in the letter: proclaim a consummate, perfect, and pure life of holiness. There are beings whose mental eyes are covered by scarcely any dust, but if the doctrine is not preached to them, they cannot attain salvation. They will understand the doctrine." P. C.

IN MEMORY OF M. M. TRUMBULL.

BY SAMUEL P. PUTNAM.

Read at Memorial Meeting, Chicago, October 7, 1894.

A soldier born, thy spirit welcomed e'er
The stir of battle, be it in the smoke
Of cannon and the bayonet's glistening surge,
The swirl and thunder of ensanguined hosts,
Where ghastly death confronts the victor's path;
Or realms of thought with fields more stormful far,
Where vaster forces meet in mightier strife,
Where pen more luminous than shining blade,
The flame electric drops which moves a world,
And crowns a truth, or blasts a giant lie;
In this thou wast a knight exultant, too,
And ever in the front with beaming brow;
Thy mind as dauntless as the unsheathed sword
That flings its splendor in the forward fray.

Thy aim was high, not for to-day's applause;
Not for the truth of yesterday's renown;
But for the truth beyond the beaten path;
The untried truth that only lofty souls
Behold and welcome on the distant heights.
Thou wast a dreamer and a toiler, too,
Thy mind was in the future's golden days;
The gates of paradise to thy far view
Were open wide—the goal of martyr's fire,
The poet's song and hero's restless march,
The bright enchantment that adorns the earth
With constant hues of beauty and delight.
And yet thou wast in touch with common life,
And hand in hand with those who strike the spark
Of earnest action from surroundings grim;
The comrade of the weary slave wast thou;
The bold defender of defeated right;
The guard of liberty when Judas-hands
Would clothe its loveliness with gilded chains;
Thine eye was clear to see great nature's law,
Above the hoary precedents of wrong;
And as our starry flag thou didst defend
Within the bloody ranks of fateful war;
So wouldst make that flag the pennon bright
Of justice to all lands and coming time.

Thy work is done; true to the line was all;
No wavering in thought or deed or word
From freedom's call, to which thy soul was pledged;
Sweet fortune thine that in the rayless grave
Illustrious ends the task thou aim'st to do;
So can we honor thee without regret;
No flaw upon the diamond of thy fame;
Thy life is crystalled now in death's white grace,
To its supreme effulgence, starred sublime
Upon the firmament, whose thousand orbs
Through ages' depths illume our life to-day.

The fruit of thy brave toil shall yet appear;
Thy spirit's flower shall bloom in years afar;
The glory of thy dream shall not be lost,
For it is burning in a million hearts—
The reign of justice on the happy earth—
The peace of liberty in every land—
The grandeur of the truth in every brain—
The melody of love in every breast—
While grand and beautiful shall be the way
Of fair humanity; the heights attained
Where wisdom shines; and o'er the laden plain
Shall glow the feet of labor, bowed no more
But throned and glorious in its native wealth;
And science, genius, music, art, romance,
Shall be the melting links that clasp the world
In bright fraternity and equal good.

Thy harvest-home is reached; our path beams on
To this great goal; we do not strive in vain;
For as thy virtues shine upon our eyes,
So shall all virtues shine through coming years;
So shall all deeds flow in one mighty stream;
The onward stream of human power and joy.

Unceasing is the struggle of mankind;
The gain to day is but the vantage point
Of grander progress on to-morrow's field;
No rest is there save as one rests like thee
In the crowned glory of heroic death.

CORRESPONDENCE.

A BUDDHIST ON THE LAW OF KARMA.

To the Editor of The Open Court:

I am sure you will do justice in your forthcoming work to the profoundly philosophical subjects, Karma and Nirvâna. Mr. Julian K. Smyth, in the *New Church Review*, in his essay on "Christianity and Orientalism," failing to grasp the law of Karma, confounds it with the pernicious doctrine of fatalism, which Buddha condemned along with materialism and teleological dualism. The law of Karma is based on the cyclic law of cause and effect. This law of Karma has no beginning and no end, and it is classified as follows:

Karma whose results are forthwith shown.

Karma that has no energy to work out in this life.

Karma that is sure to work out in any one of the many lives.

Latent Karma that lies in wait to work out when opportunity occurs. There is not one who is not free from this Karma.

Powerful Karma that gives no opportunity for lesser or ordinary Karma to work out.

Effectual Karma, which works out according to the preponderating influence one has over the other, either good or bad.

Potential Karma of the dying individual ready to come into activity before any other Karma.

Karma that works out at birth only.

Dynamic Karma, either good or bad, that works out in successive births, according to its nature.

Karma, either good or bad, which has a counter influence on the other.

Effectual Karma that does not allow the weaker Karma to operate on.

An individual latent Karma, either good or bad, which is dynamic, and having the force of weakening all the rest.

Study of Abhidharma, the psychology of Buddhism, is absolutely necessary, without which the philosophy of Buddhism is difficult to be realised. All the great exponents of Buddhism in the past were converted thereto by the profoundness of its psychology.

The study of Pali is very important to know the doctrines of Buddhism. H. DHARMAPÁLA.

CALCUTTA, July 23, 1894.

NOTES.

On Sunday evening, October 7, memorial services were held by the American Secular Union, at Fort Dearborn Hall, Chicago, in honor of the late Gen. M M. Trumbull. Addresses were made by Mr. Clarence S. Darrow, Dr. Juliet H. Severance, Lillie D. White for Lizzie M. Holmes, Shirlie Woodman, Mrs. Sarah Ames, and Mrs. M. A. Freeman. Letters were read from Judge C. B. Waite and Dr. Paul Carus, both of whom were unable to attend, and an original poem written for the occasion, and published in this number of *The Open Court*, was recited by Mr. Samuel P. Putnam. The family of Gen M. M. Trumbull were among the audience, which was large and representative. The exercises were in every way worthy of the occasion.

BOOK NOTICES.

Marriage and Divorce. The Effect of Each on Personal Status and Property Rights, with a Consideration of Fraudulent Divorces and the Ethics of Divorce. By Henry C. Whitney. (Philadelphia: John E. Potter & Co. Pp. 377.) A work written for popular and professional use. It gives a history of the institutions of marriage and divorce and a summary of the laws of marriage and divorce in all countries. The author writes sensibly on his subject, but from the point of view of the divorce-practitioner. He regards divorce as a salutary institution in the altered conditions of modern society, contending that "the field for the labors of the reformer is the social world; let the causes for divorce be abridged and divorce as an effect will be abridged also." He demands an honorable place for divorce practice in the profession, and adds a chapter on the ethical aspects of the subject.

THEODOR PARKER IN SEINEM LEBEN UND WIRKEN. Dargestellt von *Alfred Altherr*, Pfarrer zu St. Leonhard in Basel. Mit Parker's Bildniss. St. Gallen: Th. Wirth & Co. 1894.

This is a thoroughly appreciative and genial life of the great Teacher whose influence is still living in the hearts and minds of a second generation and spreading continually in other lands than his own.

The materials for his biography are fortunately ample and were gathered up soon after his death by his friend John Weiss, who had intimate personal acquaintance with him and his work. This somewhat hasty and ill-arranged volume is a precious storehouse of material, and it was followed some years later by the memoir of O. B. Frothingham whose dispassionate judgment and admirable literary skill brought this and some new-found material into more symmetric form.

Various other friends have contributed their reminiscences of this rich and varied life, and his own letters and diaries have been freely used, and now we are indebted to a German for weaving them all into a harmonious picture which gives us not only the heart and soul of the man, but also an impartial estimate of his relation to his time and the work which he did for the world.

Reading it in the slightly difficult medium of a foreign language, but one with which he was so familiar and in whose literature he found so much of his thought, I felt as the artist does when he holds his picture before a mirror, and the slight change of relation shows him its beauties and its faults more vividly than before. So freshly has the image of my friend come back to me that I have sometimes wondered if I have read all this in Weiss's or Frothingham's pages before.

To the young German public who sincerely wish to study the American life and thought of which Theodore Parker was the best exponent in the generation that is passing away this book is an immense help. Some modifications may have been made in our metaphysics and theology, for science and criticism have made great advances in the thirty-four years since his death, but his religion is unchanged; it is the spirit that carried us through the great crucial struggle of the sixties, and it is the same religion that must take us safely through the difficulties which now lie around us. The Fatherhood of God, the Brotherhood of Man, the Immortality of the Soul, and, in this world, Truth, Justice, and Righteousness unflinchingly applied to every relation of life, are all that we need to guide us on our difficult way.

To be baptised into the faith of Theodore Parker is to be strengthened for the great moral conflict which is our present duty, and in which every young man will find him an inspiration and a leader.

We rejoice that we can clasp hands with those across the ocean who are doing such honor to his memory, and who are so bravely carrying forward his work. E. D. C.

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