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ARTICLE VIII.

CRITICAL NOTES.

THE AGE OF MAN AS INDICATED BY THE NATURAL INCREASE OF POPULATION.

ALL methods of estimating the length of time during which the human race has been on the earth are more or less uncertain. Authentic history does not extend back to the beginning; and if the biblical narrative be taken as such a history, there are very serious doubts as to how far it furnishes us with a full and reliable chronology. Geologic investigations seem to present more positive results; but geologists differ among themselves as to the rapidity of geologic processes; and the alleged discoveries of human remains in early geologic formations need to be carefully tested. The estimates that are made vary largely, and are at the best only more or less probable conjectures.

There is a method of calculation not so often made use of as these others, but still well worthy of consideration, viz., an estimate based on the average rate of increase of the human race. That is, assuming the present population of the globe to be, say, 1,500,000,000, and assuming a certain rate of increase as having ruled on the average from the earliest time to the present, it is a simple question of arithmetic to determine when the human race started with one pair. But of course many elements of uncertainty come into the calculation. We have no statistics of population reaching back to prehistoric times; there are no trustworthy statistics even of the greater part of historic time. We have to assume that what holds true of the present time holds true also of previous centuries. But we must make allowance for many disturbing factors. In primitive periods there may have been unknown influences at work to increase or diminish what we might regard as the natural or normal rate of increase. Wars, pestilences, and famines have all along served to retard the increase of population. In the earlier times the ravages of wild beasts may have had a considerable effect in the same direction. The diminution of destructive wars in modern times, and the improvements made in regard to the preservation of health, together with increased facilities for the transportation of provisions in cases of famine—these and other things have undoubtedly tended to heighten the rate of increase.

But, on the other hand, there is reason for supposing that in the prehistoric times there were causes tending to promote a more rapid increase

of population than the present. The advance of culture and the increase of wealth tend to diminish the size of families. At present it is a general fact that the poorer and ruder classes and nations procreate children most largely. It may, therefore, be presumed that in the early and more uncultivated periods there would have been the same tendency. Moreover, when the race was limited to a few individuals there would seem to have been less occasion than afterwards for destructive quarrels growing out of a lust for possession. The world being before them, as they increased in numbers, they would have needed only to spread out and take possession of the unoccupied soil wherever they pleased. Furthermore, it may be supposed that many of the most destructive diseases that have ravaged the earth originated after the primeval times. So that, on the whole, we can hardly assume that in the early generations of the race the increase was proportionally much less rapid than at present.

The method of calculation must of course be based upon the succession of *generations*, of which we may roughly assume three in a century. The actual increase in the long run is not according to the number of children born, but according to the number of those who grow up to be themselves parents. If the first pair had twenty children, but only one couple among them had children of their own, the net result would be no increase at all. If the same kind of a family should result in the second case, we should have indeed more than two human beings on the globe; there might possibly be forty-two all living at the same time; but if the same conditions should be perpetual, there would in the long run be no virtual increase.

What, then, is the average rate of increase at the present time? No exact answer can be given. The rate is very different in different places, and is variously affected by local and racial conditions. Inasmuch as emigration is constantly taking place, the statistics of single nations furnish no sure criterion; certainty could be attained only by a universal census taken at stated times, by which the absolute increase of the world's population within a given period might be ascertained. The best approximation to a correct estimate may perhaps be derived from the statistics of the various European nations, as that continent has been long peopled, there is comparatively little increase through immigration, and the statistics are fairly trustworthy. Taking then the statistics of increase between 1870 and 1890, we find that it is least in France, where in twenty years the growth was from about 36,000,000 to about 38,200,000. If we add another thirteen years, in order to complete a generation, we should have not far from 39,500,000. This would indicate a rate of increase very nearly = 10:11 in one generation. In Germany within the same twenty years the increase was from about 41,000,000 to about 49,500,000. Adding another thirteen years of increase at the same rate, we should have about 56,200,000. That is, the rate of increase in one generation is nearly 5:7. This estimate leaves out of account the large emigration which has taken place

during the last generation, and which has amounted to at least 5,000,000, so that the actual growth would better be represented by the ratio of 2 to 3. In England the increase has been even greater, being about 2:3, without taking account of the large emigration. In Austria the rate has been about the same as in Germany and England; in Spain, about 7:8; in Russia, about 6:7; in Norway and Sweden, about 3:4.

Without going further, we have data here for an approximate estimate of the average rate of increase of population. Except where mentioned, emigration has been left out of account; so that the rate of increase would, fairly considered, be somewhat greater than the figures indicate. The rates vary from 2:3 to 10:11. And it would be quite within bounds to say that the increase has, throughout Europe, been at the rate of 5:6 in a generation. Now if we assume that this represents the average rate of increase from the beginning, then, starting with the first pair, the second generation would be 2 40, the third 2.88, the fourth 3.456, and so on, each generation being equal to the preceding multiplied by $\frac{6}{5}$. When the 110th generation is reached, we find the population to be something more than 1,700,000,000. But $110 \times 33 = 3630$, the number of years required; so that the present population ought to have been reached long before the birth of Christ.

Let us then take 10:11 as the average rate of increase, and see where it brings us out. The progression then would be 2, 2.20, 2.42, 2.66, etc. In the course of seventeen generations the total number would be ten. In the course of 200 generations the total population would amount to about 1,436,000,000, i. e., about the present population of the earth. But 200 generations=6,600 years, which is not far from the traditional time assumed to have passed since the creation of Adam.

But it is commonly supposed that both geologic and antiquarian researches have made it probable that the human race has existed on this globe considerably longer than the traditional 6,000 years. Evidences of a very early development of civilization in Egypt and Babylon seem to presuppose a preparatory period of hardly less than 5,000 years. It is not easy to settle such a question by *a priori* considerations. We do not know what the whole population of the globe was in those earliest periods of which the records tell us. It need not have been very great; and we cannot confidently estimate the time necessary for the development of a given degree of civilization. Let us, however, make another supposition—that the average rate of increase has been 20:21 to the generation. In this case, forty-seven generations must have been required to bring the population up to twenty persons; and 418 generations in order to produce the present population of the earth. That would give us about 13,800 years as the whole period of human history. At this rate, about 9,300 years would have been needed to produce a population of 2,000,000.

Of course it is not to be supposed that the increase of population has been regular at any of the supposed rates, or at any other rate. There

may have been great fluctuations. At some periods there may have been a material decrease in the sum total, at others an increase considerably greater than the average one. And if we suppose that at the outset the increase was much more rapid than supposed, the whole time needed to reach the present population would be very much shortened. For example, it is quite conceivable that the first pair may have had ten children who became progenitors. In this case at one bound the whole population would have been equal to what, at the uniform rate of 10:11, it would have required seventeen generations to produce.

In any case the figures above given tend to make very improbable those hypotheses which assume anything like 100,000 years as the length of time during which the human race has been on the earth. It is indeed made certain that the *average* rate of increase must have been considerably less than that which now holds in the various states of Europe. But the presumption is strongly against such an infinitesimally slow rate as would be implied in such a long period. Even at the ratio of 100:101 for each generation the present population would be reached in about 65,000 years.

C. M. MEAD.

PROBABLE RAPIDITY OF MAN'S EARLY DEVELOPMENT.'

THE ingenious and suggestive calculations of Professor Mead are worthy of following out in various other lines of application. The bearing of his figures upon primeval chronology is even stronger than he has claimed; for, it is manifest that in the youth of the race the opportunities for a high ratio of geometric increase far exceeded those in later times. Since the dawn of history the earth has been fully occupied to the limits attainable with existing knowledge. America was indeed capable of supporting a vast increase of population in response to the knowledge of civilized man, but to a race of hunters the limit had probably long been reached by the aboriginal population. Now, in the primeval condition of the race, probably the checks to geometrical increase of population which are so manifest in the historical period were not in operation. The rapidly increasing population could easily migrate to unoccupied outlying regions.

A simple calculation made upon a slightly higher ratio of increase than Professor Mead has used, and yet a ratio which is by no means improbable, will bring this enormous latent power clearly to view. Beginning with a single pair, if the population doubled once in fifty years, which is far below the possible rate, there would be in one thousand years more than one million inhabitants,—allowing us to start on the second thousand years with five hundred thousand pairs. If the increase continued without check another thousand years at the same rate, there would be in the world at that time five hundred thousand millions, or about two hundred and fifty times the present population of the globe. Thus it is clear that, without the sternest kinds of natural checks to the

growth of population, the world would have become overpopulated long ago, and it is the easiest thing to believe that under such conditions all the existing diverse characteristics of language, physiological peculiarities, and social customs might have become established traits during the first two thousand years of human history. Once established they would easily be perpetuated to our own day under the more stable conditions that ensued after the whole earth had been occupied by man.

Due attention to the primitive condition of society will thus set a check upon a number of the extravagant estimates which have been made concerning the antiquity of man. Two thousand years or at most four or five thousand years projected back of the historical limit give time enough for a great many things to happen which are not strictly analogous to the orderly progress of events under the more settled conditions of society. The human race itself has its infancy, its matured period of comparative stability, and perhaps its final decay. It is a capital mistake to assume that all things have continued as they are from the beginning of creation. There is no such thing as absolute uniformity in the progress of nature. Evolution has its paroxysms. Catastrophies are part and parcel of its handiwork.

THE NATURE OF MIRACLES.

PRESIDENT BARTLETT'S criticism of the position taken in "The Scientific Aspects of Christian Evidences" respecting the relation of miracles to the laws of nature is similar to that made by some others, and is a point on which it is difficult to secure uniformity of statement. In his view a miracle is not a "violation" of the laws of nature, but "rather a suspension of the effects of that law or force," which corresponds almost exactly with the formal definition of miracle given on page 84. But the question is one of so much difficulty and importance that it will be profitable to give it a little further attention here.

The relation of God to nature is the great point of contention between theists and that heterogeneous class of philosophers who in one way or another confound the Creator with his works, and break down the distinction between mind and matter. The experimental point of view from which to approach the discussion is that of our own conscious control of matter. On purely physical principles it can be demonstrated that mind is incapable of moving matter. The very definition of matter involves the existence of inertia in every minutest particle. This inertia can be overcome only by the momentum of something else which has weight and is in motion. But, according to the definition of mind, it has no weight, and can acquire no momentum, and still it does actually move matter. A thought, a purpose, which has neither length nor thickness nor weight nor any other physical quality, can somehow penetrate the secret forces of nature and divert them to ends that are not inherent

in their original combination. When I lift a book I produce a motion in nature that is contrary to its regular ongoing.

The paradox is inexplicable; yet its reality is established by the most certain of all scientific processes—that of direct and repeated observation and experiment. New movements among natural forces are constantly initiated by the will of man in violation of the established order of things. But clearly the human will is restricted to a limited sphere of influence. The peculiarity of a miracle consists in its manifestation of a control of the forces of nature which is superhuman and presumably unlimited. But it is no more of a paradox than are the limited interferences of our finite wills.

A prime error in speculations concerning the miraculous interferences of the Creator is in supposing that they are not directed and limited by the higher law of supreme wisdom and benevolence. It is a fatal error to suppose that either God or good men are sure to do all which they have the physical power to do. It is the wisdom of the Creator which gives the strongest assurance that miracles will continue to be his "strange" work, and that the ordinary forces of nature, combined with the more comprehensible operations of Providence and grace, will be left to accomplish his main purposes. This truth is abundantly taught not only in ordinary human experience, but in the precepts and examples set forth and delineated in Scripture.

THE TRANSLATION OF HOMMEL'S ANCIENT HEBREW TRADITION.

So much abuse has been heaped upon Mr. Edmund McClure for alleged mistranslations of Hommel's recent work, charging that he has doctored the translation to support the conservative cause, that it is worth while to give prominence to the following excerpt from a letter of Professor Hommel:—

"I have been greatly surprised to notice that some English critics of my book (for example, the much-respected Rev. Buchanan Gray, in the September issue of the *Expository Times*) have ascribed certain trivial differences between the English version and the German original to the arbitrary action of the Society for Promoting Christian Knowledge.

"To this I answer once for all that I read a clear revise of every sheet of the English translation, and that I possess a sufficient knowledge of English—witness my original English Assyriological Notes in the Proceedings of the Society for Biblical Archæology—to warrant me fully in asserting that in no single instance has what I intended to say and to prove in my book failed to find its fitting and intended expression in the English translation.

"As for the trifling discrepancies discovered by my reviewers, they are of such a subordinate character that I consider it quite superfluous to go

into them. When, for instance, in the Preface, the words *Aufstellungen der sog. modernen Pentateuchkritik* (assertions of the so-called modern critics of the Pentateuch) were rendered 'cobweb theories of the so-called modern critics' this slight alteration met with my full approval, since in the text of the book I myself have more than once referred to the theories of Wellhausen in similar drastic terms."

THE TRUE LAW OF COMPETITION.

In a private note from Professor C. S. Walker (whose article on "The Problem of the Currency" we publish in this number), he states the great object of his life's work to be "to revise and amend the old law of competition which, as stated by Dr. Francis Walker, reads: 'The unrestrained operation of individual self-interest, acting for itself alone and by itself alone, so as to get the most we can and give the least we must,' so that it shall read: 'The efficient operation of a wise self-interest, designed always to promote the *general good*, which at the same time shall secure the best interests of BOTH parties to the exchange.'"