V.—THE UNDYING GERM-PLASM AND THE IMMORTAL SOUL.

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[The following article appeared originally, last year, in the German scientific monthly, *Humboldt*. It is reproduced here (by permission)—the English from the hand of Mr. A. E. Shipley—as a specimen of the kind of general speculation to which modern biology is giving rise.—EDITOR.]

To Weismann is due the credit of transforming those vague ideas on the immortality of the germ-plasma, which have been for some time in the minds of many scientific men, myself amongst the number, into a clear and sharply defined theory, against the accuracy of which no doubt can be raised either from the theoretical or from the empirical stand-point. This theory, defined as it is by Weismann, has but recently come before us, and some time must elapse before all the consequences which it entails will be evident. But there is one direction which I have for some time followed, and indeed began to think out long before Weismann's remarkable work showed the importance of this matter. I mean the origin of the conception of the immortal soul.

Before I approach the solution of this problem, it may be advisable to recall in a few words to my readers the theory of the immortality of the germ-plasm.

All unicellular beings, such as the Protozoa and the simpler Algæ, Fungi, &c., reproduce themselves by means of simple fission. The mother-organism may split into two similar halves, as the *Amœba* does, or, as is more common in the lowest unicellular plants, it may divide into a great number of small spores. In these processes it often happens that the whole body of the mother, the entire cell, may resolve itself into two or more children; at times, however, a small portion of the mother-cell remains unused. This remnant, in the spore-forming unicellular plants represented by the cell-wall, is then naturally dead.

From this it follows that these unicellular beings are immortal. The mother-cell divides, the daughter-cells resulting from the first division, repeat the process, the third generation does the same, and so on. At each division the mother-cell renews its youth and multiplies, without ever dying.

External circumstances can, of course, at any moment bring about the death of these unicellular organisms, and in reality almost every series of beings which originate from one another in this way, is interrupted by death. Some, however, persist. From the first appearance of living organisms on our planet till to-day,

several such series—at the very least certainly one—have persisted.

The immortality of unicellular beings is not at any time absolute, but only potential. Weismann has recently directed attention to this point. External occurrences may at any moment cause the death of an individual, and in this way interrupt the immortal series; but in the intimate organisation of the living plasma, there exist no seeds of death. The plasma is itself immortal and will in fact live for ever, provided only external circumstances are favourable.

Death is always said to be inherent in the nature of protoplasm. This is not so. The plasm, as such, is immortal.

But a further complication of great importance affects the reproduction and the rejuvenescence of these unicellular organisms; this is the process of conjugation. Two separate cells, distinct individuals, fuse together. Their protoplasmic bodies not only unite but intermingle, and their nuclei do likewise; from two individuals one results. A single cell is thus produced, and this divides. As a rule, this cell seems stronger than the single individual before the union. The offspring of a double individual, originated in this way, increase for some time parthenogenetically by simple fission without conjugation, until at length a second conjugation takes place amongst them. I cannot consider further the origin of this universally important process of conjugation. I will only suggest that a kind of conjugation may have existed from the very beginning and may have been determined by the original method of reproduction, if such existed.

At any rate conjugation has been observed in very many plants and animals, and is possibly universally present in the living world.

Conjugation does not affect the theory of Immortality. The double individual produced from the fusion of two individuals, which divides and lives on in its descendants, contains the substance of both. The conjugating cells have in no way died during the process of conjugation; they have only united.

If we examine a little more closely the history of such a "family" of unicellular beings from one period of conjugation to the next, we see that a great number of single individuals, that is, single cells, have proceeded from the double individual formed by conjugation. These may all continue to increase by splitting in two, and then the family-tree is composed of dichotomously branching lines; or they may resolve themselves into numerous spores, and then the family-tree exhibits a number of branches springing from the same point.

The majority of these branches end blindly with the death, caused by external circumstances, of that individual which corresponds with the branch. Only a few persist till the next period of conjugation, and then unite with other individuals and afford the opportunity for giving rise to a new family tree.

All the single individuals of such a genealogical table belong to one another, even though they be isolated. Amongst certain Infusoria and other Protista, they do, in fact, remain together and build up branching colonies. At the end of each branch is situated an Infusorian (Vorticella), and the whole colony represents in itself the genealogical family tree.

In the beginning, there existed no other animal organisms than these aggregations of similar unicellular beings, all of which reproduced themselves. Later on, division of labour made its appearance amongst the individuals of the animal colony, and it increased their dependence upon one another, so that their individuality was to a great extent lost, and they were no longer able to live independently of one another.

By the development of this process, multicellular Metazoa arose from the colonies of similar Protozoa, and at length culminated in the higher animals and man.

If we examine the human body, its origin and end, in the light of these facts, we shall see that a comparison between the simple immortal Protozoa and Man leads us to the result, that Man himself, or at least a part of him and that the most important, is immortal.

When we turn to the starting point of human development, we find an egg cell and a spermatozoon, which unite and whose nuclei intermingle. Thus a new cell is produced. This process is similar to the conjugation of two unicellular beings, such as two acinetiform Infusoria, one of which, the female (♀), is much larger than the other, the male (♂). This difference of size in the conjugating cell is however without importance.

From this double cell produced by conjugation many generations of cells arise by continual cell-division in divergent series. Amongst the Infusoria these are all immortal, but many of them are destroyed, and only a few persist till conjugation again takes place. The same is the case with man. Numerous series of cell-families arise, which are all immortal: of these but few—strictly speaking, only one—live till the next period of conjugation and then give the impulse which results in the formation of a new diverging series of cells. The difference between man and the infusorian is only that in the former the cells which originate from the double cell (the fertilised ovum) remain together and become differentiated one from another, whilst in the latter the cells are usually scattered but remain alike in appearance, &c.

The seeds of death do not lie, as Weismann appears to assume, in the differentiation of the cells of the higher animals. On the contrary, all the cell-series, not only those of the reproductive cells, are immortal. As a matter of fact all must die; not because they themselves contain the germs of death and have contained them from the beginning, but because the structure which is built up by them collectively, finally brings about the death of all. The living plasm in every cell is itself immortal. It is the higher

life of the collective organism which continually condemns countless cells to death. They die, not because they cannot continue to exist as such, but because conditions necessary for their preservation are no longer present.

Thus, whilst the cells are themselves immortal, the whole organism which they build up is mortal. The complex interdependence between the single cells, which, since they have adapted themselves to division of labour, has become necessary, carries with it, from the beginning, the seeds of death. The mutual dependence ceases to work, and the various cells are killed.

The death of the individual is a consequence of the defective precision in the working of the division of labour amongst the cells. This defect, after a longer or shorter time, causes the death of all the cells composing the body. Only those which quit the body retain their power of living.

Of all those countless cells which, in the course of a lifetime, are thrown off from the body, only one kind is adapted for existence outside the body, namely, the reproductive cells.

Amongst the lower animals the reproductive cells often leave the body of their parents only after the death of the latter. This is not the case in man.

All the cell-series which do not take part in the formation of reproductive cells, as well as all the reproductive cells without exception, or with only a few exceptions, die through unfavourable external conditions; just as all, or almost all, of the Infusoria which arose from the double cell, die before they can conjugate again.

At times, however, some of the Infusoria persist till the next period of conjugation, and in the same way, from time to time, some of the human reproductive cells succeed in conjugating, and from them a new individual arises.

A man is the outgrowth of the double cell produced from the conjugation of two human reproductive cells, and consists of all the cells which arise from this and remain in connexion with each other. The human individual originates at the moment of the mingling of the nuclei of the reproductive cells; and the details of this mingling determine his individual peculiarities.

The end of man is manifestly to preserve, to nourish, and to protect the series of reproductive cells which are continually developing within him, to select a suitable mate and to care for the children which he produces. His whole structure is acquired by means of selection with this one object in view, the maintenance of the series of reproductive cells.

From this standpoint the individual loses his significance and becomes, so to speak, the slave of the reproductive cells. These are the important and essential and also the undying parts of the organism. Like ravelled threads whose branches separate and re-unite, the series of reproductive cells permeate the successive

generations of the human race. They continually give off other cell-series which branch out from this network of reproductive cells, and, after a longer or shorter course, come to an end. Twigs from these branches represent the human individuals, and anyone who considers the matter must recognise that, as was said above, apart from the preservation of the reproductive cell series the individuals are purposeless.

It is on this basis that the moral ordering of the world must place itself if it is to stand on any basis at all. It is an easy and a pleasant task to interpret the facts of history from this standpoint. Everything fits together and harmonises, and each turn in the historical development of civilisation when observed from this point of view acquires a simple and a clear causality.

I cannot enlarge on this topic, engaging as it is, but here a further question obtrudes itself. May there not be some connexion between the actual immortality of the germ-cells, the continuity of their series and the importance of the part they play, and the origin of the idea of an Immortal Soul? May not the former have given rise to the latter?

As a matter of fact, the series of reproductive cells possess the essential attributes of the human soul: they are the immortal living part of a man, which contain, in a latent form, his spiritual peculiarities. The immortality of the reproductive cells is only potential and is essentially different from that absolute eternal life which certain religions ascribe to the soul.

We must not, however, forget that at the time when the conception of a soul arose amongst men, owing to a defective knowledge of the laws of Logic, no clear distinction was made between a potential immortality and an absolute life without end.

Herbert Spencer has pointed out that all religions have their origin in reverence paid to ancestors. Each religion must have a true foundation, and the deification of our forefathers has this true and natural foundation inasmuch as they belong to the same series of reproductive cells as their descendants. Of course our barbaric ancestors who initiated the ancestor-worship had no idea of this motive for their religion, but that in no way disproves that this and this alone was the *causa efficiens* of the origin of such religions. It is indeed typical of a religion that it depends upon facts which are not discerned and which are not fully recognised.

With the origin and development of every religion the origin and development of the conception of the soul progresses step by step.

We find the justification of ancestor-worship in the immortality of the reproductive cells, and in the continuity of their series. This should also take a part in the origin of the conception of the soul.

Spencer derives the conception of the existence of the soul from dreams, and from the imagination of the mentally afflicted. The savage dreams he is hunting, and wakes up to find himself at home. In his dream he talks with friends who are not present where he sleeps; he may even in the course of his dream encounter the dead. From this he draws the conclusions—(1) that he himself has two persons, one hunting whilst the other sleeps; (2) that his acquaintances also have a double existence; and, from those cases in which he met with the dead, (3) that they are not only double persons, but that one of the persons is dead whilst the other continues to live.

Thus, according to Spencer, the idea arises that man consists of two separable thinking parts, and that one of these can survive the other.

When a person faints and recovers, we say he comes to himself. That is, a part of his person left him and has returned. But in this case, as in the dream, the body has not divided, so that in a swoon the outgoing portion is not corporeal.

The savage will think that this is what remains alive after death, for he is incapable of distinguishing between a swoon and death. Then he will associate the part which leaves the body during a swoon with that which gives life, and some will regard the heart, which fails to beat after death, and others the breath, which ceases when life does, as this life-giving part or soul.

Thus far I am quoting from Spencer.

The conception of the soul, which has thus arisen, has been utilised by astute priests to obtain power over their fellow-men; whilst the genuine founders of religions have made use of it, and by threats of punishment, and promises of reward, have tried to induce mankind to live uprightly.

With this purpose in view, the teachers of religion have changed the original conception of the soul and have added to it the attribute of absolute immortality and eternal duration, an attribute which is in no way connected by people in a low state of development with their conception of the soul.

At the present time amongst the religions of all civilised people the undying soul plays an extraordinarily important part.

I start from the position that no doctrine can receive a general acceptance amongst men which does not depend on a truth of nature. The various religions agree on one point, and this is the doctrine of the immortal soul. Such a point of universal agreement, I am convinced, cannot have been entirely derived from the air. It must have had some foundation in fact, and the question arises, What was this foundation? Dreams and phantasms, as Spencer believes? No, there must have been something real and genuine, and the path we have entered upon to find traces of this true foundation of the conception of the soul cannot be distrusted.

We must compare the conception of the soul as held by various

related religions, and strip off from it all those attributes which are not common to all. But those which all the various religions agree in ascribing to the soul, we may regard as its true attributes.

It would take too long to go into the details of this examination of the conception of the soul. As the general result of a comparison of the various views of the soul we may put down the following characteristics which are invariably ascribed to it :—

- (1) The soul is living.
- (2) It survives the body, and can continue to exist without it.
- (3) During life it is contained in the body, but leaves it after death.
- (4) The soul participates in the conduct of the body : after the death of the latter, causality (retribution) can still affect the soul.

The characteristics (1) to (3) hold also for the series of reproductive cells continually developing within the body ; and these attributes of the germ-cells may well be the true but unrecognised cause of the origin of those conceptions of the soul's character.

This like holds true for (4), although the connexion is not so obvious. For this reason, it will be advisable to consider the point in more detail.

It has been already indicated that the founders of religions have made use of the survival of the soul after death to endeavour to lead mankind to live righteously, by threats of punishments or promises of reward, which will affect the soul after the death of the body.

It is precisely on this point that in the most highly developed religions there is the greatest falling-off from the original conception of the after-effect of human conduct on the soul, and the most astounding things are inculcated by the Koran and other works, with respect to this.

But here again we may separate the true kernel from the artificial shell, and reach the conclusion that good conduct is advantageous for the soul after the death of the body, and that bad conduct is detrimental. In no other way can the Mohammedan paradise or the Christian hell be explained than as sheer anthropomorphic realisations of these facts, which can appeal even to the densest intellect.

What then is good conduct, or bad ?

The question is easily asked, but without reference to external circumstances impossible to answer. *Per se* there is no good or bad conduct. Under certain circumstances a vulgar, brutal murder may become a glorious and heroic act, a good deed in the truest sense of the word ; as, for example, in the case of Charlotte Corday. Nor must the view of one's fellow-creatures be accepted as a criterion of good or bad conduct, for different parties are apt to cherish diametrically opposed opinions on one

and the same subject. There remains then only one's own inner feeling or conscience. Good conduct awakes in this a feeling of pleasure, bad conduct a feeling of pain. And by this alone can we discriminate. Now let us further ask, what sort of conduct produces in our conscience pleasure, and what sort of conduct induces pain? If we investigate a great number of special cases, we shall recognise that conduct which proves advantageous to the individual, to the family, to the state, and finally to mankind, produces a good conscience, and that conduct which is injurious to the same series gives rise to a bad conscience. If a collision of interests arise, it is the degree of relationship which determines the influence of conduct on the conscience. As, for instance, amongst the clans in Scotland, a deed which is advantageous for the clan produces a good conscience, even if it be injurious to the state and to mankind.

The conscience is one of the mental faculties of man acquired by selection and rendered possible by the construction and development of the commonwealth of the state. Conscience urges us to live rightly, that is, to do those things which will help ourselves and our family, whereby our fellow creatures according to their degree of relationship may be benefited. These are good deeds, and they will merit from the teachers of religion much praise for the soul. We find, therefore, that the only possible definition of a good deed is one which will benefit the series of germ-cells arising from one individual, and further which will be of use to others with their own series of germ-cells, and that in proportion to the degree of connexion (relationship).

It is clear that in this point also the ordinary conception of the future fate of the soul agrees fundamentally with the result of observation on the prosperity of the series of germ-cells.

As all the forces of Nature, known to the ignorant barbarian only by their visible workings, call forth in him certain vague and, therefore, religious ideas, which are but a reflexion of these forces in an anthropomorphically distorted form, so the apparently enigmatical conception of the eternal soul is founded on the actual immortality and continuity of the germ-plasma.