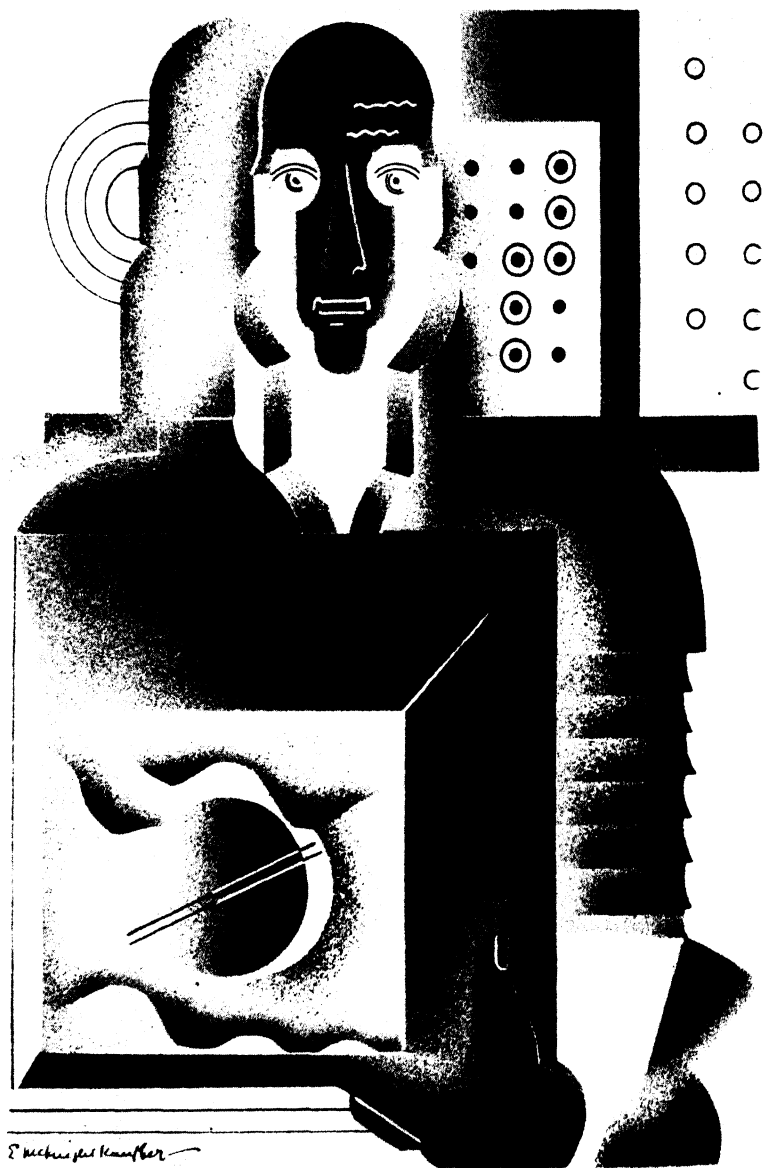


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THE WORLD IN 2030



Richard Hamilton

THE WORLD IN 2030.

THE WORLD IN 2030 A.D.

BY THE RIGHT HONOURABLE
THE EARL OF BIRKENHEAD,
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To
MY DAUGHTER
PAMELA
WITH HER FATHER'S LOVE

PREFACE

It is the purpose of the Essays which follow to attempt a series of speculative predictions dealing with the possible development of the world during the next hundred years.

If one looks back a hundred years and so looking compares the world of that day with the world of to-day, one becomes almost equally conscious of the equal risk of under-estimating and of over-estimating the developments which lie in front of us.

That man only is wise who does not dogmatise and who proclaims nothing impossible.

It may, for instance, be imagined that if the Duke of Wellington had been informed that within one hundred years an American boy, flying alone, in a machine heavier than air, would cross the vast and stormy Atlantic on a non-stop flight, His Grace would have found it necessary to draw upon a

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deservedly appraised resource in expletive.

In another sphere, it would, I imagine, have caused little less surprise if it had been announced that in the same space of one hundred years a female member of the House of Commons would become a Cabinet Minister ; that female Doctors of Medicine and Barristers would be common ; that the Speakership of the House of Commons, and perhaps even the Woolsack, were open to feminine assault, even if extremely unlikely to succumb thereto ; that the last unstormed citadel would be that of incumbency in the Church of England ; that even this was menaced ; so that theoretically, at least, we might one day be indulged by the spectacle of a female sitting on the throne of Thomas à Becket.

Remembering these and a thousand other changes, mechanical, ethical, social, political and constitutional, we shall, it may be repeated, be wise to declare little impossible in the hundred years in which our sons and grandsons will live.

The effort to predict an unknowable future must always possess a fascination of its own.

PREFACE

In the slight essays which are collected in this volume I follow—*longum post intervallum*—in the footsteps of Jules Verne, Bellamy, Wells and Haldane.

I am very conscious that each of these distinguished men possessed, or possesses, qualifications which I cannot claim. An inferior scientific equipment disables me from discussing with any real weight that aspect of our development which will assuredly be the most fruitful. And the only two branches of human knowledge upon which I can perhaps claim to write with some authority, namely, those of Law and Politics, are unfortunately, from this point of view, just the two that are least likely to sustain profound modification.

For these reasons I put these Essays forward without undue assurance. That many of the changes herein predicted will be realised is certain. Others, no doubt, will hardly escape the smile which is given to phantasy.

But, however this may be, and with whatever reputation as a prophet I emerge from the publication of these Essays, one thing may

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certainly be predicted—that I am unlikely to witness either the vindication or the confusion of my vaticinatory efforts. And it is almost equally improbable that anyone, however young, who reads this book on its publication, will live to be old enough either to acclaim or to deride its conclusions.

BIRKENHEAD.

Charlton, March, 1930.

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THE results of scientific research control the wealth of nations and the beliefs of their peoples. For it is not only in the material world that science is important; ideas and ethics no less than machines develop as the direct outcome of the discoveries of scientific workers. Without Newton, for example, the scepticism and rationalism of the eighteenth century would have been impossible. The elaboration of Darwin's hypothesis as to the development of life on the earth gave a new and startling direction to the whole course of philosophy and theology. In the last decade Einstein has put forward views about the nature of space which will almost certainly revolutionise our whole conception of the Universe.

A century hence it appears probable that the application of scientific discoveries will have altered the conditions of human life at least as

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much as they have done in the past hundred years. A child born in 1830 arrived in a world which was just beginning to exploit the steam engine, in which electricity was the useless toy of a few professors, where anæsthetics and antiseptics were unknown. The child of 2030, looking back on 1930, will consider it as primitive and quaint, as the conditions of 1830 seem to the children of the present day. Our means of travel, our sources of wealth, our medicine and even our ideas will change as drastically during the next century as they did in the course of the last.

Applied physics, which have given us the steam-engine, the internal combustion motor, as well as wireless, telephones, and all the many other practical uses of electrical energy, will certainly make prodigious advances before the year 2030. At the moment, however, the theoretical basis of physics rests in an undetermined state. Physics is on the brink of a new synthesis, a fresh simplification and restatement of fundamental ideas. This, when it comes—and it cannot long be delayed—must radically change all our assumptions

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concerning time, space, and the nature of change.

Such a revolution of ideas must be accounted among the most important reactions of science upon human life in the next century ; but it is, of course, very difficult to predict what direction this change of ideas will take. Until another Newton restates physical theory, one cannot determine how his restatement will react upon the everyday world.

It is easier to prophesy concerning the material changes which will be wrought by applied physics in the next hundred years. The best scientific opinion believes that before 2030 physicists will have solved the problem of supplying the world with limitless amounts of cheap power. At present we derive the energy which drives the wheels of industry from coal and oil. Both these substances are won from nature at the expense of much money and vast stores of muscular energy, nor are their supplies inexhaustible. By means of the most efficient methods, moreover, a pound of coal can only be made to

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yield energy of the order of one horse-power for one hour. Yet, locked up in the atoms which constitute a pound of water, there is an amount of energy equivalent to ten million horse-power-hours. It is undoubted that this colossal source of energy exists; but as yet physicists do not know how to release it; or, having done so, how to make it perform useful work.

This problem will be solved before 2030. Some investigator, at present in his cradle or unborn, will discover the match with which to light this bonfire, or the detonator needful to cause this terrific explosion.

The consequences of tapping such stupendous sources of cheap energy are almost illimitable. For the first time in his history, man will be armed with sufficient power to undertake operations on a cosmic scale. It will be open to him radically to alter the geography or the climate of the world. By utilising some 50,000 tons of water, the amount displaced by a large liner, it would be possible to remove Ireland to the deeper portion of the Atlantic Ocean.

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The heat obtainable from the same quantity of water would suffice to maintain the polar regions at the temperature of the Sahara for a thousand years.

The liberation of this energy will naturally revolutionise travel and transport. Engines weighing one ounce for each horse-power they develop will become practical possibilities ; and a power plant of six hundred horse-power will carry fuel for a thousand hours' working, in a tank no bigger than a fountain-pen. Concerning the nature of the vehicles for which such engines will provide the motive power, it is rash to prophesy. Passengers will travel in enormously swift aeroplanes, which by 2030 will ascend and descend vertically. Goods will be carried cheaply and rapidly by land or sea, propelled by motors whose fuel bill will be negligible.

The coming of this new energy will obviously be accompanied by acute social problems. Its adaptation to industry will entail, for example, the final extinction of coal-mining. Since, however, it cannot but vastly reduce the cost of all

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manufactures, there is hope that the new wealth it creates will enable governments adequately to provide for the millions whose livelihood it destroys.

Some authoritative scientists do not believe that the solution of the power problem will be reached along these lines. They consider that either the winds or the tides will be forced to yield up their energy. Water power is too unevenly distributed over the earth's surface, and too affected by seasonal variations, ever to become the principal source of the world's energy ; but the winds are never still, and the tides flow and ebb with unvarying precision.

If the winds were harnessed they could produce a superabundance of cheap power. During stormy weather their surplus energy could be stored in a variety of ways and so be available during calms.

The exploitation of tidal energy presents difficulties which have yet to be solved in a satisfactory manner. These difficulties, however, are not those of principle but of technique ; and, if the wealth and the serious engineering

attention of the world were focused on the question for ten years, there is no doubt that they would be overcome. The tides of the Bay of Fundy alone could supply the whole of North America with electrical energy.

By utilising tidal energy to any large extent, we should diminish the speed of the earth's rotation. As it is, the tides act as a brake upon the rotation of the earth. Tidal friction occurs principally in the Bering Sea, which divides Alaska from Siberia. Its present effect is negligible, since it only lengthens the day by a fraction less than a second in the course of each century.

If sufficient energy were extracted from the tides to supply every imaginable future development of human enterprise with power, this braking effect would not be greatly increased. Many millions of years would elapse before the day grew as long as our present week. Seven thousand years take us back to the dawn of recorded human history; so that even a tenth part of one million years carries us forward beyond the reach of imagination. We need

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not, therefore, grow alarmed that by harnessing the tides we shall so retard the rotation of the earth as to embarrass our remotest descendants. But the forty-eight-hour day is a possibility in the far future.

During the next hundred years, applied physics will certainly develop wireless telephony and television beyond our present most imaginative expectations. By 2030 it should be possible for any person sitting at home to be "present" at no matter what distant event. Stereoscopic television in full natural colours, and perfected wireless telephony will enable him to see and hear any event, which is broadcast, as effectively as if he stood beside the transmitting apparatus. The exiled American will never need to miss a baseball match; the M.C.C. selection committee, in conclave at Lord's, will be able to follow the fortunes of an English eleven through the days (or weeks) of an Australian test-match; absence will no longer make lovers' hearts grow fonder, for they need never be remote.

Such developments must influence the future

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of politics ; for by their aid it will be feasible once more to revive that form of democracy which flourished in the city states of Ancient Greece. By 2030 the chosen spokesmen of each political party will be able to address every voter as effectively as he can now address Parliament. And so the electorate itself, rather than its representatives, may decide each vital political issue. After the spokesman of each party has had his (or her) say, the votes of the entire country could be recorded and counted by mechanism installed in the telephone exchanges. Within twenty minutes from the end of the last speech, the will of a national jury on any subject could be ascertained and announced.

Applied chemistry has not affected human life in a manner comparable with the changes produced by physical research. So far as the ordinary man is concerned, chemistry is only useful to him when it discovers new and desirable substances ; or discovers a means of synthesising a material more cheaply than it is produced by Nature. In the past, chemists

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have enriched the resources of humanity with new metals, dyes, drugs, explosives, and other substances useful in industry or in private life. By 2030, thousands more such new substances will be available; aluminium will be cheaper than pig-iron is to-day; malleable, unbreakable glass will be a commonplace of domestic life.

It has also been suggested that chemical research will turn to the discovery of new physiologically pleasant substances. At present civilised mankind has discovered and adopted only three such substances: tobacco, alcohol, and caffeine (tea and coffee). These certainly have added enormously to the amenities of existence; and Dr. J. B. S. Haldane, the most brilliant and far-sighted of contemporary scientific philosophers, has proposed that chemists should seriously consider a search for more such additions to human enjoyment.

Most chemical substances are either disagreeable or dangerous in their physiological effects, though a small number (not more than a few thousands) are valuable to medicine. Should chemistry in the next hundred years be able

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to discover a dozen substances as pleasant and harmless as tobacco, yet each possessing a different effect on the consumer, it will have earned the thanks of every hard-worked man and woman in the world.

Any developments in physics and chemistry, which can be reasonably predicted to occur before 2030, can do no more than alter the accidentals of human existence. In biology, however, developments may be predicted which will change the whole nature of life as we experience it to-day.

Even those who know least about them confidently expect prodigious advances from medicine and surgery in the near future, and their faith will not be vain. The abolition of epidemic disease by 2030 is fairly certain, as is the discovery of cures for such scourges as cancer and tuberculosis. Complete and prolonged local anæsthesia will become practicable; so that not only will operations be painless, but the patient will feel no pain afterwards as a result of them. Such an advance also entails completely painless childbirth.

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Biologists by 2030 will have learned the secrets of the living chemistry of the human body—or at least enough to achieve startling results. Rejuvenation will be an ordinary and well recognised matter of a few injections at appropriate intervals. The desire to keep old age at bay has ever been one of the dreams of humanity; at last we can predict that it will be achieved. “This mortal must put on immortality” by extending the length of his days on earth.

The attraction of such an idea, especially to women, who will no longer grow old quickly, is too clear to require emphasis. But the universal practice of rejuvenation will be accompanied by grave social problems, the least of which would be the immense increase in population. Suppose it possible to guarantee 150 years of life to every healthy child, how will youths of twenty be able to compete in the professions or in business against vigorous men, still in their prime at 120, with a century of experience on which to draw? The benefits to humanity which will accrue if the lives of men of genius are so prolonged is obvious. It

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is impossible to predict the advantage science would reap if a rejuvenated Oliver Lodge, Ernest Rutherford and J. J. Thompson could be given a further seventy or eighty years of active life.

Before 2030 biologists will have solved some of the mysteries of human heredity. Heredity is determined by certain "genes" or units, concerning which science already knows much. They are minute bodies, so small that, if a hen's egg were magnified to the size of the world, one of the genes in it would lie on a fair-sized writing-desk. When biologists can control these microscopic genes, they will be able to control heredity. Most probably by 2030 a clever young man will consider his fiancée's hereditary complexion before proposing marriage; and the young woman of that day will refuse him because he has inherited a gene from his father which will predispose their children to quarrelsomeness. By intelligent combinations of of suitable genes, it will be possible to predict with reasonable certainty that truly outstanding children shall be born of a marriage.

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This is the kind of eugenics which will develop in the future, rather than the absurdities of the human stud-farm which so many earnest, and generally unmarried, enthusiasts at present predict.

It is possible, however, that by 2030 the whole question of human heredity and eugenics will be swallowed up by the prospect of ectogenetic birth. By this is meant the development of a child from a fertilised cell outside its mother's body—in a glass vessel filled with serum on a laboratory bench. Such a proceeding is neither incredible nor, indeed, impossibly remote. The results of much research show that the connection between a mother and her growing child is purely chemical; there is no valid reason why one day biologists should not be able perfectly to imitate that chemical connection in the laboratory.

The possibility of ectogenetic children will naturally arouse the fiercest antagonism. Religious bodies of many different creeds will rally their adherents to fight such a fundamental biological invention. In fact the mere

mention of its possibility here may strike many readers as gratuitously affronting. Nevertheless the thing is possible; and since it is possible, it is certain that scientists will be deterred by no persecution from straining after attainment.

Should ectogenesis ever become an established part of human society, its effect will be shattering. Primarily it will separate reproduction from marriage, and the latter institution will become wholly changed. Further, the character of the future inhabitants of any state might easily be determined by the government which happened temporarily to enjoy power. By regulating the choice of the ectogenetic parents of the next generation, the Cabinet of the future could breed a nation of industrious dullards, or leaven the population with fifty thousand irresponsible, if gifted, mural painters.

A further immediate consequence of ectogenesis would be a plea that society should be allowed to produce the human types it most needs, instead of being forced to absorb all the unsuitable types which happen to be born.

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If it were possible to breed a race of strong healthy creatures, swift and ductile in intricate drudgery, yet lacking ambition, what ruling class would resist the temptation?

Many of the arguments brought against slavery would be powerless in such a case; for the ectogenetic slave of the future would not feel his bonds. Every impulse which makes slavery degrading and irksome to ordinary humanity would be removed from his mental equipment. His only happiness would be in his task; he would be the exact human counterpart of the worker bee. Only the arguments of religion could be used to prevent his evolution. His emancipation could never be considered, for in freedom he would find only weariness and misery.

It seems improbable, however, that the future developments of industry will call for such a being to tend its wheels. Production will become so cheap, and, barring political or international upheavals, wealth will accumulate to such an extent, that the ectogenetic Robot will never be needed. It is far more

likely that men will work as machine-minders for one or two hours a day and be free to devote the rest of their energies to whatever form of activity they enjoy.

Such a condition obviously presupposes that all drudgery, not only the drudgery of the coal mine and the machine-shop, will be abolished by science. It predicates the end of agriculture as the fundamental industry upon which human life rests. Probably biology, in alliance with chemistry, will make an end of agriculture even sooner than the cheapening of production will render a ten-hour maximum week universal in the workshops of the world.

By 2030 agriculture, if not abolished, will be in decay—at least in civilised lands. The first step towards the end of agriculture will be the production of benevolent bacteria able to “fix” the atmospheric nitrogen which is essential to the growth of plant life. Such bacilli could never develop naturally, since many of their ancestors will be unable to live except under entirely artificial conditions in a laboratory. But when the active “nitrogen-fixing”

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bacteria are at last hardened off and allowed to multiply in agricultural land, their immediate effect will be to act as a super-efficient manure.

By their aid five or even ten ears of wheat will grow where one grows now ; while the pasture which now feeds ten beasts will feed fifty.

Such a development will, of course, be watched with anxious eyes by all governments. Food prices will slump ; millions of labourers all over the world will find a vanished livelihood.

Hard on the heels of this development will come the perfection of synthetic food-stuffs. At present we nourish ourselves by a curiously wasteful and round-about method. Solar energy is absorbed by plants and stored by them in their structures, mainly in the form of cellulose. The human body is unable to digest cellulose, and so to extract nourishment from it. Many animals, however, aided by obliging bacteria, are able to perform this feat ; and we keep herds of sheep, cattle and pigs, all engaged in the task of digesting cellulose and transforming it into the meat and milk upon which we live.

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Already it is possible to convert indigestible cellulose into digestible sugar, but as yet the cost of operation prevents its performance except as a laboratory experiment. Such processes as this will certainly be further investigated and developed, so that by 2030 starch and sugar (two of our most valuable foods) will be as cheap as sand or salt to-day.

Concerning proteins, the other most important human foods, two possibilities exist. Either they too will be produced synthetically; or else the more highly prized varieties of animal foods — such, for example, as beefsteak or chicken's breast—will be grown in suitable media in the laboratory. It will no longer be necessary to go to the extravagant length of rearing a bullock in order to eat its steak. From one "parent" steak of choice tenderness, it will be possible to grow as large and as juicy a steak as can be desired. So long as the "parent" is supplied with the correct chemical nourishment, it will continue to grow indefinitely and, perhaps, eternally. Whenever it is sufficiently

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large, a few pounds (or hundredweights) can be cut from it and sent to market.

Synthetic foods and the production of animal tissues *in vitro* will finally set at rest those timid minds which prophesy a day when the earth's resources will not feed her children. Though all the inhabitable surface of the globe were inconveniently crowded, the millions of mankind could still be fed to repletion by such means.

This second revolution in food production will consummate the decay of agriculture, which can only survive as a rich man's hobby. A man born in the twenty-first century may, in his wealthy rejuvenation, boast that the bread he eats is made from wheat which grows in his own fields. Ploughing may even become a fashionable accomplishment, and pig-keeping a charming old-world fancy. Probably, however, the synthetic foods of the next century will be so much more easily digested and appetising than their present equivalents, that agriculture will survive only in historical romances.

Since the beginnings of history the city has

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been the parasite of the countryside. In 2030 science will make the city a self-supporting unit, and Britain a land of laboratories capable of feeding no matter how many millions of mouths without importing a ton of foodstuffs. Many will bewail such a prospect, for they insist that a flourishing agricultural peasantry is the only sound basis of any political life. It will be necessary when agriculture goes into irrevocable decay, to plan the evolutions of a stable industrial society. Such an undertaking should not lie beyond human wit. The agricultural basis of society, which has existed for so many centuries, was itself evolved from nomads and savages. To reconcile such folk with the peaceful static life of the husbandman needed a far more violent adjustment than will be necessary to urbanise the descendants of the world's present agriculturists.

It is conceivable that not all these changes will have occurred by 2030. The progress of scientific discovery is chequered, and subject to no ascertainable regularity or period. In many instances an applied science after a few years

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of violent progress stagnates, or, at best, is advanced by small refinements and simplifications. The history of the locomotive steam engine provides an illustration. During the last half-century railway trains have grown steadily longer and heavier. In consequence larger and more powerful engines have been evolved to draw them to their destinations. But the huge locomotive of to-day differs only in size and power from its parent of the 1860's and 1870's. No new principle of any importance has been introduced into its design or construction. A similar stagnation may overtake the development of airplanes or of wireless telephony. Such halts in the progress of any applied science, however, are comparative and not final. A fresh mind produces a new idea or a simplification which inaugurates another period of rapid and sweeping activity.

I have assumed, therefore, that the rate of progress in applied physics, chemistry and biology during the next hundred years will be maintained approximately at its present level. It may even be greatly accelerated by the ever

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increasing interest in scientific research on the part of industrialists and governments.

Nevertheless, unless science is able to change our ideas no less rapidly than our environment, some of the developments at which I have hinted may not come to pass. Unless, for example, the ideas of Asiatic peoples are drastically changed, it will be impossible to stamp out epidemic disease from the world.

But it is not self-evident that all applications of scientific discovery deserve the support of intelligent men and women. Because science has benefited humanity in the past, there is no reason why it should always do so in the future. A biological discovery may well plunge the world into such a catastrophe as would destroy civilisation for a thousand years. As you are reading these words, some disinterested researcher may detonate an atomic explosion which will involve the world, and reduce it to a flaring vortex of incandescent gas.

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THE nature of war follows the nature of peace. Whoever would predict the course of a war waged a hundred years hence, must first imagine the conditions of peace which this war would terminate. The duration, magnitude and ferocity of the last European war were all predetermined by the national rivalries, arbitrary frontiers and personal ambitions which complicated European affairs during the opening years of the present century.

The popular belief appears to be, that, should such a calamity as another war between first-class powers ever occur, it will be more ruthless, more terrible and more destructive than any conflict of the past. Imaginative writers seek to terrify us with descriptions of aerial battles, as a result of which all London will be laid waste in a few hours. They tell us that there will be no distinction drawn between combatant



and civilian ; that it will be the object of each warring power to destroy the women and children of the enemy in addition to his armaments.

I believe such violent prophecies to be on the whole unwarranted. Should another war overtake civilisation a century hence, it will not improbably be more rather than less humane than its predecessors.

We are often reminded that the applications of scientific discoveries to warfare have made battles more horrible. The carnage wrought by high explosive projectiles, by aerial bombardment and by machine-guns, is still vivid in the memories of most men. Science has certainly increased enormously the destructive power of the soldier ; but it is too often forgotten that science has also correspondingly increased his comfort and safety. Whatever horrors marked the last war, it was in many respects humane compared with the campaigns of Napoleon or Marlborough. Tetanus, gangrene, enteric fever and cholera have practically vanished from the combatant armies of the world. Anæsthetics,

antiseptics and drugs have reduced the terrors of military hospitals a hundredfold. The armies which fought over Europe from 1914 to 1918 were spared sufferings and privations which formerly were the commonplaces of warfare. They were better fed and cared for when whole, and more successfully healed when broken, than any soldiers before them.

In the future the applications of science will further ameliorate the hardships of the combatant soldier. It is strange, however, that the activities of the League of Nations have temporarily prevented any advance being made in that application of science which most promised an increased humanity in warfare. I refer, of course, to the League's prohibition of the use of gases as weapons. It is certain that in the near future chemists could have produced a gas capable of causing prolonged insensibility with no harmful after-effects. The introduction of such gases (or clouds of vesicant particles) would obviously revolutionise warfare. It might conceivably make battles, as we understand them, impossible. Yet it has seemed good to the

League of Nations to dam future progress along this most hopeful channel of development. I cannot believe that this prohibition will remain long in force; it will be either removed or ignored.

There is a second and far more important reason why future warfare will not increase in savagery. The civilised world is rapidly becoming a single economic unit. With the partial exception of the United States of America, no first-class power is any longer economically independent. Indeed, it may be said that the disaster of one nation involves all nations. We have discovered in the last decade that it is almost as disastrous economically to win a war as to lose one.

For these reasons no nation in the future will be able to afford the destruction of an enemy's industrial area. Suppose that in 2030 Britain is at war with a Continental power, and that the latter is capable of destroying London and the industrial regions of the Midlands, Lancashire and Yorkshire, by means of aerial bombardment. I do not believe that

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such a bombardment would ever be carried out ; because, if it were, the economic fabric not only of Britain but also of her enemy would crash in ruins. Admittedly arguments such as these were advanced before 1914 with the aim of demonstrating that no general European war could ever again occur. It was then said that war was uneconomic, that no great nation could afford to go to war, that the financiers of the world would maintain the peace of the world in their own selfish interests. Events proved these arguments fallacious ; but the course of history since 1918 has shown that warfare and national bankruptcy have increasingly assumed the relationship of cause and effect.

It therefore appears improbable that the air arm will become the deciding factor in future warfare. At present this arm can destroy but it cannot occupy. An aerial bombardment may cripple the resources of the enemy, wreck his communications and disorganise his whole civic economy, but it cannot invest his territory for more than a limited number of hours at a stretch. So long as aerial navigation depends on

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petrol motors for power, its usefulness will remain restricted by the force of gravity. An aerial armada cannot supply itself from the air. It can only terrorise or destroy. It can never carry out permanent military operations.

Possibly within the next hundred years military airplanes, propelled by some form of atomic energy, will become common. Such machines will be able to remain in the air for an indefinite period, so long as they are provided with food for their occupants. A fleet of these airplanes might blockade a frontier or overawe a capital as effectively as a fleet of warships, but it is difficult to imagine them ever efficiently fulfilling the functions of an army of occupation.

I consider that the land arm, co-operating closely with the air, will remain the decisive factor in future warfare, and that wars of occupation rather than of destruction will occupy the generals of the twenty-first century. Their object will be to disarm rather than to kill, in order that hostile territory may be overrun at the minimum loss and cost to both combatants,

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and held until the loser consents to political argument. Fundamentally this is the objective of all warfare; and in the future it will be attained by more direct and less sanguinary means than hitherto.

It is possible to be more precise about the armies of the future than about the warfare in which they will engage. The last war saw the *reductio ad absurdum* of a military development which had been proceeding since the introduction of firearms. The power of the bullet determined the strategy and tactics of all operations on land between 1914 and 1918. But the bullet will not remain the deciding factor in another war. The armies of the world are on the brink of a startling transformation.

Napoleon won his victories by manœuvring troops armed with weapons whose effective range was one hundred yards. The day was still decided at the bayonet's thrust; an assault was the logical conclusion of every engagement. Infantry, cavalry and artillery all fought together under the eye of the commander-in-chief. Infantry, disposed in squares, could

withstand the onslaught of the finest cavalry and even the prolonged bombardment of artillery.

Throughout the nineteenth century the lethal range and precision of the soldiers' weapons increased. The flint-lock musket gave way to the percussion-cap musket. Then came the first military rifles, and these evolved into the breech-loading magazine rifles with which modern armies are provided. As the power and accuracy of the soldiers' firearms increased, the whole nature of warfare changed. The British square at Waterloo became the almost unmanageably extended skirmishing line of the South African War. The artillery, once the infantry's closest companion, was forced out of the range of rifle fire and learned the mysteries of indirect gun-laying to prevent itself being excluded altogether from the battlefield. The commander-in-chief was literally shot off the scene of his troops' action, and compelled to content himself with directing operations in safety—and in the rear. Generals found themselves no longer able personally to intervene

in battles. They were limited to preparing a plan which their subordinates put into execution.

So powerful had the bullet grown by the end of 1914 that it quickly put an end to open warfare. All armies dug themselves into the earth to avoid it; the bullet had reduced warfare to hugely extended siege operations. Direct infantry assaults became far too costly and demoralising to be undertaken except in special circumstances. The task of breaking the enemy's front was handed over, in despair, to the artillery. The rifle, and its logical successor, the machine-gun, drove the soldier underground, there to await the bombardment by which the enemy hoped to obliterate him.

Such a condition of affairs reduced tactics to their primitive level. There were rarely flanks to turn, few mobile bodies of troops to manœuvre, few surprises to effect. The combatant who commanded the greatest resources of men and material, and whose troops could best endure the torments of a prolonged artillery bombardment carried the day. But during this warfare of attrition, the omnipotence of the

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bullet suggested making the soldier bullet-proof, enabling him to advance across a bullet-swept terrain and destroy a vulnerable enemy while himself invulnerable. In short, the tank was invented.

It is surprising that the military experts of the world have drawn so few lessons from the tank operations during the last war. On no occasion when an engagement was properly mounted, were tanks unsuccessful. Although the machines used were primitive and unreliable, their effect against infantry was demoralising. In the tank, there has at last been evolved a weapon capable of hunting out and destroying the machine-gun, the presence of which had made advance impossible. The tank has disputed and destroyed the omnipotence of the bullet on the battlefield.

Yet, after the conclusion of the war, the armies of Europe were once more organised almost as they had been in 1914. Although it had been abundantly demonstrated that the machine-gun made it impossible for infantry to close with their opponents, the world's armies

to-day are largely composed as if infantry still remained "the Queen of Battles."

In 1862 a naval duel between the *Merrimac* and the *Monitor* occurred in Hampton Roads. It was one of the minor naval operations of the American Civil War, but it transformed the navies of the world. The *Merrimac* was a fine steam war-vessel, well manned, well gunned, but—unarmoured. By virtue of her defensive armour the *Monitor* quickly defeated and destroyed her larger opponent. On that day the British Navy possessed one hundred and forty-nine warships; but that day's events made all of them, excepting two ironclads, utterly obsolete.

In exactly the same way, the achievements of the tank in the last war have made all military organisations obsolete which do not take the tank into consideration as a primary offensive weapon. The *Monitor* demonstrated that naval battles must in the future be decided from behind armour. The tanks at Cambrai, on November 20, 1917, proved the same lesson for battles on land.

Though for many years to come, however, both infantry and cavalry will play their part in military operations, the evolution of the tank, with its attendant track-carried lorries and mobile gun-platforms, must revolutionise our ideas of warfare. Since armies first marched, until the present day, a commander's strategy has been limited by means of communication at his disposal. Roads, railways, rivers and canals determined the actions of all arms except the aerial during the last war. The invention of mechanical transport capable of rapid cross-country travel (such transport as equips the Mechanised Force of the British Army) abolishes this limitation. A body of troops depending on such transport can include all terrain, except the most broken, in its sphere of action. The earth has become as easily negotiable to the army of the future as are the seas to our existing navies.

The whole question of future strategy and tactics pivots on the development of the tank. The military mind of 2030 will be formed by what engineers accomplish in this direction

during the next sixty or seventy years. And, in view of what has been accomplished even since 1918, I see no limits to the evolution of mobile fortresses.

Heavy machines capable of fighting their way across hostile ground at an average speed of fifteen to twenty miles an hour will be a universal weapon of all armies before the end of the present century. In front of them will proceed a cloud of fast-moving light tanks; behind them will come infantry armed with machine-guns and carried in motor-lorries. The employment of infantry as a striking force will be discontinued; and this arm will be used only to garrison areas penetrated by tanks, and to protect communications. Infantry tactics will become purely defensive.

Cavalry, organised as mounted machine-gunners, will come into their own again. They will be immensely useful, both to maintain a mobile skirmishing line between groups of heavy tanks as they advance, and also to deal with enemy units which the tanks leave behind them, disorganised by their advance. In addition,

cavalry will be used for observation and intelligence work in thickly wooded or very broken country. Over such terrain as this, tanks can advance only with difficulty; nor are airplanes dependable for information, since troops concealed in woods cannot be observed from above.

Such tanks as I have imagined will be forced to depend largely on aerial support as they advance into hostile country. The supreme problem of an advance by any mechanised force is to maintain the fuel supply of its "spearhead." Petrol for the machines, and rations for the men, of the advanced tank squadrons will be supplied by large airplanes, protected on their flight against the enemy air force by swift fighting machines. Bombing airplanes will also protect advancing tanks from enemy artillery fire by searching out and destroying hostile batteries. Finally, the commanders of tank forces will be carried in the air above their commands, and thus will be able to watch the course of operations and control their progress by wireless telephony.

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All these developments in warfare are already on the way towards realisation. The British Mechanised Force, as it exists to-day, embodies each one of them in embryo. Their realisation cannot long be delayed, and entails a complete readjustment of the military mind to new conceptions of strategy and tactics. When a force such as I have predicted is in being, naval tactics will become applicable to land warfare.

Since the army of the future will be able to manœuvre at its commander's desire, it will have escaped from "communications" as we understand them to-day. Thus the supreme problem of the last war will have vanished. By 1918 it was possible to penetrate an enemy line, but the mere physical difficulty of supplying rations, ammunition and reinforcements across country which had been devastated by repeated bombardments prevented such penetrations from being adequately exploited. Offensives, both Allied and German, after brilliantly achieving their primary objectives, were first retarded and then paralysed by this cause.

Partially mechanised warfare of this description will certainly be more humane than the campaigning of the past. Since the horse will have vanished from the supply columns, the slaughter of thousands of patient dumb beasts will no longer be one of the most unhappy accompaniments of a battle. Since the infantryman will no longer trudge through the churned-up mud of intensive bombardments, bearing with him nearly a hundredweight of equipment, much of the sheer physical exhaustion and squalor of his lot will disappear. Since the heaviest fighting will be borne by men protected behind armour-plate, the casualties of an engagement will diminish.

It is argued by the opponents of tanks (and tanks have their enemies, just as railways, motor-cars, and airplanes had theirs) that they are little better than "death-traps" in battle. Facts contradict this contention. During the last war the percentage of casualties in the Tank Corps was the lowest of all arms; nor is this figure misleading through the personnel of the corps being less often engaged than the men of

other units. After the first appearance of their machines, the Tank Corps led assaults far more frequently than infantrymen.

Battles in the last war were generally decided by artillery bludgeoning carried out on a stupendous scale. Weight of material and smooth organisation were the conditions of success. Except in minor operations there was no scope for military genius as it was understood by the great captains of history. The future development of mechanised warfare will release the tactician from his impotence. Manœuvre and surprise will once again hold the supremacy with which Marlborough and Napoleon invested them. Brain will again control the issues on the battlefield; mere weight of artillery will not be able to paralyse the cunning and insight of a talented general.

I do not imagine, however, that the evolution of warfare will halt at this stage of partial mechanisation. Ultimately all arms will be mechanised. Cavalry will give place to swift light armoured vehicles armed with a heavy machine-gun. Such machines will presumably

traverse any country across which a horse can progress, with the exception of various hill-tracks and dense woods. The reconnaissance of such areas will, therefore, be carried out either aerially in the former case or on foot in the latter. Infantry, unless protected by tanks, will grow increasingly vulnerable to the attacks of enemy tanks or airplanes, as it travels in its cross-country lorries; these lorries, therefore, will gradually evolve into armoured vehicles protected by machine-guns. Thus, the infantry will travel in a makeshift tank; and the conversion of this armoured lorry into a tank proper must be the next step. At the present day, the British army possesses a few mobile gun-platforms—self-propelling machines on which a field gun is mounted, and from which it can be fired while in motion. The transition from this conglomerate of tractor and gun into a tank is also inevitable. Thus all arms, except the air, will be reduced to tanks of various descriptions, each designed to fulfil some special function.

Such a development has, of course, as its goal the theoretically perfect war-machine, a

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submersible battleship capable also of flying in the air and travelling across the land. Though many will deride this conception as fantastic, its attainment is certainly not to be lightly dismissed, although for many years to come such an engine of war, if constructed, would be no more than a curiosity of military history.

Nevertheless, an experimental floatable tank has already been constructed; and in the development of such amphibious machines many of the more acute military intellects foresee the trend of military progress.

Imagine for a moment the course of British military operations against a hostile power, were our army equipped with such machines. No sooner is war declared than the fleet, carrying with it an expeditionary force, and covered from surprise by aircraft, makes its way with all speed to the shores of enemy territory. The warships, and the vessels they have convoyed, anchor some miles from the land, and disgorge a swarm of amphibious tanks. These swim to the shore, climb the beach, and penetrate inland without delay. A landing of this

kind would probably never be contested; for, since the whole operation might be completed in an hour, it could be planned as a complete surprise.

Once the first wave of tanks is ashore, others follow, protecting amphibious workshops and supply lorries. Moving at an average speed of ten miles an hour, and re-fuelled by airplanes whose base is the fleet, a powerful raiding force may penetrate two hundred miles into hostile territory within twenty-four hours of sighting its shores.

The possibilities of such a raid are incalculable. Screened by the tank force, temporary airplane-bases could be established, so that aircraft returning from bombing expeditions need not fly all the way back to the fleet for supplies. Similarly the fleet could send out landing parties whose object would be the destruction of this or that object of strategic importance. If the whole raid were competently planned and controlled, a small force, exploiting the initial surprise to the full, could so disorganise a nation as to force its almost immediate surrender. At

the worst, retreating before superior armaments, the tanks could reach a coastal rendezvous hundreds of miles from where they disembarked and regain the vessels which transported them from the coasts of Britain.

Some military prophets are bold enough to peer even further into the future, where they foresee battles between hosts of giant tanks directed by wireless from a distant control room. These speculations have an origin in the fact that it is already possible to manœuvre a crewless target-ship for naval gunnery practice by means of wireless telegraphy.

If and when wireless control of distant mechanisms is perfected, it would be possible to control the manœuvres of a squadron of tanks, and even to lay and fire their guns by its aid. Hence the contending armies of tanks may be able to go into battle entirely unmanned ; and the issue of the day will be decided by two men, each of them directing his country's entire land armament.

The control room whence such battles would be fought might either be carried high over the

chosen field in an airplane, or else situated underground, secure from hostile bombardment. In the latter case each tank will carry in its nose a television transmitter, in order that a panorama of the battlefield may be thrown on a screen before the eyes of the general controlling operations. But this is perhaps further ahead than lies within the scope of this article.

What is certain is that in the future as in the past, victory in warfare will fall to those who command the most efficient weapons. To intelligent historians this fact has been obvious since history became an organised branch of knowledge. The eagles of Rome went down before the cavalry shock-tactics of barbarian lancers. The chivalry of France fell beneath a cloud of English "cloth-yard" shafts at Crécy and Poitiers. The Dervishes at Omdurman were routed by the rifle.

Yet, curiously, throughout history, the military mind has opposed the introduction of every newly discovered and superior weapon. During the American War of Independence an

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enterprising British officer produced a breech-loading rifle of his own design. Being a man of considerable private means, he caused a number of these weapons to be manufactured and equipped his men with them. Soon afterwards he fell sick ; no sooner was he incapacitated than Lord Cornwallis, his superior officer, confiscated all the new rifles and ordered them to be destroyed. Again, early in the 1850's it was proposed that the Minié rifle should be introduced as the standard weapon of the British Army. Sir William Napier, indignant at the idea, denounced it as a subversive attempt to transform our infantry into "long range assassins." And we all remember what Sir Henry Wilson and others thought of the Tanks in 1917.

It is profitless to multiply such examples of the distaste with which military men view improvements in their own sphere. This obscurantism is not confined to any one army or nation ; it is world-wide and appears to have flourished since the first despised innovator twanged the string of the first bow. It is left

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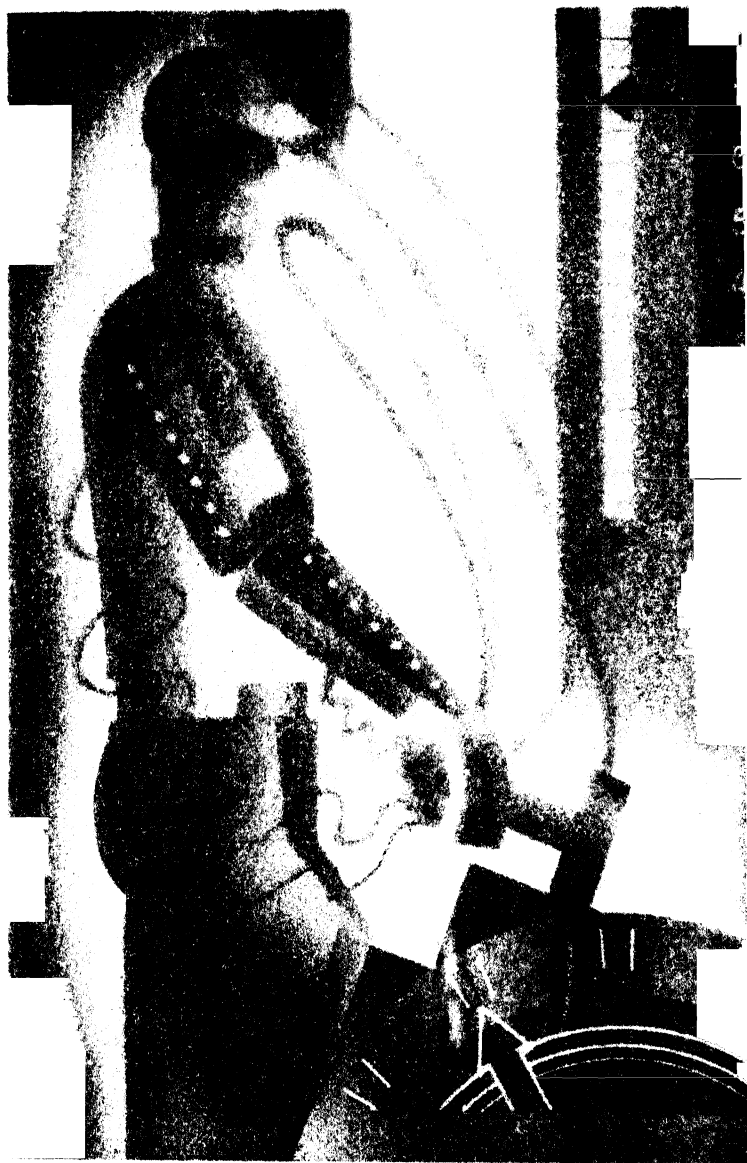
to civilians of vision to persuade the military authorities that they can wage war more cheaply and efficiently.

This idiosyncrasy of the military temperament makes it difficult to prophesy the future of warfare. Only during the actual progress of hostilities are the best civilian brains of any nation turned to solving the problems of war. In times of peace more productive and better remunerated work engages their attention. Nevertheless, it is worth considering whether the rapid development of weapons, far superior to those commanded by any possible antagonist, is not the most effective means any people can take to ensure uninterrupted peace. Had Napoleon's army been provided with even the least efficient of breech-loading rifles, he need not have feared the result at Waterloo. And had Wellington been aware that his opponents were so armed, he would never have tried conclusions, since to do so would have involved the total destruction of his forces.

Similarly in the future no nation whose troops are armed with a novel and more efficient

weapon than any hitherto employed, need fear to be embroiled in a war of another's making until the general world-level of armament had reached its own.

All this speculation may seem vain, since hundreds of thousands of well-informed men confidently believe that there will never be another war. Certainly greater precautions against war have latterly been taken than ever before in human record; and the machinery of these precautions rather than the spirit of them may prevent many disputes among nations from flaring up into wars. Unfortunately, hundreds of thousands of well-informed men have been of the same opinion after all the great wars of history. In their lifetime a memory of the horrors of war has kept peace. But their sons, who knew not war, have taken their place and, ignoring their fathers' experience, have gone to battle, deeming a just war better than an unjust peace.



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THERE can never be an industrial counter-revolution. Nothing could transform Britain into a nation of forty million yeomen farmers and peasant proprietors; the acreage of the British Isles could not support such a swarm of agriculturists. Starvation and a frantic return to the factories would be the inevitable conclusions of any large-scale "Back to the Land" experiment. England is not the only nation in such a case. France, Germany, Italy and the United States of America are also unable to support their populations above starvation level except by the creation of exportable wealth through highly organised industry. Poignantly as many economists, philosophers and poets may deplore the fact, the next century will not lead us back to the farm from the factory.

The future holds an increasing concentration and complexity for industry. Our descendants

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will consider the factory as the unit of civilisation, rather than the household or the village. It is the object of the present chapter to speculate what the factory will be like and what manner of industry will be carried on under its roof.

Two phenomena of capital importance lie in the path of industry's developments—the end of the coal age and the gradual extinction of agriculture. Each of them is of paramount importance, for the very existence of nations will depend on the steps taken to cope with their consequences.

The end of the coal age will be highly serious for Britain; our entire industrial fabric is at present built upon a foundation of coal. Our industrialists have grown up in the pleasant faith that our supremacy as a manufacturing centre was as inevitable as the sunrise, something divinely appointed as part of the order of nature. Since 1918, event after event has contradicted this simple arrogance, but it remains embedded in thousands of minds which cannot realise that good fortune and an abundance of coal created British industrial prosperity in

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the nineteenth century. Our countrymen are responsible for most of the basic inventions which followed the introduction of steam-power to industry. Locomotives, steamships, blast furnaces, power looms and spinning machines were all exploited in Britain before they were introduced abroad. Consequently for thirty years our industrialists were able to steal a march on their foreign competitors in the markets of the world; and, until the outbreak of the war in 1914 staunched the flow of British exports, no rival could make good this handicap.

I have recalled this well-known economic history in order to show how fortuitous were the root causes underlying our past prosperity, and to indicate that there is no inherent reason why it should continue when coal ceases to be important as a source of power. Scientists promise that either by releasing intra-molecular energy, or by harnessing the tides, they can produce such immense stores of available energy that power will cost only a nominal amount. One or another of these solutions of the power

problem will be reached in the course of the next hundred years. By A.D. 2030 coal will be a fuel of the past.

Will Britain's industrial importance outlast the coal age? Will the world's industrial centres of gravity shift from the North-West of Europe and the Eastern half of the United States of America? Will the commercial centre of the British Empire be transferred to Canada, India or Australia?

All these things are possible. At present industry is chained to the mouths of the world's coal-pits. Steel manufacture, for example, is pursued on a great scale only where iron ores and coal are readily available together. Often, the localities where coal is found are otherwise unsuitable for industrial undertakings; the end of the coal age will terminate the importance of such areas. Other districts, at present almost uninhabited, may well become industrially important in the future, when some advantage which they possess becomes valuable. For example, the Himalayas are provided by nature with an abundance of waterfalls; capable, when

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harnessed, of generating vast supplies of electricity. It is probable that before 2030 an intensive industrial life will grow up among the foothills of this mighty range, drawing its life-blood from great power-stations high in the gorges and ravines of the mountains. At present the population of this region at the Himalayas' foot averages under sixteen to the square mile, while the fertile valley of the Ganges supports well over two hundred and fifty agriculturists to the square mile. Sometime in the twenty-first century the condition may be reversed. The peasant farmer of the river valley will become the factory worker of the hills, and the banks of the Ganges may be peaceful and deserted where now they swarm with busy life.

The valley of the Rhone and Northern Italy are two European districts which abound in natural water-power. Both are comparatively remote from coalfields, and this fact has hitherto prevented their full industrial development. But already some part of the available water power is being exploited ; railways are being

electrified, factories built, machinery installed. Within a very few years the Rhone valley—and not, as at present, the Lille district—may be the most important industrial region of France. Italy, for the first time in her history, as a united nation, may develop into one of the most productive manufacturing countries of the world.

I do not, however, believe that Britain's industrial importance will diminish when coal is no longer mined for fuel. If our industrialists are quick to read the signs of the times, they will be prepared to adapt themselves to the new era. They will seize the opportunity of utilising the new power—whatever it may be—rather than cling stubbornly to coal-generated electricity. Possibly it may happen that the power problem will be solved by an Englishman; that the tides will be harnessed or molecular energy first liberated in this country. Then, of course, Britain will enjoy another start over foreign competitors, such as she gained when steam-power was introduced. The advantages in this case, however, will not be so

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considerable, because to-day all civilised peoples are organised industrially, and on the alert to snatch every piece of burrowed knowledge from even the slightest scientific discovery.

Wherever the power problem is solved, it is essential that our industry should be among the first to apply the solution to its needs. If this is done, I am convinced that our geographical position, Imperial connections and long experience in manufactures of all kinds will assure us a continuance of prosperity. Nor need we suppose that, because coal will no longer be useful as a fuel, its whole value will have vanished. The "fine chemical" industry already obtains a large proportion of its raw materials from the products of the destructive distillation of coal. And thus, when coal no longer supplies power, it will still be mined to provide the needs of this industry, which is certain to acquire an ever-increasing importance in the future.

The decay and ultimate extinction of agriculture will inflict even graver problems on the world than the end of the coal-age. At present

agriculture remains the fundamental industry of the human race; it employs the largest numbers of men, and on its prosperity depends the wealth of many nations. Yet, as I have pointed out on a previous page, chemistry and biology are plotting the ruin of agriculture. The perfection of a synthetic diet cannot be delayed far into the twenty-first century; and when the first synthetic food factory begins to undercut the prices of naturally grown food, the doom of agriculture will be sealed. Synthetic foods will be cheaper, more palatable, more various, perhaps more hygienic, than their natural predecessors. Therefore they will drive the products of agriculture off the market, and ruin the farmers of the world. By the year 2030 synthetic bread, sugar and vegetable substitutes may be cheaper than water is to-day.

The first consequence of this triumph of synthetic over natural foodstuffs, will be the creation of a new industry. The food factory will replace the farm, and a proportion of erstwhile agricultural countries may endeavour, by

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rapidly organising a synthetic food industry, to stave off the ruin which confronts them. It is improbable that they will be successful in the project. Lands like the British Isles, which now import huge quantities of food, will be able to synthesise within their own borders all the nourishment their population requires. An agricultural country, which attempts to export synthetic foodstuffs will find no market for its goods. This is among the first serious prospects which the future holds. The sudden impoverishment, if not the bankruptcy, of Denmark, New Zealand, the Argentine and Canada—to name only a few of the more important agricultural regions—would disconcert the financiers and dismay the manufacturers of the entire world. Of course, these and such other countries may have discovered new and non-agricultural sources of wealth long before synthetic foods kill agriculture. The discovery of such sources of wealth should henceforward occupy the most earnest attention of their statesmen, economists, and scientists.

Cellulose will be the principal raw material

from which the synthetic food industry will manufacture its products. This substance is universally distributed in the vegetable republic. Wood, grass, leaves—all vegetation is built up of a structure of cellulose. While it is possible that the necessary amounts will be synthesised on the spot from elementary bodies, it is more likely that, for some centuries at all events, synthetic food factories will depend on natural cellulose. Presumably this will be grown in the tropics, since vegetation flourishes best in a warm, damp climate. Science will discover which plant or tree produces most cellulose in the shortest period ; and the chosen species will then be intensely cultivated in every tropical land. Consequently, as the former agricultural districts decay, a new and abundant prosperity will come to tropical South America centring round the Amazon basin, to the Congo basin in Africa, to Assam, Burma and the East Indies.

Agriculture, however, although the chief, is not the only industry which is doomed in the future. Agricultural engineering will naturally

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decay with the industry on which it is parasitic ; but more important will be the passing of rubber and cotton plantations. It is already possible to synthesise rubber from isoprene in any ordinarily equipped chemical laboratory. The process is as yet uneconomic, for synthetic rubber costs anything up to fifty times the price of the natural product. It is certain, however, that this will not long continue ; and that within a very few years synthetic rubber (which has the advantage of needing no refining, as it is pure from the first) will be produced on an industrial scale at a price which will soon drive the natural rubber off the market. The world demand for rubber is expanding, and the future needs of the motor-car and electrical industries indicate that the expansion will continue. The country which first markets commercial synthetic rubber will create for itself a most lucrative new industry.

The cotton industry is slightly more complicated, but fundamentally as hopeless as the case of rubber. Artificial silk is already an important menace to the existence of cotton

spinning and weaving. It seems able to fulfil every function of cotton, and to fulfil it as satisfactorily. Materials manufactured from this substance are more pleasing to the eye and touch, more desired by women, and yet as durable as cotton goods. Artificial silk, which can be produced as cheaply as cotton, will certainly destroy the cotton industry.

The consequence of the triumph of artificial silk will be felt in every quarter of the globe. The prosperity of all cotton-growing lands—the United States, Egypt, India and Rhodesia—will decline; while the two great cotton-spinning areas, Lancashire and Massachusetts, will be ruined unless they forestall disaster by adapting their resources to new demands. Intensive scientific research has already been financed, both in Lancashire and the United States, with the object of discovering a means whereby cotton can successfully withstand the challenge of artificial silk. There is much discussion and promise of all kind of processes for mercerising cotton thread. But I foresee that ultimately all this activity will have been

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in vain. Artificial silk has already shown itself the ultimate victor. Cotton is obsolescent.

The world's cotton workers, from growers to weavers, might be best advised to realise this fact and direct their energy towards transforming themselves into an efficient artificial silk industry.

There are other industries which have not yet reached their maximum expansion and prosperity, but whose ultimate decay already seems unavoidable. Such is the motor-car industry. At present the world market for motor-cars has approached saturation point only in the United States, though during the next two decades this point will probably be reached in Europe also. Yet, even when this has occurred, the motor manufacturers will look hopefully towards India and China, the world's two greatest potential markets. Parallel with this expansion of the motor-car industry, the development of the airplane will have proceeded. The arrival of the cheap, fast, convenient family airplane will first check and then destroy the prosperity of motor-car manufacturers. By 2030

motor-cars will probably have passed their zenith of popularity. . A century later they will only be used for shopping, picnics, and the amusement of youth. They will, in fact, sink to the level now occupied by the bicycle.

I have confined myself hitherto to considering which industries will exist and which disappear in the future. I now pass to a rapid survey of the problems which will perplex future industrialists. Chief among these, I believe, will be a world-shortage of various, at present indispensable, metals. Complaints are already loud that there is not enough tin available to supply existing demands. The price of this metal has soared erratically during the past few years, and although manipulated, it has remained continually above a certain high level. This indicates that the shortage is genuine and not artificial. Malaya and Australia are the world's principal sources of tin. Every suspected vein is explored carefully, and, if tin be found, the deposit is exploited to the uttermost. In spite of this hectic activity, the demand exceeds the supply. Unless extensive new tin

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deposits are discovered in the meantime, the world of 2030 will be searching feverishly for tin ; and tin is perhaps the most widely useful of the non-ferrous metals. The value of this metal at that time will be incalculable.

A world shortage of copper will accompany the tin famine. Copper conducts electricity incomparably better than any other metal ; the electrical industry uses only copper for the manufacture of a thousand different articles. The principal supplies of copper come from mines in Spain and the United States ; and these sources are by no means inexhaustible. Since the use of electricity, both for industrial and domestic purposes, is certain to increase out of all calculation in the coming century, a disastrous scarcity of copper appears inevitable. Already the more acute among electrical engineers are facing this problem, and inaugurating a search for a substitute for this precious metal. Possibly some patient investigator may discover an alloy that will banish the difficulty. At present the quest seems almost hopeless.

Even the sources of the best iron ores show

signs of exhaustion. Although iron is the most commonly distributed metal in the world, deposits of easily worked and readily smelted ores are not as abundant as might be supposed. Spain, Northern Sweden, and certain districts in North America provide the highest grade ore. Before the end of the first quarter of the twenty-first century these districts and many others will have been nearly worked out, and the iron and steel industry will be faced with the necessity of working low grade iron ores. The supplies of these are so abundant and widely distributed that, no matter how intensive the development of industry, they will suffice for thousands of years. Their adoption as the raw material of the iron and steel industry will, however, call for the solution of many problems of metallurgy. Another Bessemer or Siemens is required to find out how to utilise low grade iron ores and yet supply the world with cheap steel.

After steel, the most important metal of the future will be aluminium. Some engineers believe that it will oust steel from its premier position among useful metals. At present

aluminium, though infinitely cheaper than when Gilbert's Eros of Piccadilly Circus was cast from it, still remains far too expensive. When Eros first adorned the Shaftesbury fountain, aluminium was something of a costly curiosity ; and though aluminium saucepans, airplanes and motor-car bodies have become commonplace, the metal must be made still cheaper if industry is to draw from it substantial benefit. The problem of extracting aluminium from clay requires solution. All clay contains aluminium silicate as one of its principal ingredients. The man who can devise a cheap method of extracting metallic aluminium from this compound will live and die a multi-millionaire.

But when all these problems are satisfactorily solved ; when the crises caused by the end of the coal age and the decay of agriculture have been met and overcome ; what will be the conformation of the industry of the future ?

Wherever the industrial capitals of the world may be situated, what manner of cities will they be ?

I prophesy that the industry of the future

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will be largely decentralised, as compared with the industry of to-day. There will be no districts thick with large towns, such as disfigure the Black Country, South Lancashire and Yorkshire. Power will be so cheap that the transport of goods by electrically hauled railway trains will add little to the cost of their production. Hence it will not be essential, as now it is, to situate factories as conveniently close as possible to both raw materials and market. Single factories will be scattered far and wide over the whole countryside, each supporting the village or small town which clusters around it. Deserted by agriculture, and "tamed" by the complete eradication of weeds and thorns, our countryside will present a very different aspect from the chequered but charming irregularity of fields and hedges which is now so typically England. The country will probably appear like an interminable park, broken only by patches of woodland, gardens, houses and factories.

We need not fear that our descendants' æsthetic susceptibilities will be deranged by the

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sight of these scattered factories. Within the next hundred years a vital school of industrial architecture will learn how to harmonise factory, landscape, and industrial function into one pleasing unity. Serious attention is already being accorded to factory design by the most eminent American and German architects; and there are some indications that this branch of architecture is not so grossly neglected in Britain as formerly. Before 2030, architects will have evolved a real industrial style of building, as beautifully adapted to its purpose as French Gothic is for cathedrals, or the symmetries of Palladio for country mansions.

This dawning attention to industrial architecture forms but a part of a more or less unconscious movement towards the evolution of industrial life. At present, though a century and a half has elapsed since the industrial revolution began, we still tolerate a hotch-potch of industrial and pre-industrial conditions. A true philosophy of industry, capable of harmonising capital, labour, factory, management, machinery and product has yet to be

stated. For lack of it, we fall into constant disputes, misunderstandings and extravagances; its evolution will be one of the most important advances ever accomplished by human wisdom. Possibly such a philosophic synthesis will only be unconsciously effected during many years.

The relationship of farmer, beast and soil, on which agriculture has so long reposed, emerged from generations of trial and error; but this was simple compared with the complicated industrial balance which we need to strike. The primitive agriculturists who evolved agrarian society were certainly not distinguished for intelligence or self-consciousness. Perhaps the next two or three generations will be able to arrive at a working philosophy of industry more rapidly than these pioneers settled the future mould of rural existence.

Whatever may be the solution of this fundamental problem of industry, it will certainly be comprehensive and capable of simultaneous application to an entire countryside. Regional town planning, architecture, factory design, communications, population, varieties of

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manufacture, social service—these are only a few of the factors which will be considered as one whole by the industry of the future. As a result the industrial “misfits” which so plentifully disfigure our country to-day, will not be perpetuated. Factories built without knowledge of functional design, or thought for their environment; the compulsion of work-people to travel many miles to and from their work; streets of jerry-built hovels run up to meet a sudden temporary demand for accommodation; countrysides gashed and disfigured by haphazard industrial “expansion”—these things will all cease in the future, because they are costly, wasteful, and shortsighted.

Although most industries will be decentralised, there must be exceptions to this rule. Whatever solution of the power problem is reached, the manufacture of electricity will grow increasingly centralised. If the tides be harnessed, establishments in the Bristol Channel, the Wash, the Firth of Forth, and Solway Firth, could amply supply the United Kingdom with electrical energy. Sub-stations would be scattered up and

down the land, transforming and distributing the power transmitted to them by the four great generating plants; but on these four plants alone the whole nation could depend for heat, light, and power. If intra-molecular energy be tapped and utilised, the same state would arise. For economy in machinery and personnel, only a few extremely large power-stations would be built, where abundant electricity would be generated by the agency of intra-molecular energy.

One obvious drawback can be urged against such an arrangement. Any political group which obtained even temporary control of these few generating stations could hold the nation to ransom. It would be idle to attempt to dislodge by bombardment a party of political adventurers who captured such a station, because the destruction of the plant would dislocate the life and industry of a dozen countries. The only method of protecting such places will be for the government to ensure that no disaffected or hostile person ever crossed the threshold. This could be done by handing over their conduct

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and maintenance to a new body of disinterested civil servants, a corps akin to the Royal Engineers in traditions and intelligence. A less formidable difficulty will be to protect the generating stations from hostile gunfire and aerial bombardment in times of war.

The superabundance of cheap power, which these stations will make available, will plainly decrease costs of production very substantially. Since power will serve every industry equally, the cost of raw materials to the manufacturer will likewise decrease, consequently the prices of manufactured articles (e.g. machinery, hardware, tools) will drop sensationally, even though the operatives engaged in their making are paid generously large wages. Wealth will be created far more easily in the future than at present; and, after a period of accumulation, a permanent state of high wages and low prices will be established.

As wealth accumulates to an ever greater extent, the community will profit by the gradual contraction of the working week. Mr. Henry Ford, the American motor-car manufacturer,

can already economically afford to pay his employees a minimum wage of a pound a day for five days' work a week. He looks forward confidently to the inauguration of the four day week in industry ; and he can even prophesy the coming of a three day week. He foresees all this in a coal and oil era, while the power question still remains in its present condition. The advent of cheap power will accelerate and increase the curtailment of the working week. By 2030 it is probable that the average " week " of the factory hand will consist of sixteen or perhaps twenty-four hours.

This will mean that industry takes a smaller place in human life. At present man is too often the slave of his machines. When he has attained to a sixteen hour working week he will be their master. This week will indicate that human ingenuity has solved the problem of enabling all men to earn a comfortable living for themselves and their dependants, while enjoying long periods of leisure. No man will grudge the one or two days he passes at work in a factory, when he considers that, as its

reward, it brings him five or six days of freedom from financial anxiety. It will not be often that his one day a week will be made laborious by specially hard work; superintending the operations of the giant machines of two hundred years hence will be supremely easy—and supremely dull.

This industrial Arcadia, pleasant though it seems and possible though its realisation is, possesses its peculiar disadvantages. Industry will grow so complicated, inter-dependent and scientific, that no one outside the technically trained manager will be able to grope his way through its intricacies. Industrial science will become as remote from ordinary affairs as mathematics is to-day; business men will develop a technical jargon as secret as higher algebra. And so the industrialist will pass beyond the ken and out of the control of the ordinary citizen.

If he begins to act in a manner inimical or injurious to his fellows, how can he be checked? The ramifications of his affairs will be so interminable that it will be hard, unless one shares

his secrets, to connect cause with effect. Even if the guilt for this action or that can be fastened on any particular industrial leader, how can the State bring him to account? If threatened with pains and penalties, he can answer with a certain justice that he is the State; that the very existence of his fellow citizens turns on his continued interest in managing his business. He can laugh at the law, because, if the law harms him, he can retaliate by throwing out of gear one of the essential wheels in the mechanism of material life. Unless his undertaking functions smoothly, a whole industry will stand still. Every industry will be a key industry.

Probably such a case will never arise; if only because the interests of management and the ordinary citizen need never diverge. It is instructive, however, to envisage the possibility of a truculent manufacturer holding up the life of a nation. The world certainly moves towards an intensification of industrial life, and towards a collaboration between industries which will make possible the success of such a solitary rebellion.

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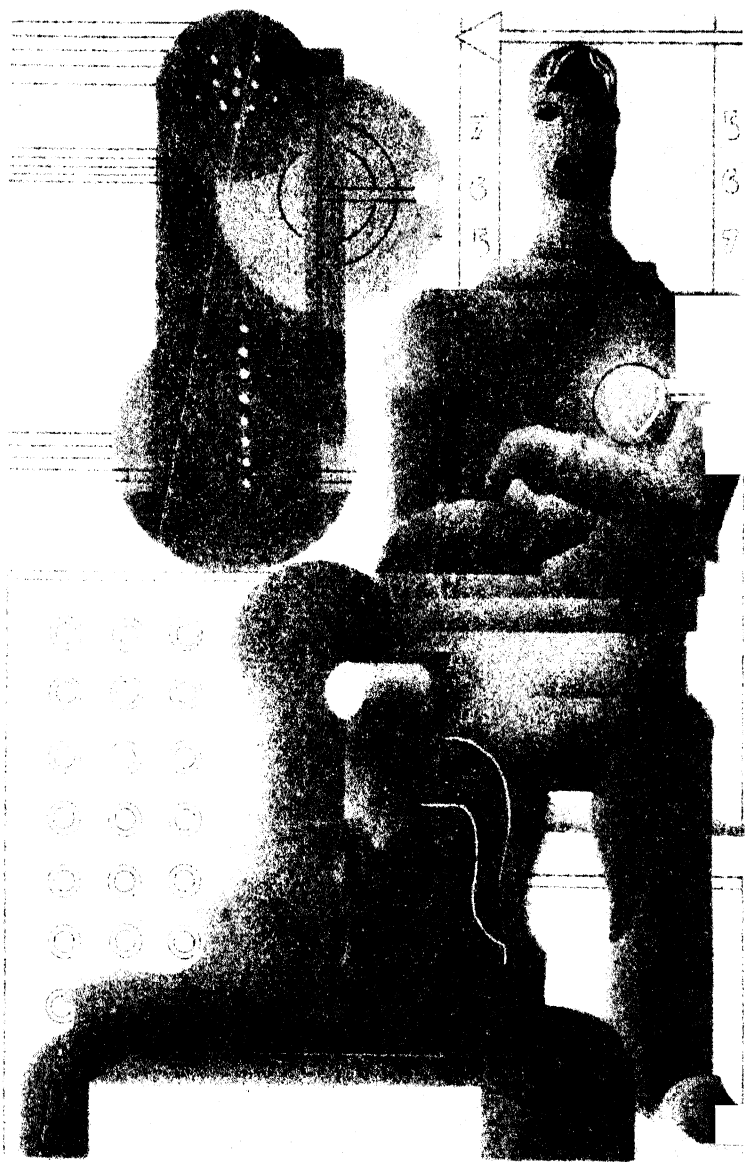
All these speculations, however, will be vain if wars distract the progress and dissipate the wealth of civilised nations. The development of industry is only possible in time of peace. War perverts and prostitutes the purpose of industry, strangles some of its branches and swells others to dropsical dimensions. War takes no account of economics, of distribution, of markets, of prices.

War may kill industry, unless industry, by internationalising the production of wealth, first kills war.

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ANY attempt to forecast the daily lives of our descendants a hundred years hence, must primarily concern itself with the instinctive mental assumptions which are likely to be current among normal men and women in the year 2030.

A universal acceptance of the dogmas of Roman Catholic Christianity conditioned the nature of that civilisation which we loosely consider as the "Middle Ages." The Feudal System of land tenure with its concomitant social pyramid—capped by the mystical and anointed person of God's regent, the King, and supported on the bowed backs of a semi-servile peasantry tied to the land they cultivated—depended for its very existence on the sanctions and machinery of the Roman Catholic Church. The Feudal System determined the life of all Christendom through several centuries ; no man



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escaped the rigid classifications, or might presume to challenge its efficacy unpunished. When the Renaissance, followed by the Reformation, destroyed the universal acceptance of Catholicism, Feudal Society dissolved and vanished.

The belief that the City State was the most admirable variety of commonwealth, involved Italy in some seven centuries of civil war and political instability. The same faith, impressed on the Greek world by Plato, was the ultimate cause which left the highest civilisation evolved by human intelligence an easy prey to the onslaughts of Macedonia.

Similar examples of how beliefs condition the lives of nations might be multiplied, for the essence of history consists in detecting and analysing the relationship between ideals and their social results. The two I have already mentioned, however, will serve to indicate that the religious, economic, and philosophic faiths of our descendants, at least as much as the material resources at their command, will regulate the daily round of their existence.

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In common with my readers, I believe myself to live in a universe of three-dimensional Euclidian space, on a globe resembling an orange in shape, which circles, as one among several planets, round the sun—itsself a small and “very ordinary” star, among the millions of such masses of incandescent gas which are disposed in empty space.

All these surprising facts concerning the universe I accept as true. They form an integral part of my mental background. I believe in them as implicitly as a thirteenth-century peasant believed in a personal Devil and a material Hell. However, I believe in them for exactly the same reason—because I have been assured of their truth by persons who appear to deserve credence. It is certain that by years of application and experiment I could check all the evidence which science advances in support of her conception of the universe; and, to this extent, I am in a position superior to that enjoyed by my thirteenth-century predecessor, who could not expect independently to verify his belief

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in Hell without first ending his earthly career. But I am exactly his equal in credulity. Concerning departments of life in which I have no personal experience, I unhesitatingly accept the best opinion of experts in those departments, and mould my conduct in accordance with a faith in that opinion.

My descendants in 2030 will certainly continue in my example, as I in that of my ancestors ; but they will believe in a very different universe from mine. The full implications of Professor Einstein's theories have yet to be explored, but beyond a doubt they will revolutionise human conceptions of space, time and the material universe. By 2030 Einsteinian physics will provide the instinctive background to all men's minds. Exactly how the universe will appear to our descendants cannot easily now be predicted ; probably it will be as different from our own as this is from a mediæval's, who firmly regarded the sun as a planet of a flat earth.

Before this revolution is accomplished, there will occur a transitive period, during which

Newtonian and Einsteinian conceptions, contradictory though they may be, will simultaneously colour men's minds. The possibility of a logical contradiction passing unperceived, even by a powerful intellect, is afforded in *Paradise Lost*. Milton ranks as perhaps the most learned of the English poets; yet in his epic, he assumes the truth both of Ptolemaic astronomy, which fixed the earth as the immovable centre of the universe, and of the then new-fashioned Galilean system, which recognised the earth as a planet of the sun.

The fact that our descendants will have absorbed Einstein by 2030 presupposes that they will receive a far greater measure of scientific education than is now usual. The whole tendency of modern life places increasing reliance on the methods and mental apparatus of science. One after another differing branches of knowledge are being reduced to sciences, where results and discoveries may be exactly expressed in the invariable terms of mathematical expression. Biology, various departments of medicine, and physiology to-day approach the exactitude of

expression which formerly distinguished only physics among natural sciences.

This taste among the scientists for mathematical methods has grown because it satisfies the modern mental complexion; because we believe in reducing truths of nature to succinct symbols common to all languages; because we trust in the infallibility of mathematics, where our forefathers believed in the infallibility of St. Thomas Aquinas.

In consequence of this belief our descendants of 2030 will express themselves and their personalities largely through the channels and machinery of science. An almost blind faith in science distinguishes our lives to-day. This faith, I suggest, will deepen in intensity throughout the twentieth century; until by 2030 it may well dominate human life as thoroughly as a belief in current Roman Catholic theology dominated the Middle Ages.

We believe in our physicians as firmly as the naked African believes in his witch-doctor. We do their bidding, though the prescribed regimen frequently involves inconvenience, absurdity and

little short of actual hardship. We frame laws and modify society in accordance with their instructions. Their grip upon the body politic has grown even firmer than the sway exercised over the minds of former statesmen by such doctrinaire economists as Adam Smith, Ricardo, and Bentham. But by 2030 doctors of medicine will not be the only scientific specialists whose decisions will modify the life and conduct of the normal citizen.

During the next century, biology promises definite and sweeping advances. The secrets of human heredity will certainly receive elucidation; the vague nonsense which now masquerades as "eugenics," will be replaced by an exact science. Its experts will claim, for example, to predict with accuracy the physical and mental nature of the children born of any particular marriage. Suppose that it is established beyond doubt that the union of A with B must inevitably produce children of a type C, congenitally criminal and mentally repulsive. Then, no matter what outcry is raised by the adherents of various religious

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denominations, the State will certainly legislate either to prohibit, or compulsorily to sterilise, such a marriage.

Conversely, when the eugenicist can predict that the marriage of D with E must inevitably produce offspring of robust physique, endowed with first-class intelligence, that State will perish which does not actively encourage such unions among its citizens.

Both these eugenic predictions and many more of a similar nature will be commonplace in 2030. Consequently young people, who contemplate marriage, will first be forced to discover what variety of children their union would produce ; and the mating of certain types, themselves innocuous, known to be disastrous in its consequences, will be sternly prohibited.

Such proposals sound repugnant, but in essence they are reasonable and even romantic. At present, by segregating them in prisons during the major portion of their adult life, we place an effective brake upon the fecundity of our incurable criminals. Our descendants will adopt the more effective precaution of preventing

the birth of those who must inevitably grow up with antisocial proclivities. Prevention is better than Broadmoor.

A similar reliance upon, and belief in, the results of science will constrain, not only the choice of a spouse, but all the other individual acts of will of our descendants. I am persuaded, on good authority, that by 2030 psychology too will rank among the exact sciences.

I am aware that already to-day many learned professors claim psychology as a science. They are premature. It remains a branch of learning in which a great mass of varied and seemingly contradictory facts has been amassed; but whose inchoate complexities have never been simplified in the light of comprehensive and tenable theory. The essence of a scientific theory consists in its power not only to account for all the ascertained facts, but also to induce new discoveries in its particular sphere. It is notorious that to-day as many "theories" of psychology flourish as professors exist to live upon them.

Psychology remains in the condition from

which the Atomic Theory raised chemistry. Nevertheless I believe that during the present century a Dalton will illuminate it by postulating a theory to co-ordinate all its data, and to expose the workings of the human mind with scientific certainty.

When this psychological theory arrives ; when a belief in its truth grows established in the common mind ; a prodigious revolution in everyday life must occur.

At present crude and blundering psychological methods are employed by all who seek to influence their fellow-men—by propagandists, advertisers, playwrights and, above all, by politicians. On the day when psychology is reduced to an exact science, the advertiser who hopes to attract custom by a specially coloured poster will be impotent against the scientific expert, able to compound an advertisement which, he can predict, must fascinate every beholder possessed of a certain mentality. The author relying for a living on the sales of novels, produced as works of art, will starve when books written so that their appeal is

inevitable and irresistible are first issued by astute publishing houses. The playwright whose scenes are salted merely by his own native wit, will not hold the stage against plays whose lines are peppered with verbal felicities guaranteed by psychological theory to bring down the house.

These are perhaps far-fetched examples, but they illustrate the inevitable consequences of the reduction of psychology to an exact science. In sober truth, this event—and it is an event which *will* happen, not one which *may* happen—will transform all our everyday occupations and pleasures.

Most particularly it will revolutionise politics. In any society, however organised, political power depends on the ability to persuade the most powerful section of citizens that a certain régime is desirable. In democracies that section is the electoral majority; in other states it may be an armed and powerful minority organised to discipline the majority to its will. In democracies the electorate may be persuaded to favour one party rather than another by appeals to blind

prejudice, ignoble passions, and unreasoning fears. Nor has the party manager at his disposal any certain means of prophesying which variety of appeal will carry the day in a general election—whether reasoned argument, patriotic sentiment or mere rhetoric. A scientific psychology will abruptly dispel such uncertainties. No political party will enjoy the chance of stampeding the nation in its own favour, once such a science is established.

Scientific psychology may destroy the possibility of conducting politics any longer on purely party lines. The voters, educated in the light of the new psychology, will be immune from specious appeals to sentiment and illogical reasoning. They will be competent to support this or that project strictly on its merits, unswayed by rhetoric, unhampered by prejudice.

That our present party system, or anything remotely resembling it, could survive under such conditions, is unlikely. The main conflicts would arise temporarily between the adherents and opponents of a projected measure. For example, a dispute such as now rages between the partisans

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of the gold standard and those other economists, who deem our present industrial depression the certain fruit of a too hasty return to the gold standard after the war, might well be imagined as distracting the political world of 2030. But a fixed and deep cleavage of opinion, comparable to that which divides the present constitutional parties from the Communists will be impossible ; because the trained minds of the nation will be satisfied that the philosophy which inspires one of these parties is true, and its converse false.

Instead of party politics, our descendants will probably be content with the rule of experts, who will seek popular sanction for each measure they purpose through a referendum. Naturally they will account it an honour to be chosen to the Parliament of skilled governors ; and the qualifications necessary for selection to it will be exacting and formidable. I do not believe that so sweeping a modification as this in our institutions will be wholly completed by the year 2030 ; nor do I imagine that it will be effected by any sudden violence of change.

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It will occur gradually and inevitably, once party politics are paralysed by the growth of psychology to the ordered logic of an exact science.

Another among our almost unconscious faiths which will mould the everyday life of 2030 is our belief in the value of education. To-day we expend an increasing proportion of the nation's revenue on education of every variety. A dispassionate observer would not greatly misjudge us were he to conclude that we attach a mystical and supernatural value to education for its own sake. From the clamorously expressed opinions of many educationalists he might deduce that we consider schooling the young, whatever the results the treatment produces, in the light of a holy occupation.

Personally I share the faith of my generation, and believe that every child should receive the opportunity of obtaining the best and most thorough education which scientific pedagogues can devise. And here, in parenthesis, I may observe that every English-speaking boy and girl of ability at present enjoys such an

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opportunity to a degree unknown in other lands or other ages. But I do not believe that the normal curriculum of higher education which exists in this country is equally suitable to train all natures and aptitudes. At present our educational machine is designed to fit its products for a certain range of activities—for government service, the law, medicine, teaching. Its elasticity is controlled, and inevitably so, by the requirements of certain boards of examiners, and the current notions of scholarship accepted by our Universities.

In 2030 a greatly modified and extended educational system will influence the life and manners of our descendants. As I forecast in a previous chapter, the problem of the ordinary citizen a century hence will not concern his working hours, but his leisure. During each month, he may spend one week engaged in monotonous but enormously productive toil. In return for this labour he will receive wages sufficient to maintain himself and his family in superb comfort through three following weeks of complete leisure. Unless he is a highly

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educated individual, so much idleness will hang heavy on his hands, if indeed it is not filled by actively mischievous pursuits. Three consecutive weeks of continuous football-match attendance, cinema-going, betting, crossword solving and newspaper reading would cloy upon even the most determined of uneducated hedonists. Therefore it will be necessary for the citizen of 2030 to command intellectual amusements with which to occupy his days.

The creation of wealth, however, will have grown so simple by 2030, that the State will be able to afford a complete education for each of her children. Every child, as a matter of course, will pass on from school to university; not until he reaches his majority will the youth of 2030 be faced with the task of earning his own living. The training he receives will be far more complete and various than can now be obtained. Educational experts will make a careful study of each pupil who passes through their hands, with the aim of discovering for what activity nature and inclination best equip him. Who shows a bent for scientific inquiry will be

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trained as a research worker, and enabled to join the ranks of those searchers after truth who will form the governing class. Whose mastery over his fellows is apparent will be qualified for an executive position where he may best employ his gift for handling men. Whose gifts are manual rather than mental will learn the secrets of a craft, and devote his life to adorning the lives of his fellows.

All this, idyllic in contemplation, will be rendered practical by the conquest of poverty ; and, for reasons which I have previously outlined, I believe that by 2030 this conquest, though not complete, will be in sight.

Universal higher education, however, may entail awkward and unforeseen consequences in ordinary domestic life. Girls, of course, no less than boys, will be given the chance to discover what work best suits their abilities. In consequence many thousands of young and intelligent women will grow up devoted to this art or that science. Such devotion will not, presumably, debar them from marriage. But the faculty for self-expression, once practised, is hard to

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discontinue, and I imagine that these young women, in the intervals left to them by eugenic child-bearing and devotion to their husbands, will desire to continue their chosen careers. They will have little time or inclination for domestic tasks. Running a household will not appeal to them as a suitable activity for an intelligent and vital woman.

Servants, moreover, to whom they might delegate such tasks, will certainly have ceased to exist in a world where thirteen weeks' labour in a year can produce a comfortable competence.

It is certain, therefore, that the ordinary household arrangements which suffice to-day, will prove inadequate for the needs of 2030. In spite of the myriad "labour-saving devices" which will doubtless have multiplied by that date, and will have converted the English domestic interior into the semblance of a machine shop, many married couples will find housekeeping beyond their powers. Perhaps they may find refuge in large communal establishments, equipped with private bedrooms and studies, but sharing refectories,

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libraries, music-rooms, lounges, nurseries and kitchens. The management of these synthesised homes may be undertaken by the large number of women who adorn every generation and who, to the eternal benefit of their friends and relations, find their greatest happiness in discharging the duties of housekeeper or nurse.

I do not believe that any amount of organised education can turn such women from domestic occupations and cares. And though the part they play in the life of 2030 may be less spectacular and dazzling than that of their more intellectually acute sisters, their honour and fame may be as high. A few years ago a noticeable body of opinion deprecated the woman who was content to rule her household, inspire and comfort her husband, and bring up her children in fine traditions. That mood is passing; in the future such women will be increasingly honoured, though in every station of life, families will live more in public, less at home. Indeed by 2030 home life as we understand it may have become the quaint

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privilege of honeymoon couples, and of old folk whose work in the world is accomplished.

Concerning the externals of life in 2030, I must confess to a certain indifference, though perhaps some forecast cannot be omitted here. In such departments as dress, for example, I can believe that radical and, to our eyes, startling changes will occur. Women by casting away their trailing draperies and figure-distorting corsets have, in the last decade, gained enormously in health, vitality and beauty. Unless men wish to be left behind the opposite sex in physical and mental fitness, it is plain that they must follow women's example, and rid themselves of their present fashions, which, convenient though they are, are unhealthy in that they constrict the neck, forbid the tonic properties of sunlight reaching the body, are too heavy, and, in regard to the external garments, collect dirt.

Similarly taste in amusements, decoration, literature, music and all the other arts will make many revolutions before 2030, if we may judge by the example of previous centuries.

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To trace the probable future development of such matters as taste, is an unprofitable speculation. The idiosyncrasy of one outstanding genius may modify a branch of the arts for a century in a purely arbitrary manner. Samuel Johnson ruled English letters for a generation ; Louis XIV imposed the canons of French " classic " architecture on the rest of Europe until his great-great-grandson's head fell to the guillotine ; Ruskin, by magnificently persuasive rhetoric allied with a mediocre taste, passed off a galaxy of third rate pictures and fifth rate architecture on the supremely gullible Victorian public as supreme works of genius. In the process he nearly ruined Oxford. Another Johnson, now struggling with syntax at his preparatory school, may rise to dominate written English ; a dictator among architects may denounce and destroy the skyscraper ; a new Ruskin may send our grandchildren into ecstasies over a Lord Leighton yet unborn.

Yet, I believe that, a century hence, our descendants will move in a clarified mental atmosphere, as bracing as the Swiss air of

midwinter. They will be able to view circumstances in a sharp outline, untroubled by hazes and shadows. But like the mountain air, the atmosphere will be cold as well as tonic. It will be less genial, less charitable, less mellow than the autumn air which has now superseded the romantic fogs of the nineteenth century. A dispassionate lust for scientific inquiry, an impersonal taste for realities, will surely typify their attitude towards life.

We, at present, are escaping from the most personal and subjective era in the world's history; an age when personality has been glorified and exalted above all else. I believe that by reaction, and through the ever-growing importance of scientific method and results, the declining years of the twentieth century will be distinguished by an insistence on the objective in all departments of human activity.

Thus by 2030 men and women will seem, judged by our standards, harsh and unemotional. They will have recaptured and transformed into new fashions, the precision, lucid sense and

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keen criticism which distinguished the small educated world of the eighteenth century. Wit rather than humour, comedy rather than farce, reason rather than sentiment, polish rather than naïveté, ingenuity rather than ingenuousness will be valued.

So intimately is the history of civilisation bound up with the expression of gigantic personalities, that a single individual may arise in Europe or America to reshape the mould of life before 2030. Another and a greater Wesley may call back our grandchildren to fervent emotional Pantheism, and recall the religious wars which racked the seventeenth century. A new and delicious Helen, inflaming the laboratories, may launch a thousand airships and bring to ruin New York's topless towers. A Puritan revulsion may sweep over us, quenching the arts and reconstituting the taboos of the nineteenth century. A mad dictator, jealous of Western progress, may precipitate a war, which will finally burn up and destroy Western civilisation, so that coming generations in China and New Zealand will know it for no more than

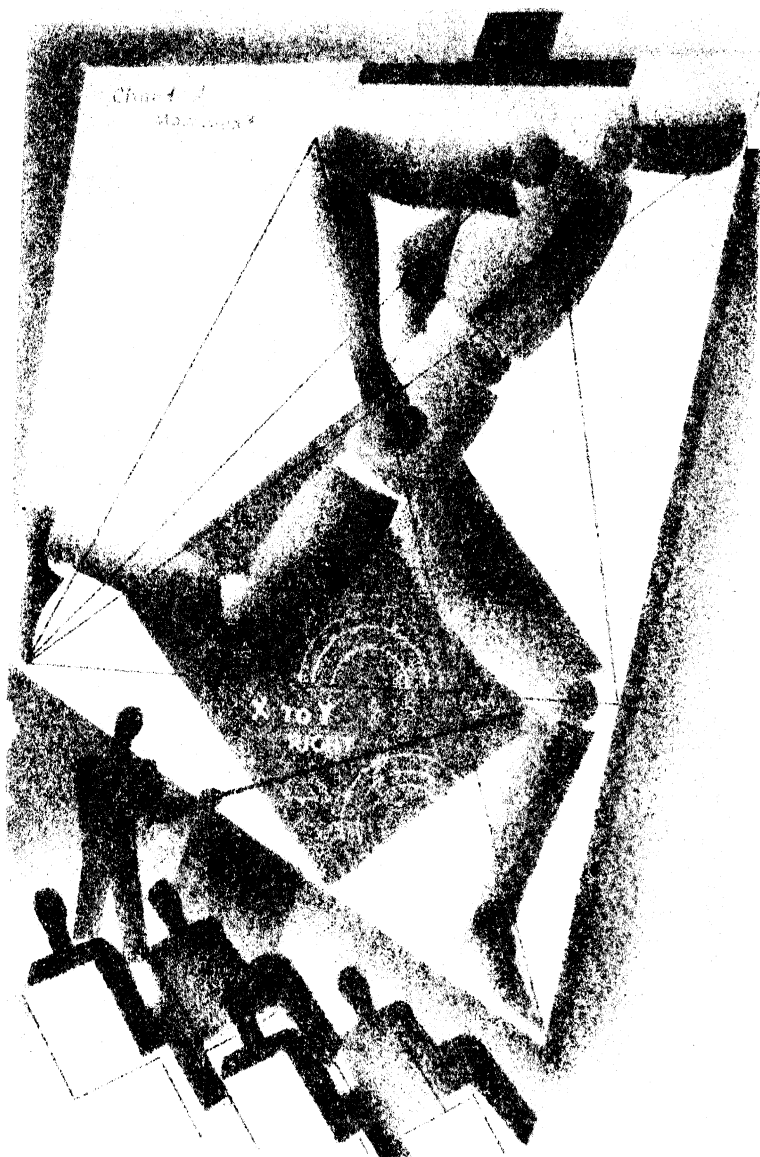
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a memory and a name. But against this peril
I pin my faith upon the genius of the Anglo-
Saxon race.

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LAMENTATIONS at the degeneracy of the present, compared with the past, have long been among our favourite amusements. The earliest historical records contain forebodings of the future, and prophecies of the inevitable ruin which must overtake frivolous sons and daughters unworthy of their ancestors. Jeremiah and Savonarola; the monkish authors of the Anglo-Saxon chronicle, the late Lord Chaplin; Seneca, and Dean Inge—all these most varied seers have warned their contemporaries of the wrath that is to come, not without a certain malicious relish.

It may also be observed with as much truth as any generalisation contains, that these prophets of disaster have seized upon the amenities enjoyed by their fellows as evidence of racial decay. "Soft raiment," works of fiction, the waltz, cocktails, cigarettes and votes for young



THE AMENITIES OF 2030.

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women have all provided the foundation of arguments irrefutably demonstrating that morals were dead, good manners a memory : and that civilisation was rushing headlong to a Gadarene catastrophe.

Actually these arguments have been fallacious. The amenities of civilised life are not in themselves either noxious or benign. Their popularity, spread generally by fashion, is as evanescent as it is misleading to the social observer anxious to discover the trend of a nation's progress.

It would be, for example, in direct contradiction to the truth to deduce from the present popularity of cocktails that this country shivered on the brink of such another epidemic of drunkenness as followed the introduction of cheap gin in the eighteenth century. It is true that what I believe is called " the cocktail habit " forms a social ritual among young people of substance to-day. Very possibly some of these young people consume more spirituous concoctions than are either proper or beneficial ; but the police statistics for the last half-century

prove that drunkenness is rapidly dying in this country. The world has never been so sober as it is to-day.

In considering, therefore, what amenities our descendants may reasonably be expected to enjoy in 2030, it should be remembered that added facilities for enjoyment do not of themselves mean debauched lives or a passion for pleasure-seeking. Our fathers were not better men than we because their amenities were less comprehensive than ours: our grandchildren will not be worse than we because they are offered avenues of enjoyment not as yet developed.

I believe that the physical and social amenities of life will enormously increase before 2030. I am aware that this view is challenged by thousands who lament the passing of "the good old days," and hold that the possibilities of leading a happy life decrease each year; but I can scarcely understand, far less support, so ridiculous an argument. The average standard of comfort, urbanity and means of recreation, has tremendously advanced during the past

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century. It has even noticeably increased since the end of the war in 1918.

A century ago Beau Brummel, that neglected social reformer, had only just persuaded London's polite society that certain congruities of dark cloth and spotless linen were preferable to the greasy satins, tarnished gold embroidery and frowsy ruffles in which the grandees of the eighteenth century passed their convivial lives.

Brummel re-discovered personal cleanliness. It began as his fad, and was regarded by his fellows as a singular eccentricity. To-day it has become a social necessity. It is, moreover, one of the first amenities; and I believe that the future will lay even more emphasis upon it than the present.

By 2030 dirt will have disappeared from the ordinary man's experience. Chimneys, blighting vegetation and poisoning the atmosphere with their acrid fumes, will be banished from industry. The machine shop, the foundry and the abattoir of 2030 will be as clean as any bakehouse or dispensary of 1930. Mr. Henry

Ford has already proved, in his immense motor-car factory at Detroit, that dirt is uneconomic, and has installed extensive machinery to make and keep these works clean. He did so originally because he valued his workers' cleanliness for its own sake. But before this machinery had long been installed he discovered that cleanliness was a paying proposition ; his new system was saving money as well as adding to his staff's amenities.

Organised industry will quickly follow Mr. Ford's lead ; and the dirt at present associated with machinery will seem a strange and hideous fancy to the mind of 2030.

With dirt will disappear much of the hideous noise which is so distressing a concomitant of modern urban existence. Noise can only be created by the expenditure of energy ; only one-thousandth part of the noise of modern London serves any useful purpose or provides measurable enjoyment. The rest represents sheer waste of effort and efficiency. The first motor-cars were uproariously noisy. Their descendants run with scarcely a sound. As they have become

efficient, so motor-cars have become silent. In the same way all other machines will grow silent. By 2030 the streets, though they be four times as thronged as in 1930, will be disturbed only by the sounds made by the human beings moving in them. This silence will be shared by the boiler-shop, the shipyard and the printing-works —by every industrial unit which now deafens the men it employs. Presuming that our descendants will enjoy themselves as well as work in this clean and quiet world, will they have abandoned our own sports and amusements for purely intellectual pleasures? Will they regard hunting, shooting and fishing as we do the cock-fights and bear-baiting so popular among our ancestors?

Neither of these questions need be answered in the affirmative. So far as recreations are concerned, the young people of 2030 will amuse themselves very much as young people do to-day. But it may reasonably be anticipated that the increase of wealth and prosperity, which will have accrued by that date, will enable the poorest to enjoy even expensive sports as

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a participant, and not merely as a spectator. Everyone will be sufficiently well off to play football, cricket or tennis in comfort and to his heart's content; and the decentralisation of towns (to which I have referred in an earlier paper) will provide him or her with easy access to a choice of playing-fields.

Nor do I believe that horse-racing as a sport need be any less popular in 2030 than it is to-day. It is a diversion which appeals to men and women of every conceivable degree of ability and intelligence. There is a tendency to-day among intellectuals to despise the racecourse as the scene of the stupid man's amusement. Such scorn is as unmerited as it is harmless. Charles II, Charles James Fox, Lord Russell of Killowen, the late Lord Rosebery, Lord 'Beaverbrook—this is not a catalogue of fools, but of men of peculiar ability, each of whom has found in horse-racing a pleasure and a relaxation from more weighty concerns which nothing else could afford him.

So long as horse-racing—with Hyde Park perhaps as a very popular course—survives,

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fox-hunting will not die. Both sports are continually attacked, the one as the root of the gambling evil, the other as a wanton cruelty. I believe that the critics of both will fail in their campaign to exterminate them. If horse-races did not afford the gambler a convenient opportunity for hazardous speculation, he would instantly devise another means of wasting his money. If the enemies of fox-hunting cajole some future government into making the sport illegal, they must logically commence an agitation for making all men vegetarians by Act of Parliament.

I believe that neither of these sports will die, but rather that both will become greatly popularised. As wealth increases, we shall all be able to ride to hounds. By 2030 the owner of the Grand National winner may be the National Union of Airplane Workers or the Timbuctoo Co-operative Society, while the Master of the Quorn may spend his working hours as a machine tool designer or a ship steward.

In fact, by 2030, everyone will be able to share the amenities which to-day can only be

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commanded by a substantial income. The best seats in theatres, more elegant and convenient than any planned to-day; foreign travel; a library of well-printed books; a pleasant and varied wardrobe; will be the portion of the employed no less than of the employer.

Every material comfort and convenience which the abolition of poverty can bring in its train will smooth the career of the child born in the next century. Some of the amenities we now value, he will not experience. They will have disappeared, killed by fashion, prejudice, or the decrees of scientists. By way of compensation, he will certainly be surrounded by pleasant possibilities which we now can only imagine.

The clothes of 2030, for example, will be a vast improvement on our present garments. The possibilities of artificial silk are now beginning to be understood. In the future, materials of the artificial silk variety will be the basis from which all clothing is made. Its cheapness, lightness and warmth, fortified with an added durability, will make it possible for everyone to possess as many and as varied

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garments as he—or, more particularly, she—may desire.

It would be highly rash to speculate concerning the fashions of the year 2030. If we consider the evolution of clothes since the end of the last century, we may obtain some idea in what direction that evolution is likely to continue.

The emergence of women from the comparative seclusion of domesticity and the universal adoption of an active and locomotive mode of life, have revolutionised dress in a very short space of years. For centuries civilised women in western Europe swathed, compressed and swaddled their bodies in an amazing variety of draperies and millinery. So long as she led a life bounded by domestic and maternal cares, these strange garments did not hamper her career. So soon, however, as she emerged to compete with men in industry, business and sport, woman discovered that her clothes placed her under a grave handicap. The fashions changed drastically and immediately; she adopted the knee-length kilt in place of the

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long clinging skirt, free airy garments in place of creaking whalebone moulds. As woman is now clad, her garments offer the least possible hindrance to her energy.

It is significant that since this break with the tradition of centuries, completed about a decade ago, woman's dress has remained practically uniform in fashion. Minor changes, of course, occur every few months; how else could the great army of workers who live on fashion survive? But despite the most determined efforts of fashion designers, woman will not materially modify her raiment, except in the evening when her work is ended and she feels at liberty to become purely ornamental.

This revolution in woman's dress must in the future react on men's attire. At present men are suitably dressed for the functions they fulfil, only when they play games. The flannels of the tennis player, the shorts and jersey of the footballer, the tweeds of the deerstalker are all fitted to the needs of the wearer. But the inconvenience of the clothes in which men direct great industrial enterprise, negotiate treaties,

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or sit in Parliaments to govern (or serve) their fellows, is farcical.

Men's dress, on formal occasions, has scarcely changed since the respectable opulence of mid-Victorian convention established broadcloth, frock-coats, starched linen and top hats. This uniform may possibly be dignified. It is certainly neither hygienic nor comfortable. Very soon, I believe, men will revolt against it, and establish a new convention of what may be worn without attracting attention or justifying derision.

I do not contemplate a descent to sloppiness in male fashions. Byronic looseness and Bohemian untidiness can have no place in an age which, even more than our own, will bring everybody in close contact with powerful and swiftly moving machinery. But the excessive complications of men's present clothes will disappear. At present, in dressing, the average male deals with forty-odd buttons; in order to appear appropriately dressed on ordinary occasions, it is necessary for him to possess at least half-a-dozen different costumes. Not

long ago, in order to carry out a busy day's programme, the Prince of Wales changed his clothes a dozen times between waking and returning to bed. This is an extreme instance of the demands which sartorial convention places upon an extremely busy man. It proves how essential it is that men's clothes shall be simplified.

By 2030 two or three simple costumes will have been devised for men—one for formal occasions, one for all workaday purposes, and the last for recreation. Each will be as rational, as well-suited to its purpose, and as healthy as the clothes which women wear to-day. Thus simply clad, the man of 2030 will set off for the week-end, after his work, in a small, swift airplane, as reliable and cheap as the motor-cars on which we depend to-day. Since speeds of at least 300 to 400 miles an hour will be within the machines' range, half the world will be within the compass of a Saturday to Monday excursion.

To cater for such travellers new pleasure resorts will spring up in previously inaccessible

regions, distinguished for their natural beauties or their congenial climate. The winter sports of Labrador or the Hudson Bay Territories will empty Montreal and New York each week-end until high summer. Ski-ing parties in Greenland will be made up in London clubs on Saturday mornings, and translated into action before the same evening.

The most interesting possibility, however, is the creation of a new playground for all Europe in Northern Africa. A vast region in what is now the Sahara desert forms a natural basin, lying well below the level of the Mediterranean Sea. By cutting a canal from the Mediterranean to this area, a new inland sea must surely be created. Its shores, now barren, would rival Florida for fertile charm; its climate would realise all the paragraphs written of the coast of southern France by publicity experts. During the summer this new Riviera might well be too hot to be pleasant; but from October until May the climate will be ideal for holiday makers.

Along the shores of such a sea will arise new

towns of hotels and villas, theatres and race-courses—pleasure cities within the reach of every European capital, attracting a swarm of airplanes each week-end. Possibly this scheme may not have been completely realised by 2030 ; but I believe that the prospect of transforming a barren desert into a prosperous region will certainly have induced some group of enterprising financiers to explore the idea, and its prospects.

To those who choose to stay at home, rather than depart by air for a remote resort, 2030 will offer attractions far in advance of anything possible to-day. The development of broadcasting and television will enable a family, gathered round its own atomically radiant hearth, to watch and listen to a variety of spectacles. On a screen let into the wall of the room where they are gathered, plays will be projected stereoscopically in full natural colours. From a concealed loud speaker the voices of the actors will emerge as from their owners' mouths—not, like the "talkies" of to-day, as if muttered through a lamp-glass darkly. It will be possible

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to create in a private house the exact illusion of physical presence at a stage performance hundreds of miles away.

By this means everyone will be enabled to assist at performances by the most gifted actors and actresses of the day. Any piece can be revived "for one night only" at a moment's notice. In this case, a perfect talking film recorded on a previous occasion will be sent out through the transmitting apparatus.

I do not believe, however, that this perfection of engineering ingenuity will prevent packed audiences from gathering to attend the performances of superlative artistes. The atmosphere of a crowded theatre or concert-hall possesses an attraction which can never be reproduced in a private house where only two or three are gathered. The mass emotion of a first night at the Metropolitan Opera House in New York, or at Covent Garden in London, or at La Scala in Milan—so easy to recall and so difficult to define—adds enormously to the prestige and excitement of the occasion. So long as human nature remains unchanged, it

will always be preferable to be present at such scenes rather than to watch a perfect simulation of them in one's own home.

Fundamentally, however, the whole question of the amenities of life is intimately connected with locality and tradition. The great country houses of eighteenth century England produced a pleasant existence for their occupants, distinct in flavour and unique in breadth of interest. The slave-supported cotton-growing Southern States, before the American Civil War, elaborated a social routine and a variety of pleasures peculiar to themselves. The amenities of each of these microcosms were indigenous and not to be transplanted. The fusion of sport and culture at Houghton, Castle Howard or Stowe could only exist in its own familiar Palladian setting. The gracious indolence of the Carolinas withered into stagnation the day the slaves were freed.

Similarly the civilisation of speed, science and machines into which our descendants of 2030 will be born must certainly develop characteristic amenities and pleasures. To-day we are

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watching the death of a society and a tradition which have existed since the first French Revolution and the Industrial Revolution. That society was founded on an unconscious alliance between the eighteenth-century oligarchic families with the new wealth created by the application of power to industry. It flowered brilliantly during the last Victorian decades ; it questioned its own authority and doubted its own prestige during the Edwardian years. The war killed it.

Nothing permanent or promising has yet risen in its place. It seems certain that industry, organised on a vast and even more international scale, will control the power of the world, during the present century. But it is not yet discernible how the controllers of this industry will mould society.

The amenities of 2030 must ultimately depend upon the course of political and economic history during the intervening century. If these years are filled with anxieties and upheavals, the amenities of life in 2030 will be crude and vulgar. Periods of unrest may produce great men and great literature ; but they do not induce a

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gracious social convention or a tradition of fine manners and highly developed living. The Imperial court of Napoleon was more vital and real than the tottering splendours of Louis XVI's Versailles; but it was in a comparison awkward, stupid and pretentious.

If the next century is tranquil and prosperous, life in 2030 will be adorned by cultured and urbane amenities in excess of the pleasant accompaniments which our contemporary civilisation can exhibit. If, on the contrary, the twentieth century is confused by strife between one order in the State and another, 2030 would find London as barren of real amenities as when Cromwell signed Charles I's death-warrant, or Henry VII rode to London from Bosworth Field. The tranquillity and the amenities would not exceed those of modern Leningrad.



THE AIR IN 2030

MAN has only very recently taken to the air as a navigator. Such spectacular and resounding results are annually wrung from aviation, that we forget how incomplete is our understanding, how insecure our conquest, and how flimsy our achievements.

Although, since the War, the airplane has become a commonplace of every existence, save that passed in extravagant retirement, it should not be imagined that this necessarily indicates the dawn of a genuine "air-age," in which the sky will grow dark with wings, and those motor-car manufacturers who have not the sense to forestall the change will be driven out of business.

Our conquest of the air has, so far, been no more than partial and desultory. Its efforts towards success have resembled the brushes of guerrilla warfare rather than an organised

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campaign conducted by disciplined forces under scientific leadership. Progress has been forced upon us in the stern school of war, or else inspired by some happy fluke.

Little more than twenty-five years ago, the Wright brothers achieved the first flight in a power-driven heavier-than-air flying machine, an "aerodyne." Quite recently a banquet was held to commemorate the twentieth anniversary of the morning when Louis Blériot astounded the world by rising into the air near Cap Gris-Nez in France, and descending on the cliffs of Dover.

Before we can look for an answer to the question, "What will the airplane be like in 2030 A.D.?" we must first, therefore, discover whether these singular machines of wires, struts, wood, canvas and "dope" are capable of serious improvement at all. May it not be that airplanes have now reached the stage of development similar to that at which the locomotive railway engine arrived some sixty years ago, and in which it has ever since stagnated? It is true that the machines which haul the great

express trains of the world look infinitely more imposing than the humble engine of 1869. The modern engine is actually more powerful as well as larger; it embodies a vast number of small and important improvements of design and manufacture. But it is only the logical development of its earlier sister. It contains the fruit of no single mechanical idea of importance, which the earlier engine did not contain.

Already railway engineers can estimate the limits of performance which can possibly be wrung from steam locomotives of the normal design in existing conditions. They can tell exactly what is possible in the future—and what is impossible. Is the same true of the airplane?

This may well be. Although flying, as I have reminded my readers, still remains in its infancy; although aerial research has vast regions to explore, at present utterly unknown; yet the limits of the airplane's achievements in the future can already be roughly determined, because the future developments of the

reciprocating explosion motor, driven by petrol, is already fairly well known.

On this motor the airplane totally depends for the defeat of gravity. Only by the regular functioning of such a motor can the airplane either remain in the air or be steered on a course. In order to keep such a motor at its work, the airplane must carry bulky and weighty supplies of suitable fuel for its consumption ; in consequence, when it first rises into the air from the ground, it is burdened with the maximum load.

All these facts threaten the future development of the airplane. The most that can be hoped for, I therefore predict, must be regular speeds in the neighbourhood of three hundred miles an hour ; an extension of the "commercial" flight from its present length of 150 miles to 500 miles ; and the perfection of safe all-metal machines up to about three times the size of the ordinary multi-engined air-liner now used on the London to Paris services.

Beyond these limits many cautious and sound engineers cannot conceive that petrol-driven

airplanes will develop. All these improvements, however, will, with certainty, have materialised by the year 2030; and the organisation of flying services for the transport of passengers, mails, and urgent merchandise will have grown to be a very large and paying industry. Regular all-the-year-round services to India, the Cape and Australia (*via* an Indian and Malayan route), as well as daily airplanes for all Continental capitals, will be the commonplaces of a breezier and more intelligible Bradshaw. Concerning an Atlantic air-ferry, however, I remain sceptical. The thing could be accomplished either by means of landing stations moored in mid-ocean; or else by following a trans-Arctic route. But if it is ever to be regularly and popularly achieved with the petrol-motor's aid, I incline to an Atlantic air-ferry operated by lighter-than-air machines.

The airship has a host of caustic enemies; but, so long as explosion motors, needing large supplies of weighty fuel, propel aircraft, it must continue to play an important part in the history of aerial travel. The airship has been

lately developed, from a technical point of view, far more than is commonly supposed.

Guaranteed passengers, a weekly London-New York ferry service of dirigibles, each carrying 100 passengers and a cargo of mails, is an economic proposition at the present moment. It is a project which, if a company were floated to achieve it, could legitimately apply to the public for capital with every hope of paying a regular and remunerative dividend on its shares.

By 2030 many such airship companies will be realities. Possibly some of the great steamship lines may have the enterprise to float them, and thus retain their valuable mail contracts, as well as a share in the fame which must attach itself to successful commercial pioneers in such a sphere. I should like to see the Cunard, the White Star, the P. & O.—to name only three great shipping companies—go “into the air” at once, and institute exhaustive experimental work towards establishing a fleet of airships to co-operate and supplement the services maintained by their existing sea-ships.

I do not expect to be so gratified. Economic

history abundantly proves that those who have profited from one mechanical invention do not as a rule take kindly to its successor. The sailing-ship owners deprecated steam—until it ruined them. The stage-coach companies alternately laughed at the railway train, and hysterically worked to prevent its capitalisation. Only Mr. Henry Ford among prominent motor-car manufacturers seems to perceive that it is worth while laying down plant to build airplanes, as distinct from airplane engines.

On the other hand the present mainstay of the airplane, the petrol engine, may not prove so irreplaceable as the engineers believe. If the physicist comes to the rescue, as I have suggested in an earlier paper, and accomplishes the necessary researches, he may enable some designer of genius to produce a motor running on intra-molecular, or less probably on intra-atomic, energy. When we may expect such a motor as a commercial proposition, it would be rash to prophesy. It is possible that it may have arrived by the year 2030 ; since the whole future of man as a flying creature depends

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upon its arrival, I propose to sketch the complete revolution which such a motor will produce in the development of airplanes.

Primarily, the molecular-energy motor will mean the defeat of gravity. Engines weighing only a few ounces for each horse-power developed, and capable of carrying fuel, sufficient for a thousand hours' continuous operation, in a tank the size of a breakfast cup will be designed and marketed. Equipped with such a motor, the airplane will no longer be tied to the ground. It will be able to remain in the air indefinitely, without refuelling. Its ratio of useful load to total weight will be enormously enlarged. Its reliability will so increase that accidents caused by engine failure can be ruled out of consideration.

The result of the introduction of this motor will be to inaugurate that "air age" which enthusiasts have already several times welcomed in an excess of optimistic fervour. Such a motor will banish most traffic from the face of the earth, and ships laden with merchandise from the ocean. The raw materials

of heavy industry, and the finished productions of its processes, will always travel to and from the factory by land and water; it is plainly not worth while dispatching them through the air. But for every other purpose aerial transport will become universal.

Since the molecular-energy motor will require no oxygen for its operation, aircraft will no longer be confined, as now it is, to the dense layer of air immediately above the earth's surface. 50,000 feet may well prove the average level of flight of trans-Atlantic airplanes, whose average speed through the thin, cold, clear atmosphere which exists at such a height, will be in the neighbourhood of a steady six hundred miles an hour.

By means of such machines New York and London will be brought within a few hours' journey of each other. Leaving London after breakfast, passengers will travel in hermetically sealed, well-heated cabins. There will, of course, be no pleasure in looking out of the window, for, above, one will see a monotonously blue sky in which a cold sun for ever shines; and

below, a level sea of cloud, white and dazzling with reflected sunlight, and broken only by distant glimpses of the grey waters of the Atlantic, which, no matter how the wind lashes them, will seem from such a height as unruffled as a duck-pond.

Much has been said recently, and more written, of the possibility of electrically propelled aircraft, which will gather their energy from the ether as they fly. Mr. Marconi has lent the great weight which, in such matters, properly attaches to his name to certain of these speculations. He has spoken prophetically of huge land-stations broadcasting electrical energy to be picked up by flying-machines, and used by them for their propulsion.

I view these speculations with caution. Such a thing may be possible in the future; but I doubt, for two good reasons, whether it will ever be accomplished. First, because the amount of energy which must necessarily be "broadcast" before even certain well-defined air routes become sufficiently highly electrified is stupendous. Secondly, because the electric

motor, as we know it, although efficient, is extremely heavy. The lightest motors at present in existence are five times as heavy, per horsepower produced, as are present-day petrol airplane engines. This is because both soft iron and copper enter largely into their construction, and cannot be replaced by any other metals.

Of course it is possible that the world shortage of copper which is already chronic and will become acute by the end of the present century, will drive scientists to evolve a substitute alloy. If this proves much lighter than copper, a really useful electric airplane motor may result. But I do not feel sanguine concerning electrically driven aircraft in any circumstances. The molecular-energy motor provides, I believe, by far the most probable and desirable solution to the problem.

There remains the possibility that the aircraft of the future will be propelled by the simple principle of reaction, like the rockets sent up on the 4th of June at Eton. Great interest in this form of propulsion has lately been shown in Germany, where numerous experiments have

taken place with a "rocket-car" running on a specially prepared railway track. So far this vehicle, though it has achieved speeds considerably in excess of a hundred miles an hour, has not proved docile. It has run amuck more than once, and slain a brave man who pinned his faith on its capacity.

Yet it would be ridiculous and rash, because this "rocket-car" has so far proved a tragic farce, to conclude that the principle on which it works is unsound and useless. On the contrary, this principle may play an important part in the future development of aviation. Long distance aerodynes of the future, climbing into the air and descending to earth vertically by means of air-screws arranged as helicopters, may well be propelled horizontally at enormous speeds by the same propulsion which drives the "rocket-car" on its crazy dash down the railway track.

Instead of utilising molecular energy to turn an airscrew the engineers of the future may obtain better results by allowing a stream of this energy to rush freely from the stern of their

airships, and so to drive them forward through the atmosphere. By adopting this means of propulsion, moreover, they will be able to fly at far greater altitudes above the Earth's surface than would otherwise be possible. A propellent airscrew needs a surrounding atmosphere of a certain density for its efficient operation. A hundred thousand feet above sea level, for example, the air is too rarefied for its functions. But, at such altitudes, the thin air offers only slight resistance to the passage of bodies through it at high speeds. Therefore it would make both for speed and economy of working if the great air liners of the future could habitually cruise at such a height. Only the "rocket" functions with equal efficiency in an atmosphere of any density.

This same system of propulsion must also be used if ever a practical attempt is made in the next century to reach the Moon or one of the planets by means of a flying machine. Such an expedition has long been the dream of scientists, and a productive mainstay for the authors of fiction. Many men believe that it will so remain.

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But our descendants will certainly attempt journeys to other members of the solar system. An expedition to our own moon seems a cold and unattractive proposition ; far less inviting than a journey to Mars ; because, while astronomers assure us that the Moon is certainly not inhabited, it is possible that Mars supports not only a luxurious flora, but also a fauna whose most highly developed specimens may prove an analogous order to the human species.

By 2030 the first preparations for the first attempt to reach Mars may perhaps be under consideration. The hardy individuals who form the personnel of the expedition will be sent forth in a machine propelled like a rocket ; and equipped with a number of light masts which can be quickly extended, like fishing rods, from its nose. The purpose of these will be to break the impact with which, granted all possible skill and luck, the projectile would strike the surface of the planet.

The great problem which such an expedition will face, however, is the possibility of missing Mars altogether ; and, having escaped from the

Earth's gravitational field, of wandering aimlessly through space unable to find a planet where they can hope for asylum. Such a fate, indeed, may well overtake the first half-dozen expeditions which set out from the Earth to reach Mars. But, one day, a few men may arrive alive on the surface of our nearest neighbour in space. It seems unlikely that they can long hope to survive there, far less that they will be able to return to their home on the Earth. The most for which they can hope, will be to send back across the ether a few messages of information concerning Martian conditions; to transmit the results of a dozen accurate scientific observations before they perish. I should not myself be a volunteer member of that party.

The fruit of their messages, and of their death, will be new expeditions, better equipped, better prepared to withstand the physical difficulties of life on another planet, and bearing with them in their flying machines the materials to erect another smaller machine on the surface of Mars. Into this, bearing with them the records

of their experiments and observations, but jettisoning the rest of their equipment and apparatus, the survivors of the later expeditions may retreat, and so hope to regain the Earth.

This outline of the exploration of Mars is admittedly fantastic ; but can we be quite sure that it is inconceivable ? It is typical of the spirit in which the man of science goes to work when he is faced by a difficult as well as a highly perilous adventure. In such circumstances he values his own life no more than an ant. So long as the human race reaches the goal towards which he strives to impel its reluctant inertia, he cares little what happens to his own life and fortunes. He is as altruistic as the first Christian martyrs ; and, it may be suggested without offence, his altruism is calculated to secure even more substantial benefits for his fellow-men. At all events we may be sure that, when expeditions to Mars first become dimly practicable, there will be devoted and highly skilled men prepared to risk certain death in the hope that, by so doing, they can add to the total of human knowledge.

When the air has become man's universal thoroughfare ; when the acceleration of flying has brought London within a short journey of New York ; when each suburban home owns its light airplane, as now it can own a motor-car ; what will be the effect of taking to the air upon human affairs and relationships ?

I believe, practically nothing. Again and again in the course of history it has been predicted that this or that mechanical invention " must " end international misunderstandings, and inaugurate an era of utter peace and prosperity. The electric telegraph, the railway, the steamship, wireless telegraphy, and—oddly enough—the telephone, were all hailed as universal pacificators. They have not noticeably fulfilled their promise.

Makers of such predictions fail to remember that European civilisation enjoyed through some half-dozen centuries a common religion and a common philosophy of life ; and that these bonds signally failed to prevent wars, or even to mitigate their bitterest horrors once they were joined.

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If such cogent bonds as these, affecting mind, habits and body alike, could not bridle the chronic pugnacity of nations, how shall we say that the adoption of travel by air in place of travel by land and sea will persuade where they failed to coerce?

The conquest of the air, instead of pacifying humanity, will place a new and terrible weapon in the hands of the bellicose.

As I have pointed out in a previous chapter, I do not believe that organised warfare in the future will grow more, but rather less, horrible both for combatant and civilian. But when the forces of a nation have failed in the field, when the last hope of a War Cabinet has been launched, and that hope has failed against the armaments of the enemy, the conquest of the air will place a new temptation in the hearts of bitter and despairing men. It will enable the beaten nation, just before treating for an armistice, to obtain, if not victory, at least revenge. As a last gesture the vanquished can launch a secret armada of the air, to rain death and plague from the heavens upon the sleeping cities of the conquerors.

Such an act would make the peace terms imposed on them twice as onerous ; it would be the cynical denial of every principle of honour and decency in warfare ; it would shock the conscience of the world.

The world has received such shocks in the past ; it will receive them in the future.

There is a mood of desperate hate which overtakes not only individuals, but nations and their governments ; a mood in which the vanquished counts no cost, envisages no reparations or reprisals, so long as he can cripple his victor before he goes down in defeat.

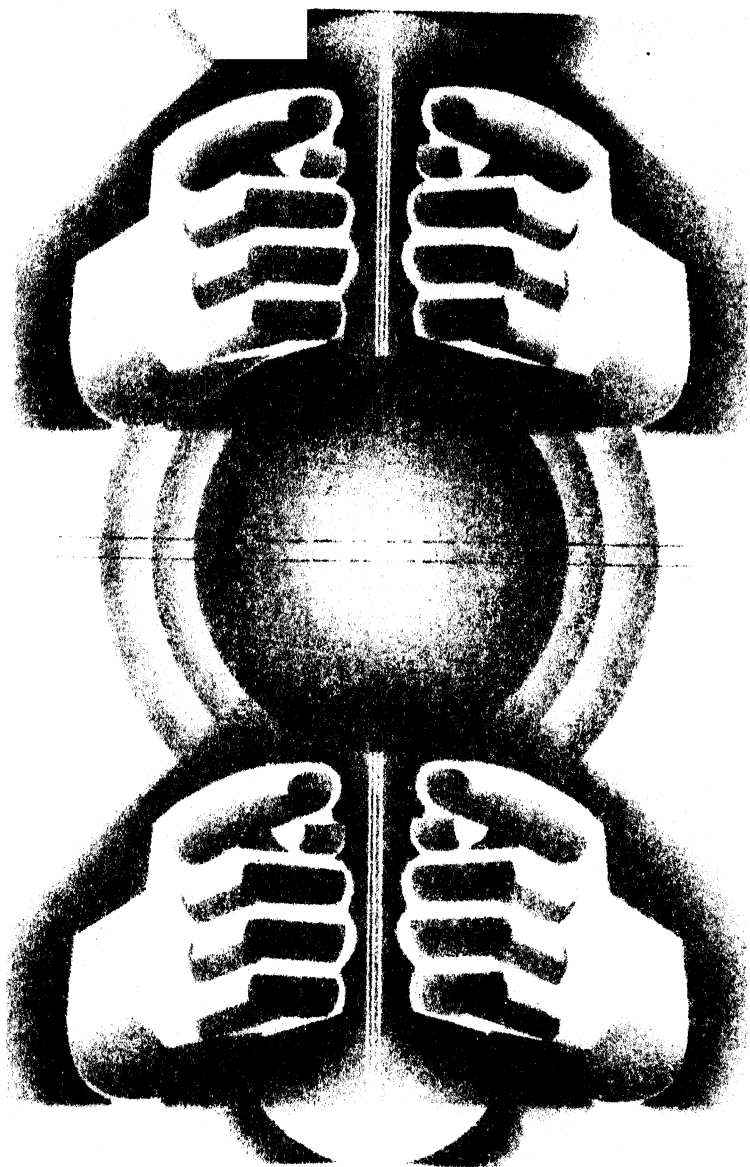
Many a future war—and there will be future wars—may terminate in such senseless holocausts.

The pious optimist will denounce this suggestion as irrational and ludicrous, as something which cannot possibly materialise. It will materialise. It is the price that man will pay for his ultimate conquest of the air.

WORLD POLITY IN 2030

WORLD polity to-day is conditioned by the conception of nationality. In world affairs we think instinctively in terms of nations ; critical events turn on the susceptibilities of national pride or on the pressure of national advantage ; a certain co-operation in regard to the specific details of life is as far as a prudent realist in politics will go towards envisaging a universal and harmonious union.

Nationality is old as an idea, but extremely modern in its concrete realisation. The ancient world did not know it ; Rome ignored it ; mediæval civilisation fought against it as a pernicious and subversive social heresy. Yet it arrived ; and established itself in Europe, championed by such diverse creatures of genius as Joan of Arc, King Henry V of England, Martin Luther, Shakespeare, Louis XIV, Cavour and Garibaldi. France, though hindered by many



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and grave internal difficulties, first crystallised the idea in a clear intellectual concept. Through successive and generally victorious wars her rulers so impressed this idea upon each Frenchman, that France still remains the pattern "nation" of the world. From the point of view of foreign Powers who wish to arrive at an accommodation with her, she is endowed with an over-developed sense of nationality. Every Frenchman is not only conscious, he is self-conscious, perhaps over-conscious, of his nationality. He bristles with it.

The last century was obsessed by this idea of nationality. The poets, philosophers and statesmen of the nineteenth century distilled into this conception all the moral earnestness of their age. It became a shibboleth with them that every agglomeration of human beings, however irresponsible, however insignificant, which could claim its descent from a stock distinguishable from that of its neighbours' ancestors possessed *ipso facto* a sacred and inalienable right to autonomy.

Sometimes, of course, to the confusion of this

theory, it was discovered by anthropologists that the peoples which most desired national "freedom" were of extremely hybrid descent; or that the same blood flowed in their veins as in those of the neighbours whom they most sincerely detested. Italy as a whole is populated by no single distinct race; yet when the careful propaganda of Cavour aroused an intense desire for Italian unity and autocracy—*under the dominion of the House of Savoy*—apostles of nationality conveniently ignored any fact which conflicted with their theory, and shouted ever more loudly in praise of the Risorgimento.

During the last decade of the nineteenth century, doubts concerning the infallibility of this conception of nationality—at least, so far as practical politics went—began to arise in the minds of various competent observers. The century had opened in an atmosphere of hope and strenuous effort. It seemed to the very foolish Liberals of 1825 that democracy must sweep all before it and solve every human problem and evil. It seemed, too, after the fall of Napoleon, that war on a large scale could never again dis-

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tract the West ; and that steam, muscular Christianity, the factory system, and Liberal doctrine, would swiftly and harmoniously civilise the Orient.

The century drew to a grey and doubtful close. Not even the solid prosperity of Europe, the glamour of Queen Victoria's Jubilees, and the establishment of Parliamentary government in even the most unlikely capitals disguised the fact that national autonomy and democracy were not the panaceas which the world had assumed. The nations of Europe, by theory supposed to grow in beauty side by side, complementary in virtues and native excellences, found themselves ranged in two armed camps. Great Britain, traditionally aloof from continental entanglements, was forced, as always in history, by the pressure of menaces to join one of the opposed organisations. On ceremonial occasions politicians, sometimes dishonest, sometimes only foolish, continued to praise freedom, to extol the idea of nationality ; but, even as they spoke, they should have known that this very idea had involved a continent in a situation which

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only the explosion of a violent military catastrophe could dissolve.

How that catastrophe came, and what course it followed, we know too well. After hostilities had ceased, the statesmen of the victorious allies met in Paris to formulate the terms they intended to impose upon a defeated Germany. Unfortunately the moral ascendancy on this occasion fell into the hands of a man utterly obsessed by the idea of nationality. It would be idle to doubt the good will, the integrity, or the high ideals of the late President Woodrow Wilson. But it is as certain as anything can be that his obsolescent beliefs have brought an unmitigated disaster to Europe, and in their reaction, to the whole world.

Conformably with his precepts a number of new states was set up in Europe. Republics, each bitterly jealous of their neighbours, were carved from the impotent bodies of the broken and vanquished, and by a stroke of the pen transformed into independent, self-governing and responsible states. In many cases, it may be noted in passing, the borders of these states

were determined by anything rather than by a dispassionate investigation of the "natural frontiers" determined by language or race. The result of this obsession with the "rights of subject nations" at Versailles is to-day only too apparent. To maintain her military ascendancy in Europe, France has necessarily engaged herself in a network of military alliances with the new Powers of Central Europe, with the result that an atmosphere of mutual suspicion still complicates European relationships. There are so many powers, so many pacts, so many secret and semi-secret agreements that even professional diplomats, educated to thread such mazes, scarcely know where they stand from one day to the next. The chronic ailments which paralysed diplomacy before the War have recurred in aggravated form.

To a superficial observer, the pre-war state of Central Europe, dominated by Imperial Germany and the Dual Monarchy, though it contained many an oppression and many an injustice, may well seem preferable to the present maelstrom of suspicious bickering. Then there was at least

calm—though it proved to be only the calm before the storm of storms.

This problem of Nationality is the most important with which the statesman of the future must deal. By the year 2030 he will have solved it satisfactorily ; or it will have destroyed our present system of civilisation. For nationality, as exemplified on the Continent of Europe, lives and draws its nourishment from such expensive and destructive agencies as competitive armament, commercial jealousy, prohibitive tariff walls, and international incidents. It is the negation of calm reasonableness and suspended judgment. Emotionalism, hysteria and jingoism are its favourite food ; an overweening pride its habitual mood ; a noisy self-satisfaction its mode of expression.

It has been abundantly plain for many years to every analytic mind that the British Empire and this narrow conception of nationality are utterly incompatible. King George V reigns over subjects of a hundred races and almost as many creeds. As equal citizens of his Empire, Saxon, Celt, Semite, Mohammedan, Hindu, Chinaman

and Maori share similar rights and are subject to identical responsibilities; the religion and the racial prejudices of each one are guarded by an impartial law. As citizens of this Empire, each man, Christian, Mohammedan, Jew, Hindu, or Confucian, whether his skin be white, brown, black or yellow, is united by a vague general loyalty which sublimates his local and racial loyalties; which transcends his smaller attachments.

Cynics may maintain that this loyalty is lip-service; and adduce, to support their thesis, the breakaway of Southern Ireland from direct English rule, and the movement towards complete secession among the Dutch population of South Africa. I believe that these movements, and such others as resemble them, are the last flames flickering up from the dying embers of "nationalism" as that word was understood in the nineteenth century. I am persuaded that the best opinion in the Free State will work for an increasingly close co-operation with the home government at Westminster; and that the party which General Hertzog ably if sometimes fit-

fully leads will orientate its policy and modify its aims as the memory of the past, or rather its legend, dies away.

After all, the conception of an imperial loyalty, transcending local and racial loyalties, is no new idea to the world. For centuries the Pax Romana embraced the whole civilisation which centred round that inland sea, the Mediterranean. The Roman Empire, however, stood and fell with Rome. The city was the only heart of the empire. From Rome came the inspiration, the sanction and the energy which made even the remotest outposts, held by the legions, function and survive.

In the case of the British Empire this is not so. As I have suggested in a previous chapter, economic and political pressure may make it imperative that the heart of this Empire should migrate from London to Canada or even to Australia at some date in the next century or in the ages which are to follow. The integrity of the Empire will survive this transplantation without shock or disaster. As a partnership of free and equal peoples it possesses a vitality

and elasticity which Rome could never achieve. We can alter our institutions and constitution to meet the changing needs of any age. Rome, cast in a mould of classic but immobile practicality, changed at her peril.

Because the constitution of the British Empire is the most utilitarian and practical form of government so far evolved by human ingenuity, it would seem that similar commonwealths of nations may be evolved in the future. It requires no vast imagination, for example, to envisage a fusion between the Spanish-speaking and Portuguese-speaking republics of South America to form a single confederated commonwealth. Central America and Mexico already lie under the shadow of the United States' authority. These regions may not be able to resist much longer the benefits and advantages of at least a partial fusion with their great neighbour.

To the north of the United States lies Canada ; an intensely individualist nation, which would oppose to the death any proposal for union with the States. As national feeling and sentiment now prevail, it seems unthinkable that Canada

and the United States can ever become a part of the same comity of peoples. Perhaps in the distant future the two branches of the English-speaking peoples will be driven into each other's arms, and forced by world circumstances into more than an alliance of close mutual co-operation in all international questions. Concerning such a union it would be rash to prophesy. But I am not without hope that circumstances may one day undo, in spirit if not in form, the breach caused by the obstinate stupidity of George III and the indolent subservience of Lord North.

To-day any confederation between the states of Europe appears remote. Jealousies and suspicions rather than a wish for mutual co-operation distinguish their relationships. Yet there are forces moulding the future of the world which may, before the end of the twenty-first century, drive these states to forget their differences and to combine in the face of a common and almost incalculable danger.

This danger may come out of Asia. One baby in every four born into the world looks up into the eyes of a Chinese mother. China, now

involved in a hopeless ferment of filibustering war-lords and new ideas, seems helpless and distracted—as involved in internal dissensions as Germany when she was still split into a hundred and one petty principalities. A handful of determined men under Bismarck, and two short wars, sufficed to transform this supine conglomeration into the most formidable military organisation that the world has ever known. A similar transformation is by no means impossible in China.

It is idle to argue that the Chinese intellect and character make such a transformation impossible. The ideas which Europe discards travel Eastwards—*ex Occidente tenebræ*—and, taking root in fertile soil, produce there a crop of monstrous fruit. A stream of eager Chinese youths, half-educated by missionaries, invades Europe and America each year ; avid to absorb all the clap-trap philosophy purveyed by half-baked intellects. These youths return to their homes infected with the poisons of Western civilisation, apostles of every dangerous and subversive creed.

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Nor is it profitable to delude ourselves by underestimating the practical genius of the Chinese. Those men were able administrators, expert organisers and sagacious men of business, who maintained the complicated machinery of the former Chinese Empire, who governed the largest single nation in the world, and who, in antiquity, undertook such feats as the construction of the Great Wall of China. The same practical qualities which distinguished their forbears animate a part at least of the Chinamen of to-day. In business they far outstrip their more obviously agile competitors, the Japanese; in laborious attention to detail, they challenge the German; in sheer powers of endurance, they surpass nearly all men. The Chinese labourer is able and willing to work longer hours under worse conditions than any other human being. And, as has been proved on many a stubbornly contested field, this same labourer, when ably led, is a soldier of high endurance.

A Napoleon, a Bismarck or a Cavour is needed to transform the seeming chaos of China into a formidable menace to the world. Exactly what

variety of danger China might so present depends, of course, upon this individual's character and aspirations. If he were primarily a soldier and could command the war material necessary for great modern campaigns, his armies might well overrun Asia, and possibly part of Europe. Such a catastrophe would make world-wars chronic, for Europe would not accept any Asiatic invasion, however successful. Wars of liberation against the yellow domination, followed by still further wars of revenge, would inevitably follow one another. Civilisation, as we know it, would break up permanently, just as the Roman civilisation cracked and crumbled under the strain of constant barbarian invasion.

If China's Napoleon were inspired by pacific rather than by military ambitions, the fate of Europe, though happier, would still be serious. Presumably such a man would concentrate on equipping his fellow-countrymen to create wealth through industry, on setting up a vast chain of factories throughout the land, on exploiting to the uttermost every natural resource within his country's frontiers. To do so, of course, he

would be obliged to attract foreign capital to China, and, therefore, to some extent, shackle his own ambitions. But such a policy, ruthlessly pursued, would enable China to undersell every industrial competitor in the markets of the world, and to throw the finances and prosperity of Europe into bankrupt confusion for a generation.

The latter of these alternatives is more probable; not because a Chinese Tamerlane is impossible, but because the prospect of great wealth, from which power grows, is more congenial to the fundamental Chinese character than that of illimitable but barren military conquest. By 2030 Chinese competition in all markets may well have become intensely critical; Chinese salesmen may be pushing their wares in every town in the world; and Europe may be drooping before the onslaught.

The first result of such a campaign would be to trustify all European industries against the common enemy. It would destroy all customs barriers on the Continent, and possibly raise a mountainous pan-European tariff wall against Chinese goods.

Such steps as these would be only the preliminaries of confederation between the States of Europe. But by the end of the twenty-first century, these preliminaries may be transformed into reality; the States of Europe, acting in concert, may launch a vigorous commercial counter-attack in the hope of regaining their place in the markets of the world. The United States of America, who dread the "Yellow peril," would certainly lend substantial aid to Europe in this trade war; and it is most likely that the white man would win. But he would only win by recognising the importance and vastness of his adversary. Ever afterwards China would remain a mighty world power, commanding and deserving an equal place with the old-established powers of Europe and America. Meanwhile, however, China lacks a Napoleon.

Scaremongers delight to inform us that the British Raj in India will shortly be thrown off by a population inspired by a spirit of nationalism. India has never in the past enjoyed the luxury of a "national" enthusiasm.

The peninsula, so far as we are cognisant of its past history, has ever been parcelled out among conflicting conquerors, themselves usually of alien origin. If these potentates have administered their territories wisely, their Indian subjects have been content. If they have oppressed and harassed the land, they have, in the end, provoked their own downfall through invasion and treachery. Nothing could be further from the idea of an Indian "nationalism" than this situation which, through the centuries, has repeated itself in monotonous cycles as one conquering race died out or gave place to another.

The spirit of nationalism in India is a new growth ; and I am sure, not a very healthy one. Despite all efforts, both British and native, India remains largely ignorant and illiterate. Many decades must pass before even the rudiments of nationalist propaganda reach the peasant cultivators of the soil. Moreover, it is abundantly certain that if the nationalists had their will, and the British withdrew from India, the whole land would quickly decline into dis-

order and bloodshed. Hindu and Mohammedan would leap at each other's throats; and after a short struggle, the latter would certainly emerge victorious. Most Hindus, especially the richer and more responsible among them, are abundantly aware of this. Even the Hindu peasant is not altogether oblivious of the fact that the British Raj stands between him and disaster. The stability of that Raj, therefore, remains infinitely more assured than one would suppose from a perusal of ill-informed newspaper reports and whispered menaces from the bazaars. Few of the mischief-makers possess even the smallest insight into the problems which confront every government of India. Did they possess such insight, they would realise that the British government of India is the one modern example of a successful benevolent tyranny.

British rule in India will endure. By 2030, whatever means of self-government India has achieved, she will still remain a loyal and integral part of the British Empire. Many longing eyes are cast upon her. Russia especially would

be gratified to see the patient work of Bolshevik agents crowned by a successful Communist outbreak on a large scale. This outbreak will not occur. The future of India presents vast difficulties and anxieties, but the devoted careers of both Englishmen and Indians, working side by side, will surmount them, and India will grow to be a bulwark of strength, and an example of prosperity to the whole empire.

There is another race besides the yellow and the brown which could threaten the white domination of the world. The negro peril has not yet been exaggerated into a meaningless scare by stupid journalism. But in the view of many authorities, not without balance and weight, the negro shadow looms across the world of the future.

The racial consciousness of the negro is dawning. The more intelligent negroes, having watched Europe derive inspiration in sculpture, in painting, in music and in dancing, from the heart of Africa, begin to ask themselves whether their race does not crystallise much more which is vital and urgent in the human spirit. The

treatment which some humbler members of the race have long received has awakened a sullen feeling of black solidarity against the rest of mankind. Imitative to the last degree, sharp-witted and adroit, the negro is quick to adapt every manifestation of European and American life which captures his fancy.

He knows that Africa was his ancient and undisputed home; that the commercial and industrial importance of Africa increases daily. By 2030 the negro may possibly be on the way to dispossess the European nations of their parcelled lots of African territory, and to establish in their stead a great all-black republic, rich, self-supporting and aggressive.

Such a state might well be distinguished by a religious peculiarity among all the states of the world. For many years Christian missions have won converts in the hearts of Africa as they have in no other region. The reason is not far to seek. If you offer a Brahmin or a Sufi the Methodist creed in exchange for his own, he will thank you politely, but point out that he already possesses an elaborate and highly

thought-out religious philosophy which strikes him as in every way superior to your substitute. But to the African, oppressed by magic and witch doctors, even the crudest Salvationism comes as the opening of windows in a stuffy, pitch-dark room. Missionaries free him from cruelty and fear; and, in consequence, he embraces their simple, highly - coloured, uncritical Christianity with all the fire of a zealot.

The negro republic of 2030—having first overcome its Mohammedan citizens, who are also increasing in large numbers—may be fiercely Christian, in the downright unquestioning fashion that the early New England settlements were Christian. It will be difficult for any other nation to enter into diplomatic relationships or treaties with such a state; for international agreements postulate a tacit but polite ignoring of religious differences between the two contracting parties. It will be particularly difficult for the British Empire to treat with this republic, because that Empire, whose citizens embrace every creed, cannot possibly express official religious views. It

is likely that such a negro republic would quickly be in acute issue with every other power in the world. It might even, on ethical grounds, launch the most terrible of all wars—a negro crusade to win back the states of Europe from their cynical paganism to the true faith, as laid down by a black revivalist Pope at Timbuctoo.

Whatever nations or groups of nations confront each other in 2030, it is important to discuss to what extent they will be armed, and what will be their capabilities of mutual destruction, should war break out among them.

Opinion to-day is hardening all over the world in favour of some measure of naval disarmament. Warships have grown so costly and so short-lived ; and nations, with one exception, so impoverished ; that the burden of supporting vast navies is almost unendurable. It is, however, improbable that complete naval disarmament will ever be achieved. It will certainly not have become a reality by 2030. To put the matter at its lowest level: the complete scrapping of navies would automatically lead to the arming of all merchant shipping ; for

how otherwise could peaceful shipowners hope to protect themselves against a recrudescence of piracy on the high seas? Such armed merchantmen would form the useful nucleus of a fleet in the event of war; the construction of such ships, as long as ships exist—and I have not forgotten my prophecies about the air—would certainly be secretly subsidised by many states. And so the world would confront again the beginning of renewed, of more secret, more sinister, naval competition.

The problem of military disarmament is little, if at all, less embarrassing. Supposing that the ten foremost powers of the world sign an international agreement, having the binding force of law, to reduce their standing armies to the minimum limit required for police purposes, what power is to give this law any sanction? What force is to punish its open breach, or to overawe a criminal power which designs to break it? The ultimate sanction on which every law relies for its observance is armed strength. Remove this, and there remains the knowledge that the law will be broken with impunity.

No nation which administers territories inhabited by semi-civilised peoples will agree to military disarmament. A serious revolt, carried out by savage hordes in an inaccessible region, demands nowadays for its extinction an armament almost sufficient to wage war against a civilised people. Consider, for example, Britain's present responsibilities in the Middle East, and on the frontiers of India. Did we not maintain a considerable and highly-organised military establishment, half of our Empire would not remain a month in peace and safety.

Aerial disarmament combines the difficulties of both naval and military disarmament. Commercial airplanes can be adapted quickly and readily for military purposes. The outlying regions of every colonial empire are to-day increasingly policed and protected from the air. For example, the British Air Force, with signal success, has now for some years undertaken the protection and pacification of Irak.

In 2030, therefore, nations will still maintain armaments; though doubtless on a scale much reduced from their present lavish provisions.

Naval building races will have become the nightmare of an unhappy past ; but a strong force of cruisers and light craft, a highly specialised mechanical army, and many squadrons of airplanes will be ready at the bidding of every government with any pretensions to power. With these resources, state will still be able to war upon state. But the outbreak of such hostilities will always be delayed and hampered by world opinion, and by a perfected organisation for international arbitration.

At present the most useful work of conciliation performed by that strange hybrid, the League of Nations, is of a commercial and fiscal nature. Very valuable activity concerning commercial treaties, patents, currency, exchange and a thousand kindred subjects, goes on quickly and smoothly at Geneva. This work is little noticed in the press. No publicity is devoted to its achievements ; yet they increase with monotonous regularity. I believe that this side of the League of Nations' work will grow until it utterly overshadows the polite but often futile exchange of platitudes

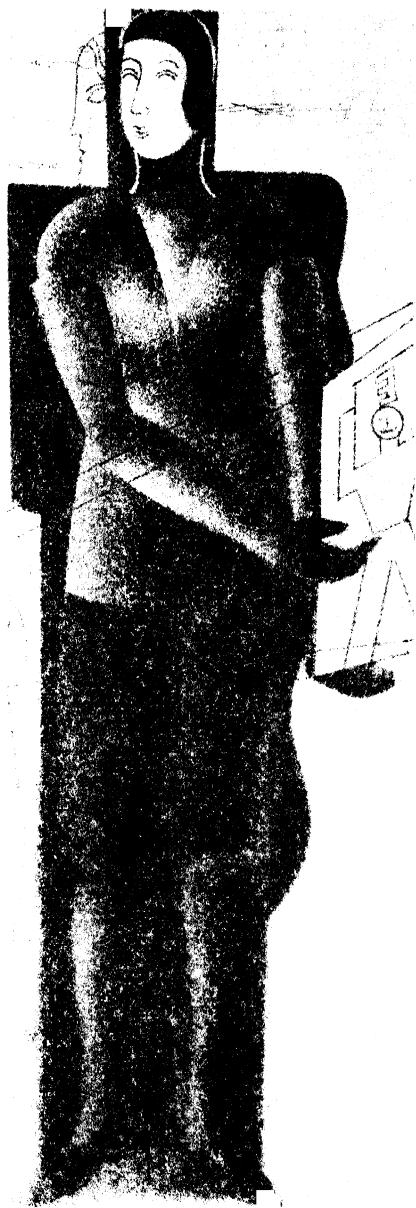
between the diplomatic delegates of the Great Powers. By 2030 the League will have been established as a clearing-house of international finance and business of all kinds ; its moral influence will, in consequence, be enormous. Since it is the tendency for business to overleap national frontiers in its new amalgamations ; the international business houses of 2030, having nothing to gain from war, will use the League in its new guise as an instrument for checking the bellicose intentions of incompetent politicians.

Industry, the development of which dominated the nineteenth century, was, in 1914, organised on too small and national a scale to speak with authority to governments. In 2030, the governments of the world will not be able lightly to ignore its plain wishes or run counter to its declared interests. Those interests will be pacific. Therefore industry and a commercial League of Nations will see to it that nations, though armed, shall not fight, save to maintain their existence ; and that swords shall be beaten, if not into ploughshares, at least into carburettors.

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AN average woman is more valuable to the state than an average man; but even the most gifted woman is less valuable to the state than an exceptional man. In this paradox lies the kernel of the ceaseless discussion concerning women and their future which so agitates the popular press and the lecture-hall.

A sufficient number of healthy and potential mothers is absolutely essential to the continued existence of any body politic. Every civilised state tacitly recognises this fact by forbidding women to sacrifice their lives in battle as soldiers. Every civilised society reflects it by such rules as that which prescribes that, in a shipwreck, the women and children on board the doomed vessel shall be granted the first chance of safety. To most minds both these examples of the preferential treatment of women are disguised as a natural chivalry, deeply in-



grained in the character of the civilised male. But such chivalry as this is both more and less than self-sacrifice : it is socially and economically essential.

It may be argued, of course, that potential fathers are as necessary as potential mothers to the healthy continuance of the state. But such an argument presupposes that the provisions of a strict monogamy are the only possible arrangement for satisfactory sexual relations between citizens. If by the devastation of a future war the population of any officially monogamous European state were reduced by one half, then, regrettable though it may to some appear, public opinion in that state would not only countenance, but would probably insist on, some form of polygamy until the balance of the population was restored.

In making this assertion I am supported by history. When Islam was in the ascendant, and continual wars of aggression levied a grievous toll upon the male followers of the Prophet, the polygamous license which he countenanced was enjoyed to the full, not only by the

rich, but by every warrior. But since the conquests of Islam have been complete, and the Mohammedan states have become fixed and circumscribed, it has grown unusual for any but a rich and influential man to marry more than one wife. A duty has declined into an indulgence.

It is equally obvious that the man of creative genius is more valuable to society and to the state than any woman. Feminine genius has adorned many ages and enriched the heritage of many nations; but it is, of course, a commonplace that it has never shown itself equal to any of the supreme manifestations of genius in the masculine mind. In making this statement I am well aware that I challenge the whole doctrine of the modern feminists, who fanatically declare that the feminine mind is, if anything, a finer, suppler and more accurate instrument than its male counterpart. These feminine champions explain away the fact that history has yet to record the triumphs of superb female genius by pointing out that, until the present day, women have laboured under acute educational and social disadvantages compared with

men. This argument is specious, but it is absurd.

Most of the male genius which has illuminated past ages sprang from obscure and poor surroundings. It was uneducated ; it was unendowed with either social advantage or wealth ; it achieved its self-expression in spite, rather than by the aid, of society. Consider such varied examples as Napoleon, Kant, Andrew Carnegie, Charles Dickens, St. Thomas à Becket, Rienzi and the late Lord Kelvin. None of these enjoyed any cultural or social advantage over his fellows. Each achieved renown, in his life-time or posthumously, as an individual who bent either circumstance or art to his purpose. Against the long list of male genius, there can be named only Joan of Arc, St. Catherine of Sienna, Sappho, Florence Nightingale, and a few others.

The reason for this fact is not far to seek. Most women eagerly embrace marriage and maternity as a career. Be it observed, the bearing and rearing of a family of healthy and intelligent children is the utmost social service which the normal female can perform. But, having married and borne children in the earlier

years of her maturity, the woman of genius finds herself somewhat handicapped for purposes of self-expression. The male genius may sacrifice his wife and family to his passion for self-expression. They may starve ; they may labour in sweated employments ; they may die, so long as his idea is brought to parturition and attains reality. Moreover, it is socially desirable, if humanly deplorable, that this should be so. Genius, as distinguished from talent, is rarely hereditary, as the careers of the children of most men of transcendent endowments prove. Society is benefited by the contribution of one genius far more than by the exemplary lives of his talented children. No woman, however, will wittingly thus prefer her genius to her children.

Again it is fitting that nature should impose such a limitation upon the female intellect. Were it not so, the family as a unit could not long survive the inevitable storms and crises of life in a highly organised and complicated civilisation.

These arguments may strike the reader as

remote from a discussion of the probable state of woman a century hence. But, in fact, their postulation is essential as a preface to the remarks I have to make.

In 2030 the prospect of woman's liberation from the dangers of childbirth will almost certainly become a matter of general realisation. This evolution, the most serious biological departure since the natural separation of living organisms into two sexes, will vitally transform the whole status of women in society. Unless their present importance and limitations be clearly apprehended, their future development cannot be apprehended.

Science, as I hinted in a previous chapter, already foreshadows the possibility of producing living offspring in the laboratory from the germs of various animal species. Hitherto no living animal has been brought to birth *ab initio*; but the foetus of various species has been removed from the maternal organism and further developed by skilful manipulation in biological laboratories. It is certain that scientists will one day succeed in producing a living human

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infant by such means. This process, known as ectogenesis, will be violently and furiously opposed by the spiritual descendants of all those who now attack contraception.

The first practitioners of ectogenesis will possibly obtain the crown of martyrdom. Most people hate and oppress every invention which threatens habits or prestige. Hand-weavers broke steam looms ; a British General opposed the introduction of breech-loading rifles into the army on the ground that it would transform infantry into " long-range assassins " ; surgeons fought the antiseptic inventions of Lister and the asepsis of Pasteur. Similarly most mothers, ignoring the benefits it will confer on their sex as a whole, will rise in emotional indignation against the mere mention of ectogenesis, and will influence their husbands, sons and daughters to follow their example.

By 2030 this battle will be joined, perhaps even concluded. I do not suppose that by then ectogenesis on a large or national scale will have become practical. But the first ectogenetic child may already be mingling with its normally

produced school-fellows—if any “decent” school will accept so monstrous a pupil—and the whole matter will have reached the state of an acute controversy. Unless they have vastly changed their habits and outlook by that period, the women of the upper middle-class will most bitterly oppose ectogenesis. These women, on the whole, are the most protected and idle who exist. Most of them are apt to imagine that the mere production of two, or at most three, children endows them with a mystic virtue. Having accomplished this need of maternity they assume that they may hand over their domestic arrangements to a housekeeper, and their children to trained nurses, while they themselves lead parasitic and aimless lives of pleasure.

The introduction of ectogenesis on a national scale will inevitably remove the false sanction for their enjoyments. If they have not reproduced their kind, they will not be able to claim as a right the leisure and the money to amuse and dress themselves extravagantly. They will be forced to discover other ways to

justify an empty and irritating existence.

Despite such a phalanx of opposition, and despite the almost inevitable opposition of the churches, it seems reasonable to suppose that ectogenesis will slowly but surely be preferred to normal childbirth as a means of replenishing the human species.

The argument that it is "unnatural" cannot be sustained for ever. All our civilisation is, in some respect, "unnatural." The Noble Savage of Rousseau and his sentimental contemporaries, the man who lived close to and in accordance with nature, has long been exploded as a ridiculous figment of the imagination, as unreal as the Average Man of politicians, or the Economic Man of the fiscal theorists. Very certainly we must accept the fact that all our civilisation is highly "unnatural." Our clothes, our food, our habits and our manners all violate the "natural" existence of the bushmen of Australia. Yet I do not notice any profound reaction in favour of a return to the barbarism of the lower types of existing human creatures. Even the process of childbirth in a modern

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civilised European woman is highly "unnatural." There exist savage matrons in the heart of Africa to whom the birth of a child is the passing inconvenience of an hour. But no one proposes that our women should imitate the life-cycle of such savages, in order thus to escape or minimise the pains of childbirth. Women accept them as the price of a multitude of other sophisticated diversions. Similarly one day they will accept ectogenesis as the price of a freedom they have never yet achieved in history.

What will be the immediate, and mediate, results of the establishment of ectogenesis on a national scale? What will happen when the present normal form of maternity becomes a phenomenon not frequently experienced, and perhaps even visited by legal rather than by physical pains? Its first and most prompt result will be economic, because it will remove the present disability under which women labour, as compared to men, in every branch of industry and commerce.

To-day, in most industries, women are paid a lower wage than men. The feminists have

long resented the fact ; they agitate for equal pay for all workers, irrespective of sex. To their often plausible arguments, the employer has one crushing answer. He maintains that, if he must pay a man's wage to each one of his hands, he will take care that all these hands are male, and that they perform a man's work. Women, at present, being specialised for the all-important duty of child-bearing, cannot perform the same amount of manual labour, even of a mild variety, as men.

To refute me, the feminists will produce the bouncing wenches who supply the labour demands of match-factories, cotton-mills, and many of the lighter trades. Again the feminist argument fails ; because the employment of these girls at low wage has long been a remarkable example of industrial parasitism. These young women are invariably the daughters of artisans and labourers ; their contributions to the domestic budget of their parents, however small, usually make all the difference between indigence and modest luxury. If they were not at work, they would be an incubus upon their

parents. Therefore they work for far lower wages than unsupported female labour could be persuaded to accept. A large part of their wages may be expended on pretty clothes and innocent amusements, but a certain part reaches their mothers' hands, and swells the amount of available housekeeping money.

It is obvious, in such a case, that the employer of such girls is, in reality, subsidised by their fathers. Certain politicians cry out continually against such an arrangement as immoral and wicked. But, in practice, it often works admirably. The girls are well-fed, well-clothed and happy ; their parents' comfort is increased ; and an industry is enabled to prosper which might otherwise not be able to exist.

Ectogenesis will quickly enable men and women to be paid equal wages for equal work—since the women of an ectogenetic age would soon be as capable of continuous industrial employment as their brothers, husbands and fathers. It is not suggested by this that women will ever be fitted for such tasks as iron-puddling, riveting or navvying ; nor will they need to be

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so, because by 2030 such heavy labour will be entirely performed by machinery. But by achieving economic parity with man, the woman of an ectogenetic age will accomplish the feminist dream of equality in the only possible way. Until man and woman are capable of identical functions in the industrial and commercial worlds, all legal provisions which place them on an equal footing are basically unfair to the man. It is this fact which hinders the feminine champions of the present day from realising their ambitious and irrational programme. I can console them with the assurance that they will obtain all they desire in an ectogenetic age.

Although its economic effect on woman is the most important result which ectogenesis will bring, I must consider also its effects on marriage and family life, as we know them. First, ectogenesis will entirely divorce physical love from the reproduction of the species. The common practice of contraception has already, in some measure, accustomed certain classes of the population to this idea; its complete realisation will occupy many generations

and create a violent social readjustment.

I do not imagine that ectogenesis will empty the homes of married couples of children. If one thing about the nurture and upbringing of children is certain—and few things appear above dispute—it is that a child who receives devoted mothering in its babyhood, and unlimited parental companionship in its early youth, thrives far more sturdily than the baby reared in the most scientific and germ-free institution. To realise the force of this assertion, one has only to compare the crowing infants who are petted by poor mothers, with the artificial inmates of expensive baby clinics. The impersonal nurse cannot replace the, sometimes perhaps, too personal mother. Therefore ectogenetic babies will, at birth, often be adopted by suitably married couples. It is even possible that their foster-mother will be enabled, by the aid of science, to nourish her children in the natural manner.

Why substitute ectogenesis for natural birth? Because there seems no other way of ensuring that the state shall receive adequate supplies

of the type and sex of citizens of whom it stands in need. The stud-farm methods advocated by the eugenicist of the present so revolt every impulse of human nature that they will never be generally adopted. Yet eugenics of one sort or another is a certainty of future politics. The indiscriminate increase of the most useless type of citizen, accompanied by the voluntary sterilisation of the best type, is the greatest menace which threatens our civilisation.

Ectogenesis appears the only form of salvation which science and ingenuity can suggest ; for by regulating this process, citizens of any desired physical and mental complexion can be produced at will. Moreover, the same process which enables the foster-mother of the ectogenetic infant to provide it with the nourishment provided by nature, may be so developed by biological research, that it will stimulate in her identical emotions towards this babe as though she had herself borne it. Obviously this method of practical eugenics is more certain of success than the crude solutions of the same problem offered by the unimaginative and

generally celibate eugenists of the present epoch.

As I have indicated previously, the general level of prosperity will have enormously increased by 2030. When, therefore, ectogenesis is nationally established, the woman with a genius for motherhood will be able to adopt as large a "family" as she desires, without worrying about her husband's ability to feed, clothe and educate it. Nor will there exist any social reason why the married woman with weak maternal passions should concern herself at all with motherhood. It will in fact obviously advantage both herself, her husband and society if she does not do so, but concerns herself with other activities.

An almost illimitable field will be open to such a woman. Her domestic duties will not occupy more than a portion of her time; because, although domestic servants will exist only as a memory, her home will practically be self-conducted. In passing, however, I would point out that this dearth of domestic servants will bring with it one most salutary result. It will force every woman, whatever her position, to

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scrape an acquaintance with the arts of house-keeping and the kitchen. Though beyond a minimum of work in her home, she may choose to follow a round of pleasures, this irreducible minimum will prevent her developing into one of the utterly idle women who are the plague of society to-day. Most women of 2030, however, having received a highly evolved education, lasting until their twenty-first year, will choose, unless engaged in rearing a family, to follow some definite career.

Scientific research will absorb the energies of many. At present our knowledge of the physical universe consists of a number of small patches, linked up by tenuous and often not clearly defined bonds. Before our descendants can boast that their knowledge is in any degree comprehensive, an enormous amount of routine research must be carried out. To-day this work is not undertaken, simply because funds and trained students do not exist to accomplish it. By 2030 tens of thousands of women will be busy on this most valuable work in laboratories scattered all over the world. Although I have

called this research "routine" work, it is not by any means dull to the executant. Rather it carries with it that complete satisfaction which scientific investigation almost alone brings to the individual suited to its performance.

Women are specially apt for this work. Their patience, painstaking application, and calm temper have already recommended them to professors of all kinds for such tasks. The results of their labours will, by 2030, have produced a vast mass of correlated data from which some future Einstein may synthesise a new theory of matter, or a Darwin yet unborn deduce a transcendent biological discovery. The patient labours of such women will transform physiology and psychology into sciences as exact as physics. These services will enormously benefit humanity; they will bring to their performers a happiness which no life of leisure, however athletic, could possibly induce.

If thousands of women are temperamentally suited to research, as many more are endowed with executive gifts of a high order. Up to the present day few such women have harnessed

their talents to the chariot of society. A few, rejecting the former limitations which convention placed on feminine activities, have provided history with such figures as Florence Nightingale, Queen Elizabeth or the legendary Dido; but most have lived thwarted lives exercising powers, which required a national scope for their development, upon the affairs of a village or even a family. In 2030 society will eagerly avail itself of such women. They will be found at the head of government departments, as managing directors of great commercial undertakings, as organisers of every kind of social and cultural activity. At present their promotion to such posts is partially prevented by the fact that many men are loath, consciously or unconsciously, to serve as subordinates to women. Luckily the levelling process of ectogenesis will remove this irrational bar, and leave women unhandicapped to achieve whatever position they are competent to maintain.

Concerning the possibility of a great woman statesman directing our national destinies in 2030, I am a trifle sceptical. I do not believe

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that statesmanship, as history exhibits it, is either congenial or indeed possible to feminine genius. Even when man and woman are placed in relations of complete equality, it is doubtful whether centuries of education will alter the basic differences which divide the male mind from the female. I am told by biologists that an essential distinction exists between each minute cell which composes the body of a woman and those which contribute to a male existence. This variation, of course, extends to the cells of the brain: so long as the two sexes remain separated, so long will they continue to exhibit diverse and complementary mental development. It is on these grounds that I doubt the emergence of a woman Chatham, or a dowager Disraeli. I do not suggest that in other spheres women will not rise to distinctions comparable with those achieved by these two great men.

A more obvious field for feminine excellence in 2030 is offered by the arts. To-day many distinguished women artists enrich the life of the world. Nor is the woman artist any

latter-day phenomenon. She certainly flourished in ancient Greece, and she has ever since maintained an honourable position among her male colleagues.

But, disregarding Samuel Butler's amusing theory that the *Odyssey* was the work of a woman, I cannot recall any supreme artist who was a woman. I shall immediately be challenged with Sappho (whose name I have myself quoted already) and such women novelists as Jane Austin and George Eliot. Sappho, unluckily, exists only as an almost mythical poet, whose works survive in fragments, superb in isolation, but inconsiderable in sum. We have taken from antiquity her tremendous reputation at its face value. The ancient world possessed an excellent sense of poetic values ; it acclaimed Sappho as magnificent ; we agree, adding that so far as the evidence to hand goes, it does not refute the ancient world. But she is certainly as legendary an individual as Homer ; no one will allow the claims of women to the highest artistic honours to be based on her legend. Of the women novelists, I would only remark that,

exquisite though their work may be, I cannot believe that an unbiased critic will compare it with the masterpieces of Fielding, Cervantes, Dostoievsky or Balzac, or place it in the same supreme class.

In the other arts the achievement of women plainly falls short of the best. No woman Pheidias, Michael Angelo or Beethoven has yet delighted mankind. Nor, I must honestly confess, do I believe that by 2030 any such woman prodigy will have arisen. In saying this I return to the opening remarks of this chapter, and reiterate the conviction that, however galling it may be to feminists, the most renowned geniuses have been and always will be male.

By 2030 a more liberal civilisation, and greater freedom for expression, will have enabled women vastly to expand their accomplishments in every sphere of life. But to the end of history they must rest content with falling just short of the best work done by men. They are assured, however, of compensations denied to men. In 2030, as in 1930, woman will remain

the inspiration, the consolation, and the desire of men. Whatever a man may do, he does largely because of some woman with whom his life is intimately complicated.

In 2030 women will still use men as the media by which their greatest triumphs are wrought ; they will still be able, by their wit and charms, to direct the activities of the most able men towards heights which they could never otherwise hope to reach.



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SINCE primitive antiquity the human heart has earnestly desired to probe the future and scan its mysteries. Prophets, even when they habitually foretold approaching disasters, occupied places of honour and advantage at the courts of ancient kingdoms. Joseph, so the authors of Genesis inform us, was advanced to second place in the realm of Egypt, because he read the future as dreams revealed it to Pharaoh. Not a great while later Moses acquired enormous prestige by repeatedly foretelling plagues which more than fulfilled his foreboding of their horrors.

The same yearning to know the future runs as an undertone through the greatest Greek literature. The Delphic Apollo haunts the richest and most sacred shrine in all the Greek world ; Cassandra prophesies in a trance ; Odysseus in Hades questions the wise dead concerning

his future fate. And, because Homer devotes so much space to this tour across the Styx, Vergil, when he came to compose the *Ænead*, did likewise, and dispatched the priggish Æneas to hear how his race should one day rule the world from Rome. This interlude of Vergil's, however, is more than mere imitation of his ancient master. Though they might be the most practical and prosaic race of all antiquity, the Romans shared the Greek passion for prophecies. Which general of the Republic set out on a military expedition without first consulting the auguries? Which merchant sold slaves, or purchased grain, or signed a contract unless he first slew doves, and, by an examination of their viscera, attempted to deduce whether prosperity or ill-luck would attend his bargain?

The Christian Church did not approve such profane attempts to forestall, as it were, the designs of an omnipotent Providence; but the universal respect for soothsaying was too deeply ingrained for the paramount authority of a mediæval Vatican to suppress. The *sortes Virgilianæ* were universally consulted by the

knowing. Cardinals even trusted their infallibility before entering the conclave which was to elect the next successor of St. Peter.

More recently, since natural science became established on some kind of exact basis, the habit of prophesying has grown chronic. The late M. Jules Verne's novels, founded on the foretelling of future mechanical developments, rapidly established themselves in the front rank of best-sellers. Mr. H. G. Wells, instructed with no small degree of real scientific knowledge, carried the game a stage further, and produced prophetic novels as remunerative to their author as they were exciting to his readers.

To-day every great city supports an army of prophets—crystal-gazers, astrologers, and mere magicians, in addition to such comparatively scientific seers as racing tipsters and stock-exchange paragraphists. Yet, for all their hard work, the future stretches before us in this year 1930 murky, obscure and terrible. In certain directions, and in general terms, it is indeed possible to indicate, as I have done in preceding chapters, that certain developments are

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probable in the course of the next hundred years. Beyond this, only the brazen quack or the self-hypnotized religious fanatic, who believes that he enjoys the particular confidence of his deity, would venture to go.

Will the Future appear equally dark to our descendants in the decade which opens on New Year's Day, 2030? Here is the question which I must strive to answer in concluding this series of forecasts. And, strangely enough, though it appears at first sight a nebulous problem, I believe it to be more easily answerable in general terms than some of the questions to which I have already attempted to propound replies.

In discussing the Future, as it will appear in 2030, we must, of course, first postulate a reasonable and peaceable development for the world during the intervening period. As I have before emphasised, a world war waged to its logical conclusion in the 1970's might very conceivably make bankrupt our civilisation, and reduce our grandchildren to barbarism. Such a catastrophe must be left out of account by so imperfect a prophet as the present standards

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of knowledge force me to be. I cannot, nor can any of my contemporaries, prophesy particular events such as another world war. We can only observe current tendencies and forecast how they are likely to develop.

By the year 2030, however, I believe that prophecy in relation to many future occurrences will be within the wit of a shrewd man. To our descendants the future will no longer be largely unilluminated; large tracts of it will be already explorable. Barring fatal accidents, it may well be possible to foretell even what life holds in store for any particular man or woman.

Primarily, since infectious diseases will be stamped out by 2030, and cures discovered for the scourges of humanity, life will stretch out much more certainly for our descendants. The average life-span will have increased to a hundred and twenty years, so that a young man in the middle of his University career will reasonably anticipate another century of active life before his conscious existence terminates in painless euthanasia.

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In order to catch a glimpse of the future as it will appear to such a one, let us suppose that his tutor requires an essay from him, dealing with "The most important aspects of human life in the twenty-second century." Such impositions on the high spirits of youth are regularly fixed by remorseless tutors at the present time. And, considering the average rate of progress at our older universities, it is conceivable that they will still be set in 2030.

Reluctantly abandoning an appointment to fly across and watch a football match at the Algeciras Stadium against Gibraltar University, our undergraduate will settle down in his college rooms, insert a sheet of paper in his typewriter, and proceed, I believe, somewhat in the following manner.

"During the twentieth century attention and research were mainly concentrated on material and economic progress. The world war of 1914-1918 destroyed so much wealth so quickly that our great-grandfathers were compelled to discover cheaper and better means of industrial production, or to face the alternative of national

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bankruptcies during the 1930's and 1940's. This necessity settled the fate of the remaining sixty years of the century, during which most of the more obviously important and beneficial material discoveries were made. Molecular energy was first liberated and then controlled. The Cambridge biologists bred and acclimatised a lichen which bound the shifting sands of the world's deserts, and made them fit for cultivation. The tides were extensively harnessed in North America and Scandinavia during the 1980's; the Anglo-German chemical trust introduced and popularised a cheap, palatable and varied synthetic diet about the same time by the simple method of offering their 5,000,000 employees higher wages if they undertook to feed solely on the trust's factory-produced food.

“ Early in the present century, however, the centre of gravity in scientific progress shifted. After the riots and civil disturbances caused, in 2010, by the introduction of state-supported ectogenesis in Nebraska, the world's interest was concentrated on the theory of Scientific Psychology, built up by a collaboration of

workers under Professor Yan Ling at Pekin University.

“ Although this theory has yet to be fully expounded to the lay mind, and although all its practical corollaries have not yet been worked out, its publication is obviously the most important intellectual event since Professor Einstein wrecked Newtonian space early in the last century. The practical effect of this theory must be prodigious. In fact, the whole future development of mankind is controlled by its application.

“ The Yan Ling theory has transformed psychology into a science as exact as mathematics and physics. Before it was discovered, psychology could only be compared with pre-atomic chemistry; it floundered, unable to reduce its masses of data to a few simple and invariable generalisations or ‘laws.’ It is true that, when psychology first attracted the attention of scientific workers, numerous theories immediately sprang up. Perhaps the most notable were propounded by Professor Freud of Vienna, who explained all things in terms of

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suppressed libido, and by Watson, who with others like him experimented in the United States. Neither of these theories, however, nor any of their successors, until that of Professor Yan Ling, fulfilled the essential function of an adequate scientific theory—that it must not only explain and co-ordinate all known facts, but must also provide grounds on which new relations may be deduced and afterwards verified by experiment.

“The most obvious future results of the Yan Ling theory will be political. The first of its experts who enters politics must rapidly achieve Cabinet rank. Aware of the arguments which will convince each particular man, he will be irresistible in council. Able to gauge the exact temper of every audience, he will be all-powerful in the House, or before the microphone. Fortunately for the State, however, his triumph will be short-lived. Soon his particular knowledge will become the material of normal education; in old age, he will find himself confronted by audiences who can analyse his motives as easily as he can estimate their mood. Then his special

pleading will be greeted with derision, and his underlying motives betrayed by the very arguments with which he seeks to make them palatable.

“ By 2130, therefore, we must anticipate the complete decay of politics as we know them. The whole machinery of national government and international relationships will require remodelling during the next hundred years. The spokesmen of parties or peoples will be able to advance their cause only by completely truthful statements of fact, reinforced by exact explanation of what such facts mean. All rhetoric will become fustian, all argument bad argument.

“ Similarly forensic eloquence will cease in Courts of Law. Prevarication whether by prisoner, witness or advocate will be instantly detected, and, therefore, worse than useless. What will it avail a murderer if a Demosthenes demand his acquittal from a jury which has been scientifically convinced of his guilt on psychological grounds? Personally, therefore, since exploring the more elementary sequels of the Yan Ling theory, I have abandoned an

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ambition to enter politics by way of the Bar, and have decided to concentrate my energies on the study of the plankton of the Caribbean Sea, a subject which holds large commercial possibilities besides an absorbing scientific interest.

“ Though the effects of the new psychology on public life seem likely to occupy the main attention of thoughtful men for the next century or more, its application to the arts will not be less revolutionary, or wholly pleasant to contemplate. Plainly, a generation expert in this science will not be able to appreciate the element of ‘ surprise ’ in art. And, both in literature and in music, surprise constitutes a large measure of artistic success. No matter, for example, how often one reads *Robinson Crusoe*, the finding of that footprint in the sand never fails to communicate its surprise ; the reader shares the solitary castaway’s amazement in learning that he is no longer alone.

“ In the future this precious faculty for astonishment will vanish. The twenty-second century will be able to deduce, from what it

has already read, that a 'surprise' is inevitable before the end of the next chapter. No climax will have any point; it will appear as prosaic as the fact that one and three make four. Music, too, will only charm as an ingenious texture of sounds; literature will only be valuable when it explains or describes. It will be impossible for either composer or author to suspend the emotions of his audience, and to arouse either their wonder or awe.

"On the other hand every book will become an autobiography, revealing to its readers the most carefully kept secrets of its author's life and character. Our descendants, therefore, will enjoy a satisfaction denied to us. They will finally decide such hotly debated questions as to whether Homer was a blind old harpist, a crowd or a woman; whether Shakespeare wrote his own plays; whether Dickens was a paragon or an unashamed egotist; and whether Tolstoy was 'sincere'. In the same way architecture, sculpture and painting will betray the minds responsible for them. Vanbrugh's Restoration morals will be deduced from a glance at the

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chaste grandeurs of Castle Howard ; Benvenuto Cellini's cheerful sensualism will cry out for notice in his salt-cellars ; and Andre del Sarto's final untrustworthiness will be apparent from a glance at any of his pictures.

“ It is clear that all human relationships will grow highly complicated, once the new psychology becomes common property. The conventional lies which lubricate our every contact with our fellows will be transparent. The true reasons for proposals of marriage will at once occur to women ; husbands and wives will no longer be able to smooth family life by judicious falsehoods ; the education of young children will become a nightmare.

“ Another revolution will take place in commerce. Advertising, after a period of intense success (while only the advertisers and not their public have mastered the Yan Ling postulates) will die. Who will care to proclaim his goods in specious half-truths to potential customers able to detect how much of this is sincere and how much mere persuasion ? Much to their annoyance, the publicity experts of the next

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century will be forced to confine their activities to simple statements that the goods they wish to sell are manufactured and easily procurable. More than this will positively kill trade. What applies to advertisers, applies even more forcibly to commercial travellers. Buyers will purchase goods purely on the intrinsic merits and prices of the samples laid before them. Salesmanship, like minstrelsy or Highland dancing, may survive as a quaint art, displayed at gatherings, Eisteddfods, and similar occasions ; but it will do less to advance business than drawing-room charades.

“ Every professional man will feel the results of this psychological revolution during the coming century. Doctors will no longer be able to inspire a will-to-live in the critically ill by sheer force of personality. Clergymen will face peculiarly awkward predicaments. Compelled by iron and age-old tradition to pretend a standard of thought and conduct which is humanly possible to perhaps only one in a dozen among them, they will be found out in every insincerity and evasion. Until matters adjust

themselves, and a larger laxity is permitted to the clergymen by public opinion—as it must be, or the Christian churches will dissolve—the wretched men will hardly dare to engage in conversation except with members of their own kind.

“ Perhaps some few of the preceding remarks are slightly exaggerated. If this be so, it is because I have purposely emphasised the more alarming results which must inevitably follow the popularisation of the Yan Ling psychology. I have done so in order to demonstrate that, during the coming century and after, civilised human beings will be faced with a complete change in all intellectual, emotional and moral values. Hitherto the ego of our neighbour has remained almost a closed book to us. By 2130 everyone will wear not only his heart, but his character and intellect also on his sleeve. In order to accommodate this psychological revolution, human relationships will be forced to change even more fundamentally than they did when the Pagan world gave way to Christendom.

“ During the past two centuries man has

remained basically much as he was, while his physical environment has violently altered. William Pitt, Lloyd George, and our present Premier, when they meet in the Elysian Fields, will be able to compare notes and to exchange stories as men who instinctively understand one another's point of view. Though Pitt acted on Europe through such agents as flint-lock muskets, three-deckers and Nelson ; though Lloyd George's weapons were newspapers, trench warfare and torpedoes ; though our own Premier commands television propaganda, death-rays and the world's largest radium reserve, the three men are fundamentally akin. Political manœuvre, party strategy, and national mobilisation for a great end, fit naturally into their mental habit.

“ But a century and a half hence, when Pitt and George welcome the man who was First Minister of the Crown in 2130 A.D., they will greet one who is unintelligible, though speaking their language, because his habits of thought, his instinctive suppositions, and his very instincts are totally at variance with their own.

“ I suggest that during the coming century

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the solution of the psychological problems, at which I have hinted, will so absorb the most powerful human minds that material advances and inventions will be comparatively neglected. The difficulties of human relationships will grow so intense, and demand such instant solutions, that all men will turn to attempting their liquidation."

Thus our undergraduate of 2030. In this slight essay, of course, he shows himself obsessed by one aspect of his world's future. I agree with him that this aspect will be by far the most important that his grandchildren must face; but in order to *épater* his tutor, he has painted too distressing a picture of the years following 2130. Although this new psychology, which will certainly be elaborated, cannot fail to present human ingenuity with tremendous problems, it will not be without compensating advantages. It will, for example, offer the first effective guarantee against wars which man has devised. War is invariably the fruit of economic pressure, fear, or misunderstanding. Sometimes, in history, men have made wars to advance their

personal ambitions ; but more than a man's ambition is necessary for the prosecution of such military operations. An army is essential, together with a population prepared to support that army in the field. In order to provide themselves with such an army and a complaisant population, bellicose and ambitious rulers have even persuaded their countrymen that a lie was the truth, and that the nation must once again fight for its existence. No people educated in an exact psychology could be deceived in this way.

Not only does this psychological invention hold out to our remote descendants a hope of lasting world peace, but it provides also a promise of close and fruitful international co-operation on all matters of importance. A Geneva Conference between scientific psychologists, representing every first-class power, would be able to discuss and decide crucial issues in an atmosphere uncharged with mutual suspicions and jealousies. Really "open" diplomacy (about which so much nonsense is poured out to-day) would then for the first time be practicable—

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because then for the first time in many centuries human nature will have undergone a radical orientation.

I believe, therefore, that our descendants in 2030 will look at the future constructively. Disarmament, down to minimum police requirements against large-scale brigandage and piracy, will be an international issue of the near future. Plans will be laid for a broad world policy towards Africa, the final completion of which may be timed for about the year 2100. This will include the conversion (already mentioned in another chapter) of the Sahara into a second Mediterranean, the drainage and clearance of the Congo and Niger basins, the exploitation of Central Africa's industrial potentialities, the abolition of the isthmus of Suez, and the establishment of a Negro Free State protected by a Pan-European pact.

In 2030 the American States will be looking forward to a similar work in the Amazon basin and other undeveloped areas. Australia will inaugurate the complete irrigation and fertilisation of her vast central wastes.

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At the same time a world scientific commission will be in permanent session, mobilising the research students of the planet for even more ambitious and far-reaching undertakings. Wealth will be collected all through the twenty-first century. Then in 2100 the artificial thawing of the polar regions may be tackled. As an alternative, the conversion of Central Asia into a fertile, and climatically delightful, dwelling-place may be deemed of great importance to progress. As a third possibility, the pooled resources of humanity may be marshalled to devote the first half of the twenty-second century to the control and stabilisation of the weather over the whole surface of the planet.

It is, of course, idle for me to suggest which of these, or of other similar cosmic improvements, will be chosen by 2030 for its grandchildren's task. I am only concerned to point out that such serious allocations of human wealth and ingenuity for the ensuing hundred years will be undertaken by the men of that period. The statesmen and scientists of the twenty-first century will enjoy such security and wealth as

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will justify a long view. They will be able to map out the world's future for a century or more, as calmly as a Cabinet now plans legislation for a session, or the president of an automobile manufacturing company decides production for next year's sales season.

Nor will these 2030 architects of the future cast their designs in the dark. They will be supplied with figures, statistics and diagrams, which will exactly guide them on such points as America's population in 2150, Britain's coal reserve in 2109, and the University of Smyrna's available output of expert biologists in 2075. The future will not be dark or obscure to them. Its twilight will be serviceable for the inception of gigantic and noble schemes, whose fulfilment can be calculated by astronomers two centuries ahead.

Nevertheless this calm certainty concerning the future must weaken, even destroy, that spirit of adventure, that feeling that we are all the children of chance, which consoles us to-day for much that is imperfect in contemporary civilisation. As I look forward towards the

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world in which my great-grandchildren may live, and in which I hope they will distinguish themselves, I find a certain solace in reflecting that my own birthday occurred towards the latter end of the nineteenth century.

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