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Sir E. John RUSSELL
D.Sc., F.R.S.

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NOTE

The Essex Hall Lecture was founded by the British and Foreign Unitarian Association in 1892, with the object of providing an annual opportunity for the free utterance of selected speakers on religious themes of general interest. The delivery of the lecture continues under the auspices of the General Assembly of Unitarian and Free Christian Churches, as a leading event during the course of the Annual Meetings of the Assembly. A list of the published lectures still obtainable will be found at the end of this volume.

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MAN AND THE MACHINE

WHEN the first civilised peoples, having tamed the horse and the camel, began some four or five thousand years ago to spread into the great empty lands of Asia Minor, North Africa and Europe, at least one group went with the command ringing in their ears :

" Be fruitful and multiply, and replenish the earth, and subdue it."

The first stage of the replenishing, the colonisation of Europe, was completed long ago, and there was little further colonisation till the early years of the nineteenth century, when the Western European peoples, having invented the steamship, began their wanderings into the wide open spaces of America, Australia and New Zealand and so completed the second stage. There still remains much vacant land—one-quarter or more of the earth's surface—that

would hold another outspread of population, but for the present it is unavailable for want of water. Some at any rate of the human races have, however, fulfilled the injunction and have "gone forth, multiplied and replenished the earth."

My purpose is to discuss the other part of the command, the subduing of the earth. The early migrants carried with them the food grains, wheat and barley, which grow wild in only few regions; they took also, besides their horses, the food-giving animals, cattle, sheep, pigs, some of which, however, were already widely spread; and with this starting material they settled down in their new homes, clearing the forests, preparing the ground and devising agricultural systems that should ensure ample supplies of food and clothing. The process seems to have been entirely empirical: something was tried; it was adopted if successful and discarded if not. The empirical method was also used in the arts and crafts and other

activities that gradually grew up, and it yielded many successful results in the course of time.

It had several advantages. It was direct and easily understood; it could be used by anybody, and its results, being largely a matter of chance, were just about as likely to come to any one experimenter as to any other; it was essentially non-selective and democratic. Further, it worked only slowly. People satisfied with what they had, or convinced that they could get nothing better, were loth to risk new trials; changes therefore came gradually, so slowly as hardly to perturb the established order, the fabric of society which had grown up with it. And, moreover, it awakened no intellectual curiosity: it was concerned only with results and not at all with the causes of things. So it lived at peace with princes, priests and students. Indeed it did more, for in one brilliant period, from the thirteenth to the fifteenth century, inspired by religion, it rose to

the most dazzling heights of craftsmanship and created those majestic Abbeys and Cathedrals, which even in their decay are exquisitely beautiful, and in their prime must have been glorious, impressive beyond words.

But the method was limited in its application. It was incapable of dealing with anything outside the common range of man's experience : with great natural disturbances such as drought, flood, exceptional seasons ; or epidemics of disease whether of men, animals or plants. The old chroniclers—Holinshed and others—show how uncertain was man's tenure of the earth : famine and pestilence never seem far away. In face of these men could do nothing, and, like their earliest ancestors, they turned to Magic and to Religion or a confusion of both and invoked the aid of witch doctors and priests, some of whose methods are still preserved in the old agricultural literature.[1]

[1] *E.g.* Palladius, *De re rustica.*

The empirical method of subduing the earth survived as the only one till near the middle of the nineteenth century. Then with almost dramatic suddenness it gave way before a new method which had been quietly growing up for many years and without warning emerged from the laboratory of the philosopher into the affairs of life. It was a re-emergence : for when science began to develop in this country at the beginning of the seventeenth century its purpose was largely the conquest of Nature. This resulted from the new-born interest in the world in which we live ; it was a reaction against the old and long-continued intellectual dominance of those concerned only with the next world and the immaterial—the theologian and the metaphysician. In Bacon's *New Atlantis* (1610) his College seeks " the knowledge of causes and secret motions of things, and the enlarging of the bounds of human empire, to the effecting of all things possible." When the Royal Society was

founded in 1663, its charter enjoined it to pursue knowledge "for use or discovery." But progress had not been great: men only slowly learned that knowledge must be sought for the sake of Truth and not of Utility: it must be pursued for its own sake and not "for the effecting of all things possible" or indeed of anything at all. This was not fully and widely realised until the nineteenth century. Then there arose the division and sometimes antagonism between those who gain the Knowledge, seeking only to learn and to know, concerned intensely that what they discover should be the Truth or as near the Truth as man can get; and those who regard Knowledge as something to be used for the supplying of some human need. While we may dismiss as mythical the Professor who, at the end of a long life, thanked Heaven he had never done anything useful, his words do express the attitude of many students of science to their work.

This division of intellectual activity, the separation of the gaining from the using of knowledge, or, to adopt the language of the University, the separation of Pure from Applied Science, has been of supreme importance in human life. It led to a combination of science with empiricism, or, to put it more euphoniously, of Science with Practice, which has been extraordinarily fruitful.

One of its first results was to simplify the subduing of the earth by solving some of the problems that had hitherto baffled mankind. Chemists and plant physiologists had analysed plants to find what they were made of, and had discovered the chief factors controlling their growth; but this knowledge was not used. Lawes, the founder of our great Experimental Station at Rothamsted, first applied it about 1839, and with Gilbert showed that plants can be made to grow better, and with far greater certainty, by merely adding to the soil certain easily procured substances

essential for their growth, the lack of which had in the past caused low yields or even failure with much subsequent human suffering. These substances were soon made by industrial chemists, and for many years they have been supplied in enormous quantities to farmers: no less than 35 million tons of these "artificial fertilisers" were made in the season 1929–30. Some of the most important are now made from the air, which is so rich in the plant-building nitrogen that the amount contained in an ordinary living-room suffices to keep one man in food for a whole year. When Hamlet declared:

"I eat the air, promise cramm'd,"

he was but anticipating the operations of a modern fertiliser factory. By proper use of these substances, and of the modern implements which expedite all operations, farm-crops are far less dependent on season than formerly, and none of the catastrophes such as happened in 1879,

or still more in the earlier years, ever occur now.

It was further found that plants do not grow simply by themselves. Associated with their growth are minute organisms living in the soil, some preparing the plant food, others consuming it, others again causing injury or disease. These organisms are exceedingly small and amazingly numerous: some hundreds of millions of them are living in a salt-spoonful of the soil of an ordinary field or garden, but the number cannot yet be stated because each improvement in instruments or technique reveals new forms never seen before. And, moreover, the number is not constant, it fluctuates from hour to hour for some reason quite unknown to us. Under the best microscopes the organisms appear only as dots or blobs, as one sees a man on a hillside far away: what they really are like we do not know and probably never shall: however good the microscopes, our eyes will always miss

the details, being insensitive to the small rays of light that alone would reveal them.

Here too applied science has stepped in: some of the most useful of these organisms are bred in a factory in Bethnal Green and sold to farmers to make their crops grow better.

There have been great triumphs, too, in the study of plant diseases. Till recently they were beyond control. The terrible potato blight brought into Ireland about 100 years ago—one of the unexpected results of rapid steamship transport—devastated the country: it killed the crop on which the peasants lived. Thousands of men, women and children died of starvation, many more suffered untold misery, but nothing could be done; even so late as 1880 men had to stand idly by and see the affected crops perish. Then the cause of the disease was discovered, and the remedy speedily followed: never since has the blight caused trouble.

Many epidemics of plant diseases have occurred since: they have caused loss, but never human death or even great suffering: control is now rapidly effective.

In recent years perhaps the most impressive results are those of the plant breeder—the geneticist as he prefers to be called. The inborn properties of a plant are a kind of mosaic, each fragment of which comes unaltered from one of the parents, which in turn derived it from its parent, and so back to the beginning. The mosaic contains only such fragments or "characters" as came from the parents: no more, but of course the fragments may be differently arranged. The "characters" are transmitted in the chromosomes, minute bodies some 25,000 of which placed end to end would barely cover an inch; but the actual "character," the gene, is much smaller—so small indeed that it has never been seen; indeed its very existence is only a matter of inference. One gene carries

a colour, another the character of producing hairs, another the character of growing tall, another that of ripening early: each gene faithfully preserves its "character" intact and hands it on to the next generation. The geneticist, knowing the "characters" of the parents, can predict with considerable certainty the properties of the offspring: he can within certain limits build up a plant to a specification.

These artificially produced plants are being much used now.

The colonists of the nineteenth century had only such varieties as they took with them, which were often unsuited to the new conditions. The Canadian prairies remained uncultivated because our wheats would not thrive there with certainty: they lacked the power of rapid growth and early ripening. Then a suitable wheat was discovered by the strangest chance and the conquest of the prairies began. The original wheat had required 130 days for ripening, so

it could be grown only in the southern part of the prairies, not in the north, where summers are shorter. Then, however, plant breeders began to synthesise wheats having more and more of the character of earliness, and with each successive increase of this character the wheat belt has been pushed further north. No less than thirty days have been cut off from the time needed by the wheat plant to complete its life-work, so that the wheat belt now runs up to the 100-day summer limit: the northern lands once waste have been converted into farms, and cultivation is pushing further and further into the wild, reclaiming it and dotting it with homesteads.

In Australia the problem was essentially the same but different in details: the need was for drought resistant, not cold resistant plants, for the rainfall decreases from the coastal belt inland. Plant breeders produced the necessary plants: with the old sorts

the limit of successful growth was the zone of 17 or 18 inches of rain per annum, now it is nearer 12 inches, and improvements still continue. Every inch taken off the water requirement greatly widens the belt of habitable and cultivable land.

The broad result of all these developments is that land which in the atlases of 1840 was rightly marked as desert in America, Africa and Australia is now populated, sometimes densely, by people of Anglo-Saxon and cognate stocks, deriving their living from an agriculture then unknown, based on plants which had not then come into existence, and which are producible now only because science has shown how to build them up.

The rate of advance has been particularly rapid during the past thirty years. As recently as 1898 Sir William Crookes declared that the methods and knowledge then current could not long suffice to feed the growing population of the world; and that prices of wheat and

other staple foods would be rising uncomfortably high in 1931 unless, in the meantime, some totally new methods were devised. The passing years have shown the correctness of Crookes' calculations, and there can be no doubt that, had science and practice stood still since 1898, we should now be facing the horrors of world starvation. Science and practice, however, have not stood still, and the great discrepancy between the prediction and the event is the measure of their progress: in place of famine, wheat is so abundant that the world's granaries hold far more than can be used, and the question has seriously been raised whether it should not be burnt or sunk in the sea so as to save storage charges. Wheat farmers are driven almost to desperation.

Other foods are in the same position: means of production have improved out of all recognition; means of transport have been completely reorganised, and refrigeration has been so highly developed

that a lamb killed in New Zealand can be marketed six months later in England in such remarkably fresh condition that the ordinary British housewife cannot distinguish it from fresh English lamb.

The broad outcome is that the world is assured of an abundant supply of food, good in quality and varied in range. So far as can be seen, no shortage is likely in any time over which prediction would be of interest. Famine, even shortage, seem to be things of the past, banished for ever from the range of human experience—except as the result of faulty distribution. The conquest of the earth, therefore, appears to be complete so far as this and the immediate succeeding generations are concerned, and the second part of the original injunction—to subdue the earth—is fulfilled.

Perhaps even more important, applied science has enormously lightened human labour. Modern methods of wheat-growing require only about one-half to

one-third the labour needed sixty years ago.

I have confined myself to achievements in agriculture because it is with them that I have been personally concerned. But the achievements of science in industry have been at least as great, and the saving of human labour has been vastly greater. You all know—it has been broadcasted—that in America, where the process has gone even further than here, the output per man over the whole of manufacturing industry has increased in the last ten years by 45 per cent., more rapidly indeed than the world could absorb the extra products, so that the number of workers needed fell by 10 per cent. in spite of the growing population. In some directions the change has been particularly marked. Five years ago a workman could produce ten motor tyres a day: now he can produce 100.[1]

[1] H. B. Butter, Deputy Director of the International Labour Office. *The Listener*, February 11th, 1931.

Factories have become more and more mechanised, almost automatic in their operations. Already in the United States one man produces so much " goods " that the full time of two men is needed to sell them.

All this has been achieved in a comparatively few years. The rapid progress is possible because science grows by accretion : each little piece of work, if it be honest, adds something, whether it be touched with genius or no. Indeed it is mainly to honest but not brilliant scientific workers that advances are due, and the advances become especially notable when some genius comes along and with magic touch lightens and vivifies all the dreary details. Advancement is cumulative and so is inevitable.

Mankind is now in possession of a new appliance, a new Machine, that easily achieves things impossible to our fathers, that does much of our work for us, saving us the tedious labours of the past. It is as if the story of Aladdin's

lamp had suddenly come true, and the Spirit of the Lamp were at our call, ready always to do our bidding.

It would be easy to wax ecstatic about the Machine and its wonderful potentialities ; to vie with and even outdo the Victorians in vivid and sentimental panegyrics on the progress of mankind upward and onward for ever.

We shall, however, spend our time more profitably in examining dispassionately some of the properties of the Machine, so far as we can at present see them. In the first place, unlike the Spirit of Aladdin's lamp, it will not be dismissed. It has been conjured up and here it stays.

Further, no one can tell what the Machine will do next. It is the offspring of Empiricism and Science—Empiricism largely based on Chance, and Science based on dispassionate exploration of an amazingly wonderful Universe, as yet almost unknown to us : an exploration carried on continuously by

highly efficient workers, unhasting, unresting in their quest. We marvel at the wonder of our bodily motion through space—of our earth speeding onwards into ever new regions towards some unknown goal, and moving so fast that even since I began this sentence we have travelled some twenty-five miles. But this is nothing compared with the wonder of our progress in knowledge of the Universe. Every day sees colossal additions: no man can even read, let alone assimilate, all the scientific journals of to-day even on one subject, and only with difficulty in one small branch. Any day, almost any hour, there may come a discovery that will completely change some branch of human activity.

Two marked effects have already become manifest. The Machine profoundly affects the individual. It calls for specialists who understand some little part of it and to whom that little part will become the supreme interest of their lives. And the specialist must

begin early: even at school he must soon drop all irrelevant subjects, no matter how much they might enrich his life, if they have no value in the scholarship examination. He goes through a specialised training at a College or University, and emerges at the end more or less efficient in one line but woefully ignorant in most others, lacking a background of culture or even of general interest, unless he had the supreme good fortune to find a teacher who impelled him to get it. Thus is produced the increasing army of trained men spending their lives in a narrow groove, seeing nothing outside it—men who can discourse learnedly on the laws of physical optics and yet miss the radiance of the sunset and the glory of the morning sky.

But this passionless state, this elimination of all emotions and desires, has its compensations: the Machine is right out of the plane of human feelings; like science, it knows nothing of race, creed

or nation. Those devoted to its service are compelled to meet for conference and discussion: in no other way can experts now keep abreast of their subject. These gatherings are international and held in rotation in the various countries of the world; they are increasing in number and are among the most remarkable movements of the day. The International Society of Soil Science over which I preside met last year in Russia; we numbered 300 or more specialists representing some thirty different nations and speaking over twenty different languages, yet all united by the bond of common service to this particular branch of Science. This is essentially a post-war development, born of the need for reconstruction, and it has the effect of fostering personal friendships among those who meet and of spreading kindly feelings of good-will among the peoples of the world.

The cultural effects of the Machine on the wider public cannot yet be clearly

seen. It tends to foster passive rather than active pursuits; it is thus inimical to the arts of self-expression and self-development; conversation, letter-writing, the practice of music in the home are all giving way before the "pictures," the gramophone and the "wireless." Concentration of interest tends to give place to a dispersion of interest. The process has gone still farther in America, and by an interesting chain of actions it is causing the magazine to displace the book and the headline to displace the article. These effects, however, may be only transient. The gramophone, and especially the wireless, have brought into thousands of homes better discourses and better music than they ever had before. There are already signs of a new and widespread interest in good music: the new Symphony concerts are well attended and the music Colleges are well filled with students. Happily also the British Broadcasting authorities recognised from the outset the possi-

bilities of their new instrument and the responsibility it imposed upon them. The " pictures " have opened up vast new possibilities of artistic and dramatic entertainment in even the poorest of towns and the remotest of villages. And by widening the range of interest the motor-car and the wireless between them have greatly reduced drinking in country districts.

Another effect of the Machine is more striking and very disconcerting. The reduction of human labour that it brings about is not evenly distributed over all the workers : some are fully or more than fully occupied, others are dispensed with altogether. The Machine is highly selective and intolerant of a succession of minders : all attempts to cut down hours of labour proportional to the increased power of the Machine have failed ; at any rate no one has yet found a solution of the problem. This unfortunate result was unexpected : in the nineteenth century men saw visions,

beautifully put into words by William Morris, of a gradually decreasing working day for all, with more and more leisure for æsthetic and intellectual pursuits. Instead, a few are overloaded with work and an increasing number find themselves unwanted. They fall out of the group of producers and therefore lose the power to be purchasers. Now without purchasers for its products the Machine must obviously come to a standstill, so that the development of the Machine tends to be its undoing. Time does not permit us to discuss the interesting question : how long can the Machine continue to reduce the number of workers and therefore of buyers ? For the present the more urgent problem is the reduction in the number of workers needed.

This displacement of labour is a new permanent factor in our life as a community, and it must increase in importance as the Machine further develops. Society is rapidly being divided into

two groups: one of which by virtue of superior intelligence and mental agility commands the Machine and gains by its activities: the other is not wanted for the Machine, is displaced, and unemployed. The change is permanent and inexorable: for nothing but economic disaster awaits the Nation or the section that attempts to contract out of the operations of the Machine while remaining within the present economic structure of the civilised world. It is already an important cause of unemployment, and it is growing in importance, for even while we wait hoping for something somehow to cure world depression, research departments are actively designing new methods and new appliances to render still more human labour superfluous.[1]

[1] Here are some recent examples, all from England, kindly given me by Professor Clay:

Cement Manufacture. Labour-saving machinery installed during the last three years at an important works enables 190 men to produce more than was formerly produced by 480.

The Machine has thus raised two serious and somewhat unexpected prob-

Banking. New calculating and posting machines are rapidly being adopted. It was recently stated that "the installation of 325 machines, worked by 86 women, to post the ledgers in 73 Midland branches, has enabled 311 men to be withdrawn."

Wire-drawing. New machinery has been installed at a large works with the result that "the tonnage is greater to-day with approximately 1,000 men than it was a few years ago with 1,500 men."

Razor Blades. A large firm has secured a new type of packing and stropping machine whereby one girl does the work previously allocated to twelve girls.

Bread Production. "Output per man a few years ago was ten sacks a week. To-day twenty sacks a man is common, and in automatic plant shops output stands at an even higher figure." It is also stated that the proportion of women and girls in the trade is increasing.

Cigarette Manufacture. A correspondent of the *Railway Review* stated that "a cigarette machine was recently installed in a certain factory capable of turning out 1,200 cigarettes a minute. . . . Not more than three employees are needed to attend the machine, and its productive capacity is equal to 700 hands."

Gas. The *Railway Review* (4th May, 1930) has a reference to a new carbonising plant known as the

lems : the tendency to moral and intellectual sterility through the discouragement of sustained effort ; and the effect on our social structure of an increasing number of people no longer wanted in industry.

The latter problem is the more obvious and is attracting at the moment most attention. It is being dealt with empirically, as usual with our social problems. The empirical method is often contrasted unfavourably on *a priori* grounds with the scientific method, but

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Woodhall–Duckham retort which is capable of carbonising 400 tons of coal per day, yielding 7,000,000 cubic feet of gas. Twenty-two men are needed to work the plant, whereas under the old system forty-four men were required to produce 4,000,000 cubic feet of gas per day.

Railway Wagon Works. The wagon superintendent of one of the largest lines stated recently that " a carriage which used to take six weeks to erect at Derby could now be put together in one hour." " The new system of organised mass production enabled them to complete the body of a carriage in six hours from the time the underframe was ready."

one must admit that the British race has worked it remarkably well, as indeed some of our more logically minded continental friends recognise when they say that we lose all the battles but nevertheless win the war.

Three methods have been tried : subsistence grants of various kinds ; the finding or making of work for the people displaced, meanwhile fostering hopes of some world revival that would replace them in their old occupations ; and emigration. Of these the subsistence grant is admittedly the worst. It is demoralising and, by removing the economic urge, it largely stultifies the operation of better methods. It has given our working classes a most unenviable name in the Dominions. In the past five years I have had occasion to visit Canada, Australia and New Zealand, and to discuss migration with leaders of thought and action. Their attitude has always been one of welcome for people willing to work hard and

adapt themselves, but of strong dislike of receiving what they call our " dole-fed unemployed." Moreover, the method has considerable elements of instability. Modern Democracy shows a natural reluctance to pay for the services it demands, and it puts the cost on to those who by good fortune, intelligence and mental ability control the Machine, narrowing down the number of contributors but steepening their contributions. So long as they continue to pay all goes well, but once they decide not to pay, the scheme of social services collapses. They being highly intelligent and mentally agile could easily find ways of escape : already they are murmuring and ceasing to interest themselves in Democracy and its doings. Being Englishmen it is improbable that they would follow the continental model and set up a Dictatorship ; they could, however, without difficulty follow the American method of meeting Prohibition : acclaim Democracy while ingeni-

ously evading its inconvenient behests. Even those who are willing to pay cannot long do so, for events have shown that high taxation kills enterprise by compelling business men to keep only to " safe " lines and avoid anything with elements of risk. Oppression of the successful affords no solution of the difficulties of the unsuccessful.

And for the unsuccessful—they, being also Englishmen, are not likely to resort to the method of Butler's Erewhonians, and rise and break up the Machines.

The second method, finding work for the people displaced, is morally less objectionable but still has serious defects. It takes two forms : public works and a stimulation of industry by the arts of salesmanship and the awakening of new desires. The present public work is exceedingly expensive—it costs on the average £500 per man employed—and beyond certain limits it is unsatisfying and destructive. The nation would lose much in fullness and richness of life if

too many of our winding lanes were widened and covered with concrete by Road Boards, if rivers, now pleasantly meandering through meadows, were straightened and canalised by Drainage Boards, if the country-side were too thickly dotted with pylons by the Electricity Board, and the new straight roads lined by Housing Committees with little standardised houses. The stimulation of industry has the merit that it is self-supporting (a direct subsidy being given only to the Beet Sugar industry), but the profound disadvantage that it is only temporarily effective, for the Machine develops at an accelerating pace with which even the most efficient salesmanship cannot keep up. Manufacturers and business men have certainly done their best and have increased sales enormously: raw materials are being used up at a feverish rate. This seems to be the special characteristic of the twentieth century. Sir Thomas Holland recently pointed out that "during the

first quarter of this present century the world has exploited and consumed more of its mineral resources than in all its previous history"[1] from the time of the Stone Age downwards. And the consumption goes on more and more rapidly. The natural supplies are still considerable, but they can be used once only, and once used can never be replaced. Coal and petrol are rapidly being drawn upon, and each is striving to outdo the other in the speed of exhaustion of supplies. Soft-wood timber—the kind most used—is being cut down or destroyed in forest fires more rapidly than the new supplies are growing, and at the present rate of consumption the supplies available now will be exhausted in less than forty years.[2]

And to come to things less easily measured: the natural beauty of our

[1] Presidential Address, British Association, 1929.

[2] Much is used for paper-making; a large newspaper requires two, three or more acres per day.

country is being rapidly destroyed despite the valiant efforts of the Council for the Preservation of Rural England. "In the Home Counties," Dr. Raymond Unwin recently stated, "ten acres of country are spoiled by unsightliness for every acre built upon." The more the Machine is speeded the greater is the destruction, and to replace natural stores, either of material or of beauty, once they are used up is one of the things the Machine cannot do. We are in the dilemma that we shall suffer economically unless we continuously increase our unprecedented rate of consumption of natural resources, and if we continue to increase it our children will suffer materially.

The third method of dealing with the problem of displaced men is to plant them out in the country. There they are much less dependent on the Machine: they can produce all the food they need and have a margin for those who will supply their other simple wants. They

can thus be self-supporting and cease to be a burden on their fellows. The very low rate of unemployment in rural England is in striking contrast with that of the industrial regions and shows the greater degree of elasticity of country life as compared with that of the towns. It is, however, only in so far as rural communities are self-sufficing that they escape the particular troubles we are considering (they still have others); when they specialise and seek to live by growing one or more products for the towns they incur the risks of drastic competition and unremunerative prices. The maintenance of a better balance between the rural and the urban types of community is probably our best way out of our present economic difficulty.

Two methods have been tried: overseas emigration and settlements at home. Overseas emigration is the historic method, and one which in the past has been the foundation of material progress. It was because of the migration of

civilised peoples that Europe and afterwards America rose out of the Stone Age culture. Migration properly done benefits both migrant and the country to which he goes. The post-war schemes were on a considerable scale and at one time they might have succeeded, so solving our problem for a generation. But they did not succeed, and for the present the propitious moment has passed : emigration, which in 1913 took 389,000 people from these islands (including all Ireland) with a population of 45·6 millions, in 1927 took only 180,000 out of a population of nearly 49 millions, and it has fallen still lower now. Social workers report an increasing reluctance to face the possibility of risk and labour overseas, no matter how well success be ultimately requited, and a preference for the security of life, even a workless life, here. And for the moment the overseas Dominions are not actively encouraging migration.

Yet one feels that migration ought not

to have failed. The Mormons driven out from the Eastern States to Utah, the Mennonites driven from Eastern Germany to Russia and thence to Canada and the United States, the Jews driven from Eastern Europe to Palestine and now to the Crimea, and the Poles from Poland to Brazil, all afford instances of successful mass colonisation in the last generation or so. From our own country, organisations like the National Children's Home, Barnardo's Homes, the Waifs and Strays Society, the Salvation Army and others have sent out thousands of young people with admirable results. The common factor in these enterprises has been a definitely religious purpose or a definite religious training emphasising personal responsibility for one's own life which naturally makes for self-reliance and trustworthiness, indispensable qualities for success. Had an equally effective inspiration been possible in the State schemes they might have been successful.

The other type of migration, settlement in this country, was tried in the nineteenth century. Bands of people enthusiastic for a new order left the towns and went to seek the New Life on the land. The technical equipment of those days was not suitable and many of the schemes failed : better success, however, could be attained now.

Whatever emigration may do in the future, however, it is doing nothing now to help. The Machine which has solved for us the age-long problem of subduing the earth has raised this singularly difficult problem, what to do with the blessings it confers. It is the usual story familiar to all scientific inquirers : the solution of one problem opening up others more difficult, which according to one's temperament can be regarded as the tragedy of humanity,

"Man never is, but always to be, blest,"

or as another and more stimulating problem still to be solved.

In seeking the solution the first question is this : What are we going to do with this wonderful Machine? At present we are in the position of a *nouveau riche* who has acquired a superb motor-car and a faultlessly efficient chauffeur, but without any clear idea of where he wants to go. Our question raises another, much more difficult and vastly more important : Where do we want to go, what is our goal as a community?

If only we knew! If only some great leader could give us a plan! How delightful it would be to try out our new Machine, to build the New City with all modern appliances! And how great a tragedy if we found no plan : how hopeless if by some law of the Universe we could have no voice in shaping one, but must, as some have taught, be carried along, having some small amount of individual freedom, but as a community mainly unfree, submissive to an uncontrollable, irresistible force, whether it be

economic, as Marx declared, or climatic, as Huntingdon argues, or some vague cause compelling growth and decay, as Spengler asserts, or, to go back to the great Greek thinkers, some supernatural Fate driving mankind eternally through recurrent cycles out of which it could never break a way! Naturally we shall assume, as our more robust nineteenth-century teachers never wearied of telling us, that we are not only individually, but as a community, captains of our own souls and masters of our own fate, that we can shape a plan, that while new difficulties will always arise they can always be surmounted.

To this fundamental question, What is our goal as a community? Science can give no answer: it will only give us a better Machine, and so make an answer more urgently needed. Politics certainly cannot answer, the question is too deep to be settled by improvisation. Even statesmanship cannot tell us, though it could solve many of the

difficulties that would arise in the course of travelling to the goal. Something much more fundamental is needed: a clear perception, and, if we can get it, a clear statement, of the relations of communities of men to each other and to the Universe. It is something different from a statement of the relation of the individual to himself and his Creator: something more than a setting forth of an ideal for a personal life which happily has been done for us. But as the aim and goal of a community must be closely related to the ideals of personal life of its members, so it must be based on the same fundamental principles. It is clearly a task in which the lead should be set either by philosophers or by religious thinkers who by the nature of their studies are accustomed to look beyond the accidental and transient in search of the essential and the permanent; and experience shows that where the mass of mankind is called upon to follow there is no leadership so permanently effective,

no inspiration so abiding, as that given by a great religious teacher.

This is the second problem that Science has presented to religious thinkers during its brief career. In the nineteenth century, Huxley, Tyndall and other scientific leaders urged that religious thinkers should bring their conceptions of the material Universe into harmony with the new knowledge, based on exact measurement, revealed by Science. This has been done with great advantage to Science, to Religion and to mankind. This twentieth-century problem is entirely different : it is a call for knowledge of our goal in order to give unity and purpose to our work ; to ensure that the bricks which we are laboriously making should be put into a worthy building instead of being left in an unsightly heap, uselessly deteriorating.

This problem is more urgent than ever before in human history. In olden days development was so slow that people

had time to grope for the next step before they needed to take it ; they could improvise as they went along. Now, however, the progress of the Machine is too rapid ; we must either ourselves control the Machine or be controlled by those that do so. If we control it we do not want to spend our lives merely in futile admiration of it—like a wireless expert spending his evenings in fatuous " tuning in " of a wide range of stations, never heeding the message from any one of them. We want to use the Machine for the common good. The greatest boon to this generation would be a leader—a Martin Luther or a John Wesley—who could not only see the way himself but make others see it and follow. But we need not sit down idly and wait : religious thinkers and philosophers and, perhaps even more important, the humbler citizens seeking after truth can do and are doing much in lifting the thoughts of men above the contemplation of the marvellous Machine

and directing them to the infinitely more important problems of the purpose of our common life. If we cannot ourselves find the way, we can at least prepare the ground for one who will.