Edith H. Gordon.

The Edith H. Gordon Bequest - 1940

in memoriam

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THE EUGENIC PROSPECT

NATIONAL AND RACIAL

THE EUGENIC PROSPECT: NATIONAL AND RACIAL . . *By* C. W. SALEEBY, M.D., F.R.S.Edin., F.Z.S.

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"Make no more giants, God,
But elevate the race at once."
BROWNING.

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THIS BOOK

IS HUMBLY DEDICATED

TO THE CAUSE OF ANGLO-AMERICAN FRIENDSHIP

FOR THE WEAL OF ALL MANKIND.

Years of the modern! years of the unperform'd!

. . . . . .

What whispers are these, O lands, running ahead of you, passing under the seas?

Are all nations communing? is there going to be but one heart to the globe?

. . . . . .

The perform'd America and Europe grow dim, retiring in shadow behind me,

The unperform'd, more gigantic than ever, advance, advance upon me.

WALT WHITMAN.

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INTRODUCTION

INTRODUCTION

In London, on May 14, 1904, our newly-formed Sociological Society was publicly inaugurated by an address on "National Eugenics," from the veteran Francis Galton. Before he had finished I had abandoned all idea of medical practice in order to follow him. Seventeen years have passed. In the interval I have always adhered to Galton's original definition of eugenics, which he gave us on that day, and in which he explicitly included, not only heredity, but all the influences which affect the development of hereditary potentialities. In other words, he recognised "nurture," as well as "nature."* His followers, however, have for the most part steadily decried nurture and have even sought formally to exclude nurture, including ante-natal nurture, from eugenics; and it has been a persistent struggle against heavy odds to insist that our founder was right; to gain recognition for my correlative concepts of *racial poisons* and *preventive eugenics*, through which the whole antithesis between nature and nurture begins to lose its meaning; and, in recent years, to direct the attention of eugenists to the findings of experimental biology, which have resulted in the triumph of "neo-Lamarckianism," so-called, in that they have established

* This antithesis Galton took from Prospero's description of Caliban:

> "A devil, a born devil, on whose nature
> Nurture will never stick."
>
> *The Tempest*, Act IV., Scene 1.

the transmission and therefore the transmissibility of *some* acquired characters. The older experiments in mutilations—such as cutting off rats' tails—were very important and valuable, but they did not encompass the whole question. Some, at least, of the acquired effects of nutritive and toxic factors may be transmitted: a fact which we know because such transmission has been experimentally produced and observed. With the demonstration of this truth the whole of class- and caste-eugenics, as advocated in Great Britain, most deplorably by the Eugenics Education Society, collapses; its fundamental assumptions being sand. The verdict of contemporary experimental biology has condemned what Professor Patrick Geddes has called the "Herodian" engenics, which applauded neglect of motherhood and the deaths of babies as "natural selection"; and has exalted the "Magian" eugenics, which wisely and humbly practises what I have long called Modern Mother and Child Worship.

The study of the mainly nurtural effects of light and darkness, of vitamin-rich and vitamin-destitute diets, as in parts of this volume, is therefore accurately included in eugenics, as we see it to-day; and none the less when we remember, for instance, that experimentally, one effect—and that second in importance to none—of a vitamin-destitute diet may be sterility. How foolish we *always* are to try to carve nature into independent fragments, whilst we "pair off into insane parties," as Emerson phrased it, like the eugenists *versus* the hygienists, the nature-ists *versus* the nurture-ists, of yesterday. Rather let us try to see Life steadily and see it whole.

The closing paragraph of the preface to the prede-

cessor* of this volume, which I published two years ago, and of which this is really a continuation, ran thus:

> The pages that follow are the best I can offer the reader to-day; but in an hour or two I board the *Olympic* for the New World, and I hope I am not so hopelessly old but that in a month of Whitman's America I can learn some new truths for teaching hereafter.

This sentence gave offence, for reasons unstated, and unsurmised by me, to one critic, who pronounced it objectionable and "characteristic." The following pages will not please him. But they are dominated, from first to last, by the series of revelations and inspirations and instructions which America, our tremendous offspring, offers to the visitor and student from these Mother-islands. I shall always regret the ignorance and insularity which had led me to refuse many previous invitations—to I knew not what opportunities of learning, reinforcement, and delight.

When at length I set sail it was in the avowed hope of learning, and the process began apace. The noble boat was bearing some seven thousand Canadian soldiers home, and Halifax was our port of disembarkation. Thus I travelled to New York by train. At a certain point, some tens of miles from the city, we stopped, for no evident reason. On inquiry I learnt that our engine, which had been producing smoke, was forbidden by law to approach any nearer than that point to our destination. A smokeless method of traction was required by the sanitary regulations in force, and therefore we had

* "The Whole Armour of Man: Preventive Essays for Victory in the Great Campaigns of Peace to Come," with an Introduction by Lord Willoughby de Broke (Grant Richards, Ltd., London, and Lippincott and Co., Philadelphia, 1919).

to wait whilst the change (to electric haulage, as it happened) was made.

Here, already, was a revelation to a British-born traveller who had spent two-thirds of his life in the abominable atmosphere of London, and the remaining third in that of Edinburgh—known affectionately to its consumption-and-pneumonia-ravaged inhabitants as "Auld Reekie," which means Old Smoky. Evidently he was on the way to a new kind of English-speaking metropolis, where it did not amuse the inhabitants to be smoked to death, as in the two which he knew so well. The process of education in this matter, which began at that moment, finding an eager pupil, who saw a smoke-stained lung in a Pathological Museum when he was twenty, and who has accordingly never been responsible for the burning of an ounce of soft coal in his life, was continued throughout that first visit—fortunately extended much beyond the hoped-for month—and issued in a resolve, when, from his homeward-bound boat, he saw the clear façade of New York, undimmed by smoke, fade into the west. The influence of that tour, and of the more systematic and detailed inquiry made in the following year, is to be found in very many of these pages—and, better still, in at least a few of the new houses which are now being built or designed in his native land.

The anti-smoke regulations of New York were a revelation, even when I was still many miles from the city. Crossing the Atlantic again in 1920, for more learning, reinforcement, and delight, and mentioning the subject at dinner in the saloon of the same Olympian boat, I was told by my neighbour, a Bostonian, that his city had similar regulations, known there as the "Blue Sky Law." That name I found and call an inspiration—with due apologies to those critics who abominate any

trace of poetic sensibility in anyone who claims to speak for Science.*

The substance of Part II., "Let There Be Light," in the following pages, has been published in many forms, with or without my name attached to it, in many organs, daily, weekly, monthly, and quarterly, during the period of nearly two years since I first "discovered" in New York a smokeless city; and has been uttered on all kinds of platforms, in public lectures or addresses, numbering between two and three hundred, in the cities and towns of England and Wales, Scotland, and Ireland. About six months after this campaign began, with reiterated insistence on its relevance to the new housing of Great Britain, the Minister of Health appointed a committee which immediately addressed itself to that particular aspect of the question. It was my privilege to lay the case before that committee on March 24, 1920; and the new facts which I obtained in America thereafter, on Feb. 1, 1921. The politicians have paid no attention to the subject, which does not interest them, being concerned not with votes but merely with life and death. But the Press throughout the country has reported much of the substance of my lectures, and the public is beginning to be interested; and therefore I hope that many readers will find the pages that follow to be not novel, but more or less familiar. "Reiteration," said Lord Fisher, "is the secret of conviction." This present propaganda is also illustrating a remark once made to me by Francis Galton—that new ideas must first meet ridicule, then reasonable consideration, and finally such acceptance that people begin to think they have con-

* "Poetry," said Wordsworth, "is the breath and finer spirit of all knowledge; it is the impassioned expression which is in the countenance of all Science."

ceived these ideas for themselves: and then victory is at hand. In this instance the second stage in this progression is now well advanced. If there had been time, I should have preferred to re-write the whole argument in strictly logical form, at full length. This would have involved, however, the cessation of the public-speaking part of the campaign, which has already involved travelling scores of thousands of miles, the greater part of my life during the last two years having been spent, by day, if not by night, in trains. But public speaking, and the argument *ad hominem*, or rather *ad urbem*, seeking to arouse civic pride and patriotism, and to interest members of local health and housing committees, advances the matter more, I believe, than could be done by any other way of using the same time; and therefore the case is here presented not quite as I would wish, but by drawing freely on material already published. But the student who desires a brief, orderly, and authoritative statement will find that the Interim Report of Lord Newton's Committee, referred to hereafter, answers to that description, and he and I will look forward with keen anticipation to its Final Report in due course. Meanwhile the most comprehensive, scientific, and valuable study of this whole subject ever made is the series of reports on its several aspects, published by the University of Pittsburgh in 1913; and I wish to express my thanks to Dean Meller, of the Department of Mines in that University, and to Dr. Richard G. Burns, Member of the Bureau of Smoke Regulation, for their patience and courtesy and instruction—not only when I visited their city, but when, thereafter, they sent me the invaluable literature which records its wonderful achievement and furnishes guidance for all who love the light of day.

For myself, long sickened by the darkness, dirt, drunkenness, disease, and degeneracy of our industrial cities, it is a source of pride and rejoicing to meet so many straight and robust bodies, such bright eyes and alert minds, not only in Canada, under the Union Jack, but in the United States, under Old Glory—the springs and sources of whose glory are not Trans- but Cis-Atlantic.

O brave New World,
That has such people in't!

I am fearful of the eugenic or racial prospect in these islands, unless we change our ways; but I am assured of the glorious future, in North America, if the conditions of Positive Eugenics be satisfied as well as those of Preventive Eugenics are now, of the stock which had its origin in the older "melting-pot" called Britain. It is impossible for the observer to refrain from drawing a distinction, therefore, as the title of this book indicates, between the eugenic prospect, as it appears for the British *nation*, and for what we may call the British *race*—by far the most promising part of which is now to be found in the North American Continent.

The racial future partly depends upon the industrial. In 1919, during my first visit to America, I saw the early stages of a development which has since made rapid and significant strides. Passing through the Southern States, one was told to observe the cotton growing beside the train, and naturally asked why, if they grew the cotton, they could not spin it. The answer, in multiple and abundant form, was soon forthcoming. What will soon be a stupendous cotton industry is now arising where the cotton is actually grown. Many large and clean and hygienic new mills did I see—they were springing up like mushrooms—and I had to ask myself a second

question, no less obvious than the first: "How can Lancashire compete indefinitely with these wonderful new cities, where there is no coal-smoke, nor saloons, nor rickets, nor neglected children, nor slums?" When I have publicly repeated this question in Lancashire, the answers are that the humidity of the air and the inherited facility of the workers are advantages which outweigh all else. To these the reply is that air can be "humidified" according to will, and that there is no evidence of the inheritance of acquired facility. And this is only one instance of the fate which I predict for our export trade, unless we quickly follow the American example in matters of public health and social hygiene.

Not physical matters alone, such as the quality of urban light and air, arrest and delight the attention of the eugenist and hygienist in the United States. Much has been written about their invigorating atmosphere. That may be true; though my own experiences happen to have been almost wholly of intense and unusually humid heat. But much should certainly be said of the psychical atmosphere. Here, if anywhere in the world, is invigoration. One goes there in one's forties, having been largely shamed out of exuberance or enthusiasm, if not even out of idealism, by the kind of reception which any exhibitions of such kinds meet from vested interest and custom and caste in Europe. Since the war, as we all know, an infidel cynicism has become, for a time, the dominant spirit of our country. It therefore is the solemn and urgent duty, laid upon all those who have had any such experience as mine, to define a particular characteristic of American life which is often obscured, though second in importance to none, especially when many lovers of peace and of mankind are

anxiously asking what is to be the future relation of America to the rest of the world.

It was my privilege, on my second visit to America, in 1920, to be a British representative at the Fifteenth International Congress Against Alcoholism, which was then held in Washington, having never taken place in America before. I know I am speaking for the delegates from some forty different countries of the world when I say that we were treated with boundless courtesy and generosity, the Department of State paying the entire expenses, from our far homes and back again, of those of us who contributed papers, and the organisers of the Congress giving their visitors practically the whole time of the long programme, despite their unique claims to a very large portion of it.

Since the struggle against alcoholism in America has always been waged essentially by the Churches and their members, it was my privilege, during that wonderful week in Washington, and for several weeks before and after, to spend my time, not with sociologists or medical men—except for a few invaluable hours occasionally—but in the churches, and with those of the American people who are specially concerned with movements of social reform, looked at from the religious rather than the political or sociological point of view.

It would be impertinent to speak of their intelligence or their generous appreciation of such contributions as science might offer to the solution of their problems. But this is surely the place and the time for an attempt to define what is so often forgotten or unrecognised in other parts of the world.

Incomparably the strongest impression of America which could not but be gained by anyone who had my experience and privileges is of her *practical idealism*.

It might have been supposed that, after winning a great victory against alcoholism in their own land, the American people would feel inclined to rest content. Not so. At once, in collaboration with their visitors, they set to work to create an organisation—first in Washington in 1919—the purpose of which is, by whatever appropriate means, of education or legislation, to fight alcoholism throughout the world. This World League Against Alcoholism is by no means an American institution. Indeed, the concern of some of us has been to prevent Americans from unduly suppressing themselves to its detriment in its organisation. But it has hitherto depended mainly upon American help, though tens of nations have contributed to it also. America's practical idealism has been demonstrated to me in the perfectly amazing way in which the simple, modest, church-going people of America, who have given during past decades for the help of their own country, have lately given their money, in their tens of thousands, wherever the suggestion was made to them, for the service of the rest of mankind in the same regard.

Undoubtedly the English-speaking world, and Britain in especial, appealed to them most. It was thrilling to learn how they loved the name of England, which not one in a thousand of them had ever seen. And it shamed me, also, to see how interested they were in the chance of helping countries which are only names to me and to them, like Esthonia and Latvia and Serbia and China. I understood these things better when I heard some figures indicating the colossal sums, made up of modest subscriptions, which the church-going people of America have steadily contributed for decades past to foreign missions throughout the world. The fight against alcoholism everywhere is to them just part of such a

mission, and they have given, and are giving, as is their wont, accordingly. I was astonished to learn that, in the year since we first founded the World League, hundreds of thousands of American dollars, thus raised, had been spent in the various countries of the world, for no conceivable benefit or advantage to the givers except the happiness of believing that they were serving their fellow men and women—of whatever continent, creed, or colour.

This was, and is, to me, sufficient answer when I am asked whether the Presidential election of 1920 does not mean that America's ideal is selfish isolation in order to enjoy the riches which accrued to her during the war. I knew something, of course, of the vast quantities of food which America is sending to the starving children of Continental Europe, but I did not realise how eagerly and generously Americans of at least one kind—and that kind very numerous and everywhere to be found—desire to be associated with other nations in a common fight against one of the enemies of mankind.

And with such experience, I do not hope or believe, but *know*, that the America which so enthusiastically and with such generous self-sacrifice enlists with other nations in a holy war against poison and disease, degeneracy and death, will assuredly enlist with them also in another league or association—call it what we will—for the prevention of that unholy war, between nations, of which disease, degeneracy, and death, of body, soul and spirit, are always and everywhere the only certain fruit.

America instructs, reveals, inspires; she does so in English, "the tongue which Shakespeare spake," quoting English poets, thinking as we think (when we think), and led predominantly, as a recent exact inquiry has shown, by those of origin from the British Isles.

If we Britons are jealous of America, it is the odious jealousy of a middle-aged mother who cannot bear to see the burgeoning youth and beauty of her own daughter. Great Britain, with her glorious record as a Mother of Nations, should know and feel better than that. Only such a mother, we should say, could have such a daughter.

And so, *pace* my critic, I close this introduction also after the fashion of two years ago :—

The pages that follow are the best I can offer the reader to-day ; but in an hour or two I board the *Olympic* for the New World, and I hope I am still not so hopelessly old but that in Whitman's America I can learn some more new truths for teaching hereafter.

ROYAL INSTITUTION, LONDON.
April 6, 1921.

PART I

THE FUTURE OF THE RACE

CHAPTER I

YOUTH AND THE RACE

RECENTLY, stepping into the streets of Liverpool, I was offered aid, as usual, with my bag by the pitiful little crowd of hoarse, rickety, stunted, anæmic children who gather round the stations of our great cities for the chance of a few coppers. They needed my help, not I theirs. In the course of the hours which I spent in that city, as on many previous occasions, I failed to observe so much as one healthy child (skin, blood, skeleton, nasal passages, teeth—may all be estimated even in the street). No such spectacle as this meets the traveller's eye in North America, as I ventured to tell the Liverpudlians in public. And the following morning there appeared in the Press many columns of reference to the newly-published report on the physique of the nation, as revealed by examinations for military service. A student who has explicitly devoted his life to the study and advocacy of national and racial health is doubtless constantly tempted to magnify his office by overstating his case; but in nineteen years I have never ventured to make allegations so terrible as those now brought before us by official authority. The facts are worse than these records show. At the Ministry of National Service, during his tenure of office there, Sir Auckland Geddes showed me memoranda indicating, for instance, that the physique of our young women is as bad as that of our young men.

And now the question is whether history is merely to

repeat itself. Memories are short and must be jogged. The revelations of recruiting during the Boer War were alarming; and the late General Sir Frederick Maurice, heir of the noble traditions of Charles Kingsley and Frederick Denison Maurice, wrote an article in the *Contemporary Review* which led to the appointment of two official bodies. There was a great argument that the physical aspect of military training was what we needed. Accordingly a Royal Commission on Physical Training was appointed for Scotland. In the course of its inquiries some rare genius seems to have suggested that the defective recruits had once been younger, and Dr. (now Sir) Leslie Mackenzie was asked to examine school children in representative districts in Edinburgh. Briefly, the results were the medical inspection of school children under the distinguished authority who is now Sir George Newman, of the Ministry of Health; and the medical treatment of school children to some extent.

There was also appointed an Inter-Departmental Committee on Physical Deterioration, under the Privy Council, and it published a valuable report, in which, for instance, it told the truth about alcohol—an enormous and omnipresent factor, which receives curiously little attention in this new report—and indicated many desirable reforms. Half a generation later we now have the evidence derived from that very partial but instructive anthropometric survey of the nation which was carried on, especially during the last year or so of the war, and in my judgment the evidence is to the effect that, despite the revelations made earlier in the century, despite the establishment of medical inspection and treatment of school children, and despite the Insurance Act, for the prevention of sickness, the national physique has gone from bad to worse.

The reasons for this progressive deterioration should

be indicated. They do not require us to assume that, for example, the medical treatment of school children has not been worth while. Nor do they require us to assume that the race, the human germ-plasm in these islands, is senile and moribund—however popular that view may be among our enemies abroad, looking at us with the biassed eye of the expectant legatee. If this were the time and place, it could be shown that the theory of racial history as comparable to that of the individual, with inevitable senility and death, though popular with philosophers from Aristotle to Mr. Balfour, denies the essential contrast between the individual and the race, and is contradicted not only by hosts of sub-human species, animal and vegetable, but also by the Jewish race of our own species.

The real reasons why physique in Britain is going from bad to worse are as follows, I believe:

First.—A steadily and rapidly diminishing proportion of the nation's children are being born to parents, and in environments, such as promise them the best inheritance, both biological or genetic, and social. Thus in Kensington, where I happen to live, there are two parts—North and South. The North has twice the birth-rate of the South; but the South has the parents least affected either by the racial poisons, or by hereditary defects of unknown origin; and the South can afford air and light and seaside holidays, and cream and butter for the children whom it ever more and more declines to produce; whilst these advantages are not available for the children whom North Kensington continues, though diminishingly, to produce. Evidently a very, very few generations of this, which is typical of the whole nation, must be fatal. School clinics are blessed and precious things, but they are less than a forlorn hope in such a racial tragedy as this.

The important argument that the death-rate is so low among the more fortunate that more of them survive in the long run was studied by us most carefully during the sittings of the National Birth-Rate Commission in 1913-16, and we found, "beyond a peradventure," that, though certainly the children of, *e.g.*, South Kensington, have a lower death-rate, there are relatively so few of them that the next generation tends to be recruited from North Kensington. (Suppose that the more fortunate save *all* of a family of three—not that they have three nowadays—whilst the less fortunate save only six out of a family of ten. We see where we are going, and who are going there, in the ratio of two to one.)

Second.—Our adolescents, whom I prefer to call our pre-parents, are drinking—which, in and through them, means racial poisoning—more than ever.*

Third.—We are becoming increasingly an urban people, without having learnt how to build or live in cities. Again, school clinics and all the rest of it are mere palliatives against this (at present, though not necessarily) fatal tendency. Civilisation is city-fication; Athens and Jerusalem were cities (as I once heard Professor Geddes reply to a questioner who said: "Then you don't believe in cities?"); but cities of our present sort are racially fatal. Their darkness, due to smoke and its consequences, we will later discuss; but they also tend to involve the breaking-up of the home, the decadence of breast-feeding, the degradation of adolescence, the rapid

* Blackburn [Lancashire] licensing magistrates to-day emphasised the necessity for prohibiting the sale of intoxicants to persons under 18. The present liberty of sale they regarded as a menace to youth, which no one could defend. Police investigations showed that 20,900 women and girls were found on licensed premises during a single round of visits. The highest number found in one house at one time was 174.—*Evening News*, London, February 3, 1921.

spread of knowledge of contraception, which latter I do not regard as inherently evil, but which is more prone to ruinous abuse than any other form of knowledge I can name. Our cities have been carrying on by the immigration and destruction of healthy young rural life so long that the rural resources are well-nigh drained—we are probably 85 per cent. urban now—and unless we can reconstruct our urban ways, as, thank Heaven, one may see them being reconstructed all over North America, we are doomed.

Fourth.—Dr. Harry Campbell, the distinguished editor of the *Medical Press and Circular,* and a foremost student of diet, is doubtless right when he says that we are the worst fed people in the world. The Scottish children used to be reared on the breast, and then on porridge and milk. They used accordingly to grow into the largest and most energetic inhabitants of our islands, their energy showing itself alike in their shoving powers in a Rugby "scrum," and in their avidity for education (a very subtle, potent, and often forgotten consequence and symptom of physico-psychical energy.) In the Glasgow region now, where half the population of Scotland resides, the children are mostly fed on tea, white bread, and jam, none of which contain any vitamins at all, and consequently the streets are full of rickets, and the kind of children one sees in Leeds or Liverpool or Manchester. Vital statistics clearly show that Roman Catholic rural Ireland is the only part of these islands where the race—and that not the English race—is in a healthy condition. But in North America the Scottish, for instance, are multiplying and dominating and splendid—like the old-time Scottish of Scotland.

Are we going to do anything about it? Where are the Churches?

CHAPTER II

NATIONAL DYSGENICS*

In May, seventeen years ago, the late Sir Francis Galton founded modern eugenics in an address to our newly-formed Sociological Society in London. None who heard will ever forget it. In later years it was my privilege, with his approval, to extend the concept of National Eugenics under three heads :

Positive Eugenics, the encouragement of worthy parenthood.

Negative Eugenics, the discouragement of unworthy parenthood.

Preventive Eugenics, the protection of parenthood from the racial poisons—

and to introduce the term dysgenics (in analogy with eupepsia and dyspepsia) for the opposite of what the great pioneer desired. In previous works I have discussed these conceptions at systematic length. We may now see how the matter stands to-day.

Ever since that date, as long before, the birth-rate has been falling. But that is a merely quantitative assertion. The fall might have been in the birth-rate of the insane, alcoholic, mentally-deficient, hæmophilic, syphilitic, unmarried. Certainly as regards all but the last of these categories the fall would therefore have been negatively eugenic. In any case the observer might argue that what we want is quality, not quantity—the

* The reader may be referred also to my brief paper, " The Birth-rate," published (1921) as one of the *People's League of Health Pamphlets* (7, Hanover Square, London, W.).

easiest and most familiar form of "thinking," *à la* parrot, on this subject—and available statistics could scarcely say him nay. But there is a plentiful lack of evidence to show that undesirable parenthood is diminishing; and latterly the most formidable evidence has accrued which proves beyond serious question that we are now practising *National Dysgenics* in a fashion entirely new in our history. There is now before us a new and authoritative analysis which far surpasses my worst fears and most ominous vaticinations as to the decay of worthy parenthood and its menace to the race.

Already there were before the public the report of the National Birth-Rate Commission, published in 1916 ("The Declining Birth-Rate," second edition, 1917, out of print); and the report of the Second Inquiry, 1918-20, "Problems of Population and Parenthood." But in neither of these documents was it possible for us to discuss the question of *differential* fertility, except indirectly and speculatively. Indeed, only one clear new fact emerged, answering an objection which I had long raised to gloomy predictions based upon such figures as showed that the classes conventionally called "upper" had fewer children than the "lower." My objection was that far more children of the "lower" than the "upper" die; and that we are concerned not with births as such, but with survival. Early in the course of our work—which began in 1913—Dr. T. H. C. Stevenson, Superintendent of Statistics at the General Registry Office, and a member of the Commission, showed that, as was said in the last chapter, large though the difference in mortality be, it is not nearly large enough to neutralise the consequences of the far larger difference in fertility. In other words, the "lower" classes have not only the highest total fertility but the highest "effective fertility."

In a critical and conclusive paper read before the Royal Statistical Society, Dr. Stevenson has given us the full measure of the facts, so far as they have been ascertained, and their meaning. His subject was "The Fertility of Various Social Classes in England and Wales from the middle of the nineteenth century to 1911," and the most significant part of the material before him was the census of 1911, which, for the first time, "by its inclusion of questions as to duration of marriages and to numbers of children born and surviving, has provided material on a national scale for analysing the fall in fertility since 1876 by social class, occupation, birthplace and locality of residence. . . . They enable us to compare not only the rates at which children are born to various sections of the community, but also the varying extents to which these sections successfully rear children."

The facts, as thus for the first time revealed, are ominous in the extreme. In Dr. Stevenson's own judgment the most important fact established is that the decay of worthy parenthood, as I have called it, is a new phenomenon. Here are his weighty words:

"We were already well aware that the more successful and prosperous classes were behind-hand in their contribution to the upkeep of the nation; but it was possible to suppose that this might long have been the case, and that, therefore, experience had proved it to be compatible with such prosperity and advancement as had been achieved. Now, however, this comforting view is no longer tenable. In the deficient fertility of the classes which, having achieved most success in life, are presumably best endowed with the qualifications for its achievement, we see that we have to face a new and formidable fact—how formidable is a question which must be left for the consideration of authorities on eugenics."

I will not now attempt to answer the question thus raised—as to the truly genetic or hereditary values of the social classes respectively in question. For the present it is more than sufficient to assert the unquestionable fact that the fewest children are being born in the most favourable environments, physical and psychical. That is bad enough—even if there be no inherent differences in racial or natural quality.

How few? the reader will ask. The answer is that we cannot say precisely, these vital questions having never been asked in any census before that of 1911. Nor shall we know more, I fear, after the census of 1921.* But we do know that the nation of the future is receiving the fewest children from, for instance, married army and naval officers, clergymen and ministers, barristers, physicians, authors, Civil Service clerks, and persons of independent means. The numbers are certainly far too few to replace the parents. It has already been proved, by the National Birth-Rate Commission, that this decay of parenthood is due to nothing other than the deliberate will of the persons concerned—who are the educated, responsible, successful, provident, sober members of the community. These persons, "the backbone of the nation," are practising race-suicide in the most rapid, drastic, effective and novel fashion. That is why, in the previous chapter, the decay of worthy parenthood was named as the first cause of the lowering of national physique even below the level observed after the Boer War. I believe that, if this practice continues, our race in these islands is doomed, decay of parenthood being the mortal disease of nations.

* At the Efficiency Exhibition (see report in *The Times*, February 11, 1921) and elsewhere I have recorded my protest against the folly of dropping these primary and fundamental questions in the Census of 1921.

CHAPTER III

THE VOTE AND THE RACE

THE gaining of the vote by the women of Great Britain and the United States in 1918 and 1920, respectively, is a great political event. But it is also much more. Many years ago I ventured on the definition that a politician is one who is ever thinking of the next election, but a statesman one who is ever thinking of the next generation. There will be an abundance, if not a surfeit, of discussion and action by the politicians thus defined. Let us here attempt a more difficult and immeasurably more worthy task—the service of statesmanship—by asking what the political enfranchisement of woman, involving as it must and will, her economic freedom also, may signify for the race—the future, the unborn, the life of this world to come.

We must try to define our first principles, and in doing so here I am merely recapitulating the doctrine laid down a decade ago in my volume on "Woman and Womanhood."*

First.—In the evolution of sex, in both the vegetable and animal world, from the beginning of æonian antiquity, the female sex has ever been *the* sex, alike the main highway and the essential vehicle of life. Incomparably the highest product of this sex is woman. In her physique and her psyche she is nature's supreme

* London, William Heinemann; New York, Mitchell Kennerley.

organ and trustee of the future. If she should fail in this function the race must fail, and history, rightly read, teaches that where she has failed, from whatever cause, the race has there failed, nought else conceivable availing. So long as the individual is mortal, parenthood must determine the destiny of any living race—and therefore, in the case of mankind, the destiny of all nations. Parenthood is dual, and I am the last man to understate the importance of fatherhood; but nature has decreed that motherhood shall be much more important still. Its racial significance and imperiousness are transcendent, and ever were and will be. In thus asserting the pre-eminence and racial sacro-sanctity of motherhood, I am not "dictating to women"—undoubtedly a gross impertinence, and properly resented, from anything in trousers—but simply indicating the supreme part which nature has allotted to her. No higher compliment to her sex is conceivable.

Second.—The old view, which we find indicated in the dogmas of certain world-religions, that the mother is merely the vessel and nurturer of her child, whereas the father is its real parent and creator, is false. She is creatrix as he is creator. Each of us is derived equally—with the strictest mathematical accuracy—from both of our parents. We should not deceive ourselves because we usually choose to name the family after its father. Though only the paternal cognomen be transmitted, we inherit equally from both parents. The maternal stock, epitomized in the maternal germ-cell, is as important as the paternal. In the interests of good breeding it is as important to recruit the future from the mothers of fine stock as from such fathers. The leading idea of the volume above-named is that, on genetic grounds, the race needs the finest women to be the

mothers of the future, and that no development of feminism will ultimately justify itself if that eugenic principle be ignored or outraged.*

The problem of the home is how to reconcile the unquestionable claims of woman as an individual, and the no less unquestionable claims of the race upon her. There are certain apparent solutions of that problem, now in practice, which do not solve, but simply evade it. We seem to be on the way toward the hope that the bee-hive may serve as a suitable model for mankind, and the structure of an enduring human society. In the bee society, the highest development of the individual, by far, is found in females who are not mothers. They have renounced maternity, as it were, and have become master-pieces of life in their marvellous instincts, their courage, their devotion and unselfishness. The so-called "queen," the only mother in the hive, is, to speak frankly, a fool, incapable of looking after herself, and, so far from being a queen, does not direct or control the least of her own activities, to say nothing of those of the hive or any individual in it.

Mankind might, perhaps, evolve some analogous form of socio-racial structure. The highly educable and educated women, the most intelligent, provident, and active, might put maternity on one side, leaving that function to the inferior members of their sex. Something of which that is no unfair description is what we increasingly see around us to-day in the leading nations of the world. My own oft-reiterated belief is that along these lines is the least happiness of the greatest number

* For the superb statement of this argument from a slightly different angle we should read and re-read, Miss Ellen Key's book, "The Woman Question," in which that great Scandinavian thinker is revealed at her highest.

of individuals and the poorest prospect for the future quality of the race. The success of the hive is no safe indication for a race that relies not upon instinct but upon intelligence, which varies widely in different individuals, and is most markedly hereditary. Whatever may be well for bees, mankind needs the finest women to be the mothers of its future.

Observation of individuals shows, further, that nature is not so perverse or ambiguous in her demands as we might suppose. For the vast majority, not least of the finest women, motherhood not only serves the race through them, but serves them as individuals—their personal happiness and completeness, their physical and psychical health, and length of days. Only too many women have learnt this truth too late.

Surely we must stick to our principles, and mayhap we shall find ourselves coming out right in the end, both for the individual and the race. Woman can, must, and will use the vote for the protection of the home and the family, of youth and the race. If she finds—as indeed needs no finding—that present economic practice heavily handicaps her in many ways, but never so heavily as when she is discharging her supreme function of maternity, she must and will rectify the economics which are, indeed, so uneconomic, so spendthrift of individual and racial welfare.

Asserting the truths above defined, she must and will say that, if money rightly exists for anything at all, it exists for the protection of motherhood, upon which national and racial destiny depend. She will say, and "*say it with votes*," that, if any service be paid for, if any labourer be worthy of his hire, the supreme national and racial service of motherhood must be paid for. Perhaps we may question whether the term, "endowment of mother-

hood," is the best to indicate this principle. We do not speak of the endowment of generalship or of statesmanship or of the bench or of the priesthood or of medicine when we pay salaries, wages or fees to the men whom we choose to direct our armies, make our laws, administer justice, guide our churches or tend our bodies. We pay these people for the useful work they do. Similarly mothers should be paid.

We have seen, however, that this just, necessary, and long overdue reform in economics will not solve all the problems which are posed for us in the present rightful demand for freedom and personal development of the individual woman. It is not for any man to attempt to solve a problem which is woman's, and which she alone can solve. Any man may, however, be permitted to remind woman of her supreme importance to the race, which she sometimes appears to forget, rating herself far too lowly in that regard, even when she thinks that she is making high claims for herself. And it may be permitted a man who can never forget that all great nations in history have fallen in their turn, and who believes that decay of parenthood—of which motherhood is the better half—is the mortal disease of nations, to ask here again the question which Walt Whitman, seer of seers, asked nearly half a century ago:

> With all thy gifts, America, . . .
> Power, wealth, extent, vouchsafed to thee . . .
> What if one gift thou lackest? (the ultimate human problem never solving:)
> The gift of Perfect Woman fit for thee—
> What if that gift of gifts thou lackest?
> The towering Feminine of thee?
> The beauty, health, complexion fit for thee?
> The Mothers fit for thee?"

CHAPTER IV

A RACIAL POISON

It has long been a short-sighted view both of temperance reformers and the "Trade" that drunkenness, or acute alcoholic intoxication of the brain, is the essential evil that follows the consumption of alcohol. Yet as long ago as those days when the expectant mother of Samson, who was to be a champion of his people, was enjoined to take no alcohol, and those later days when Lycurgus legislated against alcohol on the ground of what I call "preventive eugenics," and when the Romans explained the deformity of Vulcan on the ground that he was conceived when his father Jupiter was drunk, there have been those who believed that alcohol affects the race as well as the individual. That contention has been strenuously denied, at least in this country, though long admitted in America and on the Continent, as even by such critical and searching authorities as Forel, who has given the name of blastophthoria, or germ-cell poisoning, to one of the modes in which alcohol poisons the race. A decade ago Professor Karl Pearson published a document the upshot of which was to show that the children of alcoholics were on the average superior to those of other persons, and that document is still quoted everywhere in subsidised letters to the Press, in defence of our national trade in poison, its author having steadily refused to withdraw it even after Sir Victor Horsley and many other students had shown that, for instance, the

comparison included in one category the children of abstainers and of so-called "moderate drinkers," and that, as I ascertained after visiting Edinburgh for the purpose, in no case was trouble enough taken to ascertain whether the parental alcoholism occurred before or after the birth of the children.

Now comes the Second Report of the National Birth-Rate Commission, and from amongst the great mass and variety of matter which that document contains, and to which students in many fields must refer for many years to come, we may here refer to that section which deals with the purely medical or pathological question of the action of alcohol as a racial poison. The Commission was fortunate in having amongst its members Dr. W. C. Sullivan, one of the foremost investigators in this field, and scientific adviser until recently to the Central Control Board of the Liquor Traffic; and another member and witness, the present writer, had also had the advantage of seeing for himself the long and conclusive series of experiments conducted by Professor Stockard at the Cornell University Medical School in New York. Those experiments have been decried in Great Britain by critics who have not seen the work for themselves, but who simply dislike its conclusions, some of them because it impugns alcohol, others because they wholly misunderstand the irrelevant proposition of Weismann, that "acquired characters are not inherited"—even though Weismann himself, who is much more frequently quoted than read, expressly states that alcohol and other poisons may damage the germ-plasm, but that such damage in no way affects his contention (true or false) about "acquired characters." We may note that Professor Stockard's work, continued during the past nine years, was not designed to incriminate alcohol, but simply to

learn whether any agents given to parents can affect their offspring's qualities, whether for good or for evil.

In 1918 the authoritative committee appointed by Lord D'Abernon, including such men as Professor Sherrington, now President of the Royal Society, Sir George Newman, Professors Cushny and Mott, reviewing the evidence at that date, reported thus:

> These observations and experiments would thus appear to indicate that parental alcoholism may have a seriously detrimental influence on the stock; and if the results are confirmed by further investigation, it will be reasonable to conclude that this is probably one of the most important modes in which intemperance threatens the health and well-being of the community. But, in view of the extreme importance of this conclusion, it is clearly desirable to suspend judgment until the work has been controlled by other inquirers.

The "further investigation" then asked for has now been made; Stockard's work has been continued, and his results have been abundantly confirmed, whilst the quality of his work has received endorsement by visitors from this country, such as Colonel Adami, F.R.S., one of the foremost living pathologists. Independent observations, not brought before the Liquor Control Board Committee, have also been made at the Rockefeller Institute for Medical Research, entirely confirming the previous evidence. The National Birth-Rate Commission therefore unanimously reported, confirming and extending the findings of Lord D'Abernon's Committee two years previously:

> The evidence summarised in this section establishes beyond question the fact that parental alcoholism is capable of exercising an injurious influence on the birth-rate, both from a qualitative and a quantitative point of view.

According to the large and varied mass of evidence now before us, it seems best to beware of any confident assertions as to the racial effects of acute intoxication—as imagined by the Romans in the case of Vulcan. We need more evidence. As for chronic intoxication, which need never remotely approach "drunkenness," we may regard its effect upon the (live) birth-rate itself as relatively small: though this conclusion is only tentative, and awaits investigation of the question raised by myself some time ago (see p. 195), whether alcoholism may not account for some of the very large number of still-births hitherto attributable to no known cause. Apart from that, the finding is that alcohol is more disastrous in its action upon the quality of the next generation than upon its numbers. The Commission's recommendation—the maintenance of the methods and practice of the Central Control Board, based upon, or at any rate conforming to, the scientific evidence which connects the degree of blastophthoria with the alcoholic strength of the liquor consumed—reads tragically at this present date, when everything demonstrated in the laboratory and by public practice during the war has been thrown to the winds, and when our public houses are thronged even by adolescent girls drinking the liquors of restored toxicity which, we know, must be damaging the germ-plasm upon which the future of the race depends.

The Commission did not neglect to consider, also, the relation of alcohol to the birth-rate through its encouragement of venereal disease. The Commission adopts the formula of the present writer, that alcohol aids venereal disease in five-fold fashion: "It lessens resistance to temptation; interferes with disinfection; lessens resistance to infection; aggravates the symptoms; and complicates the treatment." Thus our present pitiful failure to protect

the race from venereal disease since the armistice may be correlated with the rapid increase in the consumption of alcohol since that date; whilst in America the number of new venereal infections has fallen fast and far since the advent of prohibition.

A much more extended discussion of this subject than I need make here will be found in a new chapter, in which it was a privilege to collaborate, in the new (sixth) edition of Sir Victor Horsley's and Dr. Mary Sturge's "Alcohol and the Human Body" (1920); and the final upshot and moral of all these findings will be found in that phrase which I have been reiterating these many years: "Protect parenthood from alcohol."

CHAPTER V

THE BEAUTY OF HEALTH

THE saying that beauty is only skin deep is only a skin-deep saying. I am not thinking of the cosmetic "beauty" so freely applied to lip and cheek nowadays —as, indeed, Sir Arthur Evans found it indicated in the mural paintings of Knossos, when even Athens was an infant city; for that beauty is not even skin-deep. But I am thinking that he would be a queer dermatologist who considered the condition of the skin without reference to the etiological factors of blood and brain. True, we read of skin-foods, which suggest that the skin depends for its nutrition upon factors without; but there is no such thing as a skin-food, though there are many excellent furniture polishes, and the skin depends for all its life and health and beauty upon the blood and nerves within.

But the skin is the least of this matter, and the present proposition is that beauty of person is a phenomenon of health and can only be obtained therethrough. Let us acknowledge possible exceptions of the kind that prove the rule, before we proceed. There is a sort of beauty of disease, celebrated wholly or chiefly in the works of the English Pre-Raphaelite school of painting. We remember those very full feminine throats, almost visibly outlining hypertrophied thyroid glands, which are in a condition of undoubted disease. Also, the paintings

themselves, and the known history of certain of the models, show that these artists admired the beauty, not always "hectic" in the popular sense, of consumption. On this relation of beauty to disease there is, or was, some controversy. The older view was that the white plague prefers a certain type of beauty in its victims—fine, soft hair, large eyes (looking large because the face is so thin), with very clear pearly-white sclerotics, a fine pale, soft skin, showing the veins beneath it—and so forth. I will not say that there is nothing in these classical pictures of the "scrofulous diathesis"; but the modern evidence is exactly bacteriological and conclusive, which shows that tuberculosis produces these effects in many of its subjects and that the infection was present, and not ineffective in this regard, possibly for many years before any definite symptoms of disease appeared. The older view thus inverted the true causal relation, and we may admit that, in many cases of tuberculosis, we do find a kind of beauty which is the direct effect of disease. We may prefer this beauty, in certain cases, to that of "rude" health, but the physician's eye, and not only his in these days, will be affected by its diagnostic and prognostic knowledge, and will find his recovering patient more beautiful as her blood grows richer, and even her skin a little more substantial.

For, indeed, there is nothing to compare with the beauty of health. Let us traverse the body from top to toe, noting many instances which we all know, and some which may be new to us. No one sings the beauty of baldness. The forehead is spoilt which is puckered with lines dependent on effort made to modify the shape of unhealthy-shaped eyes. An obstructed nose ruins the whole face, not only by the swelling of the tissues round it, but by the open mouth. Nothing destroys facial

beauty more completely than a cold in the head, and the adenoids which are so common in our civilisation are fatal to beauty, not only because they involve mouth-breathing, but also because they give an effect of stupidity, and are commonly complicated by infections which redden the eyes. "Redness of eyes," in the phrase of Proverbs, reminds us of the ruin to which alcoholism reduces all beauty, by no means only in the now rare cases of "grog-blossom" nose.

But now the mouth. In our modern civic physiognomy, with its deplorable standard of beauty, the mouth fails oftener than anything else. More even than the eye, however, is this the speaking feature of beauty, as every amateur of the kinema must have observed. I confidently assert that most of the ugly mouths one sees were not naturally destined to be so, but have been made ugly by disease. The narrowing of the Anglo-Saxon face and nostrils, described by modern anatomists, plus the neglected colds of infancy reared in our civic dust and smoke, and teeth too often neglected also, start the adenoids which prevent the mouth from developing as it should—shut when used neither for speech nor food. The type of our children's diet prevents proper development of the jaws, and inclines towards a mouth which merely sucks rather than bites or chews. Some observers thus recognise what they call the "porridge-mouth" of the Scotsman. Students assure us that properly-developed, healthy (and therefore beautiful, I would add) mouths and jaws can occur only where children get plenty of crusts and apples and so forth, to eat, instead of our modern "pap" and "mush." I think they have proved their case, and here I am insisting on its importance for the beauty of the mouth apart from the question of the teeth. As for them, their health in rela-

tion to beauty is obvious, and here again we are probably concerned with malnutrition in childhood as the cause of most of our ugliness. Lastly, in this connection, let us note the use of the so-called "comforter," which I prefer, more accurately, to call the "discomforter." Apart from its effects upon beauty as a source of infection, dyspepsia, and so forth, let us listen to the careful dental surgeons who have shown that the constant presence of, and suction of, this abomination between the plastic jaws of infancy, is liable to cause their absolute deformation, so that they develop too much forward, interfering with the position of the future incisor teeth, and spoiling the shape of the mouth and the disposition of the lips. Probably the "discomforter" is more responsible than anything else for the ugly mouths with which our land is filled. One more word on the teeth. There are people who will attend to their incisors, for the sake of appearances, but let their bicuspids and molars decay until they have to be extracted. The consequence of throwing upon incisor teeth the work of chewing, which should have been done by those allowed to become diseased and lost, is that the incisors begin to spread and splay forwards, in the fashion we often see, ruinous to beauty.

Rickets, "the English disease," as it is called on the Continent, is a chief ruiner of beauty. Like hydrocephalus and syphilis, it is liable to deform the skull, spoiling the beauty of the cranium and the forehead, which are, and contain, the organs that make man man. And rickets ruins the chest and the lie of the shoulders. It contracts the feminine pelvis, thus often putting an end to the race, for the relatively large head of the human infant must have room through which to enter our strange world alive. And rickets ruins the legs, produc-

ing not only actual knock-knees and bow-legs, but also that exaggeration of the slight normal curve of the tibia or shin-bone which the modern fashion in skirts so constantly reveals, and which is ugly in itself, and makes beauty of gait impossible. And, since rickets is a disorder of nutrition, we may note in passing the affronts to beauty which we see in obscene obesity on the one hand, and in the emaciation of wasting diseases on the other.

In woman the healthy development of her "secondary sexual characters" is part of beauty. She should have a pelvis and a bosom that mark her as capable to bear and nourish a race of heroes. Beauty of female figure is thus a consequence of healthy development. The healthy æsthetic taste of all ages agrees in this. When natural development fails, the corset is used to constrict the waist, and thus give the effect of well-developed bosom and hips. It was used in Knossos, and is used to-day, and this explanation of it, which we owe to Dr. Havelock Ellis, is doubtless valid. But we all know how miserably the lifeless simulacrum of this female beauty, by means of the corset, fails, especially in movement, to compete with natural beauty, which is healthy development of figure.

I said "from top to toe," but the ugliness of our feet, thanks to the diseased joints and skin induced by our footgear, is too distressing a theme. Let us continue to hide and try to forget them.

Hitherto, except for an illusion to gait, we have mentioned only static beauty, such as a mere statue might share. But there is also the dynamic beauty, which even the Venus de Milo cannot share, the beauty which Browning recognises when, in his "Last Ride Together," he reminds us how we all turn from the

best work of artist or sculptor to "yonder girl that fords the burn." This dynamic beauty, the beauty of life in action, is also the beauty of health. If the girl that fords the burn has knock-knees, or even an exaggerated tibial curve—as is fortunately improbable where there are burns to ford, and therefore fresh green leaves and milk to eat and drink—and fords the burn accordingly, we will quickly return to the contemplation of our painting or statue. But beauty and health of movement depend less on these structural factors than on nervous health and vigour and co-ordination. The beauty and sparkle and life of the eyes are, in large degree, dependent upon the movement of the eyeball itself and the eyelids, and the subcutaneous muscles around them, and these are dependent on nervous health, as we realise from the single instance of dropping eyelids, or ptosis, due to nervous failure, and fatal to beauty of the eyes, especially if we know its cause to be morbid. That is to say, we do not think a child's eye ugly when the lids fall because she is sleepy—sleepiness is compatible with health—but we miss the beauty that was in some "beauty's eyes" when the lids droop because she is drunk or drugged, that is, diseased. I cite this distinction because I want to show that what is to be beauty for us *must* be health, or, at least, not disease. And I will venture to suggest that, for those of us who have this sense of health and disease, the normal and the morbid, highly developed, that which would arouse pleasure in its beauty of abounding life, if we knew it to be normal, is not beautiful nor pleasurable, if we know it to be morbid—such as the hectic flush upon the cheek, the unnatural glitter in the eye, or even the alcoholic euphoria and *bonhomie* which seem, whilst they last, "good in themselves."

There is a nobler theme than this of mine, nobler and

yet the same theme on a higher plane, as we may remind ourselves by recalling the etymological cousinship of healthy and holy. In the preface to "Leaves of Grass," Walt Whitman tells us, with the strictest physiological truth, that "All beauty comes from beautiful blood and a beautiful brain." And a little later, having told us what to do with our lives, he predicts the consequences: "Your very flesh shall be a great poem, and have the richest fluency, not only in its words, but in the silent lines of its lips and face, and between the lashes of your eyes, and in every motion and joint of your body." And here, also, the poet is writing inspired science. Turn to Darwin's "Expression of the Emotions in Man and Animals," look at the photographs, and observe how the passions register themselves in the face; and consider that, as the years pass, the most frequent expressions become permanent in the lines of the skin, now less elastic than of yore, but not less beautiful if it registers beauty of soul. I am astonished to look at twenty-year old photographs of the most beautiful face I know, and to observe how much less beautiful it was then, in radiant youth, than now, after twenty more years of beautiful living. But the beauty of health was my theme, and I must leave to more exalted pens than mine the beauty of holiness.

CHAPTER VI

THE FUTURE OF THE BODY

As the astronomer predicts the future course of a comet by observation of its past, so we may anticipate the future of the human body by defining the lines on which it has reached us. The all-significant fact is the lack of any new and outstanding mechanism which may be recognised as constituting our claims to be the paragon of animals. Like all other vertebrates from, say, the frog onwards, we have two pairs of limbs, and no more; like many other such, those limbs possess terminal organs of the standard or pentadigitate type. We have an efficient opposable thumb, but not an opposable great toe. In many notable respects, these limbs are inferior to those of many of our animal inferiors. The skin is pitifully naked, our nails almost futile—as contrasted with, say, the tiger's claws—and, indeed, no one, by observation of the human exterior, could guess his place in the scale of creative evolution. But I need not now repeat the argument of my first article on "Armoured Men," published in 1915, with the object of advocating the adoption, and defining the characteristics, of a helmet for our soldiers.

But we may now ask ourselves whether the principles of simplification and denudation, which our bodies illustrate, are still in operation. Doubtless they are, for the deeper principle upon which they depend is certainly no less valid than ever. That principle may be hinted at

by the use of such useful catchwords as "Brain or Brawn?" "Mind or Muscle?"

For, indeed, "brawn," "muscle," and their like are all going—all in process of reduction to a doubtless irreducible minimum. Such a minimum there must be, since, as the philosophers remind us, we can only make our wills effective by "moving things," and some physical mechanism must be available for that purpose, even if it be only enough to push a pen. But what is no longer necessary is, of course, burdensome; it has to be nourished and drained, though we have better uses for our food and our blood. On the most evident principles of economy, therefore, let it go. Thus, what use have we for the complex and elaborate mechanism of the foot, with its five toes, numerous joints, and four distinct layers of muscles? The thing is an anachronism, and it is going. Long ago, in his twenties, my Professor of Anatomy, the late Sir William Turner, dissected a series of fifty feet, and noted their exact condition. He found that a modern foot which displays all the apparatus of joints, digits, muscles, and so forth, is not the rule but the exception. The foot, as we have inherited it, is going. If we pass from the sole of the foot to the crown of the head, do we not everwhere see the same process in being? As for the teeth, the face was once a mill, but it is now a talking machine. Accordingly, the teeth needed for the purpose of grinding the food—the molars, as we call them—are in course of disappearance. The "wisdom" teeth are doomed, not merely because they are superfluous, but because they are in the way of the mouth's and tongue's new function. One talks more comfortably without them, and their disappearance is not prejudicial to beauty. The incisors are little used for cutting—or, at any rate, for gnawing—nowadays,

but where would our dental consonants be without them, or our ingratiating smiles? Therefore, they are reprieved, as anything may be and is, which can be adapted or promoted from the mechanical plane, where only mechanical ends are served, to that higher mechanical plane which serves and expresses mind. We thus need not fear for our fingers. There was no thought of the piano, the violin, the typewriter, when the frog appeared with its pentadigitate forelimbs; but so long as "five finger exercises" are preliminary to the making of a Paderewski or a Busoni—whom not even the pianola can rival—our little fingers will not share the fate of our little toes.

If it be asked why a different future should be predicted for the terminal arrangements of the upper and lower limbs respectively, the answer is that their fate is contrasted exactly because they are now upper and lower —and no longer fore and hind. The backbone was once horizontal, the surfaces of the body vertical and dorsal, the four limbs all alike used for locomotion, as in the frog. The principal theme in the evolution of the body of man is the attainment of the erect attitude or upright posture or orthograde status by him whom Robert Louis Stevenson rightly called "man the erected," the descendent of "Probably Arboreal." The significance of this change is not that man holds his head higher in the world, but that his forelimbs have been wholly liberated from locomotion. We see the past in the crawling baby, still a quadruped, in whom the backbone has a simple curve, concave forwards, such that a vertical line from the centre of gravity of the body falls in front of the hip-joints, and the body must be supported by the forelimbs. But as the baby develops, its spine assumes a fourfold curve, such that the vertical line from the centre

of gravity of the body now falls behind the hip-joints, and the body is erect. Indeed, its tendency is to roll backwards on the hip-joints, which are accordingly provided in man, and in man alone, with an extraordinarily strong pair of ligaments on their front aspects, to prevent this rolling backwards of the erected trunk. The forelimbs being free now, they and their fingers, and still opposable thumbs, are the organs of the mind. On these grounds, in his Presidential Address to the British Association in Toronto in the 'nineties of last century, Sir William Turner declared that the body of man represents the goal of evolution. The spine is erect, the head poised thereon, the forelimbs free—what more can be imagined?

Little remains but lightening the ship, simplifying and reducing the obsolete and superseded, as in the instances above cited. Curiously enough, there appears to be one exception, though it is commonly named as if it were an illustration of the rule. That is the appendix vermiformis which, we used to be taught, is a vestigial structure, prone to disease like other decadent organs—*cf.*, the wisdom teeth—indeed better removed. We find, on the contrary, that the appendix occurs only in the anthropoid apes and man. It is a recent addition, an appendix indeed to the alimentary apparatus. Nor is it useless. It contains the specific kind of tissue which makes the white corpuscles of the blood, and is accordingly to be regarded as a defensive mechanism. If it be often the subject of disease—in modern man, but whether appendicitis is recorded in naturally-fed apes I know not—and if it be often damaged or destroyed thereby, perhaps we should no more blame it than we should blame the first regiment we sent to repel an invasion if it were shot to pieces.

As for our muscles, which constitute so much of our bulk and weight, and which make such large demands on our digestion and our blood for upkeep, they also are doubtless in process of progressive involution—a more accurate term than degeneracy. We may practise physical culture, aim at weight-lifting, worship the pugilist, but we may easily go wrong therein. The hypertrophied heart of the long-distance swimmer or Marathon runner will do wonders, but it is abnormal, and the coronary arteries, which supply the cardiac musculature, are not proportionately enlarged. In middle life, especially if the ex-athlete "lives well"—which is to live ill—and his arteries begin to age because of the intoxication of his blood, they will fail him mortally, and he will crumple up under pneumonia or influenza, or without them. The longevity of athletes makes a poor record, and if we are to admire and emulate the athlete, let us prefer the game which makes the more of mind, and the less of muscle.

If muscle and bones, teeth and hair, and so forth are to diminish, is anything to remain and increase? Yes, indeed, and that is the brain. Or, to be more precise, part of the brain. There are inferior and decadent senses, as there are inferior and decadent physical organs. The brain began as a smell-brain—in the olfactory lobes of the fish. We still have the olfactory areas, and their corresponding "first" pair of cranial nerves—first in position and in time. But this area of the human brain is decadent as compared, say, with that of a dog. So with taste. These are the primitive, humbler senses. Hearing and vision are the later, and the nobler. They reach further. One cannot smell the stars, but one can see them, and even sometimes faintly hear "the music of the spheres." In the relation of the

sexes, the olfactory, once important, recedes. The poet writes a sonnet to his mistress's eyebrow, not to her fragrance. The cook may be an "artist," but not to rank with Bach or Holbein. When Mr. Chesterton praises "noble wine," but tells us, without shame, that he does not "mind music," we note the fact, but think it polite to refrain from comment.

Always the upward trend of evolution is towards that in which there is most of mind. In 1907, in a course of lectures at the Royal Institution on "Biology and Progress," I ventured to define progress as "the emergence and increasing dominance of mind." In this sense, though we recognise the vast physico-chemical superiority of the oak to the alga, or of the phanerogams, or flowering plants in general, to the cryptogams, we cannot recognise progress in the vegetable world. Doubtless, there is mind in both alga and oak, but I doubt whether the oak has a more intense or dominant psychical life.

We live in a material world, to which we must adapt ourselves or, indeed, and that is the deed of deeds, which we must adapt to ourselves—not merely moulding ourselves upon this "sorry scheme of things entire," but actually able to "grasp," and "rebuild it nearer to the heart's desire." Therefore, we abandon bodily mechanism, as of tooth and claw, only to create superior mechanisms, to fly the Atlantic as never bird did yet, to sweep the deep as never shark or whale, to pierce the sky as never eagle's eye. We have abandoned the finite for the infinite. A bodily organ has its bodily powers, according to the strength of lever and pulley and what not. But the crescent mind and brain of man can harness Niagara or the lightning or the atom; there is no limit to his powers. By taking thought he cannot add

a cubit to his physical stature, but he is the "tool-making animal," as Lichtenberger called him, and thus, in "sky-scraper" or aeroplane, he *can* add countless cubits to his stature. Bergson has written profoundly on this limitless substitution, by the mind, of extra-organic for our organic organs—if the clumsy phrase be allowed. Claws are dwindled to nails—but what of buzz-saws, and the acetylene drill? The modern eye tends to be myopic, but what of the spectroscope by which the physically short-sighted astronomer can see the kinds of atoms in Sirius or Aldebaran?

"In the universe there is nothing great but man, and in man there is nothing great but mind."

CHAPTER VII

THE UNPOPULARITY OF PROGRESS

In the previous pages the argument was advanced that the psychical factors are predominant in man; that mere physique is ceasing to be of value except in so far as it serves the psychical, which is indeed our all; and that "progress is the emergence and increasing dominance of mind." After that argument was first published, the writer of an editorial article in the *Manchester Guardian* accepted its conclusion, but asked a searching question which he rightly described as "open and interesting." He wanted me

> to explain to us laymen the place, in the evolutionary system, of the extraordinarily strong sentimental resistance of man, especially in some periods, to the general direction of his growth? Consider the enormous volume of contempt continuously poured, in England, on any life lived in deliberate accord with that direction; the palpably more living interest of the average schoolmaster in the physical success of his pupils than in their growth of mental power to deal with the world; the immense mass and vogue of the modern literature of adoration for physique, and especially for the types of physical power and skill in which there seems to be the lowest proportion of survival value, in an evolutionary sense; above all, the vehement impulse, Kingsleyan or Kiplingesque, to attribute a mystic aureole of quasi-moral beauty to the man of action as against the man of reason and knowledge, the man of action, in this context, being usually a man of rather rudimentary action, often engaged only in forms of physical action for which no advanced personal equipment is necessary. What serious human impulse, if any, is at the bottom of all these

popular preferences and idealisations? Is there in the mind of the race some essentially sane and rightly purposeful ingredient of reaction playing a part like that of the better kind of conservatism in a State—supplying, that is, an element of brake-power adequate to steady but not to overcome the movement of vital change? Is it just that some races, at some periods, are "naughty," like little boys who feel it virile to get at logger-heads with their environment by lying on wet grass? Or what is it?

In other words, if progress be as I have defined it, if the psychical factors be supreme and all-important in man, if naught else in him be really noble or human, why is progress so unpopular? The suggestion that the popular contempt for mind and worship of muscle is a "sane and rightly purposeful ingredient of reaction," functioning as a brake, is ingenious, but I, for one, reject it here without argument. The contrary suggestion, that this is a symptom of a "naughty" period, seems to me to be consonant with the observed facts of history.

For the sentiment described in the foregoing quotation is not universal or constant. Readers who are vastly better acquainted than I with the records of the past must surely be able to name times and places where brains were most highly esteemed, though not by any means to the unnatural or quasi-mystical despite of the physical. How was it in the Age of Pericles, for instance? How has it ever been amongst the Jews? To-day, so far as the United States is concerned, I can testify from very wide observation in the two past years that my commentator's description of popular sentiment is not applicable. Of course, there are plenty of base-ball "fans" who will travel a long way to see "Babe" Ruth hit a "home run"—as he twice did when I went

to see him myself, and athletics are splendidly cultivated at the universities, as the Olympic Games of 1920 demonstrated only too thoroughly from the British point of view. But the respect for brains and the belief in education are intense and universal; indeed, they are positively Scottish, probably owing a great deal to the Scottish elements in the American civilisation. When required to lecture in the "Civic Centre," during a recent International Congress in Washington, I was informed that it was in the Girls' High School, which sounded like some mistake somewhere, until I was told that, in honour of education, and in order to remind citizens of its place, and their relation towards it, the largest and finest auditorium in the capital of the Republic has been built in the centre of a girls' school.

Perhaps the reader can name, as I fear I cannot, a period or periods when education, and the things of the mind, were honoured in England as they have been in Scotland since John Knox founded the village school, and as they are in America now. Such a period has not been within my lifetime, but I am certain that the unpopularity of progress is more intense in England since the war, and as a result thereof. In Scotland, and in America, too, one has been told that the war has had the same tendency—though that was hard to believe in the latter instance. But certainly it is on record that, though the American Civil War was won by the side which was fighting for a moral principle, at least one great reform, the closing of the saloon, was not merely arrested, but put back for many years by it. We know that similar phenomena to those of to-day were observed here after the Boer War. It was, perhaps, the same in Prussia after the Franco-Prussian War, when Bebel said "*Das Volk ist siegestrunken.*" On the other hand, the effect of *defeat* upon Prussia was directly the reverse

of the phenomena which I am here trying to connect with the close of a victorious war. We remember that, after Prussia had been overrun by Napoleon, there rose such men as Fichte, that the impoverished State began its work of reconstruction by spending a vast sum of money upon the creation of the University of Berlin, and that the Prussia which avenged herself in 1871, was avowedly the product of the "Prussian schoolmaster." It remains to be seen whether, as I for one expect, history will repeat itself. Meanwhile, amongst the fruits of victory in Great Britain are to be reckoned the unparalleled popularity of boxing, and the unchallenged postponement of the recent Education Act, by way of economy. Such things I take to be essentially morbid symptoms of the *Siegestrunkheit* of the popular mind, and of those who represent it only too accurately at Westminster.

There is a natural phenomenon, however, not to be connected causally, as a rule, with war or any exceptional or pathogenic factor, which bears upon our question. We know that some of the lower animals are of higher type in youth than in maturity. The young barnacle is a free-swimming and promising creature, and its adult state, which is unquestionably degenerate, is not morbid but normal, for the barnacle. Now, missionaries who devote themselves to the education of, say, Australian aboriginal or Kaffir children, are delighted with their young charges, and entertain high hopes of their futures. But these hopes are dashed to the ground at puberty, when the promising boy turns into a man whost interests are chiefly sexual, when he is not sleeping, eating, or hunting. Generally speaking, the child of the lower races degenerates at puberty, and, whilst the development of the beard, of the cranial bosses above the eyes—filled, alas, not with brains but with air—and so

forth, are stigmata of (quite normal) physical degeneracy, the really important fact is the decadence of the intelligence and the *moral* which were so promising in the child. Neither Stanley Hall nor Havelock Ellis, nor any other writer, so far as I know, has adequately dealt with this outstanding fact—that puberty, adolescence, the emergence of the sex instinct, involves or coincides with or implies psychical degeneracy in the men (rather than the women) of the lower races especially, and in most men of even the higher races. If we knew anything of the factors of such degeneracy we might, perhaps, be able to control it; but we know scarcely anything.

The ductless glands are involved. They have to be considered, not only individually, but also as a whole. If the "endocrine balance" be much disturbed, normal development of the individual is impossible: he becomes a giant or a cretinous dwarf, or grows senile in his teens, or what not; but most frequently of all he will become some kind of a fool. We are studying the effect of diet, and especially of the vitamins, upon the "endocrine balance"; but we know very well that purely psychical factors may directly and extremely affect the ductless glands and their secretions, both qualitatively, quantitatively, and relatively to one another. It may be that the psychical atmosphere of war, with its worship of force and contempt for the spiritual, is now affecting the "endocrine balance" of our adolescents, so as to modify temperament and instinct-emotion in the directions which exalt muscle and sex and make progress, as I have defined it, unpopular.

This is the best I can do for my questioner, and a poor best, no doubt, but in these realms we can only speculate as yet, for we know nothing certainly: except that the long and deep trough of the wave after "victory" is a damnable epoch through which to have to live.

CHAPTER VIII

THE LONGEST PRICE OF WAR

LONG before the modern advocacy of eugenics by Galton, a few perspicuous thinkers, seeing through the dust and smoke of immediate events to their far consequences, had taught that military selection of the fittest for war is "reversed selection," killing the better to save the worse. During the first decade of modern eugenics, 1904-1914, I continuously cited this Darwinian and eugenic argument against militarism, to which, unfortunately, Galton himself never referred. To-day this argument, expressly set forth in their day by Benjamin Franklin, Herbert Spencer, and Charles Darwin, is seen of all men to be true. In terms of it we may re-read some of the pages of history.

We all find reasons for the fall of the Roman Empire according to our creeds, instincts, and prejudices. But some of the reasons advanced actually have reason in them, and there is much to be said for the theory that the incessant drain of the right kind of military stuff from the population of Rome led, in the long run, to the production of that degenerate people who wished only for *panem et circenses*. The recruiting officer rejected the halt and the blind, the feeble-knee'd, the easily fatigued, saying, though he did not know it, "You are not good enough to be a Roman soldier; stay at home and be a Roman father." To and by military conquest the future of the race was ruthlessly sacrificed.

The thesis here maintained evidently depends upon the truth of its fundamental assumption, which is that the qualities for which would-be soldiers are chosen to be killed, or rejected to breed, are inherited. When some of our brave boys died at Rorke's Drift, their "savage" antagonists expressed a just belief in heredity, saying of them, "These were men *whose fathers were men.*" We now definitely know that, not without important exceptions which we must recognise and define, this belief in heredity is justified. The modern studies in, for instance, the heredity of stature, come in our own decade most signally to strengthen the celebrated observation of Michelet, that the Napoleonic campaigns had lopped a cubit from the stature of the Frenchman. That assertion must not be taken too exactly, in the absence of the necessary data, but it expresses a general truth which entirely warrants the remark of Professor J. Arthur Thomson, that not even the discoveries of Pasteur—which, as Huxley remarked, sufficed to pay the whole indemnity after the Franco-Prussian War—could restore the physique which the victories of Napoleon's armies had destroyed. Many observers in the past years of war have noted the small size of the French soldiers, contrasting them with English and German, and indeed the minimum limit for enlistment in France was only five feet and half an inch. "A boy," Napoleon came to say, "can stop a bullet as well as a man"; and the remark is an index to the destruction of the well-grown of all ages, which his lust for power had already achieved.

Doubtless military training benefits the individual trained. When presiding at a lecture of mine on this subject in November, 1914, Lord Sydenham adduced this fact as compensatory to my argument. But, waiv-

ing the obscure question as to the degree in which the effects of exercise are inherited, we must observe that the race can in no wise benefit if those whom we train are then sent forth to be slain.

History repeated itself. The correspondents during the war told us how, in Paris and elsewhere, none of the *able-bodied* remained between, it might be, the ages of sixteen and fifty. How, then, was the race being recruited while the regiments were being thus recruited? And meanwhile the past was being paid for. With some personal knowledge of, and love and admiration for France, I can scarcely doubt that the heaviest burden under which she bowed during the war was the lack of those sons of hers whose grandfathers-that-should-have-been fell a century ago. "Wars are not paid for in war time: the bill comes later," said Benjamin Franklin, the first, so far as I know, of those who have seen the longest price of war; and we may realise the truth of his saying when we refer to the careful researches of German and other historians, quoted by Dr. David Starr Jordan in his "Human Harvest," who have shown the steadily increasing deficiency of soldierly men to fill the Roman Legions, and the evident reason therefor.

In the first days of the war, passing through Hyde Park, I used to look with homage and admiration and sorrow at the splendid boys who were preparing themselves to fight for friends and freedom. And also I looked at the tramps and ne'er-do-wells, the broken-down, tuberculous, ricketty, alcoholic, and syphilitic, who breathed the same air, and loafed, or mostly lay, upon the same grass. Some of them had been rejected by the recruiting doctors; many never applied, knowing well that they would be refused; most, I fancy, had never applied, lest they should be accepted. The brave, the

vigorous, the healthy, the patriotic were taken, and the others left. Evidently, under a voluntary system, military selection is more calamitous and costly than ever, except in so far as the volunteers win more quickly. Not for a moment do I assert that all the defects of brain or body which keep a man at home are hereditary. Some are merely somatic and local accidents, which, according to what we know of the laws of heredity, are not transmissible. But many are inherited, and many more are due to the racial poisons, which involve the injury or ruin of future offspring. For such defects many men were refused at the recruiting centres, while many who were then passed were later rejected by the army surgeons; and the rejected recruits recruited the race. If nations sent their trash, instead of their treasure, to fight their battles, then indeed war might be defended as a dreadful purgative of nations—God's medicine for the human race, as Treitschke called it; but rather, because they must, nations send the blood of their best.

Here is the evident and final answer to Treitschke's shallow and pretentious "Lectures on Politics," and to his military pupil, General von Bernhardi, when he teaches that it is not only the right but the duty of a strong nation to make war, and so to make itself stronger. We have seen whether the Germany whom these villains so cozened was stronger in the end thereof. Bernhardi, like his master, and like Houston Stewart Chamberlain, impresses into his service every piece of sham biology and exploded anthropology that can serve his purpose. Every question-begging phrase that may avail this venomous trio of quacks is employed, in any meaning that may be required. Bernhardi has obviously never read Darwin, and indeed Treitschke's lectures seem to be the only book this most forcible-feeble of thinkers has

ever read at all. But he bases his whole case on Darwin's principle of natural selection, and the survival of the fittest. In war he finds the greatest and therefore the most sacred and admirable application of the Darwinian principle. "War," he says, "is a biological necessity." "War is the father of all things," he quotes from Heracleitus. And he adds: "The sages of antiquity, long before Darwin, recognised this." The honest student knows that Heracleitus did not mean what Bernhardi wishes him to mean, and that Darwin not only never recognised what Bernhardi asserts he did, but explicitly and formally repudiated the Nietzschean or militarist inference from the principle of natural selection. Bernhardi and his school, including plenty of thinkers—or, to be more precise, of writers, speakers, and politicians among ourselves, though these, during the war, began to decry militarism, and did not resume their instinctive creed until peace was declared—appeal to Darwin for their brutal gospel. To Darwin they shall go. Here is his judgment:

> In every country in which a large standing army is kept up, the finest young men are taken by the conscription or are enlisted. They are thus exposed to early death during war, are often tempted into vice, and are prevented from marrying during the prime of life. On the other hand, the shorter and feebler men, with poor constitutions, are left at home, and consequently have a much better chance of marrying and propagating their kind.—("Descent of Man," Chapter V.)*

This is that same gentle, humane, and truth-seeking Englishman who wrote of "disinterested love for all

* A comparison between the first and second editions, 1871 and 1874, of the "Descent of Man" will show that Darwin greatly added to and supplemented his statement of this argument, presumably as the result of his thought about the Franco-Prussian War.

living creatures, the most noble attribute of man." How absolutely characteristic of Bernhardi and his school, in all countries, and in all times, where and when they are not afraid to say what they believe, is this impudent citation of a noble author whom he has never read, in order to support a lie which that author loathed and exposed half a century ago.

Not even Galton ever fully appreciated the importance of the female side of race. Every man knows, or should know, that the mothers are racially and nurturally even more important than the fathers, but all our ways of thinking, naming, and acting conspire to make us forget this truth. Not one of those who have already written upon the dysgenics of war, has alluded to the fact, which is surely all-important, that this process of reversed selection is mercifully confined to one sex. It is easy to understand why Amazons have played no great part in history. If military selection, besides choosing to kill all the men who can bear arms, similarly chose and slew all the women who can bear babies, mankind would have exterminated itself long ago.

But, in any case, the effects are disastrous enough. For myself, I believe that the argument here outlined is worth as much more than the economic argument of Mr. Norman Angell, as life is worth more than gold. This argument resembles Mr. Angell's, however, in one notable respect if perhaps in no other. It certainly does not resemble his in leading to the conclusion that we should have stood aside while Belgium was murdered. Better racial ruin—to say nothing of a more sordid plea —than eternal infamy. But, like Mr. Angell's, this argument is coldly impartial. Victory and defeat, as Napoleons and Cæsars, or Kaisers, reckon them, are nothing to it. If good blood is spilled, and bad is

spared, the racial consequences, whatever the military or political, will be what they will be; and they will have their own consequences — military, political, and all other—in their season. We hear much to-day of the economic ruin of Germany. We have seen her political run. But to read of the destruction of her strong young men is to suspect that her racial ruin is almost in being too. What do those losses mean for the innocent Germany yet to be? She will not be the first example in history, though I hope she will be the last. This, in the long sequences of history, is the real Nemesis of militarism. Germany was once a noble nation. But it won three victories and became *siegestrunken*, as Bebel once said. Thus intoxicated, the ex-Kaiser and his parasites went a-whoring after Bellona, the deadliest strumpet that ever wrecked the souls and bodies of men. "For she has cast down many wounded: yea, many strong men have been slain by her." The bully and his hordes had their loathsome fling, bludgeoning those whom they were pledged to defend, and exulting in their infamy, but

> These violent delights
> Have violent ends, and in their triumphs die.

The German historian, Dr. Seeck, whom the rulers of Imperial Germany forgot, says that in Rome, out of every hundred thousand strong men, eighty thousand were slain. Out of every hundred thousand weaklings, ninety to ninety-five thousand were left to survive. Such figures will raise many queries in the statistical mind, but they indicate what assuredly happened. No wonder that "Vir" gave place to "homo," and that, as the English historian, Sir John Seeley, has said, the Roman Empire perished for want of men. Nature is not mocked, nor are her decrees the fickle whims of megalomania;

the megalomaniac nation of 1914, and he in whom its ghastly vanity was incarnate and symbolised, will surely be remembered by the age to come as merely the blind and bedizened minions of the same constant laws of life which have successively avenged themselves upon militarism, that insanity of nations, with its symptoms of national "murder and suicide," from the dawn of the historic epoch until to-day. Bernhardi, not content with attributing to Darwin the creed which Darwin refuted, grows more daring still, and quotes for his ugly purpose the powerful metaphor of Christ: "I am come not to bring peace, but a sword." He omits, however, another saying which an honest student would have found and remembered. The argument now before us, and this argument alone, plumbs the depths of the ageless doom uttered by the Prince of Peace: "They that take the sword shall perish with the sword."

More than a decade ago I had prepared for me, and published, a series of maps, which compared in a cogently graphic form the populations and areas of the leading empires of the world, together with the comparative densities of their populations. Something is said of that in the next chapter. It is, far beyond all else, the problem of the future. The wild disparity between the proportions, areas, and present natural growth of our own and the German Empires respectively, was a fact which I then discussed; but look at that disparity to-day. Of all fields for statistical inquiry there is none so wide, so fruitful, so needful of attention as this. I see no prospect of our continuing to hold our almost empty Empire in the coming world unless we are prepared not merely to own, but also to occupy it, not merely to police, but also to people it. The political economy of Ruskin, so much despised by our fathers, will vindicate itself ere long.

In fact, it may be discovered that the true veins of wealth are purple—and not in Rock, but in Flesh—perhaps even that the final outcome and consummation of all wealth is in the producing as many as possible full-breathed, bright-eyed, and happy-hearted human creatures.

THERE IS NO WEALTH BUT LIFE—Life, including all its powers of love, of joy, and of admiration. That country is the richest which nourishes the greatest number of noble and happy human beings.

It is open, I repeat, to serious question, which I leave to the reader's pondering, whether, among national manufactures, that of Souls of a good quality may not at last turn out a quite leadingly lucrative one.

In these times, when the war has taught all who can learn, what an age of ease could not teach the common mind, we begin to see that a nation should not put its faith in fortresses, nor yet, at long last, in big siege guns, nor even in Dreadnoughts, which dread a few brave boys under the water. Now that the lie we fought, that might is right, and the liars who propagated it, to satisfy their cold and cynic lust, are nailed for ever to earth's counter, we shall be wise to live by the everlasting truths that the only trusty forts, foundations, and bulwarks of empire are living, and that, in peace and in war, for the land of all our loves, and for the age to come, there is nothing so strong nor so precious as Men.

CHAPTER IX

POPULATION-PRESSURE AND THE LEAGUE OF NATIONS

Our illustrious ally, France, is deeply perturbed—as we learn from the Press, from the lips of no less intrepid and triumphant a soldier than Marshal Foch, and from all and sundry in Paris, according to my own experience there—at the prospect of a future German invasion. What can this mean? The French are magnificent warriors; they have conquered; they have terms of peace which will immensely weaken the material resources of Germany, and they have great allies. And yet these brave and glorious people fear the future and frankly say so.

The reason is only too simple, serious, and obvious. The French know that no terms of peace, no material indemnities, no international system, can alter the one fundamental fact of the vast preponderance of German numbers. There is the unalterable fact. Do we not, indeed, know that several millions will actually be added to the population of Germany by the inevitable inclusion of German-Austria? In other words, the ironic result of the victory of France will be still further to aggravate the disproportion of numbers which underlay the whole history of the past war years. What kind of omen is this for Marshal Foch and all others who know that, other things being equal, as they constantly tend to be, Providence is on the side of the big battalions? I know *ad nauseam* all the foolish things said by the neo-

Malthusians and others who hate the idea of having to pay a farthing rate for the care of other people's children, as to the futility of Russian numbers. Those numbers, when in action, saved us from the defeat which stared us in the face when we lost them and until other numbers came across the Atlantic to replace them; and if the simple or selfish here think they have heard the last of Russian numbers, Marshal Foch does not.

In a word, we are observing and fearing the operation of that which I have often discussed, before and during the war, as the *law of population-pressure*. This is the name given to it by Major Woodruff, of the United States Army Medical Service, in his volume, "The Expansion of Races" (Rebmans, New York, 1909). The book is not academic, and its style can be understood to have prejudiced it in some eyes; but the author is a serious student, and he has behind him no less a thinker than Darwin, to whose fundamental principles his argument conforms.

Briefly, Woodruff finds in the laws of population-pressure, comparable to those of gaseous-pressure—where molecules correspond to individuals—the chief efficient cause of wars. He argues that many past wars, which have been called and thought dynastic or religious, were really due to this cause, which we may define as increasing inequalities of population-pressure.

France and Prussia had approximately equal populations in 1870. The present disparity is due to various causes; but, whatever they be, their omen is alarming. The French, a more intellectually mobile and advanced nation than the Germans, began much sooner to limit the growth of their population. The consequences are before us. Until the outbreak of war, whilst the population of France was approximately stationary from year

to year, the German population was increasing by about 900,000 *per annum*, and ours by half that number, the Germans having, of course, a very much larger population than France or Britain on which to make this annual increase. There is evidence to show, further, that the scoundrels who ruled Imperial Germany deliberately discouraged male emigration in order to raise as fast as possible the "head" of population-pressure which they desired to direct towards France. Germany has suffered racial injury from the war; but what I have called the longest price of war is paid by the victors and the righteous as by the defeated and the aggressors. The losses of France involve a million and a half of men who should have been the fathers of her future, and her population in 1919 was *three millions less* than it was in 1914. The comparative figures for different countries, as shown in a new official publication of which M. March, Directeur-Générale de la Statistique de la France, kindly gave me a copy in Paris recently, show the age-long price which France will be paying for her defence of freedom in these past years.

Let us look again at the figures appended to the "Comparative Map of Empires"* which I first published in 1910, after reading Major Woodruff in the preceding year:

	Home Population.	Area in sq. miles.
British Empire ...	... 45,000,000 ...	12,000,000
German Empire ...	... 70,000,000 ...	1,236,000
France and Colonies	... 40,000,000 ...	4,207,000
Japanese Empire ...	... 50,000,000 ...	246,000

Observe that these figures, biologically considered, are mad, and that they seem none the less so when we

* This map is to be found also in my "Plea for Parenthood," a pamphlet published by the National Council of Public Morals in 1917.

make all possible corrections. Thus we find only fifteen million British in our stupendous Empire outside these islands. Australia, which could home a hundred millions, has one person to the square mile; her population has just reached five millions, say, two persons for every three in greater London. Canada—one of the world's greatest granaries—has two to the square mile. We own, but do not occupy, an empty Empire. The war has affected the balance in a fashion which may be just, but is biologically still more unstable. We find ourselves with an Empire much larger than ever. Germany loses her overseas possessions, and may find herself compelled by her enemies to contain her own rising population-pressure until it reaches an explosive point, which may mean their mortal danger. And we hope by means of a League of Nations to prevent future wars.

There was no biologist at the Peace Conference, yet here are biological considerations which may invalidate all its efforts. We have seen that France is really aware of, and desperately concerned about, them. They also concern all mankind. For it would appear that, if they be valid, no League of Nations is safe which proposes to make permanent certain present and increasing inequalities of population-pressure. Such inequalities, which are against the nature of things and must, and always will, sooner or later correct themselves, may be relieved either by the violent explosions called wars, or by individual migrations, or by actual alterations of frontiers. If all three of these be forbidden, the first will sooner or later occur, prohibitions notwithstanding. The majority of Frenchmen, including Marshal Foch, anticipate and fear a future German invasion, as we have seen, on the grounds, implicitly assumed, which have here been explicitly stated; and we observe that

the alterations of frontiers resultant upon the war will have the effect of *increasing* the inequality of population-pressure which must tend towards future wars. Turn to another part of the world and consider the case of the numerous, energetic, rapidly-multiplying Japanese, whose recent figures are half as high again as those quoted above. The Japanese are very unwelcome immigrants in California and Australia. The Australian Commonwealth will not have them and, until recently, would scarcely welcome any immigrants at all. This is perfectly intelligible; the Japanese work hard, and are content with a low standard of life, to which the Australian could not, and would not, descend. But the biologist, remembering the fundamental principles of natural survival, and observing the uniform historic fate of leisured, highly civilised and prosperous peoples, cannot view without alarm proposals the effect of which must be to bottle up the rising population-pressure of Japan, denying it the provision of a safety-valve. I am well aware of the intensity of feeling on this subject which exists in Australia; but the facts, and that with which they are pregnant, remain.

In general, therefore, I reiterate the following propositions:

That, in order to prevent future wars, any Society of Nations must either

(1) Provide for future modifications of frontiers, in order to obviate the dangers of juxtaposition* of one hungry, tightly-aggregated population with another, sparse and abounding in food;

Or (2) provide for emigration and immigration such

* In the modern world Japan, Australia, and California are juxtaposed in this sense.

that these dangerous inequalities of population-pressure, with their explosive risks, called wars, may be averted.

These two propositions were included in my lecture at the Royal Institute of Public Health in October, 1918, and early in 1919 I submitted them to the National Birth-rate Commission, which accepted them and sent them to Lord Robert Cecil in Paris. They were ignored by the men there assembled, who exactly illustrated therein my definition of the politician as one who is always thinking about the next election, whereas the statesman is always thinking about the next generation.

It would seem, therefore, that the biologist who hates war as, among other evils, the destruction of the best, must rely upon public education to avert, by the wisdom and good-will of the States concerned, the risks to Peace which are involved in the law of population-pressure and which the constitution of the League of Nations, as made at Versailles, did not undertake to avert. Let all the living know that the earth is for Life and the fulness thereof; and that no dog has natural tenure of a manger.

CHAPTER X

AFTER-WAR MORAL AND ITS TREATMENT

If the following chapter appears to partake of the nature of a sermon, I can only reply that the times need one. The sermon required should be delivered, however, not by a preacher, but by a teacher, and we sometimes need reminding that teacher is precisely what the Latin word doctor means. The national mind is suffering from grave post-bellum disorder with chronic delusions; diagnosis and treatment are urgently required, and for want of a better social physician I must essay the task.

The general phenomena are such as are always and everywhere found after a war, but there are special features which depend upon the fact that not only have we been at war, but that we were amongst the victors. Degeneration of national moral after war is a universal phenomenon, whatever the militarists may say. It shows itself in many and diverse ways, most of which do not here concern us. War in modern times involves the use of the most highly developed intelligence and the most complex scientific resources, but its fundamental nature remains unchanged. It is an appeal from reason, justice, and order to violence and brute force. Thus it is essentially a reversion to savagery. For several years we thought, because we had no choice, in terms of murder and sudden death and of getting what we wanted by means fundamentally contrary to those which we approve in civil life and by which alone the health of civil life can be maintained. It is time to

ask ourselves afresh what are the terms and conditions of civilisation and of national health in the highest department of the national being, which is the national mind. We cannot continue along these present lines : the essentials of our structure are going to pieces. To say that we are in grave danger of national decadence may sound absurd in view of our success in the war. We forget that all our Imperial predecessors without exception have gone down in the night of time and that there is not a vestige of evidence to suggest that they were destroyed by any other than internal causes, dependent essentially upon the conduct of the Imperial people, when they no longer had any external enemies to fear.

Our social phenomena to-day closely resemble those of decadent Rome. The birth-rate has reached—by similar volition, though by different means—a minimum amongst the professional and educated classes, amongst occupied women and persons of independent means. As for the mob, its cry is for "Beer and Games," one degree worse than the *Panem et circenses* of the mob in decadent Rome. There is a general belief, which may be none the less operative because it is subconsciously held rather than explicitly stated, that it is our privilege, as an Imperial and victorious people, to prosper quite independently of the ordinary humdrum laws of Nature, which declare that if a man will not work neither shall he eat, and that the straight and honest route for prosperity is to work and to save.

What is really involved in "the survival of the fittest," the most famous of all Herbert Spencer's phrases —indeed, the most famous phrase of the nineteenth century?

On our earth at present, as ever, there are nations or races which rule and others which are ruled—some

Imperial and others almost slaves. We have inherited the Imperial status, and, having lately shared in the conquest of Imperial Germany, we seem to have finally confirmed that status. On the contrary, I believe that in the essentials of national conduct we were more secure in 1914 than we are to-day. We deceive ourselves when we suppose that we are an Imperial race by right divine, by Nature's final verdict; and some of us, I fear, suppose that it is even our Imperial privilege to idle and speculate, to guzzle and booze, whilst common folk and subject races slave. But is it true that an Imperial race is one which idles and gambles and plays whilst servile races work?

Not if Herbert Spencer's phrase means anything, not unless Dame Nature stands on her head—an exceedingly improbable attitude for that circumspect and ancient lady. The great nineteenth century pioneers of evolution may all be cited as witnesses: Alfred Russel Wallace, an extreme socialist, used the phrase "the struggle for existence"; Herbert Spencer, an extreme individualist, wrote of "the survival of the fittest." Both were entirely agreed as to the terms of life and success, in the long run, for any species or Empire. They taught that the individual or the species or the race or the nation which survives and continues to survive is that which is fittest in Nature's sense—that which lives and works and saves harder and more wisely than any other. That is the profound and simple condition of Empire, which we are in danger of forgetting, like all Empires before us, and for the same obvious reason.

Lest the reader should suppose that these observations apply only to some super-human entity which we call society, let us remember that society is composed of individuals, and that the question in the last resort is,

"What is each one of us individually thinking and doing in these times?" John Ruskin condemned the historians who wrote only of externals, describing the rise and fall of "visible governments," for he knew and taught that every nation has an "invisible government," as he termed it—in the conduct of its individuals, who secretly determine its fate. Therefore, whilst attempting to submit these quasi-philosophic and apparently abstract generalisations to the reader, I should like to attach to them the American exegesis appended to such admonitions as "Please shut the door":—"This means you!"

It is one of the facts of evolution that old standards of survival are superseded. My American observations have convinced me, as such experience must convince anyone, that if we are to retain our place in the world it will not suffice to maintain that standard of efficiency and foresight and sanity which constituted us the fittest in the nineteenth century. The standard has gone up, and we must conform to it or fall behind. I fear not only the inhabitants of the United States, but those of Japan. It is of no avail to appeal to the past. With Nature it is always "anybody's game." She has no room among her ruling races for parasites, even if they be the children of the most efficient and successful workers in history. If the Japanese of to-day ask less of life and give more to it than we do, they are to be feared. If in America, as in pre-war Germany, the application of science to industry means the creation of wealth by legitimate means such as Nature approves, it behoves us to increase our national wealth no less efficiently.

A drunken man has lost his judgment, but is convinced that it is unimpaired. We are in that condition

as a nation to-day. We are drunk with victory, though, indeed, I do not know in what really fundamental and biological sense we can be said to have won the war; but, whatever the nature of our victory, it is high time for us to "sober up," in the third year after the Armistice.

Any reasonable person, even with a minimum of financial knowledge, such as my own, can see on all hands the symptoms which prove the disorder, the victory-intoxication of the public mind. The recent records of Harley Street would abundantly confirm this opinion. Here is a nation in debt, which means individuals in debt, yet we are spending as we never spent before. What do we get for the enormous sums which we ought to be saving? Certainly not increased happiness nor immunity from disease nor length of days. We are not accumulating anything tangible and lasting, such as good houses: we are simply consuming. It, of course, avails nothing from a national point of view that our immense expenditure in certain particulars, as on alcoholic beverages, brings in a revenue to the State if, corresponding to that expenditure, there is nothing but destruction and consumption, whilst America forges ahead and makes a pace which we show no signs of being able to stand.

When we come to our senses, of which awakening I see as yet no sign whatever, we shall discover that we must save and invest for all we are worth in those things without which our national life is in serious danger. Witness the deplorable ill-success of our appeal for money at six per cent. wherewith to build our houses. No, that is not good enough for us nowadays; we will take our chance of something that promises more. Where are patriotism and sanity? Our population

to-day is abominably ill-housed; the urban conditions are disgraceful and are only rivalled by the rural conditions. Let us seriously ask ourselves what this failure means.

Sane investment in those things which a nation needs for its life is a fundamental part of our social structure. Nothing do we need more at this moment than new houses. The National Birth-Rate Commission has reported on this matter, with special reference to marriage, parenthood, and the birth-rate. As everyone knows, or ought to know, we are not providing houses at this moment even for young people who wish to marry. Still less are we providing houses for those who wish to marry and have children. The present disgraceful condition of our national housing is thus directly responsible in part for the two sinister facts, first, that the legitimate birth-rate is so exceedingly low amongst the most responsible and provident persons; and, second, that the illegitimate birth-rate is deplorably maintained.

It has been already suggested that the present morbid condition of the public mind is due not only to the fact that we have been at war, but that we were victorious therein. Two historical instances of the salutary effects of military defeat may be briefly recalled. The first, to which allusion is made elsewhere, is the case of Prussia, after her overwhelming defeat by Napoleon. Thanks, above all, to the inspired teaching of the philosopher Fichte, and thence to the "Prussian schoolmaster," she made herself, within a comparatively short period, an incomparably greater and more powerful nation than she had been before her defeat. The second is the case of Denmark, after her defeat by Prussia—herself made great by defeat. The direct result of Denmark's military reverse was an unparalleled devotion to

work and to sane investment in agricultural development. By the steady application of capital and brains and industry to the cultivation of the soil, Denmark made herself the acknowledged leader and tutor of the world in dairy-farming, thus achieving great prosperity and becoming, as she is now, by far the best-fed nation in Europe. Let us beware lest *we* illustrate, *per contra*, the truth of the proposition which history everywhere supports, that Nothing fails like success.

In the minds of many, there is to be observed a hasty misinterpretation of such arguments as may be adduced against "Capitalism." It is assumed by many persons that, because the working of a capitalistic system—whatever that may exactly mean—is open to criticism, such criticism is equally applicable to capital. Let it be recognised that Sir Leo Chiozza Money, in his objections to capitalism, does not encourage this fallacy, but freely acknowledges the paramount necessity of capital in any civilised society. This necessity requires that we shall save and sanely invest. Even if everything ought to be "nationalised," thrift and sane investment are necessary alike under our present system or that which some thinkers regard as preferable. No defence, on any theory, can be made for those writers of the socialist school who make a point on every possible occasion of jeering at thrift, and attempting to identify it with meanness. Their object may be in some way to discredit the present system and hasten the coming of what they regard as a better one, but their effect is simply to encourage improvidence and extravagance. They apparently forget that, if we ruin the nation altogether under the present system, we shall have no opportunity of replacing it with a better one, or one supposed to be better.

We are an intensely undisciplined people, and we glory in it. Reckoning ourselves superior, as individuals, to those of other nations, we assume that our nation, composed, by our hypothesis, of superior individuals, must be superior to other nations. It does not follow. In the international struggle, the strength of the social structure is no less important than the quality of the individual units. In terms of individual physique, keenness of the senses, and so forth, Red Indians and many other races are far superior to the members of more highly civilised communities; but those higher communities are dominant notwithstanding, because of their stronger social structure. We must build up a social structure that is strong, and the parallel lines of wild expenditure and wild speculation by no means lead to that essential end.

More and better work: that is what the national welfare requires, and requires of us. We must therefore seek to establish those psychical conditions which are favourable to work. "Great expectations," on the part of an expectant legatee, are notoriously unconducive to steady and honest work on his part. A rare youth he must be if they do not paralyse his exertions. Similarly the prospect of making money easily by speculation paralyses the speculator. From the national point of view it matters not a straw whether his speculation be a success or a failure. In either case, the fact that he looks to speculation instead of to work and thrift and sane investment for his prosperity means that the nation does not get from him what our nation now requires from all its members—steady, faithful, productive labour. Infinitely better would it be if it were impossible, in our nation with its present needs, for any man to prosper except by hard work and economy. The

thief, the trickster, the gambler with cards or horses, the wild speculator, are all in the same category, judged by our present national necessity; they are not doing the honest work without which our nation cannot thrive; and whether they are personally successful or unsuccessful affects that verdict not at all.

From the biological and scientific point of view, it is clear that colossal new stores of capital are now urgently required in order that our country may compete successfully with Germany and the United States; nay, in order that the large population of these small islands may even be fed in the near future. I have referred already to such a fundamental necessity as sober investment for the erection of our new houses, in order to meet the fundamental biological necessity of shelter from the elements. The production of food is no less essential. Denmark, profiting by defeat, made herself the best fed nation in Europe, as we have seen. Ours is the worst-fed population in the world, as we have seen. Not much longer can we rely on other continents to feed us. Their own populations are growing. We must realise the potentialities of our own soil. That crisis in the provision of our necessary food supply which the late Sir William Crookes, our master-chemist, predicted in his famous Presidential Address to the British Association in 1899, is now at hand—at the very date which he then predicted for it. In 1915 I drew attention to his work, and the late Lord Rhondda was public-spirited and far-sighted enough to pay, at my suggestion, for the production and publication of a revised edition of his book, "The Wheat Problem."* Readers of that volume will

* "The Wheat Problem," by Sir William Crookes, O.M., with an introduction by Lord Rhondda. New and revised edition, 1918 (Longmans, Green and Co.).

learn that an immense agricultural development is an immediate and fundamental national necessity if we are to avert nothing less than famine within a measurable period. For that development we require a vast extension of chemical industry, especially in respect of the home production of fertiliser in the form of fixed nitrogen. Sir William Crookes himself was the pioneer of this possibility. The Germans now lead the world, at an immense distance, in this fundamental industry, which an Englishman of genius made possible. Ordinary Englishmen would do well to save all the money they can and be content to obtain a reasonable return for it in providing capital for all those home industries, primarily chemical in nature, which will ensure for us an adequate supply of home-grown food in future.

These two instances, of the erection of houses and the production of food, I offer to the reader as merely typical of the kinds of domestic enterprise—promising, I presume, only very moderate returns for our money, but returns which are assured. These, for any patriotic Briton, must be regarded as immeasurably preferable to speculative enterprises which may pay some lucky individuals far better, but which cannot serve the national interest in any comparable degree.

From the medico-psychological point of view no less strong a case can be made, in the individual interest, against speculation and for thrift and sane investment, than has already been outlined from the point of view of the national interest. What we are all naturally and rightly after, as individuals, is happiness. Perhaps, therefore, we should do well to ascertain, in the first place, how and where happiness is to be found—what are its veritable and abiding sources. The common

verdict of the world is evident, if we look round at the wild hunt for money which has neither been earned nor deserved; but the verdicts of psychology and medicine are "very otherwise." Let me introduce to the reader's notice a term and a concept, known in medicine as *euphoria*, which may very probably be unfamiliar to him.

We hear enough of dyspepsia, but rarely of its much commoner opposite, eupepsia. So true is it that all the good news in the world will not sell a single copy of the evening Press, whilst murder never fails. Another pair of analogous terms is eugenics, good breeding or the parenthood of the worthy, a term invented by my master Galton, and dysgenics, bad breeding or the parenthood of the unworthy, the correlative term introduced by myself with his approval, and now generally preferred to the rival coinage of cacogenics, of about the same date. One has heard gratitude expressed and reiterated for the use of the adjective dysgenic as an aid to thought and expression. Let us now consider another pair of terms, the invention of which I cannot attribute, but for which many readers will probably be grateful to the present introducer, as valuable additions to their thinking *armamentarium*.

Sitting down to this part of my argument, I *feel well;* imperfect though my circumstances I am "bearing up well" against them, and am in a condition expressed in the almost exact Greek translation of that last phrase by the term *euphoria*. This is a subjective condition, or "feeling" or "sense." It enters by no channel from without, such as the eye. It is not one of the "gateways of knowledge," the traditional "five senses," the entries into the City of Mansoul. It is an internal sense, or compound, or amalgam, or harmony, of sensations. We sometimes call it the organic sense of well-being. It is

an essential feature of health and happiness. We may never have named it, or thought of it, or recognised its existence, but it is that which for nearly all the lives of nearly all of us makes life worth living. Running home through the cold rain, down an Edinburgh alley in boyhood, I passed another youngster, barefooted, standing, whistling, happy. He had euphoria; it was not in his circumstances, but in him. Walking home in the rain the other evening, or early morning, rather, I passed a quite young woman, very drunk, making scarcely any progress, probably miles from home, and without any prospect of a vehicle at that hour. I pitied her, realised my impotence to help her, and my heart went black with anger, as usual, at those who laugh at or live on such things. As I passed her, she was faintly singing as she swayed from side to side of the wide footpath. She had euphoria, and was far happier than I—for the time. Everywhere, and always, philosophers have marvelled at the fashion in which we human beings cling to life when it apparently has nothing to offer us—the aged, the bedridden, the mutilated, the bereft, the enslaved; but to all of these Life *has* something to offer, and it is euphoria. It is not my purpose here to attempt to analyse this feeling. But if the reader will observe himself he will perceive, ere long, how subtly and thoroughly Nature makes it worth our while to be alive. We know and value the exquisite delights of sight and hearing, above all in their enhancement by art; but do we realise the imense satisfaction of sense in effectively clearing the throat, blowing the nose, or performing functions conventionally thought of as humbler still? We enjoy games of emulation, playing for our side or ourselves, in cricket or golf; but do we realise that the fundamental cause of our delight is, or ought to be, in the feeling we get from a full-blooded drive, a perfectly-

executed overhand stroke in the water, or a series of movements in the dance—*quite apart* from sex-attraction, emulation, spectators, or anything else? All these are secondary and adventitious to the enhanced euphoria, the *bien-être,* that we derive from art and sport, from a successful act of deglutition, or a leisurely unembarrassed yawn, especially if accompanied by its physiological complement of a "good stretch."

This fashion in which Nature pays us, tempts us, wheedles us for her purpose, which is that we shall live, is, of course, not peculiar to our own species. We see it in our domestic animals. The author of the Book of Job observed it in the horse who "paweth in the valley, and rejoiceth in his strength." At the "pictures" one sees teams of Alaskan team-dogs at work, their tails more eloquent than most human mouths, of delight in life. Wordsworth went further, and this present pedestrian man of science will not dare to say that he was wrong when, surveying a form of life not even animal, he avowed his belief that "there was pleasure there," or when he explicitly wrote:

> 'Tis my belief that every flower
> Enjoys the air it breathes.

The modern student, believing in the unity of Nature, the common origin and principles of all living things, will be content to quote this couplet as an illustration of its author's own *dictum* that Poetry is the impassioned expression upon the countenance of Science.

We are not asserting that external circumstances may not heighten euphoria, as when Wordsworth, exalted by a noble prospect of human joy, felt it bliss to be alive, and heavenly to be alive and young. But the fundamental condition is internal. It is correlated with youth and age; with race; possibly with sex. We observe the

euphoria of children. Clearly it is something within them; they will jump for joy *à propos* of nothing. The same is true of kids and lambs. Yet enough euphoria remains to make the centenarian—so long as something (what?) remains—tenacious of his life. There appear to be racial differences, though the subject is very obscure, and we may not necessarily be safe in estimating the intensity of euphoria from the observable expression of it. Yet it would seem that the typical Scotsman, with his motionless face and hands, and his even voice, almost needs his native whisky to make him feel as jolly as many southerners do without it. ("Let us see what it is," said Johnson, the tea-drinker, to Boswell at Inverary, "that makes a Scotchman happy," and they sampled the whisky accordingly.) As for sex, perhaps one would have to experience an Ovidian Metamorphosis to be sure; but I merely note the *obiter dictum* of a great student, Professor Arthur Keith, in his book on "The Human Body," that women are more fortunate than men, since the joy of living loses its intensity at an earlier age in the sterner sex. This statement may be true, but I have seen it nowhere else, and I do not know the evidence for it.

The reply, "It depends upon the liver," to the query whether life is worth living, suggests, in one meaning of the equivoque, that euphoria has a glandular basis. We may admit that the jaundiced eye is not worth seeing through, and may guess the existence of some truth in the view which called organic misery Melancholia, which means "black bile." This subject is worthy of the most exhaustive study, which must range from the liver, by far the largest gland in the body, to the very smallest, wherever they be. But I do not believe that any glandular or humoral theory of euphoria will ever be found to deal with more than the accidents or in-

essentials of the subject. However that may be, we shall never get far from chemistry in our study, even though chemistry may not be the essence of it.

For all, or nearly all, of us suffer at times from dysphoria, or at any rate enjoy less euphoria than we desire. And chemical means are at our hand. It is for euphoria, and for nothing else, that we take alcohol, tobacco, opium, cocaine, *cannabis indica* or any other of the so-called stimulants or sedatives. All these drugs narcotise or paralyse sensations of ill-being, and thus effect euphoria. The effect looks like stimulation. To call it pseudo-stimulation, or narcosis, however, seems inadequately descriptive. I do not see why drugs which produce euphoria should not be called euphoriacs, just as we call drugs that produce aphrodisia aphrodisiacs. The use of such drugs proceeds, therefore, directly from the natural legitimate, universal desire for happiness. Poisonous or toxic though they be, producing extreme dysphoria "in the end thereof," they are vastly less so than the people who condemn them *because* they make others happy.

The "wretched" girl, whom I found to be so happy that she could not contain her song the other evening, was an instance of what I will call toxic euphoria. We have incidentally observed the existence of toxic dysphoria, as by substances typified by what the ancients called "black bile." That is natural enough: but the existence of toxic euphoria is far less comprehensible, even when, as in the most familiar instance, its long and intense continuance is followed by the toxic dysphoria, appalling to witness, of *delirium tremens*.

Two most remarkable instances of toxic euphoria may be cited. One is the "spes phthisica," the hopeful disposition of the victim of phthisis. As a rule, not until the poor consumptive's feet begin to swell will he doubt

that he is going to get better. This is toxic euphoria, evidently. More remarkable still is the exaltation, the megalomania, the madly-inflated egoism of "general paralysis of the insane." Even when the doomed man lies in a padded room, unable as a baby to control his humblest functions, his is easier than the head that wears a crown. Yet none other of the protean forms of syphilis has this effect. How and why does the syphilitic toxin affect the basal ganglia of the brain to this result—surely the extremest irony in Nature?

Of course, I am not asserting that external circumstances, financial or other, may not heighten euphoria; but the fundamental condition is internal. We observe the euphoria of children, or kids, or lambs. Clearly it is something within them that makes them jump for joy *à propos* of nothing. Wonderful things, though delusive and costly, can also be done with drugs in this relation, as we have just seen. A very long price in subsequent dysphoria and other ill-effects has to be paid for their use; but they demonstrate my present contention that the roots of happiness are within us, and that when the problem of restoring happiness is to be solved, "It can't be done with money." I am not preaching. I am not suggesting that moral causes underlie happiness. That may be true for more exalted forms of happiness. But nothing avails unless one has euphoria. This is the most to be desired of all earthly things, and all the money in the world is not to be compared with it. The modern student of physiology and psychology, having thus discovered the internal essentials with which, in any external circumstances, life is worth living, and without which, in any external circumstances, life is intolerable, cannot but commend these facts to all who would learn. They put the race for mere money in its contemptible place. The most valuable advice which

can be offered to any man is that which directs him to euphoria, in so far as anything we can do with ourselves may affect that blessed state of being. The "friend" with a tip for a good speculation is a fool or a foe compared with him who can tell you how to avoid dysphoria, and achieve euphoria.

Well, where indigestion or insomnia enter, euphoria vanishes, and life ceases to be worth living. Worry, therefore, which interferes with digestion and sleep, is an enemy of life; and if at the end of your worry your speculation pays, you are not repaid. Better have been content with modest returns of money, plus peace of mind. But this would lead me, if pursued, to a repetition of the arguments which I advanced in my paper on "The Nemesis of Speculation," in a previous volume. Let me rather add that steady, sober, unhurried, unperturbed work is a precious factor of euphoria, even though we may often fail to be as grateful for such work, and the necessity for it, as we should. Many are the men who, having made a fortune or a competence by a "lucky" speculation, or inheritance, and giving up their regular and responsible work with a sigh of relief, have sighed from day to day thereafter, finding that no money can compensate for *tædium vitæ* and lost euphoria.

Such are the sure teachings of biological science as to the roots of that happiness which we all legitimately pursue. They are to be found not in the purse or the pocket, but in the profoundest arcana of our psychophysical being. What shall it profit a man, even in this life, if he gain the whole world and lose his "organic sense of well-being"? I therefore make my bow to the reader, wishing him neither lucky speculation nor length of days, but the most precious earthly thing I know—euphoria.

CHAPTER XI

"SOUND AN ALARM"

No lover of the ideals for which our country has so long stood can return to his native land after visiting Canada and the United Sates in two successive years, as I have done, without asking himself the poignant and disturbing question, "Are we holding our own?" To some of us, especially those who are content to be without opportunities of comparison overseas, the very question may savour of disloyalty. To others, I hope, it may seem a part of true patriotism to point to menacing symptoms and seek to correct them.

Not that this is the so-called "psychological moment" for launching such an inquiry. We have lately won the greatest war in history, the German fleet is at the bottom of Scapa Flow, our Empire has been, in effect, increased by the better part of a million square miles, we are at an unexampled height of world influence and prestige. And, taking the nation as a whole, we are in no mood to be preached at, or to listen to any who should ask whether Empire, over self, or others, is possible without discipline. But "let him that thinketh he standeth take heed lest he fall." History describes no enduring Empire. If we persist, we break all records. And the moment of apparently enduring triumph has ever been the moment of danger.

Of no present external foes am I afraid. There is nothing in Europe to cause us alarm in these days.

Even those blackguards on both sides of the Atlantic who strive to make hatred between the United States and ourselves are still in the minority. But it is possible that, like Rome and Spain and Germany, we may be "betrayed by what is false within."

Consider, as the fundamental factor, what is the condition of the British physique to-day. Its past record is entirely glorious, whether in war or in athletics, in exploration or in the daily round and common task. All over the world this magnificent race has made its mark. Superb men and women and children, of our blood, now walk the streets of Ottawa and Toronto, or swim in the waters of Lake Erie, off Crystal Beach, Ontario—as I have seen with my own eyes. Magnificent folk, also, one sees in the United States—hosts and hosts of our blood, bearing British names and visibly British physiognomies. Knowing the elements of their history, who need be jealous of the United States, unless parents should be jealous of their splendid children? In 1919 I told an audience of four thousand people in Washington that the United States were the finest thing that Britain had ever done; and it is true.

The health and vigour of those people are glorious. In two periods, of seven weeks each, in North America, carefully observing, and travelling tens of thousands of miles, I have not yet seen one case of rickets—that deplorable malady of malnourished childhood which crowds our cities and which continental students call the "English disease." Here, of course, is the beginning of that set of circumstances which ends in the production of a population whose young men, *and women,* when examined for war-time service, showed the most damaged physique of any nation that took part in the war. In 1919 I met General Leonard Wood, a great

American doctor and public man, who was deploring the fact that one young American in three had been found unfit for general military service; but shame forbade me to take the opportunity of telling him that, in our country, the ratio of similarly unfit men was two out of three.

Bodily and mental vigour, superabundant energy, daring, achieving, pioneering, breaking new ground, actuated by "divine discontent," fearing nought—these are generally, whether in the individual or the nation, the products of Health, dependent with rare exceptions upon good parenthood, childhood loved, understood, well-nourished, and youth guarded and disciplined. Who will say that in our country now we have an adequate stock of these priceless boons?

Since a man may champion education all his life and yet, the instant he refers to physical health, be accused of "medical materialism," let us ask whether, in terms of educated intelligence, or of belief in education, or of respect for mental and moral discipline, we are holding our own. Despite a few encouraging signs, the answer must be negative.

Scotland has long led these islands in education—and see where the Scotsmen stand, in London, or Canada, or the United States! That lead is still maintained, as regards both University education, and the provision of continuation schools.

In England we have a new Education Act which, if thoroughly administered and enthusiastically believed in, might bring us up to the standard of, say, twenty years ago in Germany, Switzerland or America. But when rates and taxes become very burdensome and economy is demanded, we find leading men, in Parliament and the Press, demanding the postponement of the

working of the Education Act as the first step to be taken for our relief. This is not economy but the broad road to spendthrift ruin.

There is an education of conduct as well as a development of the intelligence, and in the long run nothing matters at all, for personal and national destiny, compared with conduct. This education is chiefly a question of that irrevocable and momentous period in the life of each of us which men of science call adolescence, but which, in our own beautiful English tongue, is called Youth.

The Youth of our country has been a tragedy since 1914, and no sign of improvement is yet to be discerned. But what does this involve? From the youth's point of view, this is the moment to be free from parental and scholastic fetters, to exploit the world and all it holds, to have a good time. From the employer's point of view, it is the age at which a new "hand" becomes available for industry. From Nature's point of view, youth is the period of preparation for the supreme function of parenthood. The adolescent I therefore call the pre-parent, and adolescence pre-parenthood.

But look at our city streets. Alas, I know them too well—Oxford Street, London—Market Street, Manchester—Briggate, Leeds—Union Street, Aberdeen—Princes Street, Edinburgh—Royal Avenue, Belfast, and so forth; there is no large city in Great Britain where I do not know how to find, in a few minutes, the spectacle of unguided Youth engaged in its mutual self-destruction. At this hour we need a clarion call for the rescue of Youth and the Race.

Until quite recent years, Youth was abominably neglected in some of the great cities of the United States. The Report of a Commission appointed in Chicago some

ten or twelve years ago was sickening reading. But when it appeared, the good people of Chicago *acted*. They made a drastic and thorough reform, and now one may walk upon the most popular streets of Chicago, or of New York or Washington or Philadelphia, on a Saturday evening, as I have done, and see no offence whatever to the eye of racial hygiene.

Let me add that this has not been achieved by the methods of the kill-joy, which must assuredly fail everywhere in the modern world, whatever may be laid to their credit in the past. Youth will be served, and mere repression is futile in these times. As I have argued for many years, our choice is not between repression and licence but between two alternatives, best defined as Dissipation and Recreation. These words are profoundly expressive. Youth neglected or misunderstood takest to dissipation—a word of somewhat obscure etymology, but regarded as derived from the same root as *sweep*. It is the sweeping asunder, until they are verily dissipated, of the powers and hopes of life. But recreation is the process of renewing, creating afresh, those powers and hopes: the polar contrary of dissipation.

Accordingly, in the plea for the establishment of a Ministry of Health, I always asked that it should include a Department of Recreation as an essential and indispensable part of its saving work. A great *rôle* is open, not least for concerted music of all kinds, in this direction. In America the life of young people is rich in recreative and constructive opportunity. "Nothing is destroyed until it is replaced," a wise man has said, and nowhere more than in the psychical hygiene of youth and the race is this true.

This leads us to a brief but necessary consideration

of an unprecedented and astonishing step which has lately been taken throughout nearly the whole of English-speaking North America—a definition which expressly excludes the French province of Quebec—and about which serious misconception, deliberately fostered by malignant vested interests, is prevalent in this country.

In 1916, in order to save grain for us and France and Italy, Canada enacted war-time prohibition. Since the war, the experience of those years has led every province of Canada, except Quebec and British Columbia, to confirm that decision for the purposes of peace. To-day, Ontario, Alberta, Saskatchewan, Manitoba, Nova Scotia, New Brunswick, Prince Edward Island, Labrador—and Newfoundland also—are what, in the absurd but accepted language of America, is called "dry."

The whole of the United States is "dry" by a provision of their Constitution, adopted after decades of discussion, by popular vote taken throughout the nation, a vote in which the scales were heavily weighted against the champions of reform. This achievement began with the voice, once almost impotent, now powerful even at the polls, of woman in the home. The Churches, which are far more powerful in North America than here, having a very much larger relative membership, and concerning themselves closely and steadily with their task of saving not only their own members but the world, are beyond question *the* factors of this great decision. The recent elections have abundantly confirmed it, and the law will be ever more and more thoroughly enforced from year to year.

These are statements very different from those made in the popular Press of the Old World, but they are

common knowledge throughout the North American Continent. The dominant consideration throughout has been the protection of the home against the home's worst enemy; and in view of this supreme argument nothing else has countervailed. During the International Congress against Alcoholism, held in Washington in September, 1920, abundant and varied evidence was officially submitted from every part of the United States, demonstrating the high services of prohibition, above all to family life, childhood, and youth.

Every competent and first-hand student is agreed as to the large consequences which are following. Amongst other results, this has already proved itself to be what I called it in London in January, 1920, when we were congratulating America on the coming into force of the Eighteenth Amendment—"the greatest health measure in history." It will certainly have large effects upon industry, effects which nearly concern us. Our population is already the worst fed in the world; but what will it be if "dry" America defeats us in competition for world-wide trade, and supplants the industries to whose products we look for the exchange of the far-away food upon which we chiefly live?

Again, alcohol is a narcotic—not a stimulant, as the simple suppose—and slows our physical and mental processes whilst seeming to expedite them (the Bible called it a "mocker" long ago, and recent physiological experiment has proved the Book of Proverbs to be right).

It follows that, in what is largely a race for life between the nations, the United States and Canada are now at an immense advantage as against the United Kingdom, and will retain that advantage until we also

are wise enough to turn off the poisoned tap. The drugged Lion cannot compete with the sober Eagle.

"Wise enough," I have written, and I might add, "self-disciplined and patriotic and brave enough," and there's the rub. When returning thanks to the American Government and our hosts, after the closing banquet which they gave us in Washington, I ventured to say what I here repeat: We think of prohibition as a great cause, which will have beneficent and nation-strengthening results. We should also say of it, what Americans cannot very well say for themselves, that it is also a great effect or symptom—the proof of educated and devoted patriotism in the nation which takes such a step.

Scotland, alas, of which we hoped so much, has just made, with scant exceptions, what Dante called the "great refusal," when a similar choice was offered it, and though that decision may be in some cases reversed three years hence, we are losing precious time meanwhile.

I have little doubt but that, ere the issue again comes before the great cities and towns of Scotland, the whole of Canada and New Zealand will have gone "dry." How can we hope to hold our own if the Mother Country of the "tongue that Shakespeare spake" is content, in this colossal and momentous reform, to bring up the rear of the English-speaking world?

One point, and that no small one, in this regard remains for notice. It is that youth, in the great cities of America, and around them, has incomparable opportunities for true refreshment and recreation, of every conceivable kind. Everywhere are clean, innocent, bright places where food and delicious drinks, hot and cold, bitter, sweet, fruity or aromatic, can be obtained. The kinema is perpetually available, its standard rising

almost monthly, as its patrons demand something better than the crude stuff which, when novel, was so attractive and fascinating. There is a host of agencies catering for young people, in and out of doors. Belief in education is intense, effective, universal, and by education something painful and wearisome is not necessarily meant.

We must recover our young people in this country, for its future is theirs. One great and superb movement, continuously and rapidly extending its triumphs, and full of hope, may cheer the observer. That is, of course, the inspiration which flowed from Sir Robert Baden Powell and which realises itself in the Boy Scouts and Girl Guides This greatest educator of the age has steadily rejected all temptations to militarise the Scouts, even when large monetary endowments were involved, and who that knows to-day what militarism means will question his wisdom? He is making boys and girls into good citizens, and he must be supported by all who know that only the race which regards its young renews its youth. The pity of it is that his nation-saving work should be hampered as it is by the chronic dearth of scoutmasters and girl guiders.

The prospect is not desperate. While there is life there is hope, and our country is rich in splendid life, if only we do not spoil it. But we should waste no time. During the past seven years, with an interval during the war, some of us have been participating in a succession of inquiries regarding the birth-rate, the care of our young people, the prevention of racial disease and allied subjects. But we already have all the necessary knowledge. Another inquiry is now proceeding, but the urgent need, as in so many other instances, is not for inquiry but for action, not for research but for resolve.

If we are to prevent our Empire from following all its predecessors into the "dark backward and abysm of time," we must save our young people, not neglecting their physique, but never forgetting the high truth that "the soul of all improvement is the improvement of the soul."

CHAPTER XII

THE RACIAL DISEASES

FOREMOST amongst the racial poisons in our civilisation are the venereal or, as I prefer to call them, the racial diseases.

In 1918, in a series of articles specially written for enlightened womanhood, I discussed the following seven principles for the prevention of venereal disease:

1. The treatment of existing cases.
2. The suppression of quackery.
3. Education.
4. The recovery of adolescence.
5. The suppression of alcohol.
6. Disinfection.
7. Early marriage.

And shortly after the Armistice (in January, 1919), I published, in the general Press, the following series of proposals:

(1) Precise, authoritative, detailed instruction on venereal infection and disinfection for all soldiers and sailors before they are demobilised.

(2) Every sailor and soldier should be medically examined before demobilisation.

(3) No man should be demobilised whilst infectious.

(4) Chemists, doctors, medical officers of health, together with public lavatories, telephone boxes and other secluded public places, should be supplied with printed instructions as to venereal infection and disinfection, free for all; and the law against non-medical supply of disinfectants must be altered.

(5) The restrictions imposed in respect of alcoholic drinks by

the Central Control Board should be maintained as far as possible.

(6) Provide all possible counter-attractions to sexual adventure, including opening of museums, encouragement of choral and public music and dancing, and so forth. I repeat my plea for a Department of Recreation—non-Sabbatarian—in the coming Ministry of Health. Not at its work but at its play does youth at present destroy its life and health. It will gladly prefer recreation to dissipation if we offer it the choice. Why should not amusement be studied as earnestly by those who wish to make life out of it as now by those who wish to make money out of it?

(7) Turn up all the lights in cities, including the parks, and insist on internal lights in taxicabs and in boxes at cinemas.

(8) Make a penal offence the knowing conveyance of venereal disease by persons of either sex, within or without marriage.

None of these things have been done.

The recent history of this subject in Great Britain is lamentable. We are not succeeding in our campaign against venereal disease. Much money is being spent, many patients are being treated, there is a perpetual flood of talk, but these infections continue to spread. The Report of the Royal Commission (1913-1916) has been in large measure acted upon; its teaching is continued by the National Council for Combating Venereal Diseases, but the evil is greater than ever. Lord Rhondda concerned himself with a legislative measure against the quack in the treatment of these maladies, and it was hoped that this would be of great practical service, but the results are meagre in the extreme.

A brief phrase in that measure (Venereal Diseases Act, 1917) prevents the chemist from selling any disinfectant as for the prevention of venereal disease. Undoubtedly those of us who stood for the use of all existing knowledge against these scourges were caught napping when, in advocating the Bill, we allowed this

phrase to pass without protest. Its effect was and is to maintain the policy of making the findings of science inaccessible to those concerned. It was the logical sequence, no doubt, to the action of the Royal Commission which, in its labours of three years, omitted all discussion of the momentous and famous discovery, made by Metchnikoff many years previously, that the principles of antiseptic surgery, for ever associated with the immortal name of Lister, are obviously applicable to the case of contact with a venereally-infected surface—a case which differs from no other in any essential particular.

It is now, remember, a matter of some fifteen years since Metchnikoff gave us this definite and unquestioned knowledge, about which there is really nothing more novel or recondite than that "antiseptics kill germs." During recent years there has been an immensity of controversy and recrimination, and misstatement and misunderstanding over this simple matter, whilst disease has spread. In 1919 there was formed* the Society for the Prevention of Venereal Disease (President, Lord Willoughby de Broke; Hon. Secretary, H. Wansey Bayly, Esq., M.C., M.R.C.S., 143, Harley Street, W.), which has devoted itself to the task of preventing the suppression or neglect of the simple saving facts which

* On April 2, 1919, as recorded in my previous book, Lord Willoughby de Broke asked the Government "how they propose to utilise recently acquired knowledge with regard to disinfection." The attitude of the Government was exceedingly unsatisfactory. Shortly thereafter I was consulted by Mr. Wansey Bayly as to the possibility of forming a committee to promote the policy of immediate self-disinfection. Lord Willoughby de Broke instantly assented to my suggestion that he should sign with us a letter to certain interested persons, who formed a committee, made a series of communications to *The Times* and the medical press, and created the Society for the Prevention of Venereal Disease.

Metchnikoff demonstrated so long ago; and after prolonged inquiry, and the hearing of many witnesses, a special Committee, which we owe to the National Council of Public Morals, published a report,* the gist of which is that we should avail ourselves of disinfectants against these infections. This is, of course, the very evident truth for which the Society for the Prevention of Venereal Disease has stood, and it cannot but be hoped that the indispensable and self-sacrificing work of the distinguished clinicians and others, notably Sir Horatio Bryan Donkin, who have given their time and money so freely in the service of that society, may now be supplemented adequately by the nation and the race whose safety is at stake.

It may be pointed out, however, that the whole of this subject is by no means considered in the report above mentioned. That report is essentially an endorsement of the principles of the Society for the Prevention of Venereal Disease. But, though the non-expert accounts in the Press, and indeed the contents of the report itself, unfortunately, do not indicate the fact, there are fundamental questions, not there considered at all, without the answers to which our grave problem will never be solved. The report gives us a fresh statement of the value of immediate self-disinfection against venereal infection, and of the impropriety of the law which seeks to make disinfectants inaccessible; and that, being still necessary, as it should not be, is good, so far. But the basic matters of prostitution, compulsory notification and treatment of infected persons, and so forth—which are already appreciated, and being effectively dealt with

* The Prevention of Venereal Disease (being the Report of and the Evidence taken by the Special Committee on Venereal Disease). London: Williams and Norgate, 1921.

in the United States—remain where they were. These are the really difficult questions, and we postpone them. Exhortation and disinfection, when it fails, do not exhaust our resources. It is greatly to be regretted that the Committee should not have availed itself of the American evidence since the Armistice.

The so-called "American Plan" endeavours to suppress prostitution, the principal reservoir of disease, just as we drain swamps to prevent malaria. It provides education and recreation, it insists on notification and treatment, and on the suppression of alcohol. All this, of course, is discipline. Our choice in Great Britain is between *discipline, disinfection, and disease.* I see no prospect whatever of our adoption of discipline, moral and medical, according to the "American plan." We are apparently not even interested to know about it; and so much the more must I reassert the utility of disinfection, deplorable *pis aller* though it be in my judgment, as the only alternative to disaster. But further, since the possibility of disinfection is part of truth, and cannot be gainsaid, I believe that it cannot permanently be excluded from the "American plan," as it has been hitherto. It is not necessarily impossible to use disinfection in a complete scheme of venereal prevention, compatibly with the discipline of youth.*

* No student of this subject, no one who expresses an opinion upon it, or votes or makes any decisions upon it, is henceforth to be excused, who does not regularly study the magnificent quarterly journal of the American Social Hygiene Association (105, West Fortieth Street, New York City), which is called "Social Hygiene," and the quality and value of which, in relation to this subject, are not even remotely approached by any other publication extant. Our venereal record in Great Britain since the Armistice might have been less calamitous but for our puerile contempt for anything that has not our insular hall-mark.

PART II

"LET THERE BE LIGHT"

CHAPTER XIII

THE COAL SMOKE CURSE

FIRST we must remind ourselves of what all the chemists and physicists and engineers say. And then we must consider the verdict of hygiene, and see whether it agrees with them.

Unquestionably they agree among themselves. There is no dissentient nor uncertain voice. They declare our present combustion of soft coal to be the most outrageous and barbarous waste. If we think of coal simply as a fuel, a source of energy, our customary methods of burning it, as illustrated in the domestic hearth, are indefensible—only a tiny fraction of its potential energy being used, and the rest wasted.

It is ominously added that we have very little water-power to fall back upon in Great Britain, and that our coal is our all-in-all, our physical capital of which we are the spendthrift heirs, assured of penury ere long, unless we reform ourselves.

But the chemists point out that coal should not be thought of as a fuel—any more than we so regard our books, or linen or silk or pianos, combustible though all these be.

Coal is far more valuable, indeed, than any of them. It is an inexhaustible treasury of infinite and manifold riches, for those who have the sense to use them. Dyes, drugs, perfumes, fertilisers, hosts of chemicals for hosts of purposes, are all contained in or derivable from our coal.

When the chemist has done his splendid best, there remain certain residues, gaseous and solid, which we usually call gas and coke, and which are only fit to burn. We should burn them accordingly, and run our country on them.

That is the argument, so simple and straightforward that the non-expert in the physical sciences, like myself, may quote it in public without fear of error. But I make bold to say that these immense and cogent considerations, final and overwhelming though they be, are actually of less weight than the verdict of hygiene, as I shall try to render it, in condemnation of the coal smoke curse.

Of all the enemies of national, racial and social health, I know none which receives, or ever has received, so little attention in proportion to its importance. The history of the protestants against this curse may be told in a brief paragraph. Unhappy the people that has no more history in such a case as this. The nuisance was practically unknown in Shakespeare's time. Then came the wide replacement of wood by coal (sea-borne from Newcastle), which aroused the ire of the famous diarist, John Evelyn, one of the founders of the Royal Society, who protested against the "hellish and dismal cloud of sea-coal which maketh the city of London resemble the suburbs of Hell."

Then there was John Ruskin, who fulminated against the "plague-cloud," as he well called it, and Sir Benjamin Ward Richardson, M.D., and the Hon. Rollo Russell, and Sir W. B. Richmond, R.A.

I have occasionally written and spoken on this theme myself since 1902, and am no new convert, having, on principle, never bought an ounce of coal for my own use in my life. And individuals here and there have pro-

tested against some particular factory chimney; but that is about all.

Against these few there is the worse than puerile sense of "humour," of the kind that roars its ribs out at any allusion to adultery or delirium tremens, and that boasts of a "real pea-souper," or a "London particular," as a first-class practical joke.

There are also those who actually pretend to defend our civic production of what I prefer to call "smog" (*i.e.*, innocent aqueous fog *plus* smoke) on the ground that certain of its sulphurous constituents are antiseptics —not knowing that smog obstructs the sunlight, incomparably the best, cheapest, most natural, and universal antiseptic of all.

There are also many who defend the ordinary domestic coal fire as "healthy," which it is for the persons in the room, provided that they can successfully belch their smoke into the outer air, for the subsequent destruction of others (and, indeed, themselves).

So well established is this dirty nuisance, notwithstanding its perpetual affronts to four out of our five senses—for it can be seen, tasted, smelt, and felt—that it has actually escaped the notice of our leading official of preventive medicine, a philosophic pioneer whose name is honoured and known throughout the world.

In his masterly memorandum addressed to the Minister of Health, entitled: "An Outline of the Practice of Preventive Medicine" (Cmd. 363, H.M. Stationery Office, Kingsway. Price 6d. net) Sir George Newman, the Chief Medical Officer of the Ministry, has simply forgotten the subject, though anyone might be very hard put to it to discover anything else that he has forgotten.

In Section VI. the author defines the Elements of a

National Policy under ten headings. These will, I fancy, be something like the ten commandments of public health in Great Britain for many years to come. He begins at the beginning, with four points, heredity and race, maternity, infant welfare, the school child, respectively. No. 5 is "the influence of environment," and the author considers in their turn three great environmental factors, water supply, housing, and food.

Where are air and light? They have simply been forgotten! They habitually are forgotten, just because our supply of both is so bad, I suppose, that we have become blind to it. Thanks to our water supply, in the purification of which we led and taught the world, we have practically made an end, in civil life, of the water-borne diseases, of which typhoid and dysentery are the types.

We deserve no less for having been the first nation with sense enough to keep our sewage out of our water supply. But that is something done, and needing only to be maintained. Despite it, we have a C_3 population, promising, if we go on our present lines, to fall even lower—and North America the remaining hope of the world.

Plainly there must be other potent and general factors, hitherto neglected, which urgently need attention, and I will venture to name the supply of clean air, and enough light, as foremost among them.

What are our outstanding enemies of life and health to-day—at all ages? I include infancy, let us observe. It used not to be so. When I started campaigning for infancy in 1902, summer diarrhœa was the outstanding medical scandal of our infant life, and one used to talk and write about the "deadly third quarter" of the year.

Nowadays, as I have shown elsewhere, by superposing

curves derived from study of the seasonal incidence of infant mortality during the present century, trimester by trimester, we should talk of the "deadly first quarter" of the year, and that the epithet is not too strong we shall see when we learn that infant mortality in England and Wales during recent first quarters has been as follows—since 1915 always the highest of the year :

1911—1914	117
1915	128
1916	108
1917	123
1918	113
1919	148
1920	88

In short, the babies die as the rest of us do, in our cold, dark, dirty winters, of those respiratory diseases which are characteristic of our country, and against which no effective work has ever yet been done, nor ever will be done until we cease to produce the smoke in which nowadays four-fifths of our population are conceived and cradled.

If pneumonia were newly introduced into Great Britain to-morrow, hosts of people would emigrate for fear of it. This awful scourge, together with bronchitis and broncho-pneumonia (following on measles and whooping cough, or apart from them) and pulmonary tuberculosis above all—these are the plagues of Britain, and the "plague-cloud" is largely responsible for them. They go with cold, dirt, darkness, and the bad ventilation which is their natural complement.

I do not need to mention exceptional epidemics, like those of influenza or "spotted fever," though both, in virtue of the mode of infection, through the respiratory organs, belong to the same category. Quite apart from

them, we have always with us these respiratory diseases, against which the best and most neglected weapons are air and light.

The microbes of these diseases are destroyed, like microbes in general, by exposure to direct sunlight, and since they leave the body when we cough, spit, sneeze or speak, in small quantities at a time, readily dried and spread out, the sunlight gets its chance with them—unless, in every sense of the words, we sin against the light by depriving our cities of its salvation.

But this is exactly what we do. In our long, cold, dark, and damp Northern winter, every ray of sunlight is priceless. The premature pall which hangs superfluous over the heads of all our citizens cuts off a very large proportion of the light. And we propose to stamp out tuberculosis by increasing our sanatorium accommodation.

What pitiful folly it all is. Is there no one in power with eyes in his head, who can see the facts that stare us all in the face, befoul our noses, blacken our skins, and our lungs?

It is true that we have defences against atmospheric contamination. Your mouth, of course, should be shut, unless you have something to say or to swallow, and very often then. The breath of life, as students of Genesis will remember, was planted in man's nostrils. These have guardian hairs, and very tortuous, moist passages, which filter the air in large degree.

What the nasal filter misses, the "ciliated cells" of the air-passages, each with its fringe of hair-like processes, ever-lashing upwards, may arrest and return; and there are also the white cells from the blood, trying to keep the air passages and the lungs free for the breath of life. (Touch with a swab the back of the throat of

any of our city dwellers, and you will find under the microscope phagocytes containing particles of soot against which they are seeking to protect him.) These devices, evolved from antiquity against the accustomed and age-long contaminations of the atmosphere, are only too easily "rushed" by the "mass-attacks" of our modern urban smog.

In millions of years, perhaps, Life might evolve adequate defences even against this comparatively new menace, but the present case is that we Britons have become a grey-lunged race.

At the end of last century, strolling through the pathological museum of the University of Edinburgh as a medical student, I came across four lungs in jars, side by side. One was the pearly white, uncontaminated lung of a new-born infant, the second the similarly untainted lung of an adult Eskimo, the third the black lung of a coal-miner of that period, the fourth the grey lung of a city dweller.

It seems that coal dust protects the lungs against disease —or, at least, some students of pathological statistics say so, though I should not be surprised if a fallacy were found somewhere; but certain it is that coal-smoke, which has a very different chemical composition, spoils the lungs as ventilators, and must lower their resistance to the invading microbes of disease.

We Britons are four-fifths an urban people, and our chief disease is pulmonary tuberculosis, typically urban in distribution. It has been increasing in our country since the outbreak of the war, and is responsible for about a thousand deaths a week, though the latest figures show a slight improvement. It is an understood and wholly preventable disease. In recent years the reduction of tuberculosis in New York has been wonderful,

and later I will show the relation between its reduction and the date at which the burning of soft coal in that most wonderfully clean city was forbidden by law.

It is universally admitted, and asserted, that pure open air and light are the best preventives of this our chief disease, and are the first essential conditions for its cure. Our hopes of reducing tuberculosis by means of the sanatoria set up under the Insurance Act have been utterly blighted.

We have not come to the root of the matter—and that is the answer to the late King Edward's question, which, as Prince of Wales, he asked of this desease a quarter of a century ago, "If preventable, why not prevented?"

Instead of trying to provide "sanatoria" (*i.e.*, air and light) for a small fraction of consumptive patients, with results which are pitiful at best—because we are almost invariably too late—should we not do better to think about the supply of air and light for the nation's cities at large? "Of course," everyone replies; then why is it not done?

On the contrary, it is to be recorded that the conditions which involve the continued contamination of air, destruction of daylight and consequent perpetuation of pulmonary tuberculosis and pulmonary disease in general are being provided in nearly all the new houses where we and our descendants are to live for a century to come—and that these unhygienic, disease-ensuring conditions, which have been totally abandoned in the United States, from the Atlantic to the Pacific, are being established, despite the recommendations of the Committee appointed by the Ministry of Health.

I happen to have been the proposer of that institution, as an "urgently required war-measure," early in 1915, and the advocate who induced Lord Rhondda to take it

up. Now we have the Ministry; but I will make bold to say that these are not the lines on which to get the health.

Sunlight is fatal to microbes. There never was, nor will be, an antiseptic to approach the light of day. A few minutes' exposure to the "actinic" or "chemical" rays of the sun, and microbes die. We cannot control the infection of the respiratory diseases as we can that, for instance, of typhoid. Even if we never coughed or sneezed or spat, yet our mere speech involves the scattering of infection broadcast.

Isolation cannot solve this problem; nor is there any solution here of the same nature as the supply of protected water in pipes to our houses. The natural means, the light of day, is available to kill the infection wherever it is spread, if we please. We do not please, but prefer to destroy the daylight, and are ourselves destroyed accordingly.

Further, "smog" disposes or compels us to shut our windows, providing ourselves thus with a moist and stagnant atmosphere, the worst possible for our lungs, as Professor Leonard Hill has shown. In such an atmosphere the pace of the blood through the lungs is slowed; which means that few munitions of defence are provided, and the enemy can establish himself accordingly.

Rickets should, I consider, be always classed with the respiratory diseases in British minds as characteristic of British bodies. It is wholly preventable. But we prefer bow-legs, knock-knees, pigeon-chests, and, above all, the production of those rickety and narrow pelves which, in woman, as would-be-mother of the race, make her supreme function a source of mortal danger to herself, and probably fatal to her child, for whose head she cannot afford the room it needs in order to enter our strange world alive.

Quite recent work, as will be seen in later chapters, has shown that rickets is due to the lack of a priceless something in the diet. This something is made in and by green leaves, and reaches our infants and children either *viâ* the body and milk of a human or bovine mother, or directly in the green leaves themselves. Whatever blights green leaves promotes rickets.

But smoke blights them, for it cuts away the light by which they live; and the particles of smoke settle upon vegetation, and blight it further; and evidence given before the Smoke Abatement Committee has shown that thus our milk supply is impaired.

The "plague-cloud," spoiling the growth of vegetation in and around our cities, though strong straight bodies can only grow therein if enough fresh green leaves be available—is thus a large factor in the causation of this miserable disease, so characteristic of our civilisation.

As my train entered a city the other day at the level of the house-tops, a fellow traveller informed me that this was Sheffield, and added, "Mucky 'ole, isn't it?" All our cities are "mucky 'oles."

None of them need be. "Mother," said the little girl, "why don't they build the cities in the country?" But they do, and see what they make of it. The surroundings of Sheffield are beautiful. All our railway stations are "mucky 'oles." None of them need be. King's Cross and Fenchurch Street might be clean.

We might have railway stations as spotless and sweet and beautiful as the New York Central or the Pennsylvania termini, if we pleased. But we prefer to go on as we are, and once a month at least people repeat to me the fatuous lie that, "London is the healthiest city in the world."

This disgracefully dark and dirty city, in which I write, contains one eighth of all the British-descended inhabitants of the British Empire. It is crammed with C3 people, whose cousins, of the same A1 race, but reared in air and light, with unlimited supplies of fresh vegetables and dairy produce, grow, in the cities of Canada and the United States, into the healthiest, biggest, happiest, cleanest, most vigorous and progressive people in the world. Let us stop talking nonsense, and begin to clean up the mess and stop making more.

We are to have, it is said, a million new houses in the next five years. But, despite my reiterated protests, endorsed *au pied de la lettre* by the Interim Report of our Smoke Abatement Committee, most of them are to be equipped within and without, so as to ensure the making of more mess, by the continuance of a system of domestic heating and cooking which is now unknown in the United States, and which, so long as it is maintained, must make the ideal of National Health impossible.

According to the chemist, gas and coke, the combustible residues of coal after its still more precious constituents have been removed, are what we should use as fuel.

According to the physiologists, headed by Professor Leonard Hill, we should heat our houses by the radiant heat, smokeless, but involving ventilation, which the gas fire alone affords.

According to everyone who has ever tried to cook anything, the gas cooker is civilisation, and the kitchen-range savagery.

The kitchen-range, provided for the combustion of soft coal, and the continuance of the "hellish and dismal cloud" which makes our cities so infernal in the winter,

should henceforth be relegated to the museums which exhibit other horrors of the dark ages.

Probably no woman will consent, even if any woman be allowed, to use such an antiquated abomination ten years hence. Does the Ministry of Health, in defiance of the most obvious and elementary laws and needs of health, propose to allow local housing authorities to minister to disease, and to build houses which—like our battleships, according to Lord Fisher—will "last a hundred years, and be obsolete in five"?

Since we could save from thirty to forty pounds per house, on the average, by ceasing to erect the chimneys and chimney-stacks which are needed only for a disgusting and deadly system of coal combustion, which neither our mines nor our national purse nor our bodies can afford, are we going to build more wildernesses of such chimneys?

Or shall we bethink ourselves in time, come to our senses, and adopt anew the creative word, "Let there be light"?

CHAPTER XIV

"DISEASES OF DARKNESS"

LET it be clearly understood that the term Diseases of Darkness is meant simply to indicate those diseases of which darkness is one factor—though the immediate cause may in one instance be a microbe, in another defective diet, and so forth. Accordingly, we may name the following:

Rickets.—This we now know to be of immediately dietetic origin. The direct action of the darkness in which our city children are reared is only to aggravate the symptoms. But the faulty food supply which directly causes the disease is largely due to the smoke which reduces our supply of fresh home-grown food, first by obstructing the light, and second by blighting vegetation. And the productivity of our soil is reduced in a third way by the misuse of our coal and the consequent loss of the fertilisers which should be derived from it.

Anæmia, like rickets, a characteristically urban disease, is directly caused by urban lack of sunlight, due to coal smoke.

Optical diseases of various kinds are due to urban darkness and consequent use of artificial light, due to coal smoke.

Respiratory diseases of darkness include all the infectious diseases of the respiratory system, in so far as, first, the causal parasites are protected by darkness from

the bactericidal action of the sun; and, second, bodily resistance to infection is lowered first by lack of the doubly stimulant action of sunlight, physical and psychical, second, by lack of the protective vitamins in fresh food, and third, by the damage done to the respiratory organs by the inhalation of smoke.*

For our hundreds of thousands of consumptives the recognised remedy is the provision of sanatoria. These afford the same medical knowledge, nursing, drugs, physical appliances, etc., that are available in the cities. The only special feature of a sanatorium is that it provides light and air. Everyone knows that the sanatorium provisions of the Insurance Act have been, on the whole, a ghastly failure. We shall never prevent tuberculosis on the present lines. Instead of sending a small proportion of our consumptive hosts to sanatoria —*i.e.*, to light and air—for brief periods, thence to return to the dark cities where they contracted the disease and where it will promptly resume its fatal progress, we must readmit the light to our cities and safeguard their air supply. The abolition of civic smoke is a necessary step towards the prevention of tuberculosis. We have long known the stimulating action of light upon ourselves; we have long known that it is directly fatal to the tubercle bacillus; we have long known that the disease flourishes where daylight does not enter; we have long known that consumptives do best in daylight and clean air, as in the mountains or at sea. But we do not act.

* In the volume "Air and Health," written and contributed by Dr. R. C. Macfie to my New Library of Medicine, will be found (pp. 148-150) statistical evidence from London and Manchester (obtained by the Hon. Rollo Russell and Professor J. B. Cohen respectively) which shows how the respiratory death-rate rises during city fogs.

Let me quote from Sir Arthur Newsholme ("The Prevention of Tuberculosis," in my New Library of Medicine: Methuen and Co.):

The duration of vitality is much less when the tubercle bacilli are exposed to SUNLIGHT [capitals in original]. Koch found that in direct sunlight they died after an exposure varying from a few minutes to several hours, according to the thickness of the layer exposed. Diffuse light has the same effect after an appreciably longer time. Strauss found that flourishing cultures of mammalian tubercle bacilli perished completely on exposure for two hours to the rays of the summer sun, while cultures dried in thin smears on glass plates had lost their virulence under similar conditions in half an hour. . . . Where there is no free access of air or sunlight the retention of virulence in deposited tubercle bacilli has been observed at the end of 130 days by Ransome and of 184 days by Fischer. . . . The tubercle bacillus grows with exceptional slowness both inside and outside the body. It has a feeble vitality under both conditions and is easily rebuffed. The one circumstance under which the extra-corporeal life of the bacillus is prolonged is desiccation in places not exposed to sunshine. Such dry expectoration will contain numerous living bacilli.

So much for the bacteriological and bactericidal facts; now for the practice of prevention accordingly:

Overcrowding is nearly always associated with other evil house conditions—such as defective light and air and absence of thorough ventilation—which undoubtedly protract the extra-corporeal life and retard the destruction of the tubercle bacilli. Do they do more than this? Some experimental results appear to indicate that they may. Thus Trudeau inoculated a number of rabbits with equal doses of tubercle bacilli; half of these were allowed to run free in the open air, and the remainder were placed in a damp hole to which sunlight had no access [just as if they had been British urban children]. Both sets of rabbits were killed at the same time, and it was found that the first had recovered or only had slight lesions, while the second had extensive tuberculosis. . . .

The managers and doctors of Great Ormond Street Hospital, London, the most famous hospital for children in Great Britain, sickened by what they call the "bitter experience" of watching their little patients die in our "choking winter fogs," are now appealing for funds to establish a Children's Hospital City in the country. But evidently this argument and all our experience of tuberculosis mean that the time has come when we must cease cheating ourselves and our consumptives and the parents of our ill children by the attempt to cure in sanatoria and hospital cities what our smoke-darkened cities have caused and will cause again, but must build new garden cities, filled with light and air, and therefore with healthy children and workers.

CHAPTER XV

WHAT IS A KITCHEN?

WHAT is a kitchen? Is it a place to eat in, or to sleep in, or to live in, or to wash in? No, it is a place to cook in, and if it be used for any other purpose its proper function is imperilled. Cooking is the domestic application of certain technical processes and principles in physics and chemistry to the art of sterilising food and of making it more agreeable and digestible. The cook is the domestic chemist, and the kitchen is, or should be, the chief laboratory of the home—nothing more and nothing less. The kitchen, as we misunderstand it in this country, is, however, much more, and therefore much less.

The typical American or Canadian kitchen is the domestic laboratory, equipped completely, conveniently and immaculately for the domestic chemist. Its sole function does not require it to be large, and it is therefore very small. The chemist has everything at her hand within the space of a few square feet. Here there should enter nothing that defileth, such as soft coal. The fuel is invariably gas, and the gas-cooker is a "landlord's fixture" as a constant rule, involving no trouble nor expense to the tenant. Hot and cold water are separately available at all times, and the sink is of a rational and effective pattern. The kitchen range and all the labour and dirt, within and without, for which it was responsible have gone for ever.

After much lecturing and writing on this ideal kitchen as part of my campaign for air and light in our cities and less labour for women in our homes, I was delighted to see it actually installed as an integral constituent of the plan of the new houses which Dundee is building municipally. Each of the tiny kitchens in these new houses, which are being occupied by large numbers of newly-married tenants, is a domestic laboratory of the right kind. It is purposely made so small that a bed cannot be put in it; but that does not apply to a child's bed, and I only hope that the principle will not be broken in that possible fashion. In respect of the gas-cooker, hot and cold water, the sink, and the convenience of these little places, they conform to all the criteria of sanitary and expeditious housekeeping.

The second great department of domestic chemistry is washing or cleaning. This is, of course, a technical chemical process, involving the use of powerful chemical reagents of various kinds, and of water (the most valuable and versatile of all chemicals), and of heat. Both as regards cooking and cleaning, the two branches of domestic chemistry, we are bound to condemn the use of soft coal, and to require other and better arrangements in our new homes. A most critical and laborious inquiry has been made as to the "comparative cost of family washing in Manchester and Harrogate," and it was found that each household in Manchester had to pay 7½d. per week more for materials and fuel for washing than Harrogate households paid, simply because of the smoke of Manchester. On the most cautious reckoning the smoke tax in Manchester was a quarter of a million pounds a year at prices now increased, so that the present figure cannot be less than £300,000. The most useful contribution I can here make to the depart-

ment of domestic chemistry we call cleaning or washing is to say that an immense and costly proportion of it—as regards much more than "family washing" only—will *end* when we end the burning of soft coal, and when we make arrangements whereby the ordinary British housewife may be a properly equipped chemist in part of her time, and a woman, a mother, a citizen, an artist —what she will—in the rest of it; and no longer a domestic drudge all the time.

Housing authorities throughout Great Britain should be provided with detailed descriptions of what is being done by the Manchester Corporation and by the municipality of Dundee. There, in the summer of 1920, I saw the final stages of the splendid achievement on the Logie estate alluded to above. The houses consist each of four flats, two below and two above. Though each has a gas cooker in the tiny kitchen, one concession to the "poker instinct" is made in the ordinary grate provided for the living-room of each flat, and for this one relic of the past a coal cellar has to be provided within the flat—messily opening opposite a bedroom door. I hope that ere long the young married couples now installed on this estate will use the gas pipes already available for the living-room, banish the dirty, wasteful coal, and install a perambulator in the erstwhile coal cellar.

CHAPTER XVI

AMERICAN HOMES

THE first principle that no home is ideal unless it be smokeless is nowhere yet realised in this country. Even those to whom we owe so much seem sometimes to forget it. Professor Adshead, for instance, lately made some suggestions as to brightening London, and advocated, to that end, the more extensive and frequent use of light-coloured paint; but he did not mention that the first step towards brightening London must surely be to let in the light—immense percentages of which are excluded in the last few hundred feet of its long journey from the sun. Paint is all very well, but "Light is the queen of colours," as St. Augustine said, and if paint is to shine or to keep clean the light of day must be allowed to fall upon it.

In some quarters just now the leading word is electricity. The thing is the latest, and its semi-magical properties lend themselves to public exhibition. But, unfortunately, our national position in respect of this form of power is unsatisfactory. We are very poor in water-power. According to published estimates, our total resources are equal only to three and a half millions horse-power, whereas Niagara alone has five millions. One-tenth of these are there used, and it is very striking to see the cables radiating in all directions from the falls and carrying power to Canadian and American

cities over a wide area. Similarly, the traveller is impressed by the aerial and architectural cleanliness of Munich, and learns that the city is electrically run by water-power of "Iser, rolling rapidly," as Thomas Campbell called it in a poem we learnt in youth.

What *we* have is coal; nor need we complain if we compare our lot with that of, say, even Northern Italy, well supplied with water-power but destitute of coal. But when we examine in terms of physical efficiency the process of burning crude coal (with copious clouds of smoke from the power-station chimneys) in order to raise steam, and then producing electricity for converting the energy of the steam, we find the process wasteful to the last degree. The late Lord Moulton, F.R.S., pointed this out, and it constitutes a very serious criticism against schemes for the immense production of electrical power from coal. Ideal homes, in this country, ought to be designed for the best use, in the national as well as the domestic interest, of the particular form of power available for us, which is coal. And the answer is that lately given by Sir Oliver Lodge: that we should extract from the coal all its priceless constituents, for drugs, dyes, fertilisers, and so forth, and burn what is left, "only fit to burn," the solid and gaseous residues which we usually call coke and gas. These are the agreed axioms of physico-chemical science, and we should try to adapt our hygienic proposals accordingly, instead of proposing to act as if we had a Niagara at our disposal in a dozen convenient places all over the country.

An American invention, the skyscraper, is now under consideration for London, *à propos* the traffic problem. Sheer ignorance seems to be the explanation of the criticisms passed upon Sir Martin Conway's proposals.

Apart from the grandeur and beauty of all the modern skyscrapers are their hygienic merits. They are, of course, incompatible with the coal smoke curse. You could not have a thirty-storey building with chimneys belching smoke from coal fires in every room. No one would be able to find such a building on a still day; it would be completely hidden in a smoke-screen. And, since smoke is not produced, the light of heaven can reach the earth. A smokeless London of skyscrapers would be vastly lighter than the London of to-day.

But, before even London follows the example of New York, as it inevitably must ere long, and forbids altogether the combustion of soft coal, the skyscraper would furnish immense hygienic advantages to the majority of its occupants. Lord Montagu has noted that, flying over London, you soon find yourself above the fog. The "smog," as I prefer to call it, is mostly a matter of the hundred and fifty feet or so above the ground. Living anywhere above the lower stories of a skyscraper (which would be mostly used for other than domestic purposes), you would be already above much of the worst of the "smog." The light being prohibited from coming to earth, you would go towards heaven to meet it. (Aviators tell me that, flying above it, they can trace the foul "smog" of London even as far as Bournemouth when the wind is in that direction.) Another very great advantage of living high up is the diminution of noise—and civic noise is a very important factor in civic health, notably in its relation to the sleep of children. To live high up in a skyscraper, above the "smog" and the noise, forgetting that bulky, dirty, smoky coal so much as exists, instead of travelling to town and home again every day for miles in a tube

deep under the ground—well, who could hesitate to choose?*

* *The Landmark*, the delightful organ of the English-Speaking Union (London office, Trafalgar Buildings, Charing Cross, W.C.), has published, during recent years, several valuable articles on homes and homing—as I prefer to call it—in America, including photographs of the small detached American home, and of the great apartment house, which it has been a delight to show, in the form of lantern slides, to many popular audiences and to Lord Newton's Committee.

CHAPTER XVII

HOW TO HEAT OUR HOMES

All contributions, however small, must be thankfully received, towards the present task of building our new houses aright. How, for instance, should they be heated? The answer of physiological science is based on the exact laboratory experiments of Professor Leonard Hill, F.R.S., who has admittedly made this subject his own. According to him, methods which simply heat the air in our living rooms are unphysiological, favouring the healthy action neither of the lungs nor the skin. Here, then, is a *caveat* entered against any proposals to introduce, as a general principle, into our new housing, those methods of central heating, which are universal in, for instance, the United States; or, at any rate, we should examine this method of heating very nearly, and see whether any degree of it is desirable. In public discussion after a lecture recently, I was informed that official inquiry is now being made in the United States, as to the prevalence of certain forms of rheumatism which are attributed to central heating, or to its abuse. We must be fair and scientific, and distinguish between different degrees of such heating. But there can be little doubt that central heating constantly tends to be overdone, and that this tendency is inherent in the nature of its action upon its subjects. My own observations upon American methods have been made in warm weather, but I have one definite recollection of a lecture, following a night which had been not

quite so warm as usual. Accordingly, the auditorium, when I entered it, was like a Turkish bath, and, though no one else complained, the unaccustomed lecturer had to beg for the arrest of the mechanism before he felt he could proceed.

Pursuing this subject, I thought the time had come when a personal experiment might well be made. So far as physiology is concerned, the equivalent of central heating can be provided in any apartment by electrical means. My rooms were heated by gas fires. But in one I installed a highly recommended and modern form of electric heater, which I suppose I had better not name. At any rate, it was not an affair fitted up with those glaring, freezing sausages, of the type which I had bought and installed galore fifteen years ago, and abandoned shortly thereafter. This was one of the modern types, and its like is everywhere to be seen in the electricians' windows. The current heats a number of filaments which are not consumed, and the effect is to warm the air of the room, without producing any more than a very quiet light. The thing can be graduated in use, and when fully on—which is necessary for the room in cold weather (20 by 16 by 10)—it consumes two-and-a-half units per hour, costing tenpence in Kensington. It need hardly be said, I suppose, that the experiment is now concluded, and may accordingly be reported on, for the sufficient reason that this one heater cost more, in my little London flat, than all the cooking, heating, and two to three hot baths daily—done by gas. Contemplating my first staggering bill, I remembered a house in Buffalo, whose owner told me that he heated it, lit it, cooked in it, made his toast, and pressed his trousers, and accommodated a family of old-fashioned proportions, at an average cost of a dollar and a half a

month—by means of electricity from the water power of Niagara Falls, near by. Now I understand what the absence of water power means for the future of electricity in our country.

But to ascertain the cost was not the object of my experiment; if I had begun to inquire into that I should never have bought the heater, paid for the wiring, and so forth. My concern was really to compare the physiological effects of such a heater with those of gas fires —properly ventilated, of course—in the other living rooms. Those fires conform to Professor Leonard Hill's propositions, for they provide radiant heat in a relatively cool air, and they continuously ventilate the room by carrying the products of combustion up the flue, and thus drawing in fresh air. Thus one gets moving air and radiant heat—after, even if a long way after, the natural ideal of an early morning summer sun, and the wind on the heath.

But "an ounce of experience is worth a ton of theory"—to quote, for once, the most fallacious and fatuous of popular aphorisms; and the question was whether personal experience agreed with Professor Hill's physiology. The answer of several persons, including myself, after several months' observation—now perforce closed, unless, indeed, the Imperial Treasury would like to help me—is that Professor Hill is very very right. The electric heater provides a comfortable, soothing, enervating ease, in the direction of Nirvana; and thereafter, one is ready to shiver and succumb at the assaults of the air without. It is very pleasant, in a way and for a time, but it is unhygienic in its action on nose and throat, lungs, and skin. Really, I might have foreseen that an ounce of good theory, like Professor Hill's, is worth a ton of such expensive experience.

CHAPTER XVIII

TOWARDS DAYLIGHT

It should not need telling that there are natural limitations to the powers of any Ministry, and that in the last resort we must save ourselves. The first tasks of a Ministry of Health, as one urged for years before its formation, must be to learn and to teach. It is not in Whitehall, however, but where we live, that we must find health and fight disease. No one can save us if we will not save ourselves. If the Ministry learns, and then attempts to teach, but we will not be taught, we are doomed. Here is an instance:

Early in 1920 the Minister of Health appointed a Departmental Committee on Smoke Pollution of the Air. The Committee was specially and urgently asked to consider the contention which I had reiterated, that it would be outrageous for a Ministry of Health to sanction the building of houses designed to produce smoke for the destruction of the light and air, which are two primary requisites of health. The highly expert Committee had Lord Newton as its chairman, worked very fast, and produced, in the summer of 1920, an Interim Report (to be had from H.M. Stationery Office, Kingsway, London, for twopence) in which it recommended that no official sanction or money should be granted except for smokeless houses.*

* Not our buildings but our minds and bodies are my proper concern, but the following plaint, still pertinent, may be reprinted

The fair and useful thing for students of public health and commentators on the Ministry, would surely be to give the utmost prominence and critical consideration to this important piece of fundamental work which the Ministry has done—fundamental because it deals with

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here as a footnote that may appeal to the architect, the artist, and the historian, who may chance to see these pages:

"LONDON'S ABBEY AND LONDON'S AIR.

"Really, it is a task for a hero to try to instil first principles into the British brain. For twelve months, here and elsewhere, there have been incessantly reiterated certain most obvious, self-evident, and elementary truths about the air of our cities, and when the time comes to apply them they are forgotten. Thus, however often one repeats that to burn coal is to waste it, one's letter-bag is crowded with letters describing ways of burning coal without producing smoke. I am not remotely interested in smokeless grates *et hoc genus omne*, because I have grasped from the chemists and physicists, and will continue to retain, the truth that our national supply of soft coal should be distilled; that it is not a fuel, except for fools, but an incomparable raw material yielding fuel *inter alia*.

"Steady public objurgation against the smoke nuisance obtains the establishment of a Smoke Abatement Committee, which works against time, as the case requires, and produces an invaluable report. The object of Lord Newton and his fellow workers was to provide the nation, in the nick of time, with guidance as to the internal construction of its new houses; and the cogent arguments against smoke were marshalled under two heads—damage to health, which is my proper concern, and on which all my contentions have been accepted, and even supplemented; and damage to buildings. In their interim report, costing only *twopence*, the Committee include photographs of Somerset House, the Houses of Parliament, the Tower, and Chelsea Hospital—but not, as it unfortunately chances, of Westminster Abbey. Though this report is a potentially epoch-making document, so far as national economy and urban hygiene are concerned, it has scarcely been noticed at all by the Press.

"Now comes, about ten days after the publication of this report, an appeal for Westminster Abbey, the surface of which is being destroyed by smoke, in exactly the same fashion as the buildings

the preservation of health and the prevention of disease, and establishes a principle new in our national housing, but essential for true sanitation. But, in point of fact, this piece of work, which arouses no angry passions, and does not affect the medical practitioner directly, has been practically ignored. Really, the public would have been better served by attempts at hostile criticism, which would at least have ventilated the subject. On the contrary, nobody seems to know or care, and Lord Newton has had to make a public protest in the House of Lords. One can sympathise with him and the members of his Committee when they begin to wonder whether it is worth their while to go on with their work, if its first-fruits are to be flouted—as in effect they are—by the wholesale adoption of plans for houses designed to perpetuate the coal smoke curse, in the face of their recommendation.

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photographed in the report. London's air is blamed; we are told that the damage is inevitable, and will get worse, but we must effect repairs forthwith. As all the hospitals are in difficulties, some critics naturally suggest that the living have claims even against the shelter of such illustrous tombs. We are told that official experiments are being made as to the qualities of stone, to determine those which take longest to be destroyed by London's air.

"No one yet, however, has connected the findings of the Smoke Abatement Committee with the present needs. May I make, therefore, my humble and priceless contribution to the preservation of the Abbey, and to the problem of the hospitals, by observing that we should cease to produce the smoke which corrodes stone and lungs alike? There is nothing injurious in the air of London, either for London's Abbey or for Londoners' lungs, until we pollute and poison it by the sulphuric and other compounds which result from the barbaric burning of soft coal. In view of the Abbey's condition, nothing could conceivably be more timely or useful than the findings of the Smoke Abatement Committee. But what is the use of learning and teaching if no one will listen or remember, or put two and two together?"—*The Observer*, July 11, 1920.

There are natural limits, I repeat, to what any Ministry of Health can do. There is also room for difference of opinion as to many of the functions which it may undertake. Everyone will agree, however, that to study the effects upon public health of such an agent as coal smoke, and to make and publish recommendations accordingly, are indisputably just such functions as justify the formation of a Ministry of Health. If critics want to help the public welfare, let them, in the intervals of attacking the Ministry for other activities, try to mould public opinion to a belief in the hygienic value of pure air and clear light.

In 1920 I learnt much about the conquest of the smoke curse in New York, and notably in Pittsburgh, which was once the arch-offender, but is now a clean and decent city. But is it of any use to try to learn and teach if we are not thereupon prepared to act, as Pittsburgh did? This is, indeed, not the only present instance where all necessary inquiry has been made, but action is apparently not contemplated. Our need, as usual, is not research, but resolve.

New York had not always been smokeless, I knew. Vast quantities of soft coal were burnt in the old days, and the overhead railways belched black smoke into bedroom windows, after a fashion that even surpassed London. I had heard that the change was effected in the interests of the producers of anthracite, who obtained an injunction against the use of soft coal. But the facts I learnt at first hand are much more creditable. Fifteen years ago New York was engaged in a great campaign against consumption, its most deadly disease. Those in charge of the campaign knew the value of light and pure air, and the banishment of the smoke-fiend was part of the anti-consumption crusade. I commend this fact

to our National Association which fights consumption, but which has not yet recognised the importance of city smoke in this connexion. Naturally I asked Dr. Royal S. Copeland, the distinguished Health Commissioner of the city, whether results had been obtained. The remarkable fact is that, whereas the phthisis death-rate in New York, at the end of its age of smoke, was about 26 per 10,000 per annum, in 1919 it was 13. No other city in the world can show anything comparable with this during the present century, or at any previous period. All authorities are now agreed as to the importance of the factor of massive and repeated infection in this disease; and it cannot be too often repeated that dried tubercle bacilli are killed by ten minutes' exposure to sunlight, though they will kill guineapigs after six months, by the calendar, in darkness—in the dried condition and without having had any culture medium on which to live.

Before me is a copy of the Sanitary Regulations of New York City. They forbid the production of "dense smoke." Under this regulation the use of soft coal has come wholly to an end. In Great Britain countless industrial chimneys defile the daylight, despite the excellent intentions of a provision in the great Public Health Act of 1875, which was undoubtedly an epoch-making measure, never to be spoken of without respect. But unfortunately the Act only forbade the production of "black smoke" by the industrial chimney, and that is futile. New legislation is required.

CHAPTER XIX

PITTSBURGH AND ENGLAND'S INDUSTRIAL NORTH

In September, 1920, I found myself in smokeless New York again, with two days to spare. Then I remembered Pittsburgh, long notorious as the smokiest city on earth, black and foul beyond description—"hell with the lid off." But wonderful things had been achieved there lately, and I went to see them, at the cost of two nights in the train, for which my lesson well repaid me.

In Pittsburgh the great sinner was the industrial chimney—rising in hundreds from the vast steel works, and belching black smoke over a crowded city, which lies in a valley between two ranges of hills, and has an extremely low average wind velocity of about five miles per hour. It was easy to see what Pittsburgh must have been, and not surprising to learn that its pneumonia death-rate was the highest in the world, being graduated throughout the various sections of the city in proportion to their respective smokiness—not their respective coldness, as might be supposed.

At last public opinion was aroused—as I mean to arouse it here, sooner or later—and the University of Pittsburgh inaugurated the best and most comprehensive inquiry into all the aspects of the subject that has ever been made. This was in the years just before the war. When the report of that inquiry appeared—which would have been, of course, the end of the matter here—the city proceeded to act upon it. The offenders were

big men, rolling in money and dispensing vast influence, but the Pittsburghers dealt with them faithfully.

The matter was recognised as not merely a nuisance, but a public health issue, as I declare it to be here. A Bureau of Smoke Regulation was set up, with a medical officer, and action was taken against those responsible. Soon they discovered that, by the use of mechanical stokers, the use of powdered coal, supplied in tubes like a liquid fuel, and so forth, the production of smoke could be reduced to a minimum, and that this process paid them in their business.

The story, as told me by Dean Meller, of the Department of Mines in the University, and by Dr. Richard G. Burns, member of the Bureau of Smoke Regulation, was fascinating. I told them that, in my country, we had a Public Health Act, under which prosecutions could be launched against producers of "black" smoke, but that it had been decided on appeal that a prosecution must fail if the defence could produce a witness who said he had seen a tinge of grey in the smoke. They thought that funny, and I thought it imbecile, as it is.

Later I chanced unexpectedly to visit Pittsburgh on two occasions. At no time, in my three visits, was it as smoky as Nottingham, which is reputed a city of remarkably pure air for our country, since the lace manufacture is prejudiced by smoke.

The comparative method, which is indispensable in science, must be used in sociology and civics. We must discover and compare other methods than our own. Insular ignorance and insolence are not patriotism, nor even a poor substitute for it; they injure our country, and are therefore anti-patriotic. The after-war temper which elicits, from public meetings on such subjects as this, shouts that "We don't want to hear about America,"

or "Talk about your own country," is fatuous, and, if continued, would be fatal. That despicable and destructive passion is so commonly met by the public advocate of eugenics and national hygiene since the war, the usual alternatives being apathy and aboulia—as the alienists call lack of will—that one is aroused to something like delight when, ever and anon, a lecture seems not to be *vox et præterea nihil*. After a recent lecture in Shaw, near Oldham, in Lancashire, at which the chair was taken by Sir William Hopwood, whose close and appreciative attention, so unlike a chairman, delighted me at the time, I was publicly asked by the Medical Officer of Health what steps should be taken if Shaw were to be cleaned, and replied that the first step, surely, would be to write to the gentlemen who had so courteously taught me so much in Pittsburgh. And now at least one cotton mill in Lancashire is to be made innocuous to the air and light about it.* I venture to offer my congratula-

* At a complimentary dinner to Sir William and Lady Hopwood at Shaw, Sir William challenged the local district council and the Medical Officer of Health (Dr. A. V. Davies) to eliminate the black smoke nuisance at one of his mills in the district, and offered to bear all the expense of the necessary changes and work involved. Dr. Davies accepted the challenge, and stated that he was prepared to commence the work immediately. Sir William Hopwood's offer was prompted by the statement of Dr. Saleeby, at a lecture last week at Shaw, to the effect that the atmosphere of Shaw was unfit to live in on account of pollution by smoke.—*Manchester Guardian*, Jan. 24, 1921.

Much interest in the question of elimination of the black smoke nuisance has been aroused at Shaw by the offer of Sir William Hopwood to bear the cost of an experiment by Dr. A. V. Davies, the district Medical Officer of Health. Sir William Hopwood has selected the Shaw Spinning Company's mill as the one where the doctor is to make his experiments. Dr. Davies has communicated with the authorities at Pittsburgh, U.S.A., with a view to obtaining details of the methods so successfully employed there in combating the evil.—*Manchester Guardian*, Jan. 26, 1921.

tions to Sir William Hopwood. He will make history, I hope, in this regard. *O si sic omnes!*

In the following discussion of the "white plague," we shall find ourselves compelled to return to this fine theme.

PART III

THE WHITE PLAGUE

CHAPTER XX

INFECTION

LET us state the case afresh, as one would explain it to a very intelligent child—alas, that we were all children once, and nearly all intelligent!—to whom the subject was new.

In Great Britain and the United States the deadliest of all diseases, responsible in the former country for nearly a thousand deaths every week, has a long name —tuberculosis—given it because the parts of the body affected show little swellings called "tubercles," from the Latin. Practically all parts of the body except the voluntary muscles are common seats of the disease; but it is commonest in the lungs, where we call it "consumption," or "pulmonary consumption," or "phthisis pulmonalis." In every instance the body loses weight and substance. Hence these names, and others such as "wasting disease," and "a decline," as our ancestors used to call it.

This disease was long supposed to be a kind of inherited degeneration. But in the middle of last century a Frenchman, Villemin, showed that tuberculous material from one animal will cause the disease in another. Then, following another Frenchman, Pasteur, a German, Koch, discovered the tiny, one-celled, rod-like vegetable organism, a kind of fungus, which is the cause of the disease, and is called the bacillus tuberculosis. This creature was discovered in 1881: we have

known it for forty years. Well do I remember writing an article on the coming-of-age of our knowledge of it. But where, in the Old World, are the hopes of those days?

If we could wipe out this noxious plant, as the Americans wiped out the yellow-fever-bearing mosquito in Havana and Panama, tuberculosis would end. This we could do by simply preventing its spread from the sick to the sound; for though, in darkness, it can live outside the bodies of its victims for long periods, it would soon die out if it could not readily spread from one to another. Though it attacks very many animals besides ourselves, the only animal species that concerns us is the bovine. When it attacks various parts of the bovine body, as it does ours, we are protected partly by the inspection of meat, and partly by its cooking, which kills any living creatures in it. But the bacilli are most commonly found in cows' milk, where, hitherto, we have done, in Great Britain, practically nothing about it. (We have *studied* it most carefully, by Royal Commissions and official Committees, but we have not *done* anything worth mentioning.) By this means it is perpetually conveyed, to our children in especial, all over the country. If our national life could not furnish a dozen other instances of such monstrous wickedness, this would be incredible. The possibility of such infection was denied, by no less a man than Koch, at the beginning of the century, but everyone now knows that he was wrong.

Much more important even than milk infection is the spread of this creature from one person to another, by means of expectoration. If tuberculosis killed in five minutes, instead of five years, let us say, of course this would have been stopped long ago. But we have tried to stop it by taking patients in the latest and most in-

fectious stages to special places, apart from the rest of us. The reason given for this was that, in such places, these patients might get well. Usually they die; but they have meanwhile been prevented from infecting their quondam companions. The arguments for the fundamental principle of isolating the infection have never been set forth with such cogency as in "The Prevention of Tuberculosis" in my New Library of Medicine, the author of that important volume being Sir Arthur Newsholme, K.C.B., who wrote it at my request some time ago, and who has recently been lecturing on the subject at Johns Hopkins Hospital, Baltimore. Its latest edition should be in the library of every serious and honest student.

In some parts of the world the disease is being prevented—as in Copenhagen and New York, for instance. In Great Britain, thanks probably in large degree to the fact that "open" infectious cases were in increasing degree isolated, the disease had been appreciably and steadily declining for many years, until the outbreak of the war. High hopes were aroused in those days—and in high places, as my recollection of one of my periodic visits to Mr. John Burns, then President of the Local Government Board, and Dr. Newsholme (as he was then), its Chief Medical Officer, assured me. But the war, in this, as in nearly every department of our national life—moral, mental, and physical—has done us grave injury. Students of children report a very considerable increase of tuberculosis amongst them—the infection among children being mostly derived from milk. How and why the war should increase this infection is a profound and fascinating question, which other pages of this book may help us to answer. In urban life—we are nearly all urban nowadays—men

have hitherto suffered from this disease in far greater degree than women. Figures vary, of course, but a ratio of two to one will here suffice to express the kind of relation. But since 1914 the incidence amongst women has tragically risen, and we cannot but suppose that their immensely increased exposure to infection, as a result of substituting the factory for the home, is the principal cause.

Notwithstanding the infinite range of inquiry still open to us in this field (as in what field not?—Was not Spencer right in saying that the sphere of knowledge, as it grows, has an ever larger area of contact with the unknown?), I confidently assert that we have all the knowledge we need. Doubtless the chemo-therapeutic synthesis of a specific drug would be a short cut to our goal, but in any case the way is plain, and to refrain from treading it because of that hope would be pitiful.

The *causa causans* of tuberculosis has been known, I repeat, for forty years. The channels of infection are known, and all could be closed. King Edward's question remains to shame us Britons, whilst this quite sufficiently understood and wholly preventable disease persists throughout our land. Yet again, our need is not research, but resolve.

I am further of opinion, however, that we shall never exterminate tuberculosis on anything like the present lines. And the critical reader has doubtless observed that in the foregoing I have dealt solely with half-truths, saying much of infection but nothing of resistance thereto.

CHAPTER XXI

HEREDITY?

TUBERCULOSIS, like most other diseases, is an infection, as we have said. As in every other form of parasitic disease, we must therefore try to prevent its spread by isolating infectious cases, and by killing the parasites wherever they are accessible. But this our knowledge is only half-knowledge, unless we couple it with the complementary and no less essential concept of susceptibility and immunity. The infection only infects the infectible. Others, however certainly attacked, bear "charmed lives." Now, when we begin to discuss immunity, in general, or in particular relation to tuberculosis, we are soon in the uncharted deeps. But at least we must possess ourselves of the idea, and in its place.

Only thus, for instance, can we successfully approach the long-vexed question of heredity in relation to tuberculosis. For long the disease was regarded as an hereditary degeneration. Even in the present century, long after the discovery of the tubercle bacillus, this idea remained in a modified form. During the first decade of our cycle, the importance of heredity received much attention and, in certain instances, came to be, as we may now perceive, ludicrously over-estimated. Thanks to Francis Galton, the founder and namer of modern eugenics, and to his fondness for a particular statistical method, heredity was looked for in a host of cases, by means of data wholly unsuitable and inadequate—and accord-

ingly, was very often found when it was not there. His foremost mathematical adherent, Professor Karl Pearson, devoted his superb technique and industry to, for instance, an inquiry into the inheritance of tuberculosis, and came to the conclusion that the disease is inherited in the same degree as our physical and mental characteristics. Such a finding, both in what it states and what it takes for granted about the rest of our human being, is to-day a mere historical curiosity, too remote from our knowledge to require refutation. He assumed that we are all equally exposed to infection, and that therefore the infection factor may be ignored.

But the necessity of truly estimating both infection and resistance is evident when we conduct a statistical inquiry on data that have been collected with knowledge of these fundamentals. Thus, we know only too well that the children of consumptives often become consumptives. This looks like heredity and was naïvely assumed by Professor Karl Pearson to be what it seems. When, however, we compare the incidence of the disease in the children of consumptives who were infectious—"open" cases, as we call them, and in the children of other consumptives who were not infectious—so-called "closed" cases, we immediately find an extreme and all-significant contrast. The children of the "open" cases were closely and continuously exposed to infection, and most of them contracted the disease. The children of the "closed" cases were not so exposed, and very few of them contracted the disease; nor can we say how many of them were not, in fact, infected by tuberculous milk. These two diverse interpretations of the fact that the children of consumptives often contract the disease are not of merely academic importance. To find the true one and act upon it is salvation. We have done so

and are doing so in certain instances. Thus the calves of tuberculous cows are liable to become tuberculous. If this be heredity, we can do nothing. But it is exposure to infection. Accordingly, Professor Bang, of Copenhagen, proceeded to remove the calves, at birth, from tuberculous cows, and thus obtained tubercle-free herds. This method is triumphantly successful, and Denmark has taught the whole world to follow it. In Paris there is a charity named after the late Professor Grancher, the object of which is to remove the children of "open" cases of consumption from their perpetual danger and thus to save them, as Bang saved the calves in Denmark. And, in view of this knowledge of the importance of parental infection, so long misinterpreted as hereditary susceptibility, it is clear that we are guilty of a crime against all children whom we allow to remain in the daily and nightly company of consumptive parents—*or of any other consumptives.*

Of course, it cannot be logically inferred from the foregoing that there is no such thing as hereditary susceptibility to tuberculosis. Perhaps there is, but the evidence that will demonstrate it must exclude the infection-factor, and such evidence is not so easy to find. Meanwhile, we have quite enough knowledge for the formulation of advice to the public in general, or to individuals who ask for a ruling in particular cases.

Thus, in general, the consumptive should not marry. Even if he or she refrains from parenthood, there is the risk of marital infection if the disease is in, or should assume—as it always may—an infectious form. Perhaps the risk of marital infection is less than might be expected, but it is certainly there.

Further, married persons may become consumptive, and it seems to be the case that they tend to have many

children. The consumptive is not a depressed or unhappy person, as a rule. He has the *spes phthisica*, the "phthisical hope"; he expects to get better; he often feels well; his instinct of sex is by no means suppressed. But, despite this strange and paradoxical toxic euphoria, as one may call it (compare the toxic euphoria of general paralysis of the insane, which is an invariably fatal form of syphilis, or that for the sake of which people drink alcohol), the consumptive cannot afford the cost of satisfying the instinct of sex. He has inadequate reserves, poor fellow, though he does not know it. Least of all can the consumptive woman afford the immense cost of motherhood. It is true that, during the period of expectancy, the progress of the disease is often arrested, thanks to the rarely-appreciated truth that pregnancy is really what biologists call a symbiosis, a mutual service of two lives, and that the unborn child serves to support, in subtle ways, the mother who is wholly supporting it. But, very frequently, no sooner is the child born than the disease advances with giant strides, and kills the mother in a few days or weeks.

Lastly, it might be supposed that the child of a mother in advanced consumption might be *born* infected. The practically invariable fact is that this is not so. The placenta, or "after-birth," acts as a filter and prevents the bacilli which may abound in the maternal tissues from invading her unborn child. Its danger, and her tragic end, begin with its birth.

It is therefore not necessary to assume any hereditary susceptibility to tuberculosis in order to teach that consumptives should not marry or, being married, should not become parents. But this is very different from saying that the relatives of consumptives, if themselves uninfected, should not marry or become parents.

CHAPTER XXII

THE FOOD FACTOR

We have seen that tuberculosis is an infection; but that to name infection and forget resistance is to accept a half-truth. And we have examined the relation of the parental factor both to infection and to resistance. Next in logical order is the relation of food to tuberculosis.

Never, either for prevention or cure, can the food-factor be forgotten. It is cardinal. In the first place, a vast amount of infection is actually conveyed in tuberculous milk. Tuberculous meat is condemned by the authorities, and, in any case, would usually be sterilised by cooking. Tuberculous milk in Great Britain is neither condemned nor, in most cases, is it cooked and thus sterilised. That, however, is not our present subject, and is mentioned only because it is part of the relation of food to tuberculosis and because, in any case, it cannot be too often mentioned until this perpetual scandal is ended.

But, whilst milk often conveys tuberculous infection, it ranks second to none among what the American observers call "protective foods." One in every ten samples of our British urban milk—about the proportion that contains living and virulent tubercle bacilli—thus comprises both poison and, in some measure, antidote. For we now have good reason to suppose that the "vitamin" found in the fat of milk and in certain other foods is not only essential to growth, is not only,

further, that without which the growing child develops rickets, but is also a potent factor of immunity or protection against certain infections, and tuberculous infection in particular. Some of the evidence in support of this important conclusion must be cited.

Rickets, as has long been recognised, "predisposes to tuberculosis." That observed relation should, however, be somewhat differently expressed, it would appear. Perhaps we should say that deficiency of the first "growth-vitamin,"—"fat-soluble A," as the Americans call it—produces rickets and, also, lowers resistance to tuberculosis. That would be the more accurate statement of what is now to be observed in Vienna, for instance, on a scale never before witnessed in all history. There it is found that provision of "fat-soluble A," in whatever foods contain it—including properly dried as well as liquid milk—demonstrably cures the rickets and diminishes the tuberculosis simultaneously, in the hapless young creatures whom not even our most brutal "patriots" would openly call "enemy children." But let us leave the children, in whom alone rickets, a developmental disease, is possible, and consider adults.

In them, also, we find the most significant relations between "fat-soluble A" and tuberculosis. Rickets, observe, is not here in question, but the "anti-rachitic vitamin," or "fat-soluble A," is only one degree less important than for children. If we have any "drug" that can, with demonstrable truth, be called a "specific" for consumption, that "drug" is cod liver oil. Its value is indisputable and universally recognised. Of what does it consist? It appears to be no more than a mixture of certain quite familiar and widely-occurring fats, plus a nauseous taste or odour. This odour is a nuisance, not only for æsthetic reasons, for it interferes

with the patient's power to take and digest the oil. Let us, therefore, purify the oil so thoroughly that it becomes practically tasteless and odourless. We find it more easily taken now, but *less useful*. As a medical student in the nineteenth century, fond of chemistry and of knowing exactly what drugs contained, I went to Duncan and Flockhart's, the celebrated Edinburgh chemists, and asked them to prepare for me a medicinal oil containing the same kinds of oil as in the liver of the cod, in the same proportions. This was inoffensive to take, and I hoped that, since now much larger quantities could be taken as a rule, results amongst my dispensary patients would be correspondingly better. But they were worse. We now believe that, in the natural oil, as in milk (and cream and butter), there is present the fat-soluble A—destroyed when the oil is purified —and that this is the "active principle," as pharmacologists say, of the drug. Or, rather, cod liver oil and milk and butter and cream and *unspoilt* animal fats in general—including beef suet, for instance—are "protective foods," without which we can scarcely resist tuberculous infection, but liberally supplied with which, all our lives, we can, in no small degree, defy that infection. Recently, at the Lister Institute, Dr. Zilva has found crude raw cod liver oil to have 250 times the value of A even in butter fat.

Clearly we must now review the whole of dietetics, alike in its personal and its national aspects, alike in the home and the hospital, the slum and the sanatorium. First, we begin to value fats more than ever; but, second, we discover, quite suddenly and surprisingly, that fats must be individually examined, with the result that some are found to contain the priceless protective factor and others are not. These latter are to be

reckoned grossly inferior; and, alas, our world being as yet imperfect, they are the cheap and abundant fats, with which those who most need the protective fats tend constantly to be cheated. But the nation cannot afford that the vitamin-containing fats should be withheld from those who cannot afford them. I anticipate in Great Britain the most lamentable consequences from the recent de-control of fats and the consequent exclusion of animal fats, vitamin-containing, from the margarine which was previously required to contain a percentage of them, thanks to the Ministry of Food.*

* See Chapter XXVII., " The British Supply of Food Fats."

CHAPTER XXIII

OPEN-AIR TREATMENT

SOMETHING has already been asserted concerning the real function of open-air sanatoria in tuberculosis. Thus, we have seen that they serve to isolate infectious cases, those late, advanced, and "open" cases whence millions of virulent bacilli are expectorated in the sputum, so that persons near the patient are subjected to risks of perpetual and massive infection. From this point of view, strongly urged by Sir Arthur Newsholme, the sanatorium performs the same function as the lazar-house of the Middle Ages in the extermination of leprosy. Again, the traditional over-feeding, or "stuffing," practised in sanatoria, especially as regards the animal fats found in milk, cream, butter, cod-liver oil, suet, etc., serves, we saw, to fortify resistance against the bacillus by means of "fat-soluble A," the first of the "protective" vitamins. Yet, again, we observe that the sanatorium is in the country, far from the coal smoke that darkens our cities, and that it furnishes the natural form of light-treatment. There remains the question of air. Here we may follow with much confidence the teaching of Professor Leonard Hill, F.R.S., of the London Hospital Medical School, for he is the past master of this subject.

The air of the sanatorium is simply the air of the country unpolluted with smoke. It is the air for the breathing of which our respiratory apparatus was evolved. It is good by day and it is good by night.

Urban air is polluted by day, but less polluted by night, when less smoke is being produced. The traditional objection to night air is based, as I have argued elsewhere, many years ago, partly upon superstition, associating the darkness with the powers of darkness—"darkness and devils," as Shakespeare says—and partly upon the observed fact that persons exposed to night air fell ill, because, as we now know, the female Anopheles mosquito, which carries the parasite of malaria (Italian for "bad air"), feeds, bites, infects at night. In Great Britain, where this creature now occurs only in very limited localities, night air is the best air, because the least smoky. According to hourly examinations of the air, about 3 a.m. is the only time when it is, so to say, really safe to take a breath in London.

Whether in town or in the country, we spend most of our time indoors, and must accordingly solve the problem of ventilation which we thus set ourselves. In temperate climates it is often complicated with the problem of keeping ourselves warm enough. At what should we aim?

Clearly, as Professor Hill has shown, we should try to reproduce, so far as we can, those natural conditions in which we find ourselves at our best—those of a morning in the early summer, say, when the sun is shining and "there's likewise a wind on the heath," as Borrow says. The sun gives us light and *radiant* heat, these being related to one another exactly like two consecutive series of notes in the musical gamut—though it so happens that we perceive the upper notes, of light, with our eyes, and the lower, of radiant heat, with our skins. The breeze gives us air which is perpetually fresh—despite the fact that our own processes are perpetually tending to alter the air in our immediate neighbourhood.

In such conditions as we are imagining, the percentage of carbon dioxide in the air we breathe does not increase, despite the fact that we are continuously producing and exhaling that gas, which is a poison to all forms of animal life, though it is part of the essential food of all green plants. Further, the air, as it passes us, carries away the water which our lungs are also continuously exhaling, so that the atmosphere does not tend to become more and more humid, as it would if we were living in a closed box. Under these ideal conditions the lungs work vigorously and freely, and, in so doing, expedite the circulation of blood through them. And this blood is charged, of course, with the various protective substances—including fat-soluble A, for instance —which act as munitions against any invasion.

In warming and ventilating our houses we must try to imitate these ideal conditions of nature. What are our present methods? In Great Britain, they are a miserably inadequate attempt to solve a problem which is, unfortunately, very difficult, and the more difficult the smaller the space to be ventilated, and the more closely we are crowded in it. The smaller our rooms the more difficult is it to avoid draughts. (A draught is a current of moving air, and so is the "wind on the heath" —but we have all felt, and surely we all can see, the difference between them for ourselves.) Our tendency is to exclude the outer air, especially when it is full of what I have already discussed as "smog," and the result is that the air around us becomes warm, still, and humid, as well as laden with ever more and more carbon-dioxide —this latter being the fact upon which we used to insist, but which Professor Hill has taught us to regard as negligible in practice. In a warm, still, and humid air we breathe less vigorously, the circulation through the

lungs is retarded, their supply of defensive agents in the blood is accordingly diminished, and the microbes of "cold in the head," tuberculosis, influenza, pneumonia, "spotted fever," measles, etc., etc., get and take their chance.

The open coal fire supplies radiant heat, like nature; it ensures movement of the air by the draught up the chimney—a poor substitute for "the wind on the heath," but much better than nothing. On the other hand, it wastes the coal and pollutes the outside air—which is, after all, the source of the inside air—and it obstructs the light. It is therefore condemned, as we have already seen.

The electric radiator provides radiant heat, but it causes no current of air up the chimney, and, since thus it does not ventilate, it is imperfect. (On this, the reader will remember, a personal experiment was recorded in Chapter XX.). "Central heating"—as by anthracite in New York, for instance—eliminates the abomination of smoke, but it constantly tends to be overdone, as Americans are apparently beginning to suspect at last, and to oppose instead of providing ventilation. The gas-stove, provided with a properly functioning flue, meets every indication of physiological science, providing radiant heat, and that movement of the air which alone is ventilation, and permits of the full respiration that protects the lungs.

A moderate degree of central heating has, nevertheless, immense practical advantages in many circumstances, as where external temperatures run lower than in Great Britain.

CHAPTER XXIV

SANATORIA OR SANE AND SANITARY CITIES?

WHAT of the promise of "Sanatorium benefit" under the Insurance Act, which I, for one, enthusiastically applauded, and defended against all and sundry, the doctors included? The theory was that many early cases would be cured, and that many late and "open" or infectious cases would be isolated, so that further infection would be prevented. This latter was especially the hope of Sir Arthur Newsholme, then in charge at the Local Government Board, and in many conversations he communicated it in full measure to me, using the analogy of the mediæval lazar-houses, and the extinction of leprosy.

Alas, for the fruition of such hopes! A very careful student, Dr. W. H. Dickinson, in his new "Survey of Sanatorium Benefit," shows beyond question that, taken as a whole, the thing is a tragic, monstrous farce. So far as the industrial consumptive—and he is *the* consumptive—is concerned, not fourteen cases in a thousand may expect a cure, on these figures, and so far as prevention is concerned, the national death-rate furnishes the answer. Here is confirmation, only too abundant and murderous, of the proposition which I have been reiterating everywhere for nearly two years past. For it is now as clear as day itself to me, and must be to all, that the whole idea of sanatoria, which we have so

keenly acclaimed in past years, is weak, futile and blind, until we correct the conditions in which tuberculosis is bred, and in which it is re-bred so soon as the patient returns to them from his brief sojourn in clean light and pure air. This theorem is plain, obvious common sense, which any fool or infant could see. Why was I not—why was not everyone of average intelligence—everywhere proclaiming it during the discussion of the Insurance Bill—warning the public against the disappointment inevitably to follow its blindness to first principles? I know not, but I am very sorry, and am trying to make amends now.

In England tuberculosis is still beating us; and in New York, which knows no more about it than we do, and which has contributed much less than we to our knowledge, the disease is being beaten. That very section of the Insurance Act which, together with maternity benefit, seemed best of all, and which induced many disinterested observers to swallow the whole for the sake of such promising parts, has been as complete and deplorable a failure, a delusion and a snare, as the rest of that colossal vanity. "A snare," I say, not in order to complete a *cliché*, but because a promised remedy which fails, as in this case, involves more than failure in that it means neglect of the true remedies, though they be as plain as the sun at noon, and as near as the air in our lungs—which things, indeed, they actually are. Yet, even in comment on Dr. Dickinson's deplorable exposure, an acute critic concludes: "In short, we must follow the patient from the sanatorium, and see that he lives and works in good conditions. Here is the case for the tuberculous colony." No doubt, so far as existing cases are concerned; but, surely, here is the case for the clean city, in which tuberculous

patients are not bred, and from and to which, therefore, they need neither be expelled nor returned. We are never going "back to the land": the thing is psychologically impossible. Our civilisation must destroy itself unless we make our cities themselves inhabitable.

That is and has been my case for the abolition of the smoke nuisance, and for my reiterated protests against the Ministry of Health for passing plans for houses designed to perpetuate the darkness, dirt, disease, and death which shamefully distinguish our present cities. As we have already seen, the Minister of Health was induced to appoint an official inquiry on the lines demanded, and its Interim Report* is published, and is now before us. The Committee realised that it was engaged in what I have called a "Race for Light" with the Housing Department of the same Ministry, and therefore concentrated on the domestic aspect of the question, and issued what is in effect an emergency report, directed to that subject, with very great efficiency and speed.

And Light gets the verdict. As for the evidence, the essential parts of it have been already submitted to the reader. But, though I have used the strongest available language, and have tried to paint a very ugly and shameful picture, I am confident that I have understated the case, and have even omitted many arguments, one at least of which is not subsidiary. That is the psychological argument, and it is particularly pertinent because there is a real and entirely valid psychological argument for the open fire in one's home—especially for those who live alone or who have uncongenial house-mates, and are therefore more alone than ever. To return to one's

* Interim Report of the Committee on Smoke and Noxious Vapours Abatement. Ministry of Health. Cmd. 755. Price 2d. net.

own room and find a fire blazing, a thing active and alive, is to find a friend in need, warming the mind as well as the body. Personally, I know nothing of this, as my hygienic principles have always forbidden me to buy any coal at all, but this is what I gather from others, and it is clearly true. Thereto let me reply that sunlight also is a cheerful stimulant, and even a friend, though a less personal one. Evidence from Pittsburgh, when it, like London to-day, was in the age of dirty waste, shows that the darkness that can be smelt in cities promotes suicide, melancholia, drunkenness, depression of mind, as well as body. This is the obverse of that cheerful fire in your home, and the psychological argument thus cuts both ways. It is by no means impossible, however, to provide a cheerful friend at home who does NOT spread a blight of darkness and depression out of doors. The chemist and the engineer can, and will, meet all our needs.

Given the evidence, the conclusions are obvious and inevitable. Here are the official words, paraphrasing my long-reiterated contentions:

57. In conclusion we desire to emphasise the fact that the present housing situation affords a unique opportunity for constructive reform with regard to the heating, cooking, and hot-water supply arrangements in domestic dwellings.

58. Reformers in the past have always been confronted with established facts. It was urged, and not without point, that it was impracticable to attempt smoke abatement by altering existing appliances installed in houses constructed on old-fashioned lines.

59. But the position has changed, and having regard to the serious damage caused by domestic smoke and at the same time to the great improvements which have been introduced into modern systems of heating, we wish strongly to urge on those who are engaged in the preparation of new housing schemes, the

great importance of providing, as far as practicable, smokeless arrangements for warming rooms, supplying hot water and for cooking.

And here is the first recommendation, constituting, *au pied de la lettre,* official acceptance and endorsement of my contention ever since my return from New York in June, 1919:

That the Central Housing Authority should decline to sanction any housing scheme submitted by a Local Authority or Public Utility Society, unless specific provision is made in the plans for the adoption of smokeless methods for supplying the required heat as suggested in the body of this Report.

Evidently, all the houses designed to smoke, for which the plans have been passed, must now have such plans revised. Only those of us who naturally feel most at home in an infernal environment can now refuse to accept and act upon the verdict thus obtained for Light; for sane and sanitary cities rather than sanatoria. We shall conquer tuberculosis, not by building sanatoria where we may send our consumptives to die, but by building houses and cities in which we all may live.

CHAPTER XXV

A NEW WEAPON

IMMUNITY from and susceptibility towards given poisons are often inherited, germinal, racial characteristics. Man is naturally susceptible to arsenic or to poisons of the typhoid bacillus, but is immune towards infection and intoxication by, say, distemper or swine fever. This natural immunity (or susceptibility, either being a degree of the other) is a fascinating theme, especially as regards its origin—whether by natural selection of fortuitous germinal variations, or by the inheritance of acquired parental characteristics. Thus we may argue whether the breeding within their victim of trypanosomes that defy arsenic or antimony compounds cautiously administered by way of remedies in a case of sleeping-sickness be due to natural selection of those parasites which have a natural, fortuitous degree of relative immunity to these metalloid poisons or to the acquirement of resistance in one generation of the parasites and its transmission to their offspring. In either case, the motto for the physician, who has these drugs of power in his hands, but knows that they may soon lose it, is clearly Lord Fisher's, that "moderation in war is imbecility."

We have assumed that immunity may be acquired by the individual organism. A moderate experience of the poison breeds the power to withstand a dose which, at first, would have been fatal. "Use is everything"; "Familiarity breeds contempt." A moment's consideration will show that this power to acquire im-

munity is simply an instance of that power of adaptation which is a primary and universal characteristic of all living creatures. We may acquire immunity against all manner of formerly injurious agencies—tobacco, a hard bed, a talkative companion, a raucous voice, evil suggestion, bad cooking, unusually hot or cold or dry or humid weather—what we will. Further injury is thus prevented—we have realised prophylaxis. On the other hand, though much less frequently, if not indeed as an apparent anomaly, a "dose" of the toxic agent, say white of egg for one man, or the kind of person who has an endless supply of funny stories for another, may greatly intensify susceptibility, so that the veriest trace of egg-albumin in the one case, or the merest menace of a narrative intention in the other, may instantly produce the most violent symptoms of physical or intellectual nausea. But, whether the reaction be prophylactic or anaphylactic, in either case we have to deal with a specific modification of the organism, determined by and relative to a specific experience.

In the realm of physiology we observe that he who "trains" for athletics is acquiring immunity against fatigue—that is to say, he is producing small doses of fatigue poisons within his muscles by running shorter distances and thus learning how to withstand much larger when he runs farther. He who learns this best will, other things being equal, be the Marathon winner. In the realm of toxicology we read of the Styrians who learn to eat arsenic in doses which, taken without previous experience of lesser ones, would speedily be fatal; or we remember how a small cigarette, highly toxic at first, leads to immunity even against successive pipefuls of shag. In the realm of epidemiology, we know that an attack of, say, measles, or any of the so-called childish

ailments, usually protects against another. We call them childish ailments, thinking the children silly to be so susceptible, unlike our splendid selves; but the fact is that the child protects the man.

If, by casual exposure to such intoxications, one may acquire immunity against them, would it not, perchance, be worth while deliberately to incur exposure under favourable conditions, so as to purchase future immunity? Provident and plucky persons purchase exemption in other spheres by such means; why not immunity against, say, small-pox? Hence the Eastern invention of inoculation against small-pox, introduced into England by Lady Mary Wortley Montagu, and increasingly adopted until its supersession by vaccination, thanks to Jenner—the later method being a modification of the former, based on and applying the same principle of acquired immunity.*

Then came Pasteur and the new age. Thanks to Sir Almroth Wright, to Professor A. Calmette of Lille, and to Sir William Leishman, we have lately learnt how to apply this universal, natural, vital principle of adaptation, as illustrated by the acquirement of immunity against chemical poisons, to the prevention of typhoid and paratyphoid fevers. This Anglo-French discovery saved hundreds of thousands of lives in both the British and French armies during the war.

Some ten years ago, the late Professor Metchnikoff, then sub-director of the Pasteur Institute, visited London and gave the Priestley lecture of the National Health Society before a most discreditably small audience at the

* Having been taken on a visit to Palestine in infancy, the present writer was there inoculated with small-pox, and many subsequent attempts to vaccinate him have been unsuccessful, for he then acquired what is probably a lifelong immunity towards the poison of small-pox or its modification cow-pox.

Royal Society of Medicine. I found the lecture mighty disconcerting, and so, I fancy, did the chairman, Sir James Crichton-Browne. For Metchnikoff suggested that early infection with tubercle bacilli—as, perhaps, ingested in tuberculous milk or otherwise—would, if recovered from, provide some degree of immunity to subsequent infection. He told us how adult Kalmucks and other peasants, entering the great Russian cities, quickly fell victims to the disease, against which they had not been, as it were, naturally "vaccinated" in youth. One walked out wondering whether just the right doses of tuberculous milk in childhood might not be the best prophylactic against, say, industrial phthisis in later years: and, if so, what about our campaign against tuberculous milk?

Certainly we must not relax our efforts against tuberculous milk; but, on the other hand, if Metchnikoff was right, we may look hopefully to the laboratory for safe means of acquiring immunity against tuberculosis as against typhoid. And doubtless he was right, but I have never felt it desirable to spread his views in public, either by voice or pen, until now, for they would quickly be abused in Great Britain by the vested interests which have hitherto successfully employed the Board of Agriculture to defeat every effort towards a clean milk supply in this country. The time has come, however, when, in my judgment, the matter may beneficially be discussed in public.

Professor Calmette, now assistant director of the Pasteur Institute, was the author of the first article in the first number of a quite magnificent journal which we owe to the League of Red Cross Societies,* and his

* *The International Journal of Public Health*, Vol. I., No. 1, July, 1920. Published bi-mensually in English, French, Italian and Spanish by the League of Red Cross Societies, Geneva.

subject was "The Protection of Mankind against Tuberculosis." He showed how recent observations have demonstrated the possibility of endowing susceptible animals with a high degree of immunity in tuberculosis, by inoculating—or educating—them with small doses of bacilli of modified virulence, and now he hopes for the beneficent application of this principle to man:

> These scientifically established facts show that we may regard it as possible by a process of active vaccination to assure the protection of man against [tuberculous] bacillary infection. It is now a question of finding out what procedure will be the most surely effective and at the same time harmless even to infants, and when we have acquired a knowledge of the process, the duration of its protective effects must be determined.

Our rule against disease should be Cromwell's: "Neglect no means." We must see the problem whole. The rudiments of logic should be retained. John Stuart Mill, if I remember aright my schoolboy reading of his *System*, taught that when we say that one thing is "the" cause of another, we simplify the process of causation unduly. All causation is complex. "Remove the cause," a classical axiom of medicine, is too simply stated. The tubercle bacillus is "the cause" of tuberculosis, but so also is the susceptibility of the patient. Toxicity is not in the poison alone but in the poisonableness of the poisoned. We must neglect no means. If now I draw attention to Professor Calmette's appeal for the resources for the experiments necessary to achieve vaccination against tuberculosis, this does not mean that I would have the reader forget the immense complexity of causation in this social, urban disease—the importance of sunlight and good food rich in vitamins, of pathogenic factors such as rickets and alcoholism and starvation, the significance of exposure

to infection, the possibility of isolating "open" cases and so forth. And Professor Calmette, whilst asking and hoping for vaccination against tuberculosis—which we have seen to be not a "medical superstition" but an illustration and employment of that fundamental property and condition of all life, its power of adaptation —shows his sense of proportion when he concludes his masterly paper in these words: "Our guiding principle in the social campaign against tuberculosis is the protection of healthy subjects, whether infant or adult, against *massive* or *frequent* infections. [Italics mine.] This fundamental idea should be made known among the public by every possible means."

PART IV

NATIONAL DIETETICS

CHAPTER XXVI

THE "ABC" OF DIET

It was hard to believe at first, but now we positively know that a wonderful and momentous new chapter in the study of the food of man, and, above all, in the food of the mothers and children of men, was opened fifteen years ago. It is what we may call an English-speaking achievement, for virtually the whole of the work has been done by a few men and women in England and the United States.

It had been known for scores of years that sailors on long voyages who ate only tinned and preserved food began to suffer from a disease called scurvy that killed hosts of them. It was learned that the disease could be prevented or cured with absolute ease and certainty by adding a little fresh fruit juice, such as lemon juice, to the diet. Then only a little while ago it was discovered that a disease called beriberi, which breaks out among people who live wholly on polished rice, could be quickly cured by the use of unpolished rice instead.

In 1913, when the International Medical Congress met in London, that discovery had recently been made, and we accordingly resolved that the governments of the world should be asked to abandon their orders about quarantine for ships with crews suffering from the disease. For it is not infectious, but is what we now call a "deficiency disease," owing to the lack of a price-

less unknown something in the diet, which is present in the covering of the rice grain, and which is lost when our modern milling machinery polishes the grain.

But all that is only a small fraction of what we now know. Dr. Gowland Hopkins began the work in Cambridge, England, half a generation ago, by feeding rats with his own hands in a disused cellar. Since then many workers have carried it on at the Lister Institute in London, and elsewhere, notably Dr. McCollum at Johns Hopkins Hospital, Baltimore.

There are at least three precious things, probably ferments, contained in a healthful diet, which are called vitamins. The first is essential to growth, and its absence is the cause of rickets. It is especially contained in certain fats, and is often, therefore, in America called "fat-soluble A," or the "antirachitic factor." The second is also essential to growth, and its absence causes beriberi, a disease characterised by inflammation of the nerves, or neuritis. That vitamin in America is called "water-soluble B," or the "antineuritic factor." The third is that which prevents the development of scurvy, and we may call it C, or the "antiscorbutic factor." None of them has been isolated—in trying to do so we should probably destroy them—but we know where they are, and where they are not, because of the consequences that follow when we ourselves or animals eat foods that do, or do not, contain them.

It is not merely a question of avoiding the three "deficiency diseases"—rickets, beriberi, and scurvy. The whole of healthy growth and development, and the power to resist infectious disease are concerned. The most recent experiments show that the proper development of the teeth depends upon "fat-soluble A," and

that, in short, just as nothing is so good for making red blood as white milk, so nothing is so good for making hard teeth as soft butter!

The first important fact about vitamins is that, so far as we can discover, they are made by green leaves in the presence of sunlight—by nothing else, and nowhere else. Thus the herbivore, eating the green leaf, does well; and the carnivore, eating the herbivore, does no worse. Man and woman, and child above all, eating the green leaf, or vegetable foods that the green leaf has stocked with vitamins, or animal products that have obtained vitamins from the green leaf, will flourish also.

Such animal products are, for example, milk and its derivatives, and cod-liver oil. True, we had not thought of the cod as a herbivore, nor is it one; but all the animal life of the sea depends upon the green vegetable plankton, just as the animal life of the land depends upon the grass of the meadows. If by grass we mean green, chlorophyll-containing vegetable matter, including plankton, then "all flesh (and fish and fowl) is grass." Presumably plankton is the original source of the vitamins found, for example, in the liver of the cod, and capable of working wonders of healing in children.

The roe of fish and the yolk of birds' eggs contain vitamins. The young of the mammalia, however, do not begin thus endowed, but depend upon their mothers. When her young are weaned from the human mother, she does well to avail herself of the cow, which is the foster mother of civilisation, and to feed her children abundantly with cow's milk, and its products. For just as the old dietetics found everything it knew and cared about in milk, so the new dietetics finds every vitamin there, if the cow has been properly fed.

I am writing in crowded little England, where rickets

is tragically common, and may find readers in the United States, the land of dietary plenty. But, even so, American readers should know the values of different foods, whether for pure knowledge or for feeding themselves, or for deciding, perhaps, what foods to send to the children of Central Europe, where the "deficiency diseases" are now more prevalent than they have ever been anywhere in history.

We know what foods do and what do not contain the first growth factor, "fat-soluble A," or the "antirachitic vitamin." Enough of those foods must be supplied to mothers, and to children, at least until about the eighteenth year, when the calcification of the teeth is completed, if we are to have full-grown and healthy adults. Among the principal foods that lead in this respect are cabbage, spinach, lettuce, bananas, nuts, wheat germ, butter, cream, fish oil (notably cod-liver oil), mutton and beef fat, raw whole milk, dried whole milk, and fresh and dried eggs. On the other hand, there is none of this vital constituent in lard, olive oil, cottonseed oil, margarine derived from those purely vegetable sources, white fish, white wheaten flour, pure cornflour, polished rice, custard powders, and egg substitutes derived from cereal products. Beer is remarkable because, though it is derived from materials rich in various vitamins, no vestige of any vitamins survives in it. Indeed, for us in many parts of Europe, beer must be reckoned the most common and nationally important example of a preserved, stale, artificial, and—because deprived of vitamins—devitalised "food." This I must insist upon, because the contrary has been asserted by some writers, not men of science, who have heard that malt and yeast are rich in vitamins, but who have not thought it desirable to ask themselves what is likely to

happen to those delicate agents when treated as the brewer treats them; and also because the most recent device of the defeated and discredited American brewer is to pretend that beer is a medicine. It is incredible, fortunately, that the medical profession in America, with its great traditions, will lend itself to this mercenary outrage upon science.

Examination of these two lists from the point of view of practice enhances more than ever our estimate of the supreme, unique, unapproachable rank of milk in the dietary of young people. The reason why there is relatively so little rickets in the United States is that even in New York the daily consumption of milk is more than twice as large as in England. But in one district of New York, where certain negresses do not get the milk and fresh food they should get, the babies they nurse become rickety.

This is one more illustration that, unlike animals, we human beings do not know all we need for our lives. Thus we can find animal mothers that know their children's needs better than many untaught human mothers. There is now at the Zoological Gardens in Edinburgh the first king penguin chicken ever raised in captivity, and this is what a Scottish correspondent gave me the privilege of recording: The mother penguin lives entirely on fish, and feeds her offspring by regurgitating digested fish and transferring it from her own beak to the beak of the chicken. The interesting point is that until the egg was hatched the mother accepted any kind of fish as food, but since she has had to feed her chicken she has declined all fish except *herrings*. Remember that herrings are especially rich in "fat-soluble A." Does the penguin mother know more about vitamins than the human mother? No; it is not knowledge,

though it is admirable instinct; but knowledge is best, after all, for instinct cannot learn.

As for "water-soluble B," the foods that are rich in it, generally speaking, are the seeds of plants and the eggs of animals, where this precious agent is deposited as a reserve for the nutrition of the young offspring. First come eggs, fresh or dried, wheat germ—which we carefully remove when we make white flour—and even dried peas and lentils, and beans and germinated pulses or cereals. Like fat-soluble A, it also occurs in vegetables, but there is no trace of it in butter or cream, white wheat and flour, pure corn flour or polished rice. As for the antiscorbutic vitamin, it abounds in fresh vegetables and, above all, in fresh lemon juice and orange juice.

But all these things can be damaged or destroyed. Heat hurts them—A and B comparatively little, but C very quickly. The antiscorbutic value of vegetables and fruit juices rapidly declines when they are cooked or dried, and many sailors used to suffer from scurvy, though carefully provided with preserved lime juice, until we learned that preserving the juice—at any rate, in the fashion then employed—spoiled it.

All our foods, then, have to be revalued in the light of these new discoveries. It is not enough to know merely how much heat or energy, how many calories, they will produce. Above all, for the young, foods containing the growth factors must be especially valued, and since young people do not digest fat very readily we must not waste their digestive powers on those vegetable fats that do not contain the indispensable fat-soluble A. Remembering the teeth, we must consider "the young" to include all up to eighteen years. The young mothers are, if possible, even more important.

Therefore, all questions of the preparation, preservation, sterilisation and canning of food have to be reconsidered in this new light. Only too often we may ruin admirable material by our treatment of it, as the brewer does. The range of experiment required, and the issues that hang upon it are almost illimitable. In England, the Privy Council is now spending the utmost sum available upon these researches, on account of their very great value at the present time, and on account of the marvellous prospects that they offer for the gaining of new knowledge that will easily be worth its weight in more than gold, more than radium—in national and racial life and health, and in abundant happiness.

CHAPTER XXVII

THE BRITISH SUPPLY OF FOOD FATS*

THE new dietetics, which we owe almost wholly to pioneer students in our own country, has taught us the cardinal importance of certain fats for life and health. Experiments made in London, notably at King's College for Women, Campden Hill, Kensington, are demonstrating at last the real causation of rickets and of dental defect, henceforth to be regarded as "deficiency diseases," due to the lack of a certain vitamin in the diet. Experiment and observation have already shown that it is necessary for the diet of the nursing mother, if her infant is to thrive, and I have argued elsewhere that the dietary of the expectant mother must also contain it, and that the lack of it may account for much of the very large proportion of still-births hitherto unaccountable. The young human being requires a continuous supply of this substance for normal development, from its real beginning nine months before birth, until the eighteenth year after birth, at which date the enamel of the teeth has been formed once and for all.

But, further, we learn that this fat-soluble A helps to protect the body against infection, very notably by tuberculosis, and we cannot doubt that the specific value of certain fats, such as are contained in cod liver oil, in that disease, is due to their relatively abundant content

* First published in *The Medical Press,* London, October 27, 1920.

of this factor. They rank accordingly, as what the American observers call "protective foods."

These really epoch-making discoveries have a seriously disconcerting as well as an extremely hopeful aspect. For while we find fat-soluble A in certain fats, we find certain other fats made conspicuous by its absence. Henceforth, therefore, all food fats must be examined in this supremely important particular, and put into the first class of true nutrients, or into the very inferior second class of mere fuels accordingly. And the difference is not of degree, but of kind.

Let me offer a single instance of the extreme importance of this classification. When the war broke out, I banished butter from my home and admitted only margarine, and in 1917, when I had the privilege of being attached in an honorary capacity to Lord Rhondda at the Ministry of Food, and when the relations of food to health were the subject of continual conversations between us, I honestly believed and taught in lectures and writings for the Ministry that margarine was, to all intents and purposes, as good as butter. But later it was discovered that the vegetable fats used in making margarine are destitute of fat-soluble A, and the Ministry directed that a certain proportion of animal fats must be included in all margarine. Now, however, margarine has been decontrolled and, immediately thereupon, the greater part of it was deprived of animal fats and is thus incapable of preventing rickets or of munitioning bodily resistance against tuberculosis. It is a shameful thing that rickets, "the English disease," should now be accordingly increasing in England, where the discovery of its causation and prevention has just been made. This country to-day is also gravely concerned with the altruistic prevention of rickets and tuber-

culosis in Central Europe. It is of the utmost practical importance that in, *e.g.*, the administration of the "Save the Children" Fund, the fundamental distinction should be recognised between the fats that nourish and protect us and the fats that merely fill and "stoke" us.

The food of foods for us mammals is milk. But our supply of milk in this country is wholly insufficient. We have not the milk, the cream, the butter, rich in fat-soluble A, which we need for our own children and mothers and invalids alone, to say nothing of the needs of any other classes here or anywhere else. In this connection, I need only give the reference to the very valuable recent Report of the Astor Committee on the Production and Distribution of the Milk Supply. The daily *per capita* consumption of milk in immense and crowded New York (including its millions of "poor") is more than twice as much as the consumption in the United Kingdom. Something may, and should be, done by the importation of dried milk from overseas, as indeed Lord Rhondda did at the Ministry of Food. But, in any case, the world supply of milk is short, and I am glad to be informed from Geneva that the Child Welfare Department of the League of Red Cross Societies is calling attention to the fact and to the necessity of "reserving all milk for infants and young children"—to which I would add what is implicitly involved in that proposition, "and expectant and nursing mothers."

In view of the serious disqualification which the new dietetics pass upon the most abundant and least expensive fats in the present dietary of Great Britain—to the effect that these fats will serve to provide energy but are worthless in respect of development and of protection against disease—we are required to make a survey

of the existing sources of the vitamin-containing, or *protective fats*, as we may call them, and to advise the public accordingly.

First, we must learn and act upon the recommendations of the Astor Committee on the Milk Supply.

Second, we must find and use all possible other sources of the protective fats. The results of such an inquiry, which I have been trying to make, agree with those obtained by other observers. The immense needed supply of protective fats cannot be practically found in, say, eggs, nor in cod-liver oil, nor even in fat fish, such as the salmon and herring, valuable though all of these are in their places, and as far as they go. If we turn to the authoritative official report (Report on the Present State of Knowledge concerning Accessory Food Factors (vitamins), Medical Research Committee, Special Report No. 38, H.M. Stationery Office, Kingsway, 3s. 6d.), we get indications. Fat-soluble A is made by green leaves and is found in them accordingly. But the quantities of vegetables necessary to provide us adequately are really enormous. Practically and nationally speaking, we are led to rely in very special degree upon beef fat or suet, which ranks as high even as cream in its possession of fat-soluble A, and which many of us well-grown adults of to-day used to consume in the form of suet puddings in our childhood, to our great advantage. Let us have done with the ignorant and criminal folly of trying to rear an Imperial race on a diet of tea, white bread, and margarine, all destitute of vitamins. Cream, butter, and eggs are insufficient in quantity, and their cost is well-nigh prohibitive. Plentiful nonsense has been talked about the "roast beef of old England"—nonsense which I never hear without recalling Meredith's definition of

the religion of the Englishman—"his beef, his beer, his pew in eternity"; but there is very much to be said for our British worship of beef if it means that the present disastrous shortage of protective and really nourishing fats—as distinguished from merely fuel fats—in the dietary of our children and their mothers, can be made good by the more general appreciation of beef suet. Professor Henry Armstrong has already drawn attention to suet puddings in this connection. One need scarcely add that, just as when milk is recommended, one means clean milk properly produced, so when beef suet is recommended, one is assuming that it is properly clarified and prepared, that it is not subjected to those extremely high temperatures at which fat-soluble A is destroyed, and that, in short, it is a good and complete specimen of its kind.

Inquiry has satisfied me that suet answering to these demands is obtainable, but whether there is enough of it for the national need is more than doubtful. It is evident, from our present assured and exact knowledge, that if we were to substitute expenditure for suet puddings, especially in the dietary of the young, the mothers, and the tuberculous, for their present expenditure upon fats that are "only fit to burn," being destitute of vitamins, an immense amelioration would be effected in the present deplorable physique of our population.

CHAPTER XXVIII

THE DIETETICS OF GESTATION, OR ANTENATAL DIETETICS*

LET us outline certain considerations and indications for further research which seem to arise from the recent work on "vitamins," as set forth in the invaluable new document published by the Medical Research Committee as Special Report No. 38. It would appear that the "growth" or "antirachitic" factor is furnished to the milk of mammalian mothers in their diet, if at all; and in its absence therefrom rickets will ensue even in breast-fed infants, as notably in those of the wrongly fed negresses of the Columbus Hill district of New York (*loc. cit.*, p. 88). If the breast-fed infant is to thrive, the breast itself must be properly fed.

So much for lactation; but what of gestation? We cannot doubt that the growth factor is as necessary for embryo and fœtus as for the infant. This assurance is corroborated by the observation that in fishes the growth factor is found in the roe, and that in birds it is found in the eggs. The developing organism, piscine or avian, is endowed and provided with this essential from the first. As for insects, we must study, in respect of vitamins, the two contrasted diets one of which produces a "worker" or sterile female bee, and the other a fertile "queen." We may expect to find a vitamine factor of gametogenesis. The mammalian embryo, however, must depend, in this newly discovered par-

* First published in *The Lancet*, January 3, 1920.

ticular, as in all others, upon the maternal blood—at least after the very earliest stages of segmentation. Surely these considerations open a new chapter in what we may call, according as whether we look at the present or the future generation, either the dietetics of gestation or antenatal dietetics.

Two well-known facts, hitherto obscure in causation, would seem now to be capable of explanation, if we proceed to experiment on the lines which it is the purpose of this communication to suggest.

The less important of these two facts is the dental caries so common in pregnancy. The work of Mrs. Mellanby on the development of the dental enamel in puppies' teeth,* according to the supply of the growth factor in their diet, suggests that the dental caries of pregnancy may be associated with the demands of the fœtus upon the growth factor which it requires from the maternal blood. Evidently the production of enamel and the protection of enamel are not the same process; but if the growth factor be the antirachitic factor, if it be protective in function, defect of it may cause defective production of enamel in the one case and defective protection of already formed enamel in the other. We know that thyroid deficiency produces different results in the developing and in the fully developed organism respectively. Further, defect of the growth factor in experimental rats and in children may cause xerophthalmia, due to lessened resistance to bacterial action; and the case of dental caries may be analogous. Should we not now make very exact and statistical observation, *in re* vitamin content, upon the dietaries of those pregnant women who respectively do and do not suffer from the acute dental caries of gestation?

* *The Lancet*, December 7, 1918.

The more important of the two facts which now seem nearer elucidation is the large proportion of hitherto inexplicable still-births. We have lately learnt how many still-births are due to syphilis. In view especially of the experimental work of Stockard and Papanicolaou on guinea-pigs (work which I lately had the advantage of studying in detail at first-hand in New York) I suspect maternal alcoholism of frequently causing still-births in our species as in the experimentally alcoholised guinea-pigs.* Sir R. Welsh Branthwaite, in many official reports, has given the reproductive history of chronic inebriate women in reformatories, showing a proportion of still-births, with tendency thereto *increasing* in successive years, unlike the sequence of syphilis. Dr. W. C. Sullivan, in a paper prepared for the National Birth-Rate Commission, has noted the same increasing tendency to still-births in inebriate women. But, even if and when we make due allowance for this factor, there will remain a quite extraordinary proportion of unexplained still-births—32·6 per cent. in the well known American series, and at least 25 per cent., according to Dr. Amand Routh in evidence recently given before the National Birth-Rate Commission (the possible influence of alcohol not having been considered in either estimate). May not some at least of these deaths be due to antenatal "rickets" or deficiency disease consequent upon defective feeding of the mother?

Surely, these questions can and should be answered,

* For summary of this work see "Alcohol: Its Action on the Human Organism," Report of Committee appointed by the Central Control Board (Liquor Traffic), H.M. Stationery Office, Kingsway; and for greater detail, the fifth edition (1920) of Horsley and Sturge's "Alcohol and the Human Body," Macmillan.

clinically, pathologically by further microscopic study of dead-born fœtuses, and experimentally. But, even already one notable contra-indication for practice in the dietetics of gestation may be defined. Stout and porter, so long commended for motherhood, are signally condemned, first, as we knew, because they contain the toxic ingredient, alcohol; and, second, as we did not know, because they do not contain the essential vitamins. Malt and yeast are rich in these factors, but the process of brewing totally destroys them, beer, as we brew it, being thus the most common and nationally important example of a preserved, stale, artificial, devitalised because vitamin-deprived "food." Whether the alcohol or the high temperature involved in brewing destroys the vitamins—or dietary ferments, or trophozymes, as should we not call them?—is a subsidiary but not unimportant question.

The conclusion is that we must make further experiment upon the dietary of gravid mammals. In 1906 I introduced the term "racial poison," now in general use, for such agents as lead and alcohol, which produce the germ-cell poisoning, or "blastophthoria" of Forel, or intoxicate the embryo or fœtus when ingested by the pregnant woman or other mammal. But it would now appear that we have to reckon with antenatal deficiency disease as well as with germinal or antenatal intoxication. My friend and teacher, Dr. J. W. Ballantyne, discussing the pathological condition of certain fœtuses, wrote as follows in 1902: "At the present time the cause of the dystrophy which has been described above is unknown. It may be guessed that the conditions which produce rickets in post-natal life are active in a modified form or in a different degree here."* I shall

* "Antenatal Pathology and Hygiene," vol. ii., p. 346.

be honoured if he is able to attach any importance to my present suggestions for testing his views; and perhaps to amplify his pages on diet in his volume on "Expectant Motherhood," published as recently as 1914.

The recent experience of the Zoological Gardens in respect of pregnant animals under war restrictions of food may furnish some data worthy of correlation with future researches by the Antenatal Investigation Committee of the Medical Research Committee, and elsewhere on the lines here suggested; and the dietetics of expectant motherhood, hitherto exploited mainly by superstitions about beer and by quackery about the determination of sex, may attain a new and effective importance in the genesis of a healthy race.

* * * * *

Let me add two notes. (1) At our own Zoological Gardens the view is suggested that the Polar bears, Sam and Barbara, failed to breed during the war, though they always bred before and have done so again this year, because of the deficiency of fat (? of fat-soluble A) in their diet. (2) A Scottish correspondent tells me how its mother feeds the King Penguin chicken, the first ever raised in captivity, at the gardens of the Scottish Zoological Society: "The mother penguin lives entirely on fish and feeds its offspring by the regurgitation of the digested fish, and its transference from her own beak to the beak and down the throat of the chicken. The interesting point is that, up to the hatching of the egg, the mother accepted any kind of fish as food, but since she has had to feed her chicken she declines all fish except *herrings*. You will remember that herrings are specially rich in fat-soluble A. Query: Does the

mother penguin know more about vitamins than the human mother?" This query raises the profound question of the hazardous supersession of ready-made finite animal instinct by ignorant, teachable, infinite human intelligence; but the fact of natural history here recorded is fascinating.

CHAPTER XXIX

THE LAWS OF GROWTH

AMONG present subjects for research, none is more hopeful, fundamental and—surprising though the statement be—novel, than the study of the subtle internal laws of full and healthy development (a far deeper word than growth) of the body, and of the central nervous system in especial.

Physiology, until the present century, scarcely concerned itself with this superb theme. To try to understand the working of the adult body was task enough for it; but now we are just beginning to get inklings of how that adult body comes to be, a process which we have practically taken for granted hitherto. And henceforth the study of development and the prevention of the factors which so often cause it to go awry or to arrest it, must be reckoned fundamental for all physiology and pathology. In order to clear the ground, we must exclude the question of infection, which naturally tends to dominate and even obsess our physio-pathological thinking. We need only too little research to teach us that ante-natal infection with syphilis—as I prefer to call the utterly mis-named "hereditary syphilis"—or with acute rheumatism, spoils development. We need little more research to teach us that the too-familiar infections of childhood, such as measles and scarlet fever, frequently, if not always, leave serious permanent consequences. Those childish infections are

of immense national importance, and have been scandalously neglected, but they are not my present theme.

Further, we must here exclude the results of other intoxicants, not due to living parasites, such as those due to alcohol and lead, affecting the young creature before birth or after, through the expectant or nursing mother. The research now needed deals with more difficult and obscure matters than these.

First, we are beginning to learn how the so-called ductless or "endocrine" glands direct the development of the young body. Hitherto, we have chiefly considered their functions in the adult, recognising myxoedema as the result of defective action of the thyroid gland, and exophthalmic goitre or Graves's disease as due to its excessive and perverted action; Addison's disease as due to defective action of the adrenal glands; acromegaly as due to disease of the pituitary gland; and a large and ill-defined variety of disorders as due to disturbance of the due co-ordination of these glands, now often called the "endocrine balance."

But, interesting and important though these studies be, they are now being seen to yield place altogether to far more significant discoveries as to the functions of the ductless glands in development. We already knew that cretinism, marked by dwarfish idiocy, is the result of thyroid failure during childhood, and that is only the first of a whole series of discoveries now in the making. Above all, the endocrine glands, and the endocrine balance, are important for due development, of which they are the directors. Every tiniest speck of glandular tissue must now be studied from this point of view. It is by no means enough to observe those glands which have no ducts, and produce no obvious secretion—none

but that which they add to the blood as it passes through them; or which, perhaps, function by removing something harmful from the blood as it passes through them.

We are learning that familiar glands, with well-known ducts and secretions, may *also* produce internal secretions, just like those of the ductless glands, and in many cases from special cells, embedded in their general structure, and distinguishable under the microscope. You do not know the alphabet of the liver if you suppose that it only produces bile, or of the pancreas if you can name merely the pancreatic juice. Foremost in importance, from puberty onwards, are the internal secretions of the reproductive glands, in both sexes. These are products which use no ducts, and do not leave the body at all; but the boy cannot become a man nor the girl a woman without their all-pervasive and sovereign influence. When we begin to enumerate these many secretions, from so many sources, and to consider the chemical complexity of each of them, we cannot wonder that disturbance of the "endocrine balance" is so common. The marvel is that Nature so often holds the balance true.

Faced with these discoveries, we may ask whether we have any means of control over biochemical reactions so recondite. The new discoveries about vitamins begin to show us where our powers may lie. Two of these substances which we had formerly associated only with the prevention of rickets and beriberi respectively, are now recognised to be essential for development. Fat-soluble A ("antirachitic factor") and water-soluble B ("antineuritic factor") are now to be also called the two "growth-vitamins." Whatever we have to say about the "internal secretions," here are constituents of the diet, which we can give or withhold, increase or

diminish, in vegetables and milk and meats and fats, and so forth, to any extent we please. And naturally we ask, what relation, if any, exists between them and the "internal secretions"?

It has been suggested by the pioneer, Dr. Gowland Hopkins himself, that the relation is simple—at least in principle—and direct. Probably we have not to deal with two distinct and independent factors of growth, internal or endogenous, and external or dietetic respectively; but rather the action of the external or dietetic factors, the vitamins, is to stimulate, or "activate," the internal or endogenous ones. In a word, on this theory, the vitamins act by stimulating the endocrine glands, and regulating the endocrine balance. It is a very elegant hypothesis, and offers a splendid field for research.

Yet again, this must cost money. It involves the feeding of immense numbers of animals, for prolonged periods, with skilled observation, and with means of "control" experiments, essential for the avoidance of fallacy. The Medical Research Council will doubtless give every penny it can to this work—and certainly pence are the units in which to think when we are referring to research in Great Britain. Nor is there any Member of Parliament who will exalt the pedestrian records of debate by persuading the Government to multiply manyfold—not *though* the Treasury is poor, but *because* it is poor and we need whole, hale men and women to enrich it—the present ignominious pittance on which we starve Life-Saving Knowledge!

Finally, lest any accusation of materialistic and monocular vision should be made against the foregoing, let me add that the psychical influences upon development are momentous and here unforgotten. No experi-

ments upon the lower animals will suffice without observations on man, especially in respect of the internal secretions of the reproductive glands, which are apparently of much greater and less intermittent importance in our species. We must prosecute the researches that may enable us to resolve the disharmonies, as Metchnikoff called them, which are so conspicuous in relation to sex in our species. And we may learn why it is that the Kaffir or native Australian child is seemingly the equal of the European, but degenerates at puberty; and why so many of our children degenerate then too; and whether our present infamous neglect of adolescence can be long compatible with the continuance of Empire.

CHAPTER XXX

OUR SHAMEFUL TEETH

VISITING Manchester lately in the course of my attempt to abolish the "plague-cloud" in that and all other cities, I was fortunate enough to have several spare hours occupied by participation in the National Conference on the Nation's Teeth, most usefully convened by the Food Education Society. Some public attention was directed to the admirable papers read by doctors and dentists at that Conference, but—characteristically enough—only in respect of a jocular commendation of dry champagne as a mouth wash, which received the head lines and chief comment even in the most responsible journals. Meanwhile we have a national disgrace and danger to recognise and remedy. Let us avoid the temptation to indulge in the amusing and intriguing discussions on the tooth-brush and its dangers, fine wines as mouth-washes, the vagaries of cowardice (as in many brave airmen), and courage (as in many frail old women) among dental patients; for the main facts must be set forth first. I cannot do better than transcribe exactly the author's synopsis of the paper on "The Extent and Consequences of Dental Disease," read by Dr. Harry Campbell, an original and acknowledged authority on dietetics:

We have the worst teeth of any nation. The state of our teeth beggars description. It is a national disgrace which should excite a feeling of shame and humiliation.

Diseases of the teeth include: (1) Irregularities. (2) Loss from extraction and shedding. (3) Decay. (4) Disease at the fang-tips. (5) Pyorrhœa, or socket disease.

Regarding the extent of these among the British, dental irregularities are practically universal among us. Some hundred million teeth have been extracted. About the same number have been spontaneously shed. The decayed teeth number some two hundred million; there are about the same number of pyorrhœa sockets; finally there are some twenty million diseased fang-tips. *At least nine-tenths of this disease is preventable.*

The consequences of dental diseases are: (1) Malodorous breath. (2) Unsightliness (from irregularities, decay, long teeth). (3) Pain (toothache, pain inflicted by dentist, fear of dentist). (4) Reflex disturbances. (5) Defective mastication (causing indigestion). (6) Secondary local disease (abscess and cancer). (7) Blood poisoning (arthritis, neuritis). (8) Economic loss (loss of time; need of supplying army of dental surgeons).

In the course of the discussion none of these statements was impugned in any degree, and the essential ones were confirmed. Those, then, are the shameful facts.

Dr. Harry Campbell has lately said what is doubtless true, that we are the worst-fed nation in the world. And in our discussion in this volume of the new dietetics, which mankind owes almost wholly to British men and women of science, we have already seen that relation between diet and the dentition which may help us to correlate Dr. Campbell's deplorably accurate superlatives.

Indeed, at the Conference in Manchester, Mrs. Mellanby not only read a valuable paper on her experimental work, but also showed us a number of the jaws of young animals which had been supplied with varying quantities of food containing the fat-soluble A, or anti-rachitic vitamin, which is probably

responsible for the proper development of the teeth, as well as of the skeleton. Alas, that this precious substance should be, as she says, "On the whole associated with the more expensive articles of diet, such as eggs, butter, whole milk, and animal fats." Observe now Mrs. Mellanby's experimental findings in puppies, which received, instead of such things, only linseed oil, lard, separated milk, and so forth; and note how closely those results coincide with what we everywhere find amongst the children of our land to-day. They "showed according to their size and rate of growth, some or all of the following defects: (1) jaw bones were soft; (2) teeth irregularly arranged; (3) delay in the eruption of the teeth; (4) defective enamel; (5) poorly formed and deficient dentine; (6) low calcium content of the teeth compared to their size; (7) a much diminished resistance to disease."

On a previous page I have suggested that the dietary of the expectant mother receives a new importance when we realise that the unborn child needs vitamins, which it cannot make for itself, and which the maternal body cannot make for itself, or for the child; and have asked for experiments upon expectant animal mothers in order to elucidate this matter and the large proportion of still-births still unexplained and referable, I hazard, to vitamin deficiency. Mrs. Mellanby is now conducting such experiments; and already, it appears, experimental evidence is being obtained which shows the importance of vitamin supply (through the mother's diet, of course) during the rapid growth that occurs before birth. The so-called "milk-teeth" of puppies are not properly developed in cases where their mothers, expectant or nursing, were not properly supplied with the necessary vitamins.

(The term "milk-teeth" is absurd—unless, indeed, we transfer it to the so-called "permanent" teeth, which are being developed in a child in those early years when its diet contains much milk, and which are largely the actual products of that milk.)

Most dentists would regard as far more important than the foregoing the other relation of our food and our teeth, namely, their direct relation in the mouth. If special reference has here been made to the relation of food to teeth after the absorption of the food, that is because of the new and significant discoveries which we owe to Mrs. Mellanby in especial. But Dr. Harry Campbell and Dr. James Wheatley, Medical Officer of Health for Shropshire, who has done marvels in reducing dental disease by education in his county, are in essential agreement with Dr. Sim Wallace, whose interesting books on these topics are well known, that, when the utmost has been said for the tooth-brush as a cosmetic agent, which makes the teeth *look* clean, yet (in Dr. Wallace's words)—

> Dental caries can only be prevented by physiological means. These are:
>
> (1) Mechanical (the motions of the jaws, tongue, lips, and cheek) and the action of foods with certain physical qualities, *e.g.*, fibrillar or spongy foods.
>
> (2) Chemico-physiological, resulting from the activities of the glands of oral hygiene (mucous and salivary).
>
> When the physiological activity of the muscles of mastication, tongue, etc., and the physiological activity of the glands of oral hygiene are not interfered with or stultified by unphysiological foods, especially at the end of or between meals, dental caries does not occur.

We need not trouble about the difference of opinion here implied between Mrs. Mellanby and Dr. Wallace. All her work may be valid and invaluable; and yet his

contention may be true that our teeth decay because we do not use them properly. We see this happening to the brain (as of persons who nowadays can only "listen to" lectures consisting of lantern slides, and "read" papers consisting of pictures); and if it be not true of the teeth they are outside the general and vital law, that what is not used declines, decays, disappears, dies.

* * * * *

From visits to North America one returns to be confronted on every side, as it seems, with multitudes of false teeth. This is all wrong; it is intolerable in its consequences, and it is unnecessary. The people in North America are, for the most part, of the same racial stocks as ourselves, and we should be ashamed to have worse teeth than they.

But as every eye can see, and as all statistics—not least those of military recruiting—conspire to show, we have the worst teeth in the world. The trouble begins in childhood, is abominably neglected as a rule, casually maltreated, and culminates in disastrous loss of teeth or in serious disease of the gums, leading to foul breath and general intoxication.

The causes of our peculiar national liability to dental caries are not single, nor briefly to be disposed of; but the first, as we have seen in previous chapters, is a faulty dietary in childhood, deficient in certain precious constituents such as abound in good milk—wet or dried—in suet, brown or wholemeal bread, and fresh green vegetables. Second is neglect of oral and dental hygiene. Third is the poor service of dentistry in this country. Fourth is the stupidity or cowardice, or misguided thrift or laziness, which prevents people from using such dentistry as is available.

The possible remedies for this ugly and unpleasant state of things, with all the inefficiency and pain and disease that it involves in peace and in war, must necessarily correspond to the causes here indicated.

Thus we are required for this and many other reasons greatly to improve the dietary of our children—and young people in especial—at least until the eighteenth year or so, when the development of the enamel of the teeth is completed, or arrested, if not completed. Large questions of national policy are here involved, for one food is not "as good as another," nor is our milk supply what it should be, though much helped by the import of dried milk from New Zealand. Second, we need to teach and practise an oral hygiene which recognises the value of such foods as demand the use of the jaws and teeth, and which includes the use of the tooth-brush and of "dental silk" to keep the spaces between the teeth clean and sweet. Third, we need a very largely increased supply of qualified dental surgeons in this country, where their numbers during many past years have shown no increase proportionate to the increase of the population. Here, again, questions of policy and legislation are involved. There is little prospect of getting enough qualified dental surgeons whilst, as now, the unqualified practitioner is protected by the law, and by public ignorance.

Fourth and last, we must overcome, for children and adults alike, the causes which lead them to lose the help of dentistry when it is urgently needed. We have already done much in many localities, towards the provision of a dental service for school children. Several years ago, when visiting Edinburgh for a public meeting, I was taken by Lady Leslie Mackenzie to see the pioneer and well-equipped service for the children of

the Scottish metropolis. Since that date such clinics have multiplied.

But a service of the most efficient kind is urgently needed for adults, and has been authoritatively recommended by those appointed to study the subject. The present tendency and prospects of public finance suggest that, though the establishment of a national dental service would be a genuine economy, a piece of public thrift which would speedily pay for itself many times over, yet such a service may be long to seek.

The dental clinic will save many teeth and relieve much pain—no doubt. It must do more. It must function as an educative centre, where people are taught that good dentistry is the cheapest thing in the world, and where sound ideas on this important subject, which bears so directly on the public health in general, may be disseminated to counteract the insidious teaching of the charlatan and the mercenary, who suggest that one's own teeth may just as well be allowed to go to rack and ruin, for replacement by beautiful substitutes which will never ache or decay. Every student and champion of public health will wish for the multiplication of the clinics, which promise to demonstrate the best antidote to that plausible but profoundly false teaching.

CHAPTER XXXI

THE CREATION OF NEW FOOD PLANTS

More than sixty years ago, a monk of Brünn, named Mendel, made experiments upon the inheritance of characters in the edible pea, which produced remarkable results, deserving of universal attention. Instead, they were totally ignored during a whole generation.

Just before the dawn of the present century they came to light, and were studied, in especial, by the Englishman—Professor William Bateson—who speedily made the subject his own. He and his pupils have found that what Mendel showed, for the edible pea, is true of many characters of many plants and animals, even to the colour of the human eye. The application of Mendel's Law, and the extensive elaborations of it which we owe to the school of Bateson, makes possible the creation of new and permanent varieties of plants, which combine characters never before combined in nature, and which breed true from generation to generation.

This work is, of course, of the highest value to pure science, and justifies Bateson in coining a new term, genetics, to indicate the exact science of heredity, as studied experimentally, under exact conditions, for its own sake.

The most distinguished of Bateson's fellow-workers, Professor Rowland H. Biffen, now head of the Department of Agriculture in the University of Cambridge, has especially devoted himself, however, during several

past years, and not least during the war, to the experimental study and practical application of the laws of Mendelian heredity, as they are found to operate in plants of economic, and especially of dietetic importance. It is evident that, in the production of living things, two factors are always at work, which Galton, following Shakespeare, called nature and nurture. In the production of food-plants, such as wheat, the importance of nurture, especially in the use of suitable fertilisers, is known to all. But the natural characters of the plant are no less important, and may be transcendent in many instances.

Thus, there is not merely one constant plant called wheat, but there are, indeed, thousands of varieties of this most precious creature. To the uninitiated, wheat is simply wheat, and steel is simply steel; but the difference between one kind of steel and another is life and death to the soldier who wears it as a helmet, and the difference between one kind of wheat and another may be life or death to the nation which plants it for the supply of food.

The lessons herein apply to all nations, but, in the first place, they have been learnt in Britain for British purposes. Other nations, having their own conditions of soil and climate to consider, must in degree solve their problems for themselves. Each nation must create the food plants which are naturally best for its conditions of nurture, but the all-important fact is that the principles which Biffen has followed in England are amongst the principles of success everywhere.

Thus, for instance, our typical English wheats have a heavy yield, but, unfortunately, are susceptible to the attacks of the fungus called yellow-rust, which takes five per cent. of the crop in average years and sometimes

takes ten per cent. or more. This important proportion of the whole could thus be saved every year if this disease could be eliminated. Now it appears that, just as in the case of our own species, but in more precise and controllable degree, immunity and susceptibility to the attacks of parasites are largely—it may be, exclusively—dependent on a natural, inherited, transmissible quality within the species attacked.

If a high enough degree of natural immunity exists, no prevention of infection, no provision of antiseptics, is needed. Of all means for the prevention of parasitic disease, other than the total extinction of the parasite, this is surely the best—to breed an immune race.

Such races of wheat exist, naturally immune to the attacks of yellow-rust, but it is of no use to offer them to the English farmer, for their yield is light, and he would much rather have the wheats he knows, with their heavy yield, even though yellow-rust taxes it so severely. What we all want, of course, is the wheat, unknown until this present work was achieved, which shall have a heavy yield and be immune to yellow-rust.

The problem was to call such a race of wheat into being, and it has been solved, thanks to the long-forgotten observations of the Silesian monk, fifty years ago, and the application of the principle which they revealed under the auspices of the University of Cambridge in the present century.

The first task was to analyse the genetic origin of susceptibility to, or immunity from, the attacks of yellow-rust. Thence followed an achievement which was essentially completed by Biffen and his fellow-workers well before the outbreak of the war.

By crossing parents of which one gave a good yield susceptible to rust, and the other a light yield rust-

resisting, they obtained the marvel called Little Joss, which gives the heavy yield of its heavy-yielding parent, but, thanks to its other parent, resists the rust which would otherwise take a tax of from five to ten per cent. of that yield.

Here, then, is a new plant in the world which is worth so much more to the nation than its predecessors. More men and women can live in consequence, the wheat yielding life to them instead of to a yellow fungus. This is, in the strict sense of the words, the creation of a new food-plant, and a model to be followed wherever the food-problem exists—as where does it not?

Much more than the food-problem, I may remark in passing, is really involved. No one who has ever sat in a clinic, where his fellow-men and women, of widely various types, showed widely various degrees of susceptibility to the attacks of those other fungi which rust and rot the machinery of our bodies, can fail to see the immense significance, not only for our food-supply, but also for ourselves, of such achievements as these in what might be called the eugenics of wheat.

It would be well to breed strains of men and women with the heavy yield in music and thought of a Schubert or a Spinoza, yet, unlike them, insusceptible to the attacks of the fungus we call the *bacillus tuberculosis*.

But to return to our wheat. Observe how directly the creation of this new species bears upon the food-producing power of a country, without making any further demands upon the soil, or labour, or the supply of fertilisers. It is, in effect, something for nothing—except the devoted and ill-paid labours of a few men of science.

In Britain, hitherto, the farmer has harvested about thirty-two bushels of wheat per acre. That figure is

very good, judged by Transatlantic or Australian or Russian standards, but is inferior to the yield in Denmark, which is forty-two bushels. Yet, to-day, we need by no means regard even that figure as the limit, or anywhere near it.

Recently, at the Royal Institution, I heard Professor Biffen declare that twice the Danish figure could then be achieved and that no one may venture to name the further upward limit. Professor Biffen has only been at this work, with little help and very limited resources, for some fourteen years. This is merely the beginning of the beginning.

For let us take another instance. Heavy yield is a character of hazardous value in a wheat if the straw that holds up the riches of the head be weak, and liable to fall before the onslaughts of wind. When it cannot hold up its riches to the weather, and it lies prone upon the ground, far too much of that wealth may be lost. But stiffness of straw in wheat depends upon Mendelian factors. Indeed, Biffen has already justified himself when he declares that there is no known character of value in wheat, which may not be built up into the types we most desire, by the further application of the genetic methods which have already done so much.

Let us have, therefore, since we may choose, a wheat with a naturally high yield, which can defy both the yellow-rust and the stormy wind.

Again, there is a quality in wheat which the miller and the baker know as "strength." This quality enabled us to enjoy the light, well-piled loaves of pre-war days, much more appetising, pleasant, and widely digestible than the loaves of to-day, or those which our grandparents knew. The chemistry of "strength" is of great interest, like the exact pathology of suscepti-

bility to rust; but here, as there, we are concerned now only with the heredity of the quality in question, without asking in what feature of anatomy or chemistry that quality consists.

First, we find that we must not lose our judgment because we have ascertained the factor of heredity or "nature" to be so important. "Nurture" must also be considered. Wheats are known which have the desirable character of "strength" due to, and inseparable from, the climate and soil in which we grow them. In other "strong" wheats the determining cause of their "strength" is not nurture but nature. It would be best and most philosophic, of course, to perceive and acknowledge the concurrence of both factors, in varying measure, in each case.

Every vital character is the product, not the sum, of nature and nurture, as I have long urged; the figure 100, corresponding to the measure of "strength" in two varieties of wheat, may be due to nature x nurture, 2 x 50 in the one case, and 50 x 2 in the other. It will matter very much, in practice as well as theory, if we choose the first, instead of the second, to introduce to our soil and climate from Canada or Hungary.

In any case, the necessary work has been done. A "strong" Canadian wheat, yielding but poorly on our soil, can be combined with an English parent, which yields heavily, though "weak" in the chemical quality of its flour; and in the upshot such a new variety as that called Burgoyne's Fife will flourish in our fields, combining the "strength" of the Canadian and the heavy yield of the English parent.

The foregoing are very important examples of qualities of high practical importance found in a single plant and they do not exhaust the list, even for that one plant.

Thus, similar genetic work to that already described will enable the breeder to produce varieties of wheat which, for instance, ripen at the most convenient season, without losing other qualities which are valuable in themselves, but which have hitherto been found only in conjunction with an inconvenient "seasonal habit" —to use the botanical term.

Hitherto, I have mentioned wheat alone, for that is the most important of all the food plants and has accordingly received most attention. But there are other food-plants of high value which, of course, exhibit similar combinations of desirable and undesirable qualities in different varieties, and similar achievements will surely follow for them. One need only mention barley and the potato, for instance.

This latter plant, once despised, surpasses all others in its food-producing powers, and will assuredly repay the kind of study which depends upon the recognition of genetic principles and which it has not hitherto received. Admirable new varieties of potato are frequently put upon the market, but most of them deteriorate after a time.

As Professor Punnett, who occupies the Chair of Genetics in the University of Cambridge, has said, "Were the potato plant subjected to careful analysis and the various factors determined upon which its variations depend, we should be in a position to remake continually any good potato without running the risk of losing it altogether, as is now so often the case."

It would be very insular and unfair to conclude this chapter without reference to the world-famous work of Luther Burbank, in the United States. His methods are markedly dissimilar to those of Biffen, and he has achieved very great results. I am by no means pre-

pared to assert that the Mendelian discovery, which has found in England so kind and capable a foster-mother, is of the all-embracing character which some have claimed for it. There will be limits to Biffen's success, accordingly, as there are limits to Burbank's, but already the Englishman has created several valuable varieties of wheat, and, whatever may be his future success, that achievement is a lasting triumph.

Evidently the State is concerned with such scientific matters as these, and it was good to find a recent Minister for Agriculture paying at least formal tribute to this work as he lately did. And it is clear that we need a great institution, with adequate means and resources, perpetually to study these few precious plants upon which the existence of the great majority of mankind depends, and to improve their natural qualities up to the unknown limits which may, indeed, have no real existence.

It was one of the achievements of Great Britain, during the war, to have recognised this, and to have taken in hand the foundation and establishment of a great Plant-Breeding Institute, where the creative work already done by Biffen will be immensely extended in the creation of hosts of new food plants, yet in the womb of Time, for the benefit of mankind at large.

CHAPTER XXXII

OUR SOLAR INCOME

DEEP and distant in my ears is the most wonderful sound—other than those made by living beings—in all the world, the eternal vibrant thud of the waters of the Niagara River as they suddenly drop some eight or nine score feet on their way from Lake Erie to Lake Ontario, the St. Lawrence River, and the Atlantic. This noble theme is not primarily one for the biologist. It should first be treated by a geologist, who could describe the slow but certain cutting of the gorge below the receding falls, and might estimate, from the observation of a few years, the length of time it has taken to cut the channel through which the rapids now rush. The theme should be taken up by the physicist thereafter, considering the forces at work in the production and maintenance of this head of water, and by the astronomer, asking whence the sun derives the heat which has first lifted all this water into the sky so that, whilst all the rivers run into the sea, yet the sea is not filled, and asking also the nature of the force of gravitation, which pulls down the waters of Erie into Ontario. After its treatment *maestoso* by these three, the theme should be dealt with, in strict time, and without too much feeling, by the engineer, who would tell us of horse-power, and a possible means whereby such power might be made mechanically available.

After that, perhaps, the biologist with sociological

tendencies may be allowed a word, in order to show how this thunderous music may be transcribed as a civic and domestic symphony—and that is my present intention.

In 1913, after a journey through Bavaria, Northern Italy, and Switzerland, I tried to interest my fellow countrymen in the bio-sociological importance of water-power, which is current sun-power, illustrated in the running of Munich by the power of "Iser, rolling rapidly," and by the approaching conversion of the Swiss railways to hydro-electric power, disposing of the need to import English coal, and to close the windows before entering the sub-Alpine tunnels. At Niagara Falls one sees the same thing on a much vaster scale. Without any hint whatever, at any rate hitherto, of what anyone could call vandalism, the engineers have utilised some 500,000 horse-power out of the estimated 5,000,000 of the Falls. Unfortunately, I had not time to go to see the shaft, two hundred feet deep, where some of the water drops sheer upon a turbine beneath, but on re-visiting the Falls after fifteen months, I learn that the incomparable advantages of this source of power are asserting themselves more than ever. In a few years the American city of Niagara Falls, to say nothing of Niagara Falls, Ontario, has doubled its population, which is now sixty thousand. It is no longer only a show-resort, but a manufacturing city, unique in all the world, thanks to the power at its doors. Vast factories are springing up, on both the American and the Canadian sides. Cities so far away as Toronto on the other side of Lake Ontario, ranging to distances such as a hundred miles, share in these advantages. In Niagara Falls itself I was entertained in a modest home (Americans never speak of a "house") where the lady of the house, as we would call her, had had ten children,

eight of whom were then under her roof. I naturally asked questions about domestic heating, etc., in the winter, when the Falls freeze in the intense cold. Then I began to learn what electricity, that costs next to nothing, can do in the home—heating, lighting, cooking, washing, toasting bread, pressing clothes, telephoning, and so forth. Spontaneously this mother of ten remarked on the sorry old fable that a woman's work is never done, and congratulated herself, as well she might, on the comfort, ease, cleanliness, and economy of her lot. Unfortunately, as we have seen already, in England is no Niagara. We must distill coal and burn the residues.

Consider now the adjoining city of Buffalo, with its half-million inhabitants, and vast industries. Here one sees on a vast scale the civic aspect, as previously the domestic aspect, of hydro-electric power. A city so fortunate can scarcely be other than prosperous. And observe the fundamental fact that this source of power is endless. No expert need be called in, as with coal and oil, to say when the Falls will run dry. My article of 1913 was called "Our National Income of Sunlight." The argument was for the use of our perpetual solar income, otherwise wasted, as against the spendthrift, dirty, disease-breeding, light-destroying combustion of coal, the hoarded capital from annual solar income of sæcular ages gone by. And that is where and why it behoves us at home to think furiously.

We have no source of power in Great Britain that could furnish our housewives in general with almost costless advantages such as may be seen at Niagara Falls. But no one, surely, who loves his country and has seen what I have seen, can hesitate to declare that, at least, we should use all the water-power we have.

Our resources of this kind have lately been examined and were stated to amount to about 3,500,000 horse-power in the British Isles—as compared with 5,000,000 in Niagara Falls alone, to say nothing of the rapids above or below, which look as if they could drive a continent. As compared with Scandinavia, Bavaria, Northern Italy, Switzerland, our resources are meagre. But surely in view of the enormous advantages of hydro-electric power, to say nothing of the present cost and inevitable depletion of our coal, we should use all we can of what we have. At Chester, on the Dee, one has seen something of this, and there are instances in Scotland, but the experience of many countries, including the use of falling water in forms much more nearly resembling those we possess than the Falls of Niagara, must teach us that even a country so rich in coal as we are should use its water-power in these times. Alas, that, apart from such water-power, we have practically no expedient for electric-power except the wildly wasteful combustion of our capital of coal.

Let us note what other means we have for using our solar income. The growth of food is the first: no economist, no transformer, like the green leaf. For eighteen years, in peace and in war, I have been protesting, on biological grounds, that we do not grow enough food at home. This proposition has been and is strenuously denied by many clever people—some of them, I believe, because they suspect an ugly political swindle at the bottom of it; but Sir William Crookes was always right, and so was Malthus in his insistence on the importance of food-supply, and the modern study of vitamins supports the contention. The best use of our solar income is to grow the right green leaves in our soil. By the proper use of those radiations we can

do vastly more for our lives than by even the entire use of all the water-power which we owe to solar gravitation.

It should be remembered that our solar income of sunlight includes all that falls upon our fishing waters and yields us fish (through the intermediation of plankton, the "grass" of the sea) as the radiation on our land yields us the beasts of the field.

The claims of food, and of the energy that can be used in food by the body directly, are paramount: and ere long we shall have to grow the typical vehicle of energy, sugar, in our own soil. There remains the possibility of getting power, corresponding to the power in coal, by growing plants which will yield a suitable fuel. This practically means the growth of more potatoes than we need for food, the surplus being made to yield industrial alcohol. To this also we shall come; though perhaps the cultivation of some other plant, with a high carbohydrate yield, under a tropical sun in some of our sparsely-populated overseas possessions, may come first.

Whatever the conflicting interests, whatever the special advantages and disadvantages of our country, the biologist is surely entitled to contend that, especially in view of such experience as that of the city of Buffalo, we should not be content to find in our finite inherited capital of coal practically the whole of our national supply of energy, but should learn how to use to the utmost the current income of power with which the sun, by its gravitation and its radiation, perpetually endows those careless creatures of its light who used (if memory does not betray me) to call themselves Britons.

CHAPTER XXXIII

CITY STREETS AND GREEN LEAVES

THE census of 1920 in the United States revealed the most important of all demographic facts. In it, I suspect, is a part-explanation of that supreme phenomenon of self-repeating history which we call decadence; and it has a practical bearing, of the most ominous kind, on our own chief national problem.

The rural population of the United States has declined during the last decade. Civilisation, which is literally city-fication, means urbanisation. Let us first define the causes of this process, and then consider its consequences—not least for our crowded, hungry, and ill-fed selves.

There is an idea, in Great Britain, that our extreme and increasing urbanisation is due to the small size of our country and to our land laws. This is a baseless myth. At least among progressive peoples—a qualification here made because I am going to ask a question about Russia later—the phenomenon is universal, and has nothing whatever to do with the ratio between the area of a country and its population. In colossal Canada, people accumulate in a few growing cities, ignoring the stupendous spaces of virgin and fertile soil without. Half the population—probably more by now—of the continent of Australia is in a handful of five or six crowded cities. And now we learn that, even in the United States, with its rapidly increasing popu-

lation, now estimated at 105,000,000, the fertile and almost illimitable countryside is being depopulated. Meanwhile, all over the world, moralists, social reformers, economists, and hygienists are echoing the cry of: "Back to the Land." In Great Britain we were told that, after the war, hosts of demobilised men would decline to return to the desk and the factory, and would long for the rustic ideal of "three acres and a cow."

Such proposals and expectations, however desirable in appearance, are all vain, I suggest, because they ignore part of the constitution of human nature. More than nine out of ten readers, I avow, would assent to this proposition. A popular American song, now running, asks a question, in the only three lines of it which I know, and to that question no answer has yet been found—not even in Sir Arthur Yapp's proposal to use war-time Y.M.C.A. huts as centres, during peace, for the "pictures" and other urban amenities in village life. The question is:

> "How yer gonna keep 'em
> Down on the Farm,
> After they've seen Paree?"

For recent recognition, in more serious literature, of the same argument, I may remind the reader of two works which I have long quoted in this connection. One is "Youth and the City Streets" (Macmillan), by Miss Jane Addams, "the Abbess of Chicago," as Professor Patrick Geddes has called her. In psychological understanding and intimate sympathy this little work is a masterpiece. The other is the libretto of "Louise," the famous opera written and composed by Gustave Charpentier, of Paris, wherein the tragedy depends upon the refusal of Louise's parents to realise what incarceration means to their daughter, when she hears the "Voix de

Paris" coming through the open windows and reads to her father, from the paper, the news that "Paris est tout en fête."

No doubt there is an appreciable minority. Some are slow-witted and cannot stand the pace of urban life; some are hermits by nature, and of these not a few are abnormal, as a psychiatrist would testify. Of the slow-witted, most or all display the cerebral type which cannot survive in cities. They are examples of the most retarded form of what I have discussed elsewhere under the name of "Mental Tempo." Since that paper was written, I have heard a lecture by one of our foremost psychologists, Dr. W. H. Rivers, in which, after making fullest allowance for the racial poisons, alcohol and venereal disease, when introduced by civilised men amongst "savages," he concluded that the real reason why primitive peoples decline in numbers and disappear when brought into contact with modern men, is not anything so obvious as those pathological agents, but the subtle, simple fact that they cannot stand the modern pace. Life on such terms is intolerable to them; they give up the struggle alike for themselves and their children, and die out.

But men of the modern type desire the city, and their youth desires its streets. Two instincts are at work, which Sir Francis Galton distinguished long ago, in his "Inquiries into Human Faculty."* Galton distinguished between the social instinct and the gregarious instinct. The first, of course, is immeasurably higher than the second, and is eminently characteristic of man,

* Here I will use the word "instinct" loosely, not forgetting the more exact and luminous definition of the term which we owe to Dr. William McDougall (in his "Social Psychology"), who has now been summoned to the Chair of Psychology, formerly occupied by William James, at Harvard.

except in his abnormal eremite forms. The second, which we also display, Galton observed in, for instance, cattle during his travels in Africa. The creature does not desire to establish any psychical or social relation with its fellows, but it does desire to be with the rest of the herd, and the evident reason is that the gregarious condition spells physical safety when beasts of prey are in the neighbourhood.

It is not my present purpose to define closely the share of these instincts respectively in the urban trend of modern man. Doubtless other factors enter in, such as love of physical comfort, dislike of laborious physical exertion, hope of rapid self-advancement, appreciation of urban entertainment and so forth. My present object is served if we can agree that modern (like ancient) urbanisation is not a consequence of special local conditions, but is the result of instincts or desires which are inborn in nearly all modern men, which cannot be changed, and which are therefore displayed by such men throughout the world.

The consequences are very large, and constantly tend to be ominous. I am not now thinking of the unholy trinity, Mammon, Bacchus, and Priapus, that reigns in nearly all cities—certainly outside modern North America, at any rate. That heathen trio furnishes matter for the moralist and for the philosophic historian and student of decadence, no doubt; here I am considering the matter only as a biologist who knows that cities do not grow food, but must be fed, and that human life cannot long flourish far from green leaves, which make all the food of man. It does not suffice to plant trees and grass, as in the side walks of the superb American cities. Man's body cannot live on that sort of grass, refreshing though it be to his spirit.

In America now people are talking seriously and anxiously about the food supply—for American, not for European, mouths. They are discussing the by no means remote prospect of *importing* food—into America with her almost boundless prairies. It is not the farms that are lacking, but the men willing to stay "down on the farm." In Albany, capital of New York State, in the autumn of 1920, I saw an immense official placard, appealing to people to increase the national food supply by going to work on the farms during their holidays. The price of food is soaring, and the farmer flourishes, but he cannot get labour, and his ideal for the end of his days, when he has saved enough, is to buy a house in town and enjoy life there.

What does this portend for Europe, a large portion of which America is now feeding in charity, and especially for Great Britain, which grew for herself about one loaf in six before the war, and is rapidly reverting to that unnatural and dangerous condition since the Armistice?

The answer to that question is as obvious as it is ominous. I do not pretend to predict how we shall be fed in years to come—but assuredly it will not be as we have been fed hitherto! There is Canada—our Canada—but the psychological factors I have named are at work there also, and the recent census shows that the population of the Dominion, including those who would grow food for us, does not increase as we might expect, because of the immense—and natural and inevitable—immigration of Canadians to the cities of the United States.

My mind now turns to Russia, which M. Anatole France has lately proclaimed as the possible saviour of "dying Europe." Russia is, or might be, a vast

granary. And now I ask the question whether the Russian peasant, of whom I have no first-hand knowledge, is of the primitive psychological type and tempo which does not like cities, and desires only to own some land and grow food thereon. It looks to me as if we hungry Europeans must hope so. The Russian peasant may be worth saving—if we would fill our bellies with more than the east wind.

PART V

THE NEXT NECESSITY

CHAPTER XXXIV

HEALTH CENTRES FOR POPULAR HEALTH EDUCATION

THE Medical Consultative Council of the Ministry of Health in London, has recently submitted to the Minister and the Nation a comprehensive, co-ordinated and costly scheme for the reorganisation of the medical services of the country. The plan seems well-fitted for the work it seeks to do, and those who know the disinterestedness, the vision, and the devotion of Colonel C. J. Bond, F.R.C.S., of Leicester, the Vice-Chairman of the Consultative Council, would confidently follow him blindfold anywhere, if it were necessary. Some such scheme for the alleviation of the immense and increasing volume of disease and defect in our cities of dreadful days and nights, we should certainly have. But it may be noticed that the first-aid stations, so to say, in the new scheme, are to be called primary health centres, and the general hospitals secondary health centres. Now, it so chances that, on the other side of the Atlantic, a closely similar term is now coming into use, but for an institution of a fundamentally different kind, the goal of a train of thought entirely different, if not the polar contrary of that which has reached the medical scheme now before us.

The Ministry of Health, as represented in this scheme, and in the avowed desire of the Minister to build more hospitals, is evidently, and very properly, desirous to

treat and relieve disease. That is a duty which must certainly be discharged in any decent community, and doubtless the Ministry of Health is the proper authority therefor. The Ministry of Health is seeking to function as a Ministry for Disease.

The wary reader may suspect, at this point, an attempt to suggest a strained and merely verbal antithesis. Therefore, in order to show that I am not merely trying to emulate the feats of some of our most popular and successful word-jugglers, let me contrast forthwith the idea of a "Primary Health Centre," as lately submitted to this nation, and the idea of an "Elementary Health Centre," as now being realised in New York. Briefly, London's idea of a health centre is a place whither disease is to gravitate, and New York's idea of a health centre is a place whence health is to radiate. The first is nineteenth-century and palliative, the second twentieth-century and preventive; the first the ambulance at the bottom of the cliff, the second the fence at the top.

Just as our Minister of Health (or Minister for Disease) appointed an expert medical committee to draw up a scheme for him, so the American Red Cross appointed a special committee of experts to study a programme of health activities for its consideration. But our committee was dominantly clinical, whereas the American committee was composed of public health authorities, and each has reported accordingly. Here is the substance of the New York Report, which was adopted in January, 1920, and has now been put into practice:

> That the New York County Chapter definitely enter the field of Public Health and plan to make this one of its major peace-time activities; that the primary and most important activity of the Chapter along Public Health lines should be Public Health

Education of a far more comprehensive nature than has hitherto been the case in any city, laying special emphasis on teaching health measures to children in interesting and entertaining ways; that the New York County Chapter should serve as clearing house for all existing Public Health agencies in New York City, with a Central Bureau for Public Health Information, which would furnish up-to-date information regarding all phases of Public Health activity in New York County, and that the Chapter should arrange for periodical conferences of representatives of the leading Public Health agencies in the city for the purpose of free interchange of opinion, attention being called to important needs for which no adequate provision had been made.

For the foreging, and somewhat to follow, I am indebted to a very valuable publication,* which we owe to the Red Cross in its constructive peace-time phase. "A health centre," says the American Red Cross, "is any place from which health influences radiate." It must be conveniently and favourably situated in the centre of the city it is to serve, and its personnel will be the local Red Cross workers, the local health officer and his assistants, officers of the local health society, dentists, school superintendents, and officials of voluntary health agencies. Its primary aim is not to cure, but to prevent disease. The health centre once established, its work of health education begins. It distributes pamphlets with such titles as, "How to care for children," "What we ought to eat," "How to Prevent and Cure Cancer," It distributes information as to hospitals, nurses, and all other available services for disease. It arranges health exhibits, graphically teaching child welfare, dietetics, etc. It arranges lectures on hygiene at schools, churches, clubs, etc., It uses health plays, lantern slides, and films.

* *Bulletin of the League of Red Cross Societies,* Vol. I., No. 11, June 1920, Geneva, Switzerland, pp. 15, 26 and 27.

It teaches first-aid, and links up with Boy Scouts and Girl Guides. It must win public sympathy or it fails :

> The people must be made to see that the health centre is their own organisation, to be developed and to accomplish results according to their wishes. They must know that it is by no miracle that the progress of contagious diseases may be checked, that their sons and daughters may be stronger and healthier, that the general health of the nation may be bettered. There is no magic word which will check the unnecessary deaths in the civilised world each year. This can be done only through full co-operation between the people and the leaders who will show them the road to health.

The contrast, the antinomy, between the two ideals is complete and absolute. One would not feel it so acutely if the very term "health centre" had not been used in the scheme presented to us. Lord Dawson, a successful clinician, who is Chairman of the Consultative Council, has already employed the term in a recent lecture, and doubtless its use is owing to him. He has described an ideal health centre, of a complete and elaborate (and very expensive) kind, as an extra-mural appendage or addendum to any of our present cities. In the foreground of the illustration which an artist has prepared for his lecture is a delightful spot, reminding us of one of the places where Hippocrates used to treat his patients, and in the background is a great city, its industrial chimneys belching smoke into the atmosphere, and exemplifying thus the present (and presumably future) intra-mural or central production of disease in the city outside the circumference of which this "health centre" is so eccentrically placed.

This geometrical contradiction in terms symbolises, for me, the fundamental confusion of thought which underlies the whole conception.

Not this, but something "very otherwise," is what I hoped for when urgently advocating the establishment of a Ministry of Health as a war and demobilisation measure, from 1915 onwards; not this, but a real Ministry of Health, was what appealed to Lord Rhondda, when, as the newly-appointed President of the Local Government Board, he invited me to visit him, and cross-examined me on the subject, at the beginning of 1917. Not this, but the real thing, illustrated in its simplest form in the New York idea of a health centre, was what Lord Rhondda and Sir Robert Morant would have established, by now, or ere long, had they been spared to finish their work.

We must act as men knowing what New York knows, that the beginning of public health is public health education, and that, whilst the druggist dispenses drugs, the doctor should dispence doctrine, a doctor being literally—as Wordsworth desired himself, as a poet, to be—"a teacher, or nothing."

How abysmal, how universal, how suicidal, how fratricidal, the darkness we have to dispel, no ink running from this pen is black enough to say.

In Great Britain, the most promising and hopeful agency, by far, that I can discern—apart from official means, much handicapped by their nature—for the primary need of needs, Popular Health Education, is the People's League of Health,* now devoting itself to that task, upon which the physical health of any dynamic democracy must depend. As an example of its teaching, I cite the following, in the hope that many readers may

* Patron, H.M. the King; Founder and Honorary Organiser, Miss Olga Nethersole, R.R.C. Address 7, Hanover Square, London, W.

thereby be persuaded to line up with this profound and simple work:

Maxims of Health.

(1) The true Aim of Life is SELF-EXPRESSION, which means the highest development and the fullest exercise of the best powers of which the individual is capable, and depends upon healthy activity of mind and body.

(2) Healthy living consists in a wise control over the expenditure of energy and over its restoration, which is effected by rest and food.

(3) FATIGUE of mind and body is brought about by prolonged or violent effort and by the presence in the system of *waste products* which are removed from the body, in health, by the lungs, the skin, the kidneys, and the organs of digestion.

HENCE THE VALUE OF FRESH AIR, EXERCISE, PERSONAL CLEANLINESS, AND ATTENTION TO BODILY FUNCTIONS.

(4) Recreation. Mere change of occupation and thought is itself a form of recreation, and *some form of recreation is necessary for health.*

(5) SELF-CONTROL AND MODERATION IN WORK AND PLAY, IN FOOD AND DRINK, AND IN EVERY PHASE OF LIFE, ARE ESSENTIAL TO THE PRESERVATION OF HEALTH, AND TO BE PERMANENT AND EFFECTUAL SHOULD BECOME A HABIT; and the formation of HEALTH-PROMOTING HABITS by the individual is an essential step towards national health and efficiency.

(6) The Health of the Individual is a condition of the production of a HEALTHY AND VIGOROUS RACE, and as A TRUSTEE for the well-being of the next generation the individual is responsible for the maintenance in health of the bodily organs on which this production of New Life depends.

(7) It is *not true* that CONTINENCE during youth is inconsistent with the full attainment of health and bodily and mental vigour. Both these can be destroyed or seriously damaged by the racial poisons, alcohol and venereal disease.

"There is no darkness but ignorance;" and therefore, not forgetting an earlier theme of this book, we may end it by repeating, now with a twofold meaning, the creative fiat,

"LET THERE BE LIGHT."

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