

Sir Charles Darwin

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to all of us so natural must be quite fantastically unnatural so that they must ultimately come to an end. However, since then I have been studying this second question of how soon they will come to an end, and it is about this I will speak. Most of my information is derived from the UNO conference on population, which I attended in Rome four years ago.

First, as to the actual numbers of human beings in the past and the present. Nobody really knows how many people there were in paleolithic times, but a wild guess suggests 10 million. With the invention of agriculture in neolithic times, they increased many times and by the beginning of the Christian era, that is to say, <sup>about</sup> ten thousand years later, there were perhaps 350 million for the whole world. With fluctuations they continued at this level, perhaps slowly increasing, but even as late as 1700 they were probably not 500 million. They are now 2500 million. It is only a slight over-simplification then to say that the number was roughly constant for 2000 years, <sup>and then in 200 years</sup> it suddenly multiplied itself by five.

The general causes are ~~a~~ fairly obvious, being partly the rapid filling up of almost <sup>uninhabited</sup> ~~uninhabited~~ parts of the world and partly the Scientific Revolution which produced effects both in a general easing of transportation for food and also in a different way by the great developments in medicine and <sup>hygiene,</sup> ~~hygiene~~ which have much prolonged the average length of human life. The increases have been going on at a roughly constant rate for two <sup>centuries,</sup> and for five <sup>generations</sup> ~~generations~~ no one has seen anything different, <sup>e</sup> so that all this seems to us quite natural. But it is obvious that these tremendous increases

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must stop soon, and the crucial question for us all is when and how they will stop and what sort of a world will emerge when the population ceases from increasing as it certainly must one day. To take a meteorological analogy, we are living in the most wonderful anti-cyclone of fair weather that the world has ever enjoyed, and we want to know how much longer it can last and what the average weather of the world will be <sup>like</sup> afterwards.

The Rome conference of course made a study of many of these things, though some of us very much regretted that the question of whether population numbers might be controlled was excluded. It will be convenient to consider the results in terms of the "Malthusian balance", that is to say how many people there will be, and how they will live. I will first take the answers given by the <sup>d</sup> Demographers about one side of the balance, that of the numbers.

They estimated that in 50 years - which meant roughly speaking by the year 2000, the present 2500 million would be 4000 million. Many thought that this was an over-cautious estimate. It was based on an increase of 1 percent per year, whereas the actual average world-wide increases are nearly 1-1/4 percent at present, so that the number is really quite likely to be nearer to 5000 million. Put in another way, which avoids these big figures, every day, year in year out, there are 90,000 more people at the end than at the beginning of the twenty-four hours.

The way these increases are spread over the world is rather unexpected. We all know that India and Japan have population ~~problems~~ <sup>problems</sup>, but I personally was much surprised when, a few years ago, I learned that the USA, was increasing much faster than India, also that the increase was coming at all social levels both high and low. The importance of this information is that it disposes of an argument that used to prevail, that population increases would

disappear with prosperity, because people preferred cars to <sup>children</sup> children, so that if we made the whole world prosperous there would be no population problem. We would all be living in a comfortable permanent millenium of luxury. We are now seeing that high prosperity does not prevent great increases in numbers.

The <sup>2</sup>Demographers' estimate of 4000 million in 50 years was, broadly speaking, an extrapolation from current data, and it is worth seeing what might ~~allow~~ alter it. What about a war? If it is a war of the old kind, it would be entirely ineffective. In the First World War ten million people were killed in four years, but it only takes four months to make up this number again; are we to require a world war every four months!

An atomic war would of course be different, <sup>3</sup>but in my view, its direct effect would not be nearly so important, as its indirect effects, for these would mean the ruin of the world's economics. Thus, suppose that we here achieve all our aims and have nothing but "<sup>5</sup>clean" bombs, and that someone embarks on an atomic war and kills out half the world. It would only take fifty years to double the population again up to its present value, and then it would all have to be done over again. However, I am not suggesting that the best solution of the population problem would be to have an atomic war with clean bombs every fifty years.

Famine is a third possibility for reducing the forecasts of the <sup>4</sup>Demographers. I think it is far the most important of all, but I shall defer it and only consider it when I come to the other side of the Malthusian balance, the way in which the people are to be kept alive.

The obvious hope for controlling numbers is by birth control, <sup>6</sup>but in order to consider this I must go a little deeper into biology. Every animal which survives in the struggle for life must produce a sufficient number of individuals for the next generation. Lower animals often produce thousands, of whom only one survives, but even among higher animals, birds or mammals, there is always

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a need of some excess of numbers, which are then cut down to the original number by ~~XXXXXX~~ the operation of Natural Selection. The production of sufficient offspring is ensured by two instincts, the sexual and the parental. Man shares both these instincts strongly, and until rather recently they were enough to ensure that each generation would outnumber its parents in the way required by Nature. But recently it has been found that these intense instincts can be satisfied without guaranteeing the replacement numbers for the population. I am saying this from experience which I am sure many share, that I have many acquaintances who have only one or ~~two~~ <sup>two</sup> ~~two~~ children and appear perfectly content, though, allowing for the accidents of life, this is well below the replacement level. We have found a way of cheating nature, and many people have exploited it.

I do not believe that in the long run Nature can be cheated. There are many ways it can triumph. The point is that Nature's brutal method is automatically stabilizing, whereas any man-made device is only too likely to be unstable. If half the world practices birth control and the other half refuses to do so, then within a generation or so the proportions will have become one-third to two-thirds, and in a century ~~by~~ the birth controllers will only be a small minority. The quickest way this may come about is by the adoption of a creed, <sup>that birth control is wicked</sup> which of course already exists among the Roman Catholics, ~~that birth control is wicked~~ <sup>suspect</sup> though I ~~expect~~ many of them do not conform to it. I do not want to embark <sup>L</sup> on a discussion of the theory of ethics, but I would like to put out the suggestion that ~~e~~ ethics are not by any means absolute, but have come into existence for the preservation of the human race. For example, what could be better for a social animal than the Golden Rule. So I wonder whether future generations will not almost unconsciously evolve an ethical principle that birth control is very wicked.

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I ~~do not want to enlarge~~ will not <sup>enlarge</sup> ~~enlarge~~ on this speculation, because there are many ~~to~~ other things that can happen, ~~for~~ <sup>for</sup> example, the evolution of <sup>a</sup> new instinct having insistence on parenthood as strong as the sexual instinct. It suffices to say that the change from Nature's method is necessarily unstable, and I question if man can devise any other that would possess the same stability.

However, this is a long range speculation. For the short range we have got some very limited methods of contraception available, and it is fairly sure that they will be developed further. This is <sup>to be</sup> ~~is~~ welcomed, if only <sup>because</sup> ~~because~~ it will postpone the evil day, but it can only be useful if applied on a world-wide scale. For this purpose, it seems to me really dreadful how little study is being given to the subject - contrasted for example with the incomparably less important subject of cancer. I will only say that at the present time there is nothing available that could be put over to the whole world, and if a discovery were made tomorrow, it would have to be tested extensively before it was made world-wide. In the light of this, I do not see how the population numbers can be seriously reduced below the <sup>Demographers'</sup> estimates for fifty years hence. There may be more hope for a hundred years, but by then the general difficulties I have referred to above may be becoming important.

Taking this side of the Malthusian balance, we have got to accept <sup>L</sup> doubling of world population in fifty years. How are these people going to live? It has first to be recognized that at present half the world is undernourished. A detail that came out at Rome ~~was~~ that between 1947-53 the produce of world agriculture increased by 8 percent - a very remarkable improvement - but its effect was spoiled by the fact that world numbers increased by 11 percent in the same period. The world ~~was~~ hungrier at the end than at the beginning.

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However, the experts did estimate that assuming all normal improvements, and also a good deal of capital expenditure on irrigation, the world could double its food supply in fifty years, but that that seemed to be the end. It thus seems likely that half the 4000 million will be hungry at the end of the next fifty years.

It is natural to speculate on possible quite new sources of food - such as chemical synthesis or cultivation of the oceans, but it seems very unlikely that any such novelty could be developed within fifty years to a pitch where it would make any serious contribution to the world's demands. However, I would like to put before you a view, which seems to me to diminish the importance of all this. Man is an animal, and as such will tend to obey the rule that however much food is produced, there will always be too many mouths asking for it. If we could double our food supplies once again, would it not mean merely that we had 5000 million out of 10,000 million hungry people instead of 2500 out of 5000. So I conclude that all the effort of attack on the population problem must be aimed at controlling the numbers rather than their means of life.

I have said nothing about the very important question of industrialization<sup>s</sup>. It would take a long time to do so, and I have taken long enough already. I will only say that the matter has been very much changed by atomic energy<sup>a</sup>, but that I cannot feel that this revolution can entirely alter all our ways of life within fifty years, by which time the <sup>crisis</sup> ~~crisis~~ of population will certainly be with us.

In relation to the subject of this conference, I ~~can~~ conclude that all the world conditions twenty and more years hence will be of the type that will provoke wars, so that we have now the responsibility of trying to ensure that when those wars do break out, they will not lead to the annihilation of our planet.