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*The Academic Aspect of the
Science of National Eugenics*

A LECTURE
DELIVERED TO UNDERGRADUATES

BY
KARL PEARSON, F.R.S.

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THE ACADEMIC IMPORTANCE OF EUGENICS

May Eugenics grasp the obligation that springs from success, the obligation to maintain the highest purpose of science, namely single-minded pursuit of truth, combined with pride in wholly faithful work and logically sound criticism. *Suggested by Nils Finsen's Aspiration for the Light-Institute.*

EUGENICS is the name of a new branch of science which has had so far only a few years of life. Yet, as all new things, which have reality behind them and are therefore growing, it has been quickly seized upon by innumerable 'cranks', and used as a banner to proclaim their own special 'crankeries' and push their own peculiar nostrums for the reform of society. In such a state of affairs it is little wonder that Eugenics appears in a distorted form in the Christmas annuals; it will probably get into the Christmas pantomimes and ultimately into *Punch*. It is needless to say that academic Eugenics has no relation at all to any idea of the State as a great matrimonial agency. Eugenics covers the double idea involved in the word 'well-bred', that is well-born and well-nurtured, and the study of how far good nurture can replace bad birth, and bad nurture destroy the advantages of good birth. The academic definition of Eugenics was provided on the original foundation of the Galton Eugenics Laboratory. It runs: 'National Eugenics is the study of agencies under social control that may improve or impair the racial qualities of future generations either physically or mentally.'

Now you will note that this definition has not been

drawn up without much thought over the value of each word used. Look at it carefully. Note those words 'under social control'; they surely imply that there is at least a possibility that some agencies which improve or impair racial qualities are not 'under social control'. The use of those words suggests how very careful we must be to measure the limits of 'social control' both from the standpoint of scientific possibility and from the standpoint of practical human politics and practical human knowledge. No eugenicist can include the geographical position of this country as an agency under social control; every eugenicist must accept the bulk of his nation and its permanent environment as he finds them. Whatever be the characteristics of the Englishman, we cannot hope to exchange straight away, and in the mass, even if it were desirable, his intellectual habits for the industry of the German, the lucid expression of the Frenchman, or the fertile imagination of the Oriental. We have to take our own racial qualities as they are given to us, and study how they are being or may be improved or impaired. The moment you realize this, you will see that the words '*National Eugenics*' have been rightly used. Every nation has in a certain sense its own study of eugenics, and what is true of one nation is not necessarily true of a second. The ranges of thought and of habit are so diverse among nations that what might be at once or in a short time under the social control of one nation, would be practically impossible to control in a second. Eugenics must from this aspect be essentially national, and eugenics as a practical policy will vary widely according as you deal with Frenchmen or Japanese, with Englishmen or Jews.

Again, note how carefully the definition has been

framed by the use of the word *racial*. What does this word signify and why is it introduced? We understand by a racial character, one which is the product of many centuries of selection, one which passes from generation to generation, and one which is not fundamentally modified if a child be born to the race in India, Canada, or Australia. We are looking, therefore, at the range of qualities fixed by selection and transmitted by heredity, and the next sentence speaks of modification either physical or mental. There is not the least doubt in my mind that the author of our definition was convinced that the physical and mental qualities he was speaking of were essentially *hereditary*. He felt that we had already reached the perfectly definite knowledge that both physical and mental characteristics were inherited. He knew that this knowledge was so certain that it might be assumed in forming a definition of National Eugenics, and that controversy—especially newspaper controversy—with people who rush but do not read—was perfectly idle.

Let me put before you as clearly as I can what we understand by heredity. It is not the *absolute* resemblance of parent and child. There is no meaning whatever in the resemblance of *A* to *B*, unless it also indicates that they are both unlike somebody else. Heredity is not the possession merely of the same thing as one or both of your parents possess, it is also the absence of that sameness between you and the mass of persons who are not your parents. The mere possession of a heart or liver is no sign of heredity in our sense of the word; you possess it in common not only with your parents, but with every viable human being. Heredity only comes into place when you determine how far your heart and liver are like those of your stock and differ from those of other

people. Now, if you once understand that heredity signifies *unlikeness* as well as *likeness*, you will have no difficulty in realizing that environment, without selection and solely by nurture, can modify characters and yet these characters show full hereditary likeness.

In the middle class our daughters are taller than their mothers—the average increase is more than an inch. Our sons have not that full advantage on us. We belonged also to a generation that, as boys and young men, rowed and shot and played cricket—nay we, perhaps, played football more frequently and looked on at it less than the males of the younger generation do. Our sons are hardly on the average taller than we are. Shall we say that they are more like us than their sisters are to their mothers? That is to forget the fundamental fact that *likeness* of individuals is only measurable relative to the *unlikeness* to others. And, as we might anticipate, the resemblance of mother to daughter is found to be no less than that of father to son, when we come to investigate the problem numerically.

Hence in using the term *racial*, which signifies ultimately hereditary qualities, we are not *a priori* refusing to consider how far nurture and environment affect physical or mental characters. On the contrary, we assert that the relative intensity of nature and nurture with regard to both physical and mental qualities is directly prescribed in our definition as part of the study of eugenics.

Now there are two ways at least in which this problem of nature and nurture can be approached. The one method is direct. It takes a number of physical and mental characters and measures the resemblance between relatives with regard to these characters, and then it takes the same or similar characters and investigates in precisely the

same way how the variation of these characters is related to variation of the environment. This has been done now for practically hundreds of series of characters, each one of these series embracing numbers running from 500 to several thousand individuals. We have questioned the influence of parental habits, of parental employment, of parental wages, of the nature of the house, of the manner of life and occupation of the children on their physical and mental qualities. These are not without influence, and no statement to that effect has been made by the members of the Eugenics Laboratory. But their influence in the case of man is of a wholly different order from that of heredity. We find that the effect of nurture is on the average hardly one-fifth to one-tenth that of heredity.

The two tables put up will give you some idea of the relative value of these agencies in improving or impairing our mental or physical qualities.¹

The second method of approaching the problem is an indirect one. We investigate the resemblance of a long series of characters, some of which are admitted by all, and others denied by many, to have hereditary value. Now no one supposes eye-colour or hair-colour to be sensibly altered in the living individual by the environment; few would accept the view that the cephalic index of two brothers is made like because they are members of the same middle-class English household. We know that if we keep within a moderate middle-class range the supply of food is much the same in character and sufficiency, and we find all types of physical characters practically inherited at the same rate. Now there are a number of persons who assert that while fully admitting the inheritance of physical characters, the mental and

¹ For such tables see Lecture VI of this series.

moral characters are matters of tradition and not of heredity. No one supposes unconscientiousness or untruthfulness, crime or immorality, directly inherited. Tuberculosis is not directly inherited, but when we remember that 80 per cent to 90 per cent of the population show tuberculous lesions by the age of eighteen, we begin to understand that it is not the tubercle bacillus, but the tuberculous diathesis, the want of constitutional power of resistance, which is the danger and which forms the basis of heredity in the case of tuberculosis. So it is with both crime and immorality: it is not the infection, but the power of resistance, the constitutional immunity, which is the ultimate factor. As a teacher of nearly twenty-seven years' experience it is a wonder to me that any one can doubt the inheritance of the mental and moral qualities in man. You see students going through the same schools and the same universities, the same external environment, with wholly divergent results, mentally and morally. At once, when this is asserted, you are told it is the home influence, the *family tradition*. Again, I think, those people who speak thus have never been parents, or shall we say observant parents? They have never realized how circumscribed is the moulding power of the parent. The mental individuality of the child is not under the parents' control, and, perhaps, it is much the better for humanity that it is not. But as the child passes from the physical control of the parent, who fancies that it is mere plastic material ready to the parent's moulding hand, he can watch those mental features developed which we have already marked in this or that branch of the ancestry—good or bad as the case may be, and wholly beyond home influence or family tradition. Of two boys brought up under identical

home, school, and university conditions, one is shy and conscientious, the other self-asserting and unscrupulous. These things are impossible on the basis of tradition as the dominant factor, they are explicable on the basis of alternate heredity.

In our second method we can take these two classes of characters—those acknowledged to be due to the hereditary factor, and those asserted to be due to environment and tradition—and we can investigate how close is their resemblance in relatives.

Now suppose the resemblance between these two types of qualities shows no *differentiation*, beyond the probable errors of our samples, and the observational errors of our estimates? What is the natural inference to be made? Why, the probability that the two series are both due to heredity, and not one to nature and one to nurture, becomes so great, that we say that the proof that it is nurture which is giving substantially the same values as nature in these cases must fall on those who assert that nurture makes two brothers resemble each other in shyness to the same extent as nature makes these brothers resemble each other in the shape of their head or the length of their forearm! We are at liberty here to appeal to that fundamental logical principle, so often overlooked—the razor of Occam—which asserts that not more, or more complex, causes are to be predicated than suffice to describe phenomena. Nurture might have produced more or it might have produced less than nature, but that it produces sensibly the same intensity of resemblance cannot be got over by simply *asserting* that environmental influence has not been allowed for. As a matter of fact, there is overwhelming evidence now to show that the direct effect of nurture is very markedly *less*, so much less that its

influence on hereditary measurements in man within practically one social grade scarcely exceeds the probable errors of our results.

So far I have been entirely occupied with what I may term the academic definition of eugenics, the one originally provided for us by Sir Francis Galton, when he founded the laboratory. Our attempt, as staff of that laboratory, has been to create the academic study as thus circumscribed and defined. It is clear that progress in this study must depend essentially on quantitative appreciations of the intensity of heredity in the case of racial qualities, whether physical or mental, and of the intensity of environmental influence on the same qualities. Such investigation we have endeavoured to carry out with the means and the staff at the disposal of the laboratory.

Now it is really at this point that the *academic* aspect of eugenics appears. And I want to illustrate it by a concrete case. You know that there is a strong feeling among many workmen that the employment of women is reducing their own wages, and the restriction of the employment of women is likely to be a plank in the platform of trade-union politicians. The restriction will be advocated on the ground that it is detrimental to infant life. Now here is a perfectly definite statistical problem: Does the employment of women influence the mortality of their offspring or the health of the children? It is not in the least an easy problem to answer; it is not a question, as I will soon show you, of merely collecting isolated data; it is a most subtle and difficult problem, which requires an immense range of data and most refined analysis. Yet it is a problem on which dogmatic opinions will be and are being expressed with a view to social and political action. One side refused us material, because if we came

to an unfavourable opinion we should cripple the freedom of women to seek paid work ; the other side are collecting data to support a preconceived opinion on which a definite line of political action is to be based. Now it seems to me that the only place where such a problem can be dealt with is the university laboratory ; it must be investigated as any biological or physical problem is dealt with, without any ulterior motive or preconceived opinion : ' There,' as we say to a research student in biology or physics, ' is a good problem for you, go and find out the truth about it.' But the professor of biology or physics who does that subjects himself to no public criticism beyond that of his colleagues and his co-scientists. The unfortunate worker at eugenics, on the contrary, cannot express an opinion at present on any problem at all without exciting an amount of invective which we can only parallel among the rival scholars of the age of Scaliger. And the reason for this is very clear. With regard to every problem which concerns the improvement or impairment of the racial qualities of the race, with regard to every question of social reform, two and often more parties are already in the field. They have set up their banners and blown their trumpets, and proclaimed their shibboleths, and they want nothing, *they will have nothing*, which cannot be used for their own purposes. You may plead that the arguments by which they support their views are not valid in the court of science, and that you feel absolutely ignorant as to whether employment of mothers does injure the unborn child, or whether sanatoria are curing the tuberculous ; that you want to find out the truth by any means in your power before you come to a judgement. They reply : By all means, but if your judgement be not identical with ours, then keep

C. W. Saleeby?

it to yourself, or woe betide you! 'If alcoholism and inebriety do flow from mental defectiveness, and not mental defect from alcohol, you have no business to tell the public so,' said a distinguished medical man the other day. Why? Because we have been using the argument that mental defect is sure to come both to you and your children, if you use alcohol, and you are depriving us of a plank in our platform. Again, quite recently and solemnly assembled in conclave, the wise men of medicine agreed that the constitution *was* an important factor in tuberculosis, but that it was not desirable to lay stress on it at the present time, for it would check the flow of public money into the fight against the tubercle bacillus. But what if the tubercle bacillus is actually committing suicide, or what if immunity be surviving without the aid of the expenditure of hundreds of thousands of pounds of public money? Well, to say that, means that you will cut off the present or prospective occupation of a certain number of gentlemen who are fighting in one special manner the tubercle bacillus, and therefore, even if true, it must not be rashly said in public.

Now I am personally neither a believer nor disbeliever in any suggested form of social or of clinical treatment. I have no feeling at all when the subjects of vaccination, of antitoxin treatment of diphtheria or enteric, or of tuberculin are introduced. They are to me nice academic problems in statistics; but if you endeavour to reach truth with regard to these subjects in a quite non-party rational way, again woe betide you! The fact is, nobody wants the truth: the defence and attack of this or that party view has become so closely associated with the special interests of individual men or classes of men, that actual truth—often in agreement with the opinions of neither

party—is the one thing which both will unite in belittling. You may, perhaps, remember Socrates' words to Euthyphro? The Athenians don't mind a man being wise or knowing the truth, but they get very angry if he endeavours to impart his knowledge to others! Now what is it, then, that I want to impress upon you to-night with regard to the *academic* nature of eugenics?

Why, not that this or that solution of a vital social problem is right, but that we simply cannot find a solution at all if we start with preconceived and party notions. I wonder if any of us ever sit down to think. I know we sit down to read or to work or to play—but I mean, sit down to think without a book before us. I believe it is one of the hardest things to do, because we are so desperately ashamed if any one comes into our room unexpectedly and finds us 'doing nothing'. We feel it would appear a perfectly vain excuse to say we were doing what is the hardest task in life, *thinking*; and we reach out for a pen and shuffle about papers or books. The result of this absurd idea that thinking is 'doing nothing', is that no time is allowed for it. We never sit down for a morning's thinking. We do our thinking in odd moments, when we are out walking or cycling; in omnibuses and railway-trains, and when our mind is tired after we go to bed at night. We think as we shave and as we do up our hair, and we have no organized time and method of thinking. We talk a great deal to-day about education and its methods, but if we assert that true education is not a process of gaining knowledge, but of training a person to think, we certainly provide little opportunity for practising what we preach. The student is driven, 'from dewy morn to noon and noon to odorous eve', from lecture-room to laboratory and laboratory to lecture-room, without

the least opportunity being provided for a quiet hour or two of thought. Every college should have a *cogitarium* as well as a *laboratorium* and a *librarium*, and every student should remember that it is infinitely more important to have learnt during his university career *to think* than to have filled endless notebooks with facts or current opinions. In after life, unless you are fortunate enough to escape the need for earning your own living, the world will give you little time to think. You will look back on your college days as the days when you had a chance of thinking. The successful barrister, the successful medical man, the successful business man, never have any time to think, and when they come to the top of the tree, and have to direct public opinion and guide social action, you will find that in nine cases out of ten their opinions are taken on faith from some party organization, from their customary newspaper, or from the traditional views of their class or profession. They have wholly lost the power of independent thinking, because they have been compelled to cease all practice in thinking for so many years.

Now I am not at all certain that our academic education fully enough recognizes that its fundamental object is to teach students to think, and to do this it must practise them in thinking. We professors are too apt to fill students' notebooks with the names of things, with descriptions of routine processes, and with the current or fashionable scientific hypotheses. But do we always equally well impress upon the student that these things are only the material, and not the practice of education; that the training produced by thinking about them is the main thing, and the knowledge of them worth very, very little except to the small minority who propose to earn their living by again teaching them to somebody else? And

even then, how fluctuating is the whole body of scientific knowledge! The names of many things have changed since my college days of thirty-five years ago; the laboratory processes have changed, and as for scientific hypotheses, the whole foundations of science, physical and biological, have been reconstructed—no, that is saying too much—they have been dug up, and we hope a strong logical mind will come along some day and reconstruct them. Matter and force have had their day, the atom as a fundamental unit, and mass as an invariable constant, have had their day, the nebular hypothesis has had its day; the electron is having its day, and Mendelism is having its day, and inoculation and the opsonic index are having their day, but who can doubt that their day will be yesterday as we march along? If the student comes out of the lecture-room untrained *to doubt*, then his education is inefficient. The education which does not cause you to question, to doubt at every stage, is not doing its duty by you. Please understand that I have not a grain of sympathy with those who think it fashionable to doubt every convention, whether in science or in art or social conduct. The mere existence of a convention is strong evidence that there is something to be said in favour of it—that it supplies, or at least has supplied, some aid to conduct, or provided some economy of thought.

If you come out of the lecture-room ready to accept some hypothesis as effectively describing facts on the authority of your teacher, then that lecture has been perfectly idle from the true academic standpoint. It would be equally idle if you came out with the conviction that it did not fit the facts. The only healthy attitude is to come out as a doubter, ready to accept nobody's

opinions on authority, but very keen to find out the facts for yourself in library and laboratory—and then go and consider them in the *cogitarium*, summing up for and against the hypothesis. One such hypothesis balanced against facts in the course of a whole academic session is worth more than a pile of notebooks filled with so-called scientific knowledge. *It has started you to think for yourself.*

The great wonder is that science has progressed as rapidly as it has done, when we consider how hypothesis has been taught as dogma in textbook and lecture-room to generation after generation of students. Is the fault wholly in the teacher? Not in the least: speak with certitude, and scratch, scratch, go the pens and down go the words in the notebooks. But come to the vital part, where the criticism of current knowledge begins, where the teacher points out assumptions, and then down go the pens; polite tolerance is visible on each face till the lecturer reaches again material quotable for examination purposes.

Five hours a day, you understand,
 And when the clock strikes, be on hand!
 Prepare beforehand for your part
 With paragraphs all got by heart,
 So you can better watch and look
 That naught is said, but what is in the book:
 Yet in thy writing as unwearied be,
 As did the Holy Ghost dictate to thee!

I recognize to the full all the weak points of Oxford and Cambridge, Berlin and Heidelberg, and our great superiority here in London! But if I look back on life, I think the chief advantages I have enjoyed arose from the circumstances which enabled me to take five years of university training, never to hear more lectures than three

hours a week, and for the great bulk of the time to possess three rooms, one to sleep in, one to read in, and one to think in—with a stout oak door to keep out the world when necessary. And the biggest advantage of all was only three hours of lectures per week, for without this the others would have been of small profit !

At present you may see little relation between what I am now saying and the topic of my paper, and I will therefore hasten to pick up my threads. They are these : As human beings, our object is to enjoy life and to make life enjoyable for others—the present others and future others. We do not in the bulk come to the university to learn about the processes of cell-division, the properties of the electron, the intricacies of Old High German metric, nor ‘ to settle Hoti’s business or properly base Oun ’ ; we come to the university in order to learn to *think* for ourselves, and the actual material on which we learn this doesn’t matter a rap—provided we do learn it. And what I mean by learning to think, is the attainment to that attitude of mind which, insisting on starting with doubt, goes a long way further than doubt—it proceeds to collect facts and reason upon them independently. It declines to accept opinions because they are authoritative, or because they are those of your family, your teacher, your party, or your religious sect. If the university does not say to you of every question—This to *you* is an open question ; study it without prejudice and form your own judgement—it is not doing its duty by you. When you do learn to treat each question in this way, then you have grasped what I mean by the academic spirit. Many things are not really open questions, but as learners you have to study them and form your opinion on them as if they were open questions. And if you do this, you will reach a method which will soon

reveal to you how many other things truly are open questions, which have been settled by authority, by party or sect, and thrust as settled questions upon mankind at large. Now the problems on which turn not only our own enjoyment of life, but the enjoyment of life by others (upon which our own largely depends), are essentially family and social problems. It is on these family and social problems that the improving and impairing of the racial qualities of future generations mainly if not entirely hinge. A right judgement on them is essential to good citizenship. But these problems are not problems light and easy to answer. We cannot experiment on man in the laboratory; we have laboriously to observe and collect data, and, when they have been collected, to reason upon them by methods which allow no place for party spirit, for preconceived notions, or platform emotions. All biological problems are obscure and difficult enough, but these eugenic problems, because they come so close to each one of us personally, and because they deal with man, whom we cannot cage and dissect, are the hardest and most obscure of all problems. The very existence of human society depends upon a strong gregarious instinct having been evolved among men. Our highest human product, sympathy with our fellow men, is as much a product of evolution as the gregarious instinct of a herd of deer, or the combined action of a pack of wolves. Only it is more completely developed, and with increasing knowledge we have lost more and more touch with its instinctive gratification. The sympathy is there ready to run riot in a thousand ways, which sober reflection may not show to be for the ultimate advantage of the herd. It is easy to give a shilling to a beggar, to subscribe a pound to a charity, or to found stipends for the blind or

the deaf and dumb. Our own strong instinct of sympathy with suffering has been gratified, but shall we have really contributed to the total enjoyment of the race? May be, and may be not—the pedigrees I place before you may help you to a judgement.¹ Of one thing, however, I feel sure, that no judgement will lead to lasting social gain which is reached by appeal to the emotions, which is based on inadequate knowledge of facts, or which collects data with the view of supporting any preconceived opinion. In short, on all these grounds we see that what is needed is the *academic* judgement. You cannot settle such essential problems of society as alcoholism, tuberculosis, mental defectiveness, or the changing status of women, by oratory in the market-place. I claim that these things must be studied in university laboratories, where Oxford shall check the results of Cambridge, and London correct both of them, if need be. You don't fancy that you can reach the truth, or even form an approximately true judgement on the laws of motion by discussing them in your debating societies; but the problems of society are much harder than the problems of mechanics, and yet we all think it possible to come to conclusions on them by debating-society methods. The university has provided you with physical laboratories and biological laboratories because it recognizes that the problems of inorganic and organic change need not only academic treatment, but are a splendid field for training the mind to think. Is the field of biological science as applied to man a degree less splendid, a shade less complex, or less worthy in any particular of our university studies? Is it not really the highest of all fields, the most difficult of all studies, and

¹ The lecturer showed a number of pedigrees of general physical and mental degeneracy: see for illustration Lecture VI.

the one with the greatest and gravest import to mankind ? Nay, I believe that the purpose for which we enter the physical or the biological laboratories is not to learn facts, nor to collect hypotheses, but to train and develop our minds so that we may become ultimately good citizens. And by 'good citizens' I mean those men and women who refuse to accept the judgement of party or sect ; who strive in social problems to form an independent judgement, to study the facts and reason about them, and above all believe that profitable answers to these problems can only be found when their real difficulty is grasped and they are submitted to patient and unbiased research. We never think of taking the opinion of the man in the street on the reasons why the moon does not keep her calculated times, we do not ask his opinion on the value of the opsonic index ; we recognize that these are problems which require special training and analysis wholly beyond his grasp, but we still think he is quite capable of expressing an opinion on whether the employment of woman is good for her infants or not, although he may be in possession of no data on the subject, and although, if he were, he would be quite incapable of interpreting them. The time is at hand when we shall realize that our social problems are *the* great academic problems—the chief problems of science, which it is utterly impossible to solve by party methods or by hustings oratory. Understand that I speak solely of finding solutions to these problems ; the *application* to human conduct must ever depend on the will or the vote of individuals. But our power of influencing the will of individuals will become immensely greater when we realize that the true answers to social problems are only to be reached by arduous study and not by the enumeration of untrained opinions.

I have more or less asked you to take these views on faith, but I should like to revert as an illustration to a problem I have mentioned earlier—the employment of women. As I have told you, the subject is one in which there is strong feeling among certain trade-unionist circles, and the ground of any action in the matter will be the supposed ill to the offspring. Elaborate inquiries have recently been made officially, and a certain association, far less than was anticipated, has been found between infantile mortality and the employment of the mother. The degree of relationship is about $\cdot 10$ —just one-tenth up the scale of correlation. It is about the degree of resemblance between a man and one of his great-grandfathers. I do not know whether this association will be considered to justify legislative interference with the employment of child-bearing women, but those of us who go a little beyond the surface of such a problem see that it is far more complex than any mere observation of increased mortality for the infant of the employed mother. In the first place, what about the age of the mother? Well, her age produces 50 per cent more effect than her employment on the death-rate of her infant—the correlation of mother's age and infantile mortality is $\cdot 15$. Shall we restrict, therefore, the ages at which a woman shall be allowed to have children? Again, what about the father's occupation, or want of occupation? The occupation of the father, whether he is a *general labourer*, a *factory hand*, a *skilled labourer*, or a *shopkeeper*, has just 100 per cent more influence on the mortality of the infant than the employment of the mother; it is $\cdot 20$. Are you going to legislate as to the father's occupation? What is more, the correlation between mother's employment and father's occupation is $\cdot 35$,

or the employment of the mother depends very sensibly on the father's occupation.

Again, what about the mother's food? The infantile death-rate is 20 per cent more closely associated with the food in the home than with the mother's employment. Shall we legislate as to the food the mother may take? Further, that food is associated with the drinking of the mother, and her drinking with her employment and with the infantile death-rate. It is quite possible that legislation with regard to the drinking of mothers might lower the death-rate more than restricting their employment.

More important than the mother's food is the baby's food. The manner in which, when the baby is not breast-fed, the milk for the baby is stored is 90 per cent more important (correlation $\cdot 19$) than the employment of the mother.

Now turn to the nature of the house in which baby is reared. The cleanliness of the house is 20 per cent more influential than the employment of mother, $\cdot 12$; the proper ventilation of the house, its dampness and its lighting, are about double as influential as the employment of the mother.

Again, what about the overcrowding—a factor quite sensibly associated with the father's occupation and wages? Well, overcrowding produces just 130 per cent more influence on the infantile death-rate than the employment of the mother; the correlation is $\cdot 23$.

As another illustration, let me refer to the manner in which the baby is fed—bottle or breast feeding; this has 170 per cent more influence on the infantile death-rate than the employment of the mother. Would it not be more effective to legislate on how the baby is to be fed? Nay, if we allow for the manner in which the baby is

fed we actually find that the employment of women is associated with a lower infantile death-rate, i. e. of those women who breast-feed their children the employed women have fewer infants who die than unemployed women.

Lastly, let me give one other striking illustration. There is a thing called a 'dummy teat' or 'baby-pacifier'—an india-rubber tantalizer and bacilli-collector pushed between baby's lips, at which it sucks ineffectually and indefinitely. Out of 2,000 Rochdale babies 1,500 used these dummies. Well now, how does a dummy teat compare with an employed mother? The former is 110 per cent more closely related to the infantile death-rate than the latter, i. e. $\cdot 21$ is the correlation. Now I ask you how you can possibly legislate with regard to employed mothers, who if they breast-feed their infants show better results when employed than when not employed, and neglect those baby-pacifiers? If you ask me whether I really think the baby-pacifier kills the baby, I must say that I don't know, any more than I know whether the employment of the mother is the source of a slightly higher infant death-rate. I strongly suspect that the baby-pacifier is more often used when the baby is fractious and the parents don't want to be bothered, i. e. with weak children and selfish or careless parents. But I know that the employment of the mother is associated with fewer rooms, lower wages of the father, and lower class of occupation of the father, and it is further associated with the house rental. I know also that the infantile death-rate is as closely associated with the total earnings of the family as with the employment of mothers. Hence it seems to me that the real source of the death-rate is not housing, or employment of mother,

or dummy teats, but all these are associated with a stock having lower types of employment and a lower wage, i. e. of a stock which is *physically inferior*, and when this is directly tested by comparing the mother's health with the infantile death-rate we find that this health is in Blackburn 200 per cent more influential than the mother's employment, for the correlation in this case is .30. I owe these results to my colleague Miss Elderton, of the Eugenics Laboratory; they are by no means final, but they will suffice to indicate how complex a problem of this kind is, and how hopeless it is to try and solve it by the opinion of the man in the street as to whether the employment of women is a good or bad thing.

There is not a single social problem which is simpler than this one, and in nine cases out of ten we have nothing like as ample data upon which to attempt a solution.

Take another instance of the same sort.

The Local Government Board has just issued a report on 'Back-to-Back Houses' in which it is shown that the mortality rate is greater in such houses. There is the vaguest reference to the 'through houses' and 'back-to-back' houses being chosen so that the occupants were in like economic conditions. Yet what do we find from the data in the Eugenics Laboratory? Why that the wages of the occupants of such houses are lower, that they drink more, that their habits are more irregular and uncleanly, that they pay lower rents, and crowd their rooms more than in 'through houses'. I have little doubt that legislation will be brought in to prevent the building of back-to-back houses in order to lower a mortality which in the first place is due to the physically and mentally feebler class which seeks the cheaper house.

I have little doubt that a higher insanity rate would be found associated with back-to-back houses, as well as increased mortality, but this could hardly be attributed to want of through ventilation.

These cases must suffice to illustrate how complex are all the problems of social reform. My object to-night has not been to put forward solutions or even to picture to you the wide range of exciting problems that await solution. My object has been rather to indicate that the great social problems of to-day and of to-morrow—problems which are of far more vital importance to the nation than tariff reforms or hereditary chambers—cannot be solved by debating-society methods, still less by appeal to the passions of the uneducated, or to broad instinctive sympathy. We are told that back-to-back houses have a higher death-rate; we do not stay to question whether it is association or causation; we legislate forbidding their construction. We hear in glorified language of the fight against tuberculosis; we do not examine the death-rate, but subscribe hundreds of thousands of pounds to provide ammunition for a sham fight—for the victory has been won on other grounds already. We are told of the woman toiling in the factory consigning to death the infant that is to be, and we are prepared to restrict her freedom by law, although we leave that dummy teat with twice the influence of the factory unthought of! My point to-night is that these social problems dealing with the improvement and impairment of our racial qualities are *academic* problems—problems that must be solved in the atmosphere of the laboratory undisturbed by party factions and by hustings methods; that for their solution you have for the time being to put aside sympathy and prejudice and emotion as

you must do when you dissect a worm or a frog—you are seeking for truth and knowledge solely.

Of course, when you have found it, then you may rightly throw all your energy and your enthusiasm, your emotions and your sympathy and your fighting power, into the task of persuading humanity that you have the right solution. But that is a later phase—it is science in its practical application when it passes from the university into human life. We claim that the day has come when a real study of man has been rendered possible—that it is now feasible to measure the influence of heredity and of every phase of environment; that it is feasible, in short, to study man as you have studied other organisms, and to measure the influence of all sorts of factors on his *future*. We do not stand alone in this respect; the problems of national eugenics are rapidly becoming the chief problems of many biological workers both in America and Germany. The twentieth century will not only be remarkable as witnessing the full acceptance of national eugenics as an academic study, but it will follow this acceptance by the recognition that the knowledge reached in university laboratories is of the highest value to the State. You will say it is a long way from our small beginnings in Gower Street to practically influencing legislation. Yes, but sometimes prophecy is easy. Twenty years ago¹ I made another prophecy: ‘In the recent discovery of Hertz . . . we have a result which, if of striking interest to pure science, seems to have no immediate practical application. But that man would indeed be a bold dogmatist who would venture to assert that the results which may ultimately flow from this discovery of Hertz’s will not in a generation

¹ *The Grammar of Science*, 1st ed., chap. I, § 10.

or two do more to revolutionize life than the frog's legs of Galvani achieved when they led to the perfection of the electric telegraph.'

We go faster nowadays than in the fifty years that followed Galvani's death. The universities are in closer touch with practical life. Well, my second prophecy is that within ten to fifteen years national eugenics will be everywhere a branch of academic training, and that in less than twenty years legislators will accept the fundamental results of the science of eugenics as indisputable facts. What is more, the nation that favours these studies most heartily, and most readily accepts the knowledge gained as a guide to practical conduct, is destined to be the predominant state of the future.



of 1900 to more to revolutionize the land the state's life
of 1910 in 1915 when they led to the production of the
electrical technology.
We do have knowledge that in the fifty years that
followed Germany's death. The machine age in that
epoch with practical life. Well, my second proposal is
that within ten to fifteen years national security will be
everywhere a part of national economy and that in
less than twenty years perhaps will work the same
general results of the science of economy as independent
state. What I want to mean is mean that forms these
study your health and most easily accept the
I want the national and a good practical teaching is
the best of the world.

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