the two white strata, and were described by him by the name of "solitary cells." I trust at no distant date to review the entire question of the distribution of large cortical cells with measurements and to submit them to the society.

For the present I think the existence of the large cortical cell group which I have described, shows conclusively that before the existence of large cells can be considered a demonstration of the correctness of functional localization, a more extended study must be made.

THE UNITY OF NATURE.

By the Duke of Argyll.

VII.

ON THE MORAL CHARACTER OF MAN CONSIDERED IN THE LIGHT OF THE UNITY OF NATURE.

(Continued).

It may be well, before proceeding farther in this branch of our inquiry, to retrace for a little the path we have been following, and to identify the conclusions to which we have been led.

In the first place, we have seen that the sense of obligation considered in itself—that is to say, considered apart from the particular actions to which it is attached—is a simple and elementary conception of the mind, insomuch that in every attempt to analyze it, or to explain its origin and growth, this absurdity can always be detected,—that the analysis or explanation universally assumes the previous existence of that very conception for which it professes to account.

In the second place, we have seen that, just as Reason, or the logical faculty, begins its work with the direct perception of some simple and elementary truths, of which no other account can be given than that they are intuitively perceived, or, in other words, that they are what is called "self-evident," so in like manner the Moral Sense begins its work with certain elementary perceptions and feelings in respect to conduct, which arise out of the very nature of things, and come instinctively to all men. The earliest of these feelings is the obligation of obedience to that first Authority the rightfulness of which over us is not a question but a fact. The next of these feelings is the obligation of acting towards other men as we know we should like them to act towards ourselves. The first of these feelings of obligation is inseparably associated with the fact that all men are born helpless, absolutely dependent and subject to Parents. The second of these feelings of obligation is similarly founded on our conscious community of nature with other men, and on the consequent universal applicability to them of our own estimates of good and evil.

In the third place, we have seen that this association of the higher powers of Man with rudimentary data which are supplied by the facts of Nature, is in perfect harmony with that condition of things which prevails throughout Creation,—the condition, namely, that every creature is provided from the first with just so much of instinct and of impulse as is requisite to propel and guide it in the kind and to the measure of development of which its organism is susceptible, leading it with unfailing regularity to the fulfillment of the law of its own being, and to the successful discharge of the functions assigned to it in the world.

In the fourth place, we have seen that the only really exceptional fact connected with Man is—not that he has faculties of a much higher kind than other creatures, nor that these faculties are susceptible of a corresponding kind and measure of development—but that in Man alone this development has a persistent tendency to take a wrong direction, leading not towards, but away from, the perfecting of his powers.

In the last place, we have seen that as a matter of fact, and as a result of this tendency, a very large portion of Mankind, embracing almost all the savage races, and large numbers of men among the most civilized communities, are a prey to habits, practices, and dispositions which are monstrous and unnatural—one test of this unnatural character being that nothing analogous is to be found among the lower animals in those spheres of impulse and of action in which they have a common nature with our own; and another test being that these practices, habits, and dispositions are always directly injurious and often even fatal to the race. Forbidden thus and denounced by the highest of all authorities, which is the authority of Natural Law, these habits and practices stand before us as unquestionable exceptions to the unity of Nature, and as conspicuous violations of the general harmony of Creation.

When, however, we have come to see that such is really the character of these results, we cannot be satisfied with the mere recognition of their existence as a fact. We seek an explanation and a cause. We seek for this, moreover, in a very different sense from that in which we seek for an explanation and a cause of those facts which have the opposite character of being according to law and in harmony with the analogies of Nature.

With facts of this last kind, when we have found the place into which they fit in the order of things, we can and we do rest satisfied as facts which are really ultimate—that is to say, as facts for which no other explanation is required than that they are part of the Order of Nature, and are due to that one great cause, or to that combination of causes, from which the whole harmony and unity of Nature is derived. But when we are dealing with facts which cannot be brought within this category,—which cannot be referred to this Order, but which are, on the contrary, an evident departure from it,—then we must feel that these facts require an explanation and a cause as special and exceptional as the results themselves.

There is, indeed, one theory in respect to those mysterious aberrations of the human character, which, although widely prevalent, can only be accepted as an explanation by those who fail to see in what the real difficulty consists. That theory is, that the vicious and destructive habits and tendencies prevailing among men, are not aberrant phenomena at all, but are original conditions of our nature,—that the very worst of them have been primitive and universal, so that the lowest forms of savage life are the nearest representatives of the primordial condition of the race.

Now, assuming for the present that this were true, it would follow that the anomaly and exception which Man presents among the unities of Nature is much more violent and more profound than on any other supposition. For it would represent the contrast between his instincts and those of the lower animals as greatest and widest at the very moment when he first appeared among the creatures which, in respect to these instincts, are so superior to himself. And it is to be observed that this argument applies equally to every conceivable theory or belief as to the origin of Man. It is equally true whether he was a special creation, or an unusual birth, or the result of a long series of unusual births each marked by some new accession to the aggregate of faculties which distinguish him from the lower animals. As regards the anomaly he presents, it matters not which of these theories of his origin be held. If his birth, or his creation, or his development, whatever its methods may have been, took place after the analogy of the lower animals, then, along with his higher powers of mind, there would have been corresponding instincts associated with them to guide and direct those powers in their proper use. It is in this essential condition of all created things that Man, especially in his savage state, presents an absolute contrast with the brutes. It is no explanation, but, on the contrary, an insuperable increase of the difficulty,

to suppose that this contrast was widest and most absolute when Man made his first appearance in the world. It would be to assume that, for a most special and most exceptional result, there was no special or exceptional cause. If Man was, indeed, born with an innate propensity to maltreat his women, to murder his children, to kill and eat his fellow, to turn the physical functions of his nature into uses which are destructive to his race, then, indeed, it would be literally true that

> "Dragons of the prime,
> That tare each other in their slime,
> Were mellow music matched with him."

It would be true, because there were no Dragons of the prime, even as there are no reptiles of the present age —there is no creature, however terrible or loathsome its aspect may be to us, among all the myriads of created things—which does not pass through all the stages of its development with perfect accuracy to the end, or which, having reached that end, fails to exhibit a corresponding harmony between its propensities and its powers, or between both of these and the functions it has to perform in the economy of Creation. So absolute and so perfect is this harmony, that men have dreamed that somehow it is self-caused, the need and the requirement of a given function producing its appropriate organ, and the organ again reacting on the requirement and the need. Whatever may be the confusion of thought involved in this idea, it is at least an emphatic testimony to the fact of an order and an adjustment of the most perfect kind prevailing in the work of what is called Evolution, and suggesting some cause which is of necessary and universal operation. The nearer, therefore, we may suppose the origin of Man may have been to the origin of the brutes, the nearer also would his condition have been to the fulfillment of a law which is of universal application among them. Under the fulfillment of that law the higher gifts and powers with which Man is endowed would have run smoothly their appointed course, would have unfolded as a bud unfolds to flower,—as a flower ripens into fruit,—and would have presented results absolutely different from those which are actually presented either by the savage or by what is called the civilized condition of Mankind.

And here it may be well to define, as clearly as we can, what we mean by civilization, because the word is very loosely used, and because the conceptions it involves are necessarily complex. Usually it is associated in our minds with all that is highest in the social, moral, and political condition of the Christian nations as represented in our own country and in our own time. Thus, for example, respect for human life, and tenderness towards every form of human suffering, is one of the most marked features of the best modern culture. But we know that this sentiment, and many others which are related to it, were comparatively feeble in the case of other societies which, nevertheless, we acknowledge to have been very highly civilized. We must, therefore, attach some more definite and restricted meaning to the word, and we must agree to understand by civilization only those characteristic conditions which have been common to all peoples whom we have been accustomed to recognize as among the governing nations of the world. And when we come to consider what these characteristics are, we find that though complex, they are yet capable of being brought within a tolerably clear and simple definition. The Latin word *civis*, from which our word civilization comes, still represents the fundamental conception which is involved. The citizen of an imperial City,—the subject of an imperial Ruler,—the member of a great State,—this was the condition which constituted the Roman idea of the rank and status of civilization. No doubt many things are involved in this condition, and many other things have come to be associated with it. But the essential elements of the civilized condition, as thus defined or understood, can readily be separated from others which are not essential. An extended knowledge of the useful arts, and the possession of such a settled system of law and government as enables men to live in great political communities, these are the essential features of what we understand by civilization. Other characteristics may co-exist with these, but nothing more is necessarily involved in a proper understanding, or even in the usual application of the word. In particular, we cannnot affirm that a civilized condition involves necessarily any of the higher moral elements of character. It is true, indeed, that no great State, nor even any great City, can have been founded and built up without courage and patriotism. Accordingly these were perhaps the most esteemed virtues of antiquity. But these are by no means confined to civilized men, and are, indeed, often conspicuous in the savage and in the barbarian. Courage, in at least its lower forms, is one of the commonest of all qualities; and patriotism, under the like limitation, may almost be said to be an universal passion. It is in itself simply a natural consequence of the social instinct; common to Man and to many of the lower animals—that instinct which leads us to identify our own passions and our own sympathies with any brotherhood to which we may belong,—whatever the associating tie of that brotherhood may be,—whether it be morally good, bad, or indifferent. Like every other instinct, it rises on its moral character in proportion as it is guided by reason and by conscience, and in proportion as, through these, it becomes identified with duty and with self-devotion. But the idea of civilization is in itself separate from the idea of virtue. Men of great refinement of manners may be, and often are, exceedingly corrupt. And what is true of individuals is true of communities. The highest civilizations of the heathen world were marked by a very low code of morals, and by a practice even lower than their code. But the intellect was thoroughly cultivated. Knowledge of the useful arts, taste in the fine arts, and elaborate systems both of civil polity and of military organization, combined to make, first Greek, and then Roman, civilization, in such matters the basis of our own.

It is, therefore, only necessary to consider for a moment these essential characteristics of what we mean by civilization, to see that it is a conception altogether incongruous with any possible idea we can form of the condition of our first parents, or, indeed, of their offspring for many generations. An extended knowledge of the useful arts is of necessity the result of accumulation. Highly organized systems of polity were both needless and impossible before settled and populous communities had arisen. Government was a simple matter when the "world's gray fathers" exercised over their own children the first and the most indisputable of all authorities.

It is unfortunate that the two words which are habitually used to indicate the condition opposite to that of civilization are words both of which have come to mean a great deal more than mere ignorance of the useful arts, or a merely rudimentary state of law and government. Those two words are barbarism and savagery. Each of these has come to be associated with the idea of special vices of character and of habit, such as cruelty and ferocity. But "barbarian," in the classical language from which it came to us, had no such meaning. It was applied indiscriminately by the Greeks to all nations, and to all conditions of society other than their own, and did not necessarily imply any fault or failure other than that of not belonging to the race, and not partaking of the culture which was then, in many respects at least, the highest in the world. St. Paul refers to all men who spoke in any tongue unknown to the Christian communities as men who were "to them barbarians." But he did not associate this term with any moral faults, such as violence or ferocity; on the contrary, in his narrative of his shipwreck on the coast of Malta, he calls the

natives of that island "barbarous people" in the same sentence in which he tells us of their kindness and hospitality. This simple and purely negative meaning of the word barbarian has been lost to us, and it has become inseparably associated with characteristics which are indeed common among uncivilized nations, but are by no means confined to them. The epithet "savage," of course, still more distinctly means something quite different from rude, or primitive or uncultivated. The element of cruelty or of ferocity is invariably present to the mind where we speak of savagery, although there are some races—as for example, the Eskimo—who are totally uncivilized, but who, in this sense, are by no means savage.

And this may well remind us that, as we have found it necessary to define to ourselves the condition which we are to understand by the word civilization, so it is not less essential to define and limit the times to which we are to apply the word primeval. For this word also is habitually used with even greater laxity of meaning. It is often employed as synonymous with primitive, and this again is applied not only to all times which are prehistoric, but all conditions even in our own age which are rude or savage. There is an assumption that,the farther we go back in time, there was not only less and less extensive knowledge of the useful arts,—not only simpler and simpler systems of life and polity.—but also that there were deeper and deeper depths of the special characteristics of the modern savage. We have, however, only to consider what some of these characteristics are, to be convinced that although they may have arisen in early times, they cannot possibly have existed in the times which were the earliest of all. Things may have been done, and habits may have prevailed, when the multiplication and dispersion of Mankind had proceeded to a considerable extent, which cannot possibly have been done, and which cannot possibly have prevailed when as yet there was only a single pair of beings "worthy to be called" man and woman, nor even when as yet all the children of that pair knew themselves to be of one family and blood. The word primeval ought, if it is to have any definite meaning at all, to be confined to this earliest time alone. It has already been pointed out, that on the supposition that the condition of primeval man approximated to the condition of the lower animals, that condition could not have been nearer to, but must, on the contrary, have been very much farther removed from the condition of the modern savage. If, for example, there ever was a time when there existed on one spot of earth, or even on more spots than one, a single pair of human beings, it is impossible that they should have murdered their offspring, or that they should have killed and eaten each other. Accordingly it is admitted that cannibalism and infanticide, two of the commonest practices of savage and of barbarous life, cannot have been primeval. But this is a conclusion of immense significance. It hints to us, if it does no more, that what is true of one savage practice may possibly be true of others.

(To be Continued.)

ASTRONOMY.

COMPARISON STARS:—Under this heading Mr. Dreyer, in the last number of *Urania*, makes a most excellent "Suggestion to Astronomers" upon a matter which, of late, attracted some little attention. It is to be hoped that other observers will follow the example set at the Dunsink Observatory. Mr. Dreyer's "suggestion" is as follows:

"In spite of the numerous star-catalogues in the hands of observers of minor plants and comets, it frequently happens that a well-determined place for a comparison star cannot be found in any catalogue. Many stars have therefore to be re-observed, and much time is no doubt lost by a number of observers, each having to determine the places of a few stars, which, if put together in on working list could be observed by one person with but little trouble.

It would evidently be an advantage if an astronomer, having at his disposal a good transit circle, would, for a time, endeavor to determine the places of all the comparison stars recently used and requiring re-observation.

In accordance with this scheme, I shall, until further notice (with the concurrence of Dr. Ball) be glad to determine with the Dunsink Transit Circle the places of any comparison stars north of —20° Declination not found in modern catalogues, and recently used in observations of minor planets or comets. The mean places, based on the Fundamental Catalogue of the 'Astronomische Gesellschaft,' will be worked out and published as soon as practicable."

THE SOLAR PARALLAX.

M. Faye has recently communicated to the Paris Academy of Sciences (*Comptes Rendus Tome XCII., No.* 8), an interesting paper upon the actual state of our knowledge of the sun's parallax. Remarking that there is no other constant in science whose determination depends upon such a large number of entirely independent results, he subdivides the various values assigned for the sun's mean parallax, as follows:

Geometrical Methods 8.82″	8.85″	by Mars (Cassini's method)	Newcomb
	8.78	by Venus, 1769 (Halley's method)	Powalky
	8.81	by Venus, 1874 "	Tupman
	8.87	by Flora, (Galle's method)	Galle
	8.79	by Juno "	Lindsay
Mechanical Methods 8.83″	8.81	by the lunar inequality (Laplace's method)	———
	8.85	by the monthly equation of the earth	Leverrier
	8.83	by the perturberations of Mars and Venus	Leverrier
Physical Methods 8.81″	8.799	velocity of light (Fizeau's method)	Cornu
	8.813	" " (Foucault's method)	Michelson

In regard to the value 8.85″ obtained by Cassini's method, M. Faye says that Mars has always given values for the solar parallax somewhat too large. The first value 8.″81 obtained by mechanical methods was calculated by adopting for the coefficient of the inequality 125.2″, the mean between the result of Airy from the Greenwich observations, and that of Newcomb from the Washington observations, taking for the moon's parallax 57′ 2.7″, and for her mass $\frac{1}{80.8}$. By the second of the "mechanical methods." Leverrier found 8.″95, which was afterwards reduced to 8.85″ by Stone upon correcting two slight errors in the computation. The value from the perturbations of Venus and Mars, assigned by Leverrier was 8.86″, but one of the numbers requiring a small correction, it is reduced to 8.83″. Michelson having overcome all the difficulties in Foucault's method, found for the velocity of light 2,999.40 kilom. ± 100 kilom. Using Struve's constant of aberration the corresponding values of the parallax are 8.799″ and 8.813″, as above. The general mean is 8.82″, to which M. Faye attributes a probable error of ± 0.016″. Although each of the values may be effected by systematic error, nevertheless, since the causes of error are varied, and without the least possible connection, these errors must be to a great degree eliminated, as well as the accidental errors.

The following conclusions are reached:

1. That the physical methods are superior to all others, and should be adopted.

2. That the value of the solar parallax, 8.813″ (by physical methods), is now determined to about $\frac{1}{100}$ of a second.

3. That the seven astronomical methods converge more and more towards that value, and tend to confirm it, without equalling it in precision.

This fact does not diminish, however, the great importance of observations upon the coming transit of Venus, to which we can now bring to our aid the most effective of photographic apparatus. W. C. W.

WASHINGTON, D. C., *April* 14, 1881.