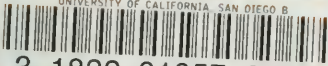


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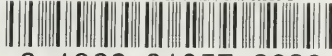


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DARWINISM, MEDICAL PROGRESS, AND EUGENICS

THE CAVENDISH LECTURE, 1912.¹

An Address to the Medical Profession.

By PROFESSOR KARL PEARSON, F.R.S.

MR. PRESIDENT, GENTLEMEN,—I confess to strangely mixed feelings in venturing as a layman to stand up and address you—a professional audience—to-night. When I look through the long list of names borne by those who have, during more than a quarter of a century, given the Cavendish Lecture, I find all that is best in English Medical Science represented, and more than one foreign authority of world-wide repute. Your lecturers have been men known not only within the medical profession, but men who have won the confidence of a wide lay public by the extent and efficiency of their labours for general social welfare. It must appear presumption on my part to stand on this platform and break—if it be only for a single occasion—that flow of wide medical and surgical experience which has been placed before you annually for more than twenty-five years. It seems to me that I have before me the very serious task of justifying not only my acceptance of this post, but also your Council's invitation to a layman, who is not only a layman—*i. e.* a man without medical training—but is held by more than one distinguished leader in your profession to criticise without knowledge more than one accepted medical truth.

I am quite clear, however, that the suggestion conveyed by your Council's invitation and my own inclinations would lead me on this occasion to give a wide berth to these controversies. I feel

¹ This lecture was delivered to the West London Medico-Chirurgical Society as the Cavendish Lecture for 1912, and originally published in the *West London Medical Journal*, vol. xvii, pp. 165-193, 1912.

sure that it is rather the office I hold than my personal opinions which explain that invitation and my presence here to-night. I ask myself: What is the bond between the Director of the Francis Galton Laboratory for National Eugenics and the medical profession? How far have we common ends, and how far do we follow the same path towards increased social welfare?

The founder of our laboratory, Sir Francis Galton, was descended on one side from a stock which was clinical by instinct, and produced a number of medical men of distinction. Erasmus Darwin and Robert Darwin are still honoured names in medicine. Sir Francis Darwin, being on a pleasure journey in the East, settled down in charge of a plague hospital that he might understand the nature of plague. His nephew and godson, Francis Galton—then a medical student of the Birmingham General Hospital—found his chief disappointment in visiting Smyrna that the plague was over, and that he could not study it at first hand. He spent nearly four years in medical studies, partly before and partly after his mathematical work at Cambridge, and when independence came to him on the death of his father, he tells us: "I abandoned all thought of becoming a physician, but felt most grateful for the enlarged insight into Nature that I had acquired through medical experiences" ("Memories," p. 82).

Sir Francis Galton was, like his grandfather, by instinct a clinician, and that instinct, together with his four years' medical study, influenced both his lines of research and all he wrote. Within a few months of his death he approved the scheme we had drafted for the University Commissioners, by which the first application of any new funds accruing to the laboratory should be the provision of a permanent medical officer. I mention these matters because, from our founder downwards, we have always sought co-operation with the medical profession, and I venture to think—as a study of our publications will indicate—that that co-operation has been as generously given as it was frankly sought.

Examine with me for a moment the definition of my science: "National eugenics is the study of those agencies under social control, which may improve or impair the racial qualities of future generations, either physically or mentally." How can you expect to do anything in a science such as that without the hearty co-operation of the medical profession? Hereditary deformities and diseases,

influences of special environments, alcohol, syphilis, tuberculosis, insanity, feeble-mindedness, all racial defects known or asserted to influence future generations, fall at once into the category of medical experience, even if ability, genius, physique, and craftsmanship belong less markedly within its sphere.

Who are the men who, alone in the present state of our development in this country, can provide adequate data as to the influence of occupation, environment, parental history, on the racial qualities of future generations? Why, in the first place they are the local medical officers of health, who, directly and through their district visitors, are recording home environment, parental occupation, and infantile and child health and mortality. And in the second place they are the school medical officers, who are annually examining thousands of children and scheduling their characteristics. And in the third place they will shortly be the medical officers of the National Insurance scheme, who will have material at their disposal of even wider importance and of more interesting scope.

To the outsider, like myself, it appears as if a sharp dividing line were being at present drawn right across the medical profession. I do not suggest that men will not at first pass from one division to the other, but the interests of the two divisions will be largely distinct, the tastes of the men who follow them will be widely different, and ultimately the training will be markedly differentiated. The one class of men will be in public service, they will be studying and recording humanity in the mass—the normal and the pathological, side by side—their objects will be to enforce medico-social legislation, and to provide data from which proposals as to further legislation can be judged. The limits to the public health service seem for the time beyond our ken; we are only at the very beginning of the movement, and its possibilities are enormous, and in one sense or another every man in that service is concerned with what makes for the racial efficiency of future generations—he must *volens volens* become a eugenicist.

Pray understand me. I am using the term “eugenicist” in no narrow sense. I do not signify by it membership of any propagandist body—such societies often do more harm than good to the cause we have at heart. I do not understand by eugenicist one who desires to segregate the mentally defective or prohibit the epileptic from parentage, although I might sympathise with

both those attempts to improve the racial qualities of future generations. No, I am thinking of something far wider and broader than this! The public health service brings a man right up against the fundamental biological problems of society. He is forced to consider them; he cannot progress until he has determined whether nature or nurture contributes more to the evils he sees around him. The physician in general practice has one main object—the welfare of the individual human being who chances to be his patient; the relief of individual suffering and the prolongation of lives which possibly have little or no social value are the primary duties before him. But in the public health service the medical man must see individuals in the mass. For example, within his district he finds a certain intensity of infant mortality. Is it due to employment of mothers, to dearth of breast-feeding, to unhealthiness of parents, to alcohol, to syphilis, to overcrowding? Or again in what proportions is it due to one or more of these causes? He turns to thousands of school-children, and at once recognises among them factors which render them racially inefficient—congenital cataract, defective teeth, epilepsy, feeble-mindedness, evidences of active or healed tuberculous lesions; he is at once impelled to inquire into the causes of these things, and from that moment he is a eugenicist in the true sense of the term. In the words of Sir Francis Galton, he begins to study the agencies under social control which may improve or impair the racial qualities of future generations, either physically or mentally. The whole range of eugenic problems is opened up for him at once. He has an entire city, a county at his disposal, and data in quantity beyond the dreams of the most avaricious statistician, but what can he do with it? What is it possible for him to make of it?

He is given a laboratory on a scale unparalleled in pure science; he has before him a population being born, breeding, and dying, which the most keen experimental disciple of genetics must envy him. He has his thousands, and he is able to record fine differences in parentage and environment which must escape those of us who can only breed our tens of dogs or hundreds of mice or guinea-pigs; we can only discriminate crude differences, such as colour of coat, or length of hair, or shape of nose; or environments which are measured in rough differences of temperature, of light, or of bulk of food. What differentia are there that we can observe in the intelligence of mice? Even with the dog relative

intelligence is difficult indeed to estimate, and what man calls intelligence is often obedience to human wants, and not the obstinacy and self-determination which would actually aid these animals in a free struggle for existence. The male of a race of dogs I breed is ever alert, eminently companionable, and can be taught to do all sorts of tricks—he is at once supposed to be very intelligent; the female is apparently relatively inert, learns few tricks, and shows no special keenness for human comradeship—she is accordingly described as less intelligent than the male. And yet her whole conduct is planned so that pregnancy and motherhood may be successful. She knows the right amount of exercise at each stage; she knows at the critical time what she herself has to do and what she expects you to do, and, if you go beyond that, the hand will be held firmly in her mouth, to be really punished if the intrusion be persistent. As a mother her conduct is at every point pre-eminently intelligent; the male is only intelligent under circumstances wholly artificial. I have digressed thus to indicate how on the mental side there is no comparison between the value of the data at the disposal of the experimental breeder and of the medical officer of health working in conjunction with the school medical officer. The wages, the habits, the employment of parents, the nature of the home, are all at the service of the medical officer of health; they have been tabled in thousands and thousands of cases; the physique and mentality of thousands of children are studied every day by teacher and school medical officer.

What is done with all this material? What can be done with it? I venture to assert that but little has been done with it, and that but little can be done with it as circumstances are at present. Let me give some of my reasons for these statements. In the first place you have government officials and regulations checking all useful inquiry into the actual health of the children. You have an enormous number of children, and in order for some inexplicable reason to cope with them *all*, instead of studying selected samples, the school medical officer is compelled to examine “entrants” and “leavers,” and to do this at a rate which destroys all efficiency in the examination. How can you find out anything useful in a five minutes’ examination? Why, a really effective test of the eyesight would occupy a quarter to half an hour! And take that very question of eyesight, what is it that we want to learn? Why, we want to

distinguish four things: (1) How far defective sight is a result of parental defect. (2) How far it is affected by purely growth changes. (3) How far it is a product of home habit and environment. (4) How far it is a product of school environment and habit of posture, of type of books, and of lighting.

Now what is the actual process? The bulk of "entrants" are too young to have their eyes properly examined at all, certainly not in the time allowed for it. You next examine them when they are leaving school, and supposing you did make even then a thorough examination, you could do but little for them, because they are leaving school and you are losing touch with them. And granting the sight is defective when they are twelve or thirteen, how are you to tell whether it is due to school environment, home environment, heredity or growth changes? You can only investigate these all-important points if you have a large enough sample of children of *all* ages carefully observed, and have studied them in association with their homes and parents.

I do not write without knowledge of the splendid work done in following up defective children into their homes by many school medical officers. I am in possession of many pedigrees provided by such energetic investigators in cases of cataract, albinism, polydactyly and other marked pathological states. But these very men will tell you that this type of inquiry, which should be an essential part of their work, is directly discouraged, and must be done, so to speak, outside hours and *sub rosa*. "Your business," they are told, "is to provide a remedy, not to investigate causes." Can you conceive a more fatuous position to take up? The school medical officer recognises a large amount of myopia, he is to treat each individual case as it comes to his notice, but he is not to strive towards that knowledge which alone would enable him to cut at the root of the evil! It is precisely the same with carious teeth—you can do little when a child is entering at five or six, you can do nothing when he is leaving your control at twelve to fourteen. The intermediate history is unknown to you, and many a problem which could be solved in a few years by a full school inspection of a sample group of children—for example, whether caries is hereditary in character, is due to special food, to the character of the water supply or to any other form of nurture—remains a matter of pure guesswork and individual opinion. These difficulties, such as I have indicated in the case of eyes

and teeth, occur in every organ examined—even to that most delicate organ, the human brain. We are now proposing national legislation with regard to the feeble-minded—a class familiar to most school medical officers—and yet do we really know definitely at present how far the feeble-minded produce the feeble-minded? I have been looking into that question recently and have been struck by the hopelessly unscientific character of most of the evidence on the subject, and yet 0·5 to 1 per cent. of our school population are recognised as feeble-minded, and one feels quite certain that with the aid of a couple of keen medical men and half a dozen trained district visitors that problem could be satisfactorily answered in eighteen months. Take another aspect of it: the 60 to 70 per cent. of mentally defective among the female inebriates, and the 30 to 40 per cent. mentally defective among our habitual criminals—where did they spring from? Are they merely the grown-ups of the feeble-minded among our school-children? It is nobody's business to investigate and find out, and yet by the expenditure of a relatively small sum of money a definite answer on this crucial point could be secured. The illustrations I have given may suffice to show you how effective inquiry on the part of medical men in the public health service, whether of municipality, school, prison or reformatory, is directly checked by the short-sightedness of government departments and of local authorities.

But there is another feature of the matter which deserves our attention. The public health service, in the wide sense in which I am dealing with it here, is relatively new; it brings its officers into contact with a whole set of new problems, often social and economic in character, frequently actuarial and statistical rather than medical. No provision has so far been made for training the public health service to deal with problems of this character. It is almost piteous to see how the reports of medical officers of health and of school medical officers grope towards solutions of nationally important medico-social problems. The most complex and difficult problems in vital statistics—problems to which trained actuaries with the highest mathematical knowledge have devoted years of work—are solved to the apparent satisfaction of the proposers in a few lines of simple arithmetic. I could give you numerous instances of such cases where the writer tumbles into pitfalls which every actuary, every trained statistician has learnt by training and by experience to avoid.

That we may not single out any of our countrymen to be pilloried to-night, I will give you a German instance which will indicate what I mean. No problem can be more important than the prevalency of syphilis in a large urban population ; a knowledge on this point is one of the most urgent medico-social questions. Well, how is it to be found out so long as syphilis is not notifiable ? Indirectly there are means of doing it. We know the deaths from general paralysis of the insane, and there is one town in Europe at least, namely Copenhagen, where syphilis is notified. It occurred to Dr. Fritz Lenz that the ratio of deaths from general paralysis to syphilitics notified, as found from Copenhagen, might be applied to other towns. In other words he proceeded to deduce from the known deaths per year from general paralysis in Berlin the number of syphilitics that would be notified were notification there compulsory. Armed now with the annual increase in the number of syphilitics in Berlin, he found their total number by the simple process of multiplying this annual increase by the expectation of life at fifteen years of age ! The result was astounding ; practically the whole population of Berlin is syphilitic ! Dr. Lenz did not apparently find this result so improbable that he thought it worth while to question his premises. Any actuary would have told him that his problem could not be solved without a knowledge of the age distributions of the populations in Copenhagen and in Berlin ; nor without regarding the fact that Berlin is a rapidly growing town and Copenhagen is not. Further, Dr. Lenz should have realised that the general age distribution of syphilitics is all important ; why should the expectation of life of men of all ages, especially men with syphilis, be that of boys at fifteen in the normal population, the minimum age at which syphilis would be in the least likely to be incurred ?

Now here you have a capital illustration of a most important medico-social problem, and you have a medical man with an excellent key to its solution, but alas ! he is wholly wanting in the training which would have taught him how to put it in the lock and to turn it round. Gentlemen, this is only a single illustration of the sort of problems which modern medicine has to deal with, problems which crop up in almost every school report and in every public health report, problems the solution of which is essential to social welfare, yet which cannot be solved without special training, and when the training is there, need a large staff of practised computers working for months, if not years, to prepare

the data in a form suitable for analysis. Is that special training available, is that staff of practical computers forthcoming in the office of any single medical officer of health in this country? I venture to think it is not, and will not be for many years to come.

Medical men in public service, whether as officers of health, school officers, or as superintendants of asylums, sanatoria and reformatories, have access to immense masses of data bearing on medico-social problems, and schedule it in increasing quantities. Are these schedules to be wasted, to be stacked and ultimately burned for want of space, or shall they form archives from whence knowledge as to the factors which improve or impair national well-being may be extracted?

To anyone who hopes for human progress—not by arbitrary guesswork—but by the gradual unravelling of truth there can be but one answer to that question. Many medical officers of health and school medical officers have answered it already by placing their data unreservedly at the disposal of professional statisticians. The Eugenics Laboratory possesses thousands of schedules bearing on the health of children, the effect of the employment of mothers, the family histories of imbeciles, the action of tuberculin, and many other problems. We have the material to answer—in numerous cases already have the answers to—various medico-social problems. Now I would ask you whether it is better that this material should perish, or that it should pass through the hands of laymen who at least have the requisite statistical training to analyse it?

Remember the material does perish. I can give you an illustration in point. We were permitted access to the records of a society which looks after young servants at a critical portion of their career. A certain proportion of these girls are from industrial schools, and a certain number of these industrial school recruits are failures. Why do some fail and some succeed? Now no child passes into an industrial school without a most elaborate report on its home environment, on the habits of its parents, and on their occupations and wages.

It is a police report which goes to the magistrate, and is ultimately filed at the industrial school or by the educational authority. The mental and physical history of the child in the school is also recorded by teacher and medical officer. It seemed possible on the basis of such data to investigate the type of girls

who fail and see how they are differentiated by environment and parentage from the successful girls. We were checked by the discovery that eight or ten years after a girl has left the schools, and when it is known, generally speaking, whether she will be a useful member of society or not, all school and police records have perished. The material is apparently too great in bulk to be indefinitely stored.

Now I ask again is it not better that material bearing on medico-social problems should be handled by laymen than that it should perish without contributing its quota to our knowledge?

If you suggest that it would be best that we created a new class of Ἱατρο-μαθηματικοί—of medical mathematicians—I am wholly with you; this is undoubtedly the ideal of the future. It has been to some extent the ideal of the past, for I rejoice to number among those who have worked in my laboratory the Director of the Pasteur Institute of India and the Medical Statistician to the Lister Institute of London. But is its full realisation possible? You know how arduous is the five years' training in medicine, but do you appreciate how equally arduous is the requisite training in mathematics to be followed by at least a two years' training in statistics? Do not fancy for a moment that the medical lectures on vital statistics in a course for the D.P.H. are of the least service in view of the modern statistical calculus. Sir Francis Galton, who is the father of the scientific treatment of medico-social problems and the founder of the modern science of eugenics, spent four years over medicine and four over mathematics, and the result was simply that because he was not a certified specialist in either study the medical world gave no weight to his judgments, and the mathematicians denied he was one of their number!

No, I am afraid the fully-trained and qualified Ἱατρο-μαθηματικός is a man wholly of the future. Few men can afford the years of training, and after it is over the officials who hold the appointment to the few posts, where he might be of inestimable value would at present be blind to his merits. The immediate line of least resistance appears to me not the fusion of statistician and public health officer, but the *entente cordiale* of the two branches of investigation. I am convinced that every officer of the public health service who really appreciates the magnitude and importance of his work both for medical progress and with it for social welfare, is, however unconscious he may be of Sir Francis

Galton's definition, a true eugenicist. I know from many talks with medical officers of health that at least a moiety of the problems before which they find themselves at a halt are precisely the fundamental problems of eugenics. The alliance between this branch of medicine and eugenics is in the essential nature of things; it is basal; and no amount of surface differences, no intensity of personal prejudices, can avail to screen it permanently.

Is it not after all this fundamental fact, the existence of this alliance, which explains the invitation of your Council and my presence here to-night? So far it seems to me that those who are really working at scientific inquiry in eugenics and those belonging to an important section of the medical profession are wholly at one in their aims. But there is undoubtedly a fly in the amber, and if the alliance between eugenics and medicine, as a whole, is to be a real one, we cannot for a moment overlook a possible source of divergence between them.

I belong to a school which still believes that Darwin taught us the truth. I think it is rather the fashion nowadays to dismiss its views, not by meeting its arguments, but by describing it as "mid-Victorian." When in literature, science, and statemanship this twentieth century has produced minds which out-top the "mid-Victorians," then it will be time enough to reply to a mere nickname. Let me, even at the risk of talking about the familiar, sketch for you the broad outlines of Darwin's theory of evolutionary progress. The individual better fitted to its environment lived longer than its fellows, had more offspring, and these, inheriting its better fitness, raised the type of the race. The environment against which the individual had to struggle here was not only formed by the other members of its species, not only by its physical surroundings, but by the germs of disease of all types. According to Darwin—and some of us still believe him to be right—the ascent of man, physical and mental, was brought about by this survival of the fitter. Now, if you are going to take Darwinism as your theory of life and apply it to human problems, you must not only *believe* it to be true, but you must set to, and demonstrate that it actually applies. That task I endeavoured to undertake after the late Lord Salisbury's famous attack on Darwinism at the Oxford meeting of the British Association in 1894. It was not a light task, but it gave for many years the *raison d'être* of my statistical work. In the first place it was demon-

strated that on the average the longer lived leave sensibly more offspring. In the next place it was proved that both physical and mental characters were definitely inherited. Then, if the third point could be demonstrated—namely, that there was a selective death-rate in man—there could be no flaw in the argument that Darwinism applied to man; from a mere plausible belief it would become a law of human life. How was this selective death-rate to be determined? How was general physical fitness to be measured? It occurred to me that taken all round physical fitness was properly measured by length of life. If length of life in the case of human beings was a perfectly arbitrary quantity, then the shafts of death were random shots. Death did not select his victims. In other words the question of the selective death-rate in man was the question of the random character of length of life. Now if length of life depends on physical constitution and power to resist disease, then on the Darwinian theory these characters would be inherited, and length of life would on the average be related in parent and offspring. Briefly, if there be no selective death-rate there will be no relation between lengths of lives of parent and offspring, or generally between members of the same stock; if all deaths be selective, then the relation between durations of life will be the same as that of any physical character in parent and child. As a matter of fact neither one nor other position is true; *not all deaths* are selective, but we can determine what proportion are. In the case of individuals living under the same environment over 75 per cent. of the deaths were thus shown to be selective.

That demonstration that some 75 per cent. of deaths depend upon hereditary constitution seems to me conclusive, but it has not seemed so to a distinguished member of the Local Government Board, although my conclusions have been verified by a distinguished biologist, Prof. Ploetz, working on German, not English material. Dr. Newsholme has recently published a Government report on infantile mortality, and, working in conjunction with Mr. G. U. Yule has discovered that when the infantile death-rate is high in a given locality, then the death-rate of children of a greater age during the same period is also high. This result has apparently been used to demonstrate that a high infantile death-rate does not mean a low child mortality, and indirectly by one of its authors and a whole army of party newspapers to preach that the Darwinian doctrine has no application

to man, and that environment, not constitution—nurture, not nature—is the sole thing that social reformers need pay attention to. It is astonishing that two statisticians of such repute should not have recognised that practically no result of any importance could be deduced from the fact that in the same neighbourhood and for the same period the death-rates for two classes of the community would both be high or both low! How could the deaths of infants in this year possibly influence the deaths of children of three and more in the same year? Darwin's theory means this, that if individuals are reared under a constant environment, and a larger percentage of them are killed off in the first year of life, then a smaller percentage of those remaining will die in the later years of life, because more of the weaklings have been killed off. Dr. Newsholme's position is, if I grasp it, this: that a high death-rate means a high rate of sickness, and this sickness produces a general weakening in those that do not die, so that they fall an easier prey in later years. In other words he wholly rejects Darwin's position that a hard winter or general scarcity would leave a stronger race of birds behind. Whether Newsholme or Darwin held the truer view could not possibly be tested upon Newsholme and Yule's data. You must follow each array through its life and see whether increased infantile death-rate means decreased child death-rate for the same group. This method has actually been followed by Dr. Snow, working in my laboratory. He has taken English (Fig. 1) and Prussian data (Fig. 2), and he has endeavoured to follow the same group from birth through childhood. The difficulties of the problem arise from ensuring that the environment shall be alike for all groups dealt with. Dr. Snow has attacked the equality of environment from a number of sides, but the general conclusion is substantially the same: *When the infantile death-rate is intensified, then the death-rate in childhood of the survivors is lessened, not increased.* In other words, a heavy infantile death-rate does select the weaker individuals and leave a stronger population physically to the later years of life. It is difficult, indeed, to believe that it could possibly be otherwise, and I have every confidence in my view that Darwinism applies absolutely to the case of man.

Dr. Newsholme states definitely that it is a general rule that a high infantile mortality means a high child mortality. Now the Registrar-General's office has provided us with a series of life tables which lead to the following results:

NATURAL SELECTION IN MAN.
DATA CORRECTED FOR CONSTANT NO OF BIRTHS AND "CONSTANT ENVIRONMENT"
BIRTHS 3226 **BIRTHS 3119**

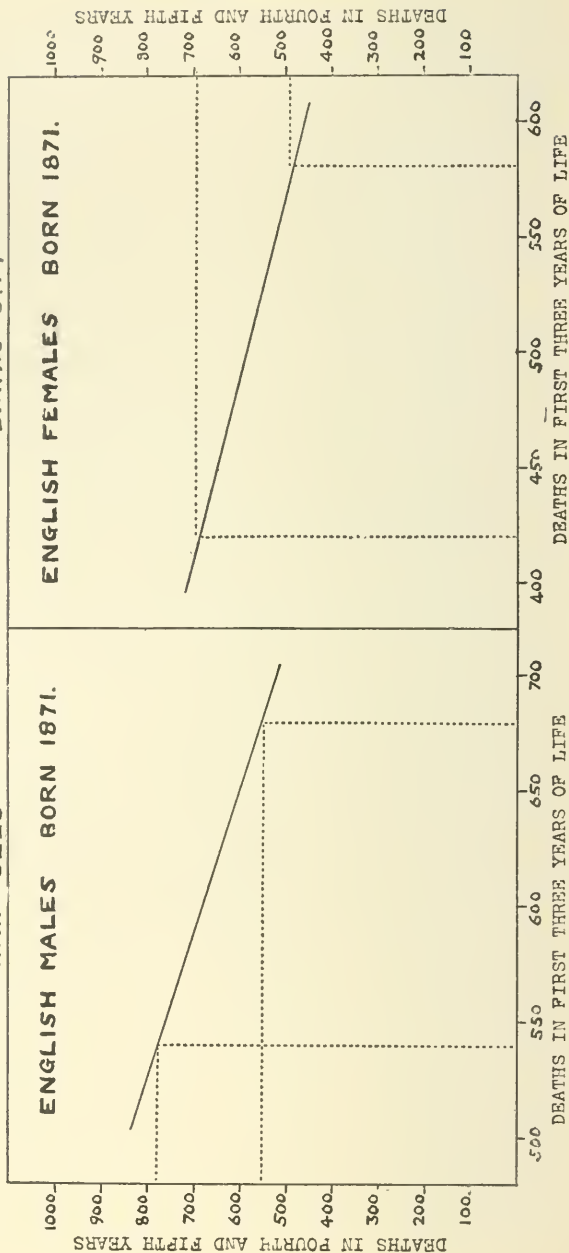


FIG. 1.—Dr. E. C. Snow's diagrams to illustrate how, for a constant number of births and constant environment, child mortality in England falls when infantile mortality rises.

NATURAL SELECTION IN MAN.
 DATA CORRECTED FOR CONSTANT NO OF BIRTHS AND "CONSTANT ENVIRONMENT"
 BIRTHS 8793

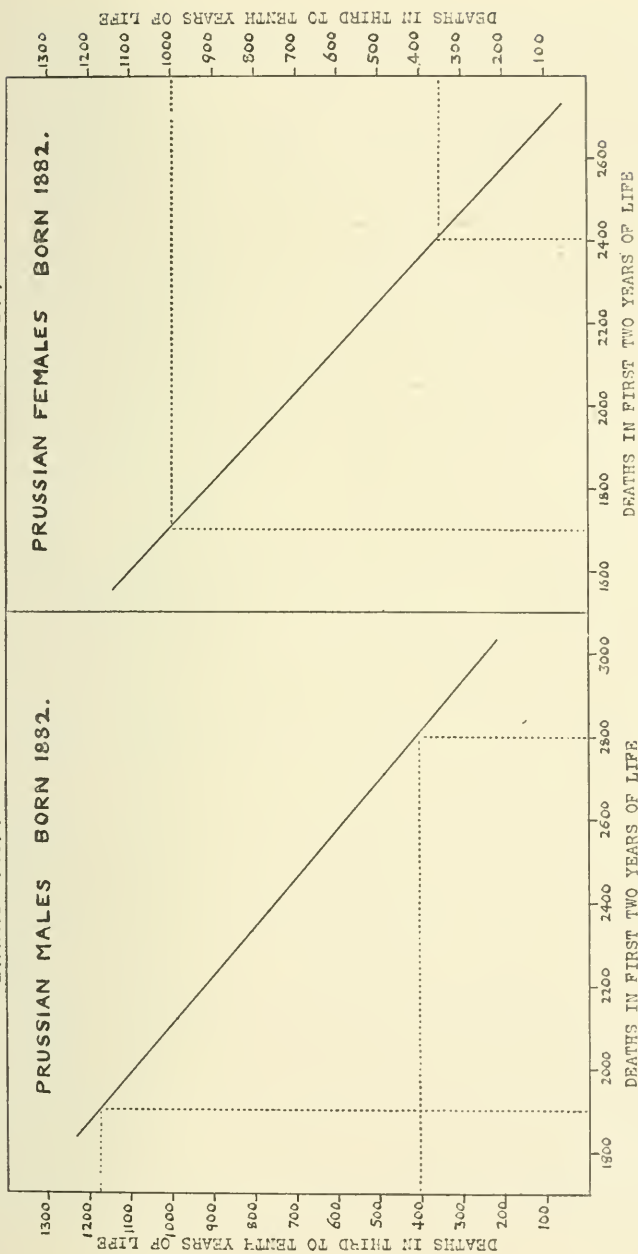


FIG. 2.—Dr. E. C. Snow's diagrams to illustrate how, for a constant number of births and constant environment, child mortality in Prussia falls when infantile mortality rises.

Registrar-General's Life Tables.

Period.	Death-rate 0-1.	Death-rate 2-5.
1838-1854	163·5	134·7
1871-1880	158·6	127·6
1881-1890	161·0	104·3
1891-1900	171·9	94·0

Now I do not assert that the rising infantile death-rate is the *cause* of the falling child death-rate. All that I ask you to note is that three out of these important tables indicate that when the infantile death-rate is high the child death-rate is low. No such general law as that stated by Dr. Newsholme really holds, even when no correction has been made for differential environment.

But, because I state that the infantile death-rate is selective, and assert that it by no means follows that a low infantile death-rate will compensate racially for a falling birth-rate, why should I be described as a Herod, and those who hold the same views as supporters of the "better-dead" doctrine? I feel sure that many of you who have, by your skill, helped into the world the cripple, or the child of deformed or diseased parents, must have said to yourselves, when you found it viable, better it had not been born. Many of you, I take it, hold with me the "better-not-born" doctrine, but the recognition of the fact that the infantile death-rate is selective cannot of itself justify the charge that we wish the weaklings killed off.

Nevertheless, medical science has to face the fact that the upward progress of man in the past has been largely controlled by a stringent Darwinian selection. We shall gain nothing for racial efficiency by neglecting that central fact of human development.

Now if there be—and I, for one, think that two independent lines of inquiry demonstrate that there is—a fairly stringent selection of the weaker individuals by the mortality of infancy and childhood, what will happen, if by increased medical skill and by increased state support and private charity, we enable the weaklings to survive and to propagate their kind? Why, undoubtedly we shall have a weaker race. Remember that "general health" is undoubtedly inherited (see Figs. 3-5). Now couple this partial suspension of the stringency of natural selection with a reduced

fertility of the fitter stocks and we have the state of affairs—the very grave state of affairs—which we of to-day are called upon to meet.

Now you will say, and rightly say, that each stage of this argument needs to be supported by very solid facts. Well, as far as

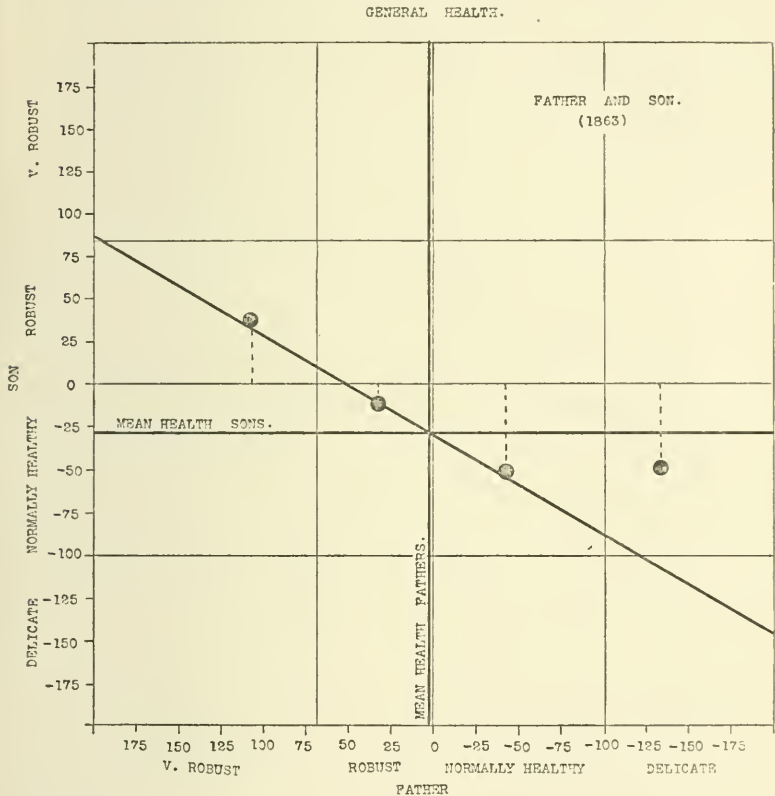


FIG. 3.—Diagram illustrating fall in health of son with fall in health of father. Note anomalous position of sons of delicate fathers. In these diagrams 100 units of health correspond to the normally healthy group.

is consistent with the time available let me give you illustrations of what I mean.

In the first place, I hope you will agree with me when I say that the general death-rate is selective. Secondly, the progress of medical and sanitary science has altered the stringency of selec-

tion. To deny that, Gentlemen, is after all to deny the progress of medical science. You know in a general way that the death-rate, corrected for age, has fallen enormously in this country. But I should like to place before you its actual history.

You see (Figs. 6 and 7) at once the three great periods in the

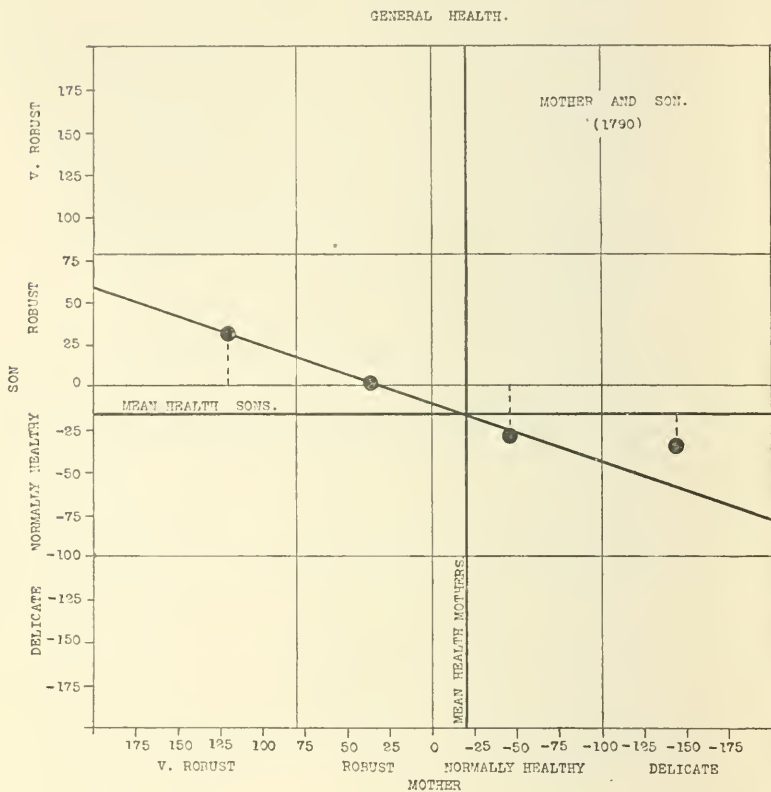


FIG. 4.—Diagram to illustrate fall in health of son with fall in health of mother. Note anomalous position of sons of delicate mothers.

history of our English death-rate: (1) The period of stability, quite uninfluenced by factory legislation, 1835–1865; (2) the period of sanitary science, 1866–1891, with its continuous fall in the death-rate; (3) the period of modern medicine, 1891–1911, with still further acceleration in the fall. I think we can be quite confident

that within sixty years from 1865, namely, in 1925, we shall have reduced the death-rate by nearly 50 per cent. in this country. To this extent modern progress—chiefly medical progress—has suspended the action of natural selection.

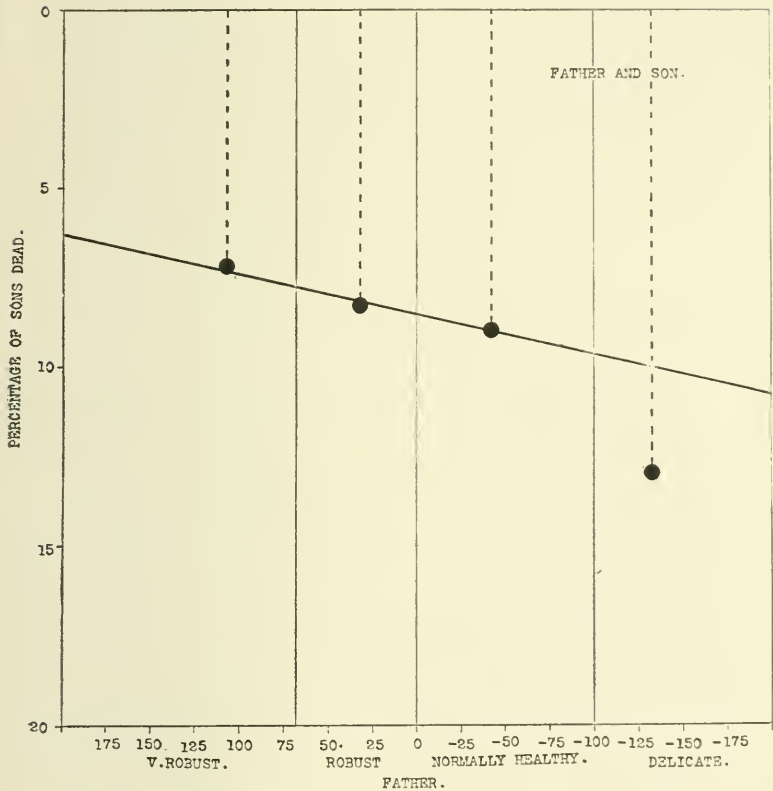
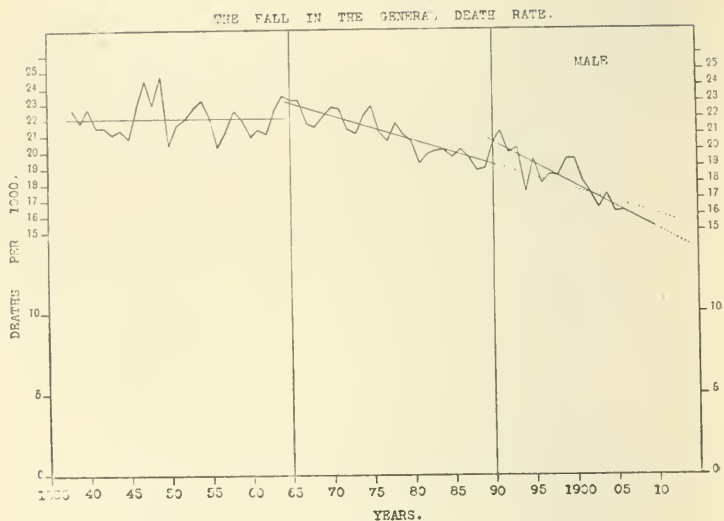


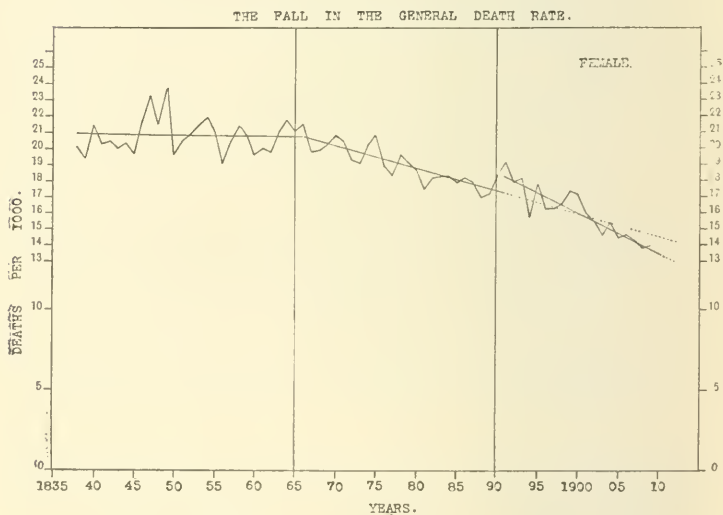
FIG. 5.—Diagram (1900 odd cases) to explain anomalous position of sons of delicate parents; a much larger percentage of them die, and thus their health fails to be recorded. The more delicate the father the more children die.

Does this suspension of natural selection really mean that more of the weaklings survive to propagate their kind? Some light may be thrown on that point by considering the percentages of the population in 1881 and in 1901 in broad age-groups.



Factory legislation. Sanitation. Modern medicine.

FIG. 6.—Diagram of general death-rate. Corrected for ages—males.



Factory legislation. Sanitation. Modern medicine.

FIG. 7.—Diagram of general death-rate. Corrected for age—females.

CENSUS RESULTS.

Percentage of each Age-group.

Census.	Ages 0-20.		Ages 20-55.		Ages 55 and over.	
	M.	F.	M.	F.	M.	F.
1881 .	47'4	45'1	42'6	43'9	10'0	11'0
1891 .	46'5	44'0	43'7	44'9	9'8	11'1
1901 .	43'7	41'2	46'3	47'6	10'0	11'3

The population has been sensibly growing older; the persons of reproductive ages have increased by about 3'5 per cent. A certain portion of this is almost certainly due to the survival of weaklings, but a part is also due to the decreased birth-rate. It is not an easy matter to determine how much is due to each source. But we can show from isolated instances that in many ways medical science has led to a survival of the unfit. I may, perhaps, be permitted to illustrate this matter from one or two concrete cases. The reduction of mortality in child-bed has been very considerable, especially in cases where operative surgery is needful. A century ago, or at least a century and a half ago, Caesarian section was rare, or at any rate if adopted very doubtful in its success. The result was that an achondroplastic mother rarely survived childbed; even normal mothers confined with an achondroplastic child much more rarely had a viable offspring. Medical literature and old pathological collections abound in illustrations of how the achondroplastic dwarf failed to survive in the struggle for existence. Many cases were screened under the name of congenital or foetal rickets in the old theses, and few survived birth. The whole matter has now been so modified by increased surgical skill that we have cases of women in which Caesarian section appears to be the usual method of childbirth—two or three, even five instances in the same woman being on record. The result is that modern pedigrees of achondroplastic dwarfs begin to show descent through the female as well as through the male—an occurrence of great rarity in the older pedigrees.

As my audience is wholly medical to-night, I throw on the screen one or two photographs to illustrate this point. First we may have photographs of this type of dwarfism (Plate I). It is well represented by those sent me by Major C. H. James, I.M.S.

I now give you in a pedigree provided by Professor Nijhoff, the well-known Dutch gynaecologist, an illustration of the hereditary character of achondroplasia (Fig. 8). Here is another case,

DWARFISM. ACHONDROPLASIA.

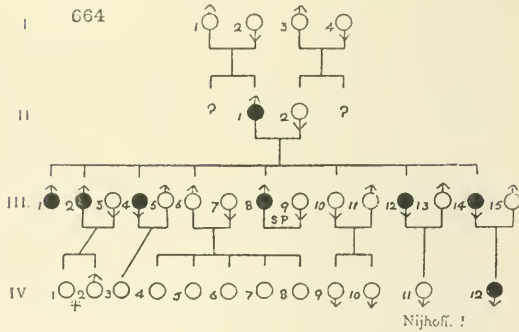


FIG. 8.—By permission from "The Treasury of Human Inheritance."

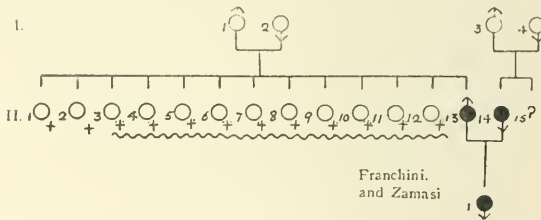


FIG. 9.—By permission from "The Treasury of Human Inheritance."

DWARFISM ACHONDROPLASIA

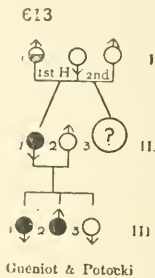


FIG. 10.—By permission from "The Treasury of Human Inheritance."

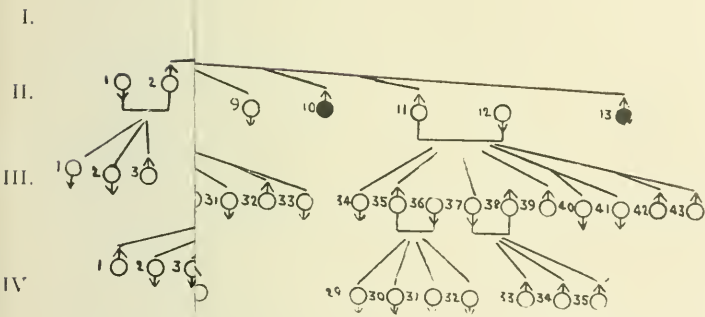


FIG. 11.—Pe. Reproduced by permission from "Biometrika,"

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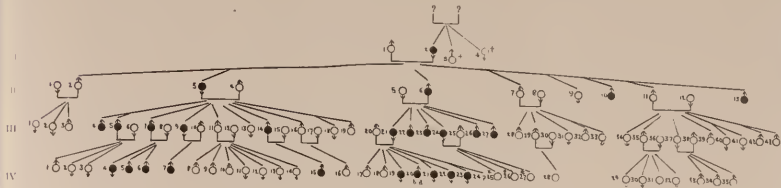


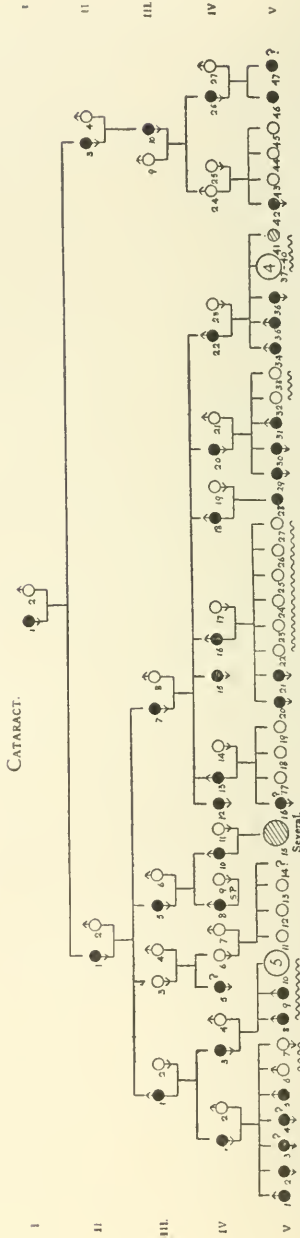
FIG. 11.—Pedigree of lobster claw family—Pearson's case—IV, 24, since born, was a girl deformed in both hands and feet. Reproduced by permission from "Biometrika," vol. vi, plate VIII.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CASES OF INHERITANCE.

due to Franchini and Zamasi (Fig. 9), in which both father and mother were achondroplasic; in both these cases the offspring are reaching adult age, and were born by Cæsarian section. Lastly, here is a case due to Gueniot and Potocki (Fig. 10), showing achondroplasia for three generations, in the last there being no less than three Cæsarian operations. Still more vividly is the matter brought before us by photographs with which Professor Nijhoff himself has kindly provided me. Here are two sisters (Plates II and III); both, as you see, have already had Cæsarian operations, and they are taken when they were in his clinic waiting for further like operations. Their father, as we have seen in the pedigree, was achondroplasic, they had achondroplasic brothers and sisters, and they have at least one achondroplasic child. From the same source I could show you cases of women waiting for their third and fourth Cæsarian sections.

Nor is the matter confined to achondroplasia; rickets runs in families also. Here is a case of familial rickets, five in the same family (Plate VI); and here a case of a brother and sister, the latter waiting for a second Cæsarian section at the hands of Professor Nijhoff (Plates IV and V). Do you think that the reproduction of such deformities tends to racial efficiency? Should not such families at least stop at the first child?

What I have just indicated has a wide application to a great variety of deformed and pathological conditions. Here is a pedigree of split hand and foot (Fig. 11), which I put together some years back. You will see twenty-five deformed descendants of *one* woman alone. Here is a photograph of the mother and two of her eight children, six of whom are affected (Plate VII). Well, what is the history of this family? They are largely tramps, many of them in and out of workhouse and prison. Since that photograph was taken the woman has been in gaol for cruelty to those two children, and she came out to have her eighth child, her sixth deformed one. In this case one woman was responsible for twenty-five deformed out of seventy-five descendants. Here is a case of *one* woman with congenital cataract giving rise to thirty-nine descendants with cataract (Fig. 12). Here is a case of *one* "blind" man responsible for fourteen "blind" descendants (Fig. 13). Deaf-mutism shows the same sort of propagation (Fig. 14), and I have endless pedigrees demonstrating how "general degeneracy" runs in stocks, epilepsy, insanity, alcoholism and mental defect being practically interchangeable, numberless members failing to reach normality; as



The Treasury of Human Inheritance

FIG. 12.—Gjersing's case of congenital cataract.

examples we may take Pisent's case (Fig. 15) and a wonderful pedigree of Mr. Bishop Harman (Fig. 16). Well, these are individual illustrations of what is happening, because the intensive

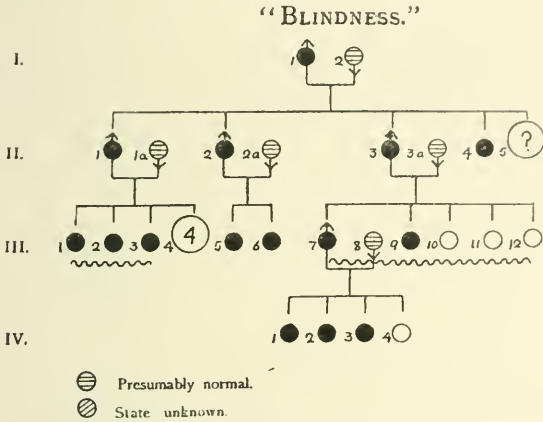
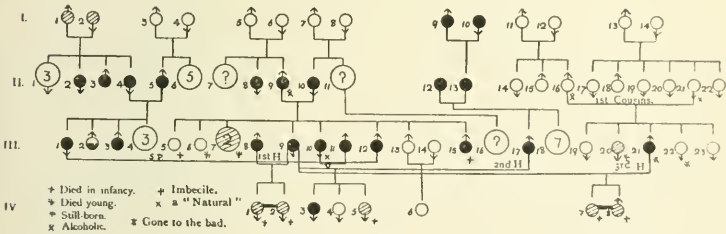


FIG. 13.—By permission from "The Treasury of Human Inheritance." Loeb's case of hereditary blindness. All members in blind asylums.

selection of the old days has been suspended. That suspension is partly due to medical progress; you are enabling the deformed to live, the blind to see, the weakling to survive—and it is partly due

DEAF MUTISM.



The Treasury of Human Inheritance

FIG. 14.—Eugenics Laboratory case to illustrate propagation of deaf-mutism by the intermarriage of deaf-mutes.

to the social provision made for these weaklings—the feeble-minded woman goes to the workhouse as a matter of course for her fourth or fifth illegitimate child, while the insane man, overcome

by the strain of modern life, is fed up and restored, for a time to his family and to paternity. In our institutions we provide for the deaf-mute, the blind, the cripple, and render it relatively easy for the degenerate to mate and leave their like. In the old days, without these medical benefits and without these social provisions the hand of Nature fell heavily on the unfit. Such were numbered, as they are largely numbered now, among the unemployables; but there were no doctors to enable them to limp through life; no charities to take their offspring or provide for their own necessities. A petty theft meant the gallows, unemployment

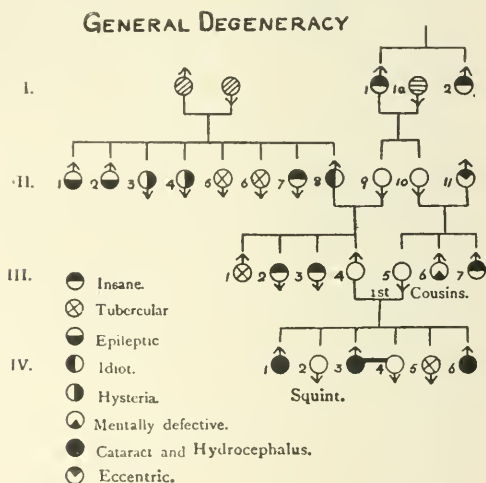


FIG. 15.—Pisenti's case from "Treasury of Human Inheritance," showing multiple degeneracies.

meant starvation, feeble-mindedness meant persecution and social expulsion; insanity meant confinement with no attempt at treatment. To the honour of the medical profession, to the credit of our social instincts, be it said, we have largely stopped all this. We have held out a helping hand to the weak, but at the same time we have to a large extent suspended the automatic action whereby a race progressed mentally and physically.

Surely here is an antinomy—a fundamental opposition between medical progress and the science of national eugenics, of race efficiency. Gentlemen, I venture to think it is an antinomy, and will remain one until the nation at large recognises as a funda-

mental doctrine the principle that everyone, being born, has the right to live, but the right to live does not in itself convey the right to everyone to reproduce their kind.

Our social instincts, our common humanity enforce upon us the conception that each person born has the right to live, yet this right essentially connotes a suspension of the full intensity of natural selection. Darwinism and medical progress are opposed forces, and we shall gain nothing by screening that fact, or, in opposition to ample evidence, asserting that Darwinism has no application to civilised man.

It is here, at this opposition of Darwinism and medical progress, that eugenics seem to provide a key to the situation. As eugenicists we assert that the right to live does not connote the right of each man to reproduce his kind. Step by step, as we lessen the

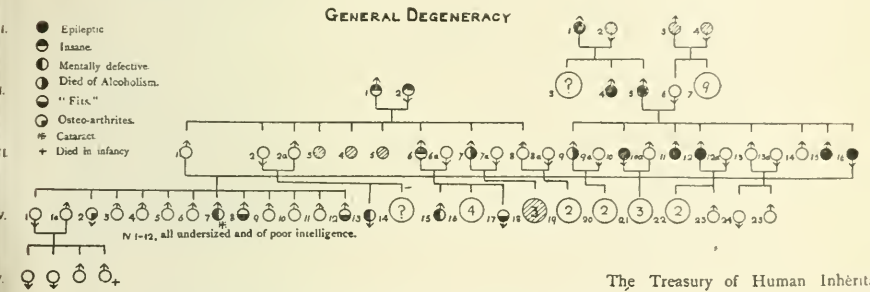


FIG. 16.—Mr. Bishop Harman's case of the intermarriage of degenerate stocks and the propagation of multiple degeneracies.

stringency of natural selection, and more and more of the weaklings and the unfit survive, we must increase the standard, mental and physical, of parentage. We must say to the diseased and the deformed, to the syphilitic, the epileptic, the feeble-minded and the insane, "Medical progress must do all in its power to make your life easier, but you have no right to be the parents of the coming generation whenever and wherever heredity or contact insures that even a sensible percentage of your offspring will be themselves deformed or diseased." I shall be told that men of genius have occasionally had an insane parentage. My answer to that is that the average number of insane offspring of an insane parentage is about 25 per cent., and that when we follow these families of the insane up to fifty years of age it is more nearly 40 per cent. Are we for the sake of a genius once in a century to inflict

the suffering denoted by these percentages, not only on the individuals themselves, but on their friends and relatives, and what is more important, on the nation as a whole? I believe, if the general public, but above all the medical profession, once fully realised the very large part which heredity plays, not only in cases of deformity, but in cases of general mental and physical debility, where it leads to many forms of degeneracy, they would be most wholly and heartily with me when I say that only a very thorough eugenic policy can possibly save our race from the evils which must flow from the antagonism between natural selection and medical progress. You will say: "In what way can help be most efficiently given to such a eugenic policy?" There are two ways in which it can be done—by public action and by personal influence.

By public action: In supporting some measure, whether it be the present Government Bill or a modified form of it, for the segregation of the mentally defective. By insisting in and out of season on the necessity for a general register of the insane, so that there may be really definite information as to the insane population of this country. By forwarding every movement for the notification and registration of all diseases and deformities of which we have already definite knowledge as to their hereditary character, *i. e.* hæmophilia, epilepsy, albinism, congenital cataract, deaf-mutism, etc., and of all diseases, non-hereditary in character, where an active condition is injurious to offspring.

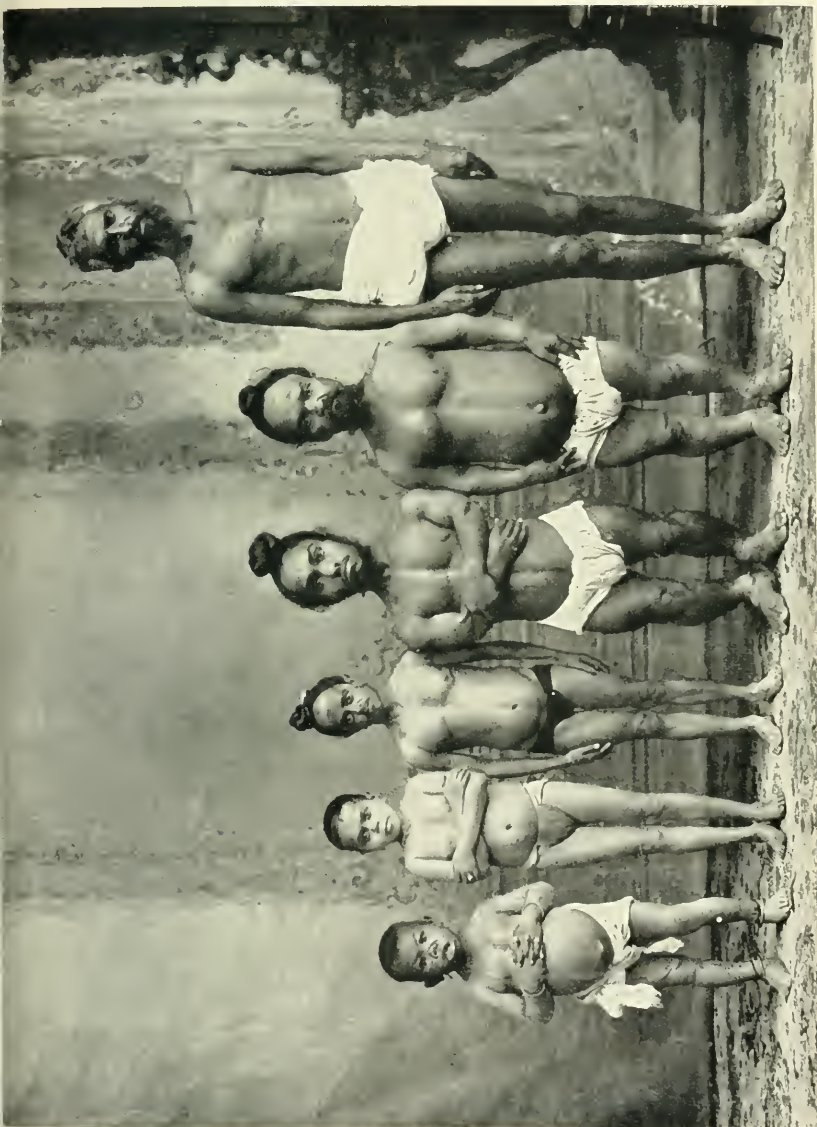
But great as is the influence of medical opinion on public action, it is more than equalled by the weight which the individual medical man can exert in his private relationship either as consultant or as family doctor. He is the confidential friend of many men and women, and as such in a quiet and unobtrusive way he can do much to encourage the fit to parentage and discourage the unfit. The public is in a receptive mood at the present time - I feel sure of this by the number of letters of inquiry, often with elaborate pedigrees, which reach my laboratory—and a very little directive from medical advisers may have great ultimate national value.

Be this as it may, I am certain there is from the racial standpoint a divergence between the conception of natural selection and the progress of medical science; I see only one way of bringing the two into harmony. If we suspend—as we all agree we ought to suspend—the stringent selection of the living, then

we can only progress as a race, mentally and physically, by a stringent selection for parenthood; we must resolve that the fit shall not only be parents, but have a fertility which entirely dominates the fertility of the unfit. Unless we have a firm belief that man differs *in toto* from every other type of life with which we are acquainted—and there is no basis for such a belief in our experience of the influence of environment on man—then the acceptance of the eugenic standpoint is, I am convinced, the only way in which we can safely reconcile medical progress with racial progress. We cannot make a fine race of men—as Mr. John Burns seems to believe—by simply reducing the infantile death-rate; that death-rate is selective, and if we check Nature's effective but roughshod methods of race betterment, we must take her task into our own hands and see to it that the mentally and physically inferior have not a dominant fertility. In the organised and conscious race-betterment of the future I believe that medicine and eugenics will advance hand in hand, for their missions, if not identical, will, I venture to think, be in complete sympathy.

In replying to a vote of thanks proposed by the President, the Lecturer heartily thanked his audience for their careful and prolonged attention; it was the first medical audience he had known in which professional duties had not called away at least one or two members.

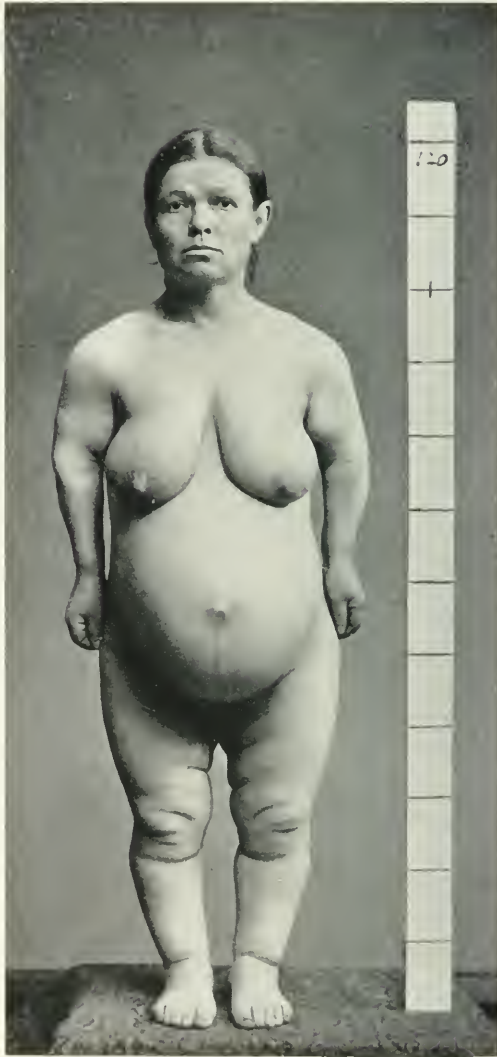
PLATE I.



Major C. H. James' illustration of Dwarfism, reproduced from the "Treasury of Human Inheritance," vol. i, plate I.L.
 A, Cretin. B and C, Atelosis. D and E, Achondroplasia. F, Normal native.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENDISH LECTURE, 1912.

PLATE II.



Two achondroplastic sisters, daughters of achondroplastic father. Cæsarian section. Professor Nijhoff's cases. Reproduced from "Treasury of Human Inheritance," vol. i, plate PP.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENDISH LECTURE, 1912.

PLATE III.



Two achondroplastic sisters, daughters of achondroplastic father. Cæsarian section. Has already one achondroplastic child.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENTISH LECTURE, 1912.

PLATE IV.



Dwarf growth of rickets. Professor Nijhoff's cases. Sister and brother.
Repeated Cæsarian section.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENDISH LECTURE, 1912.

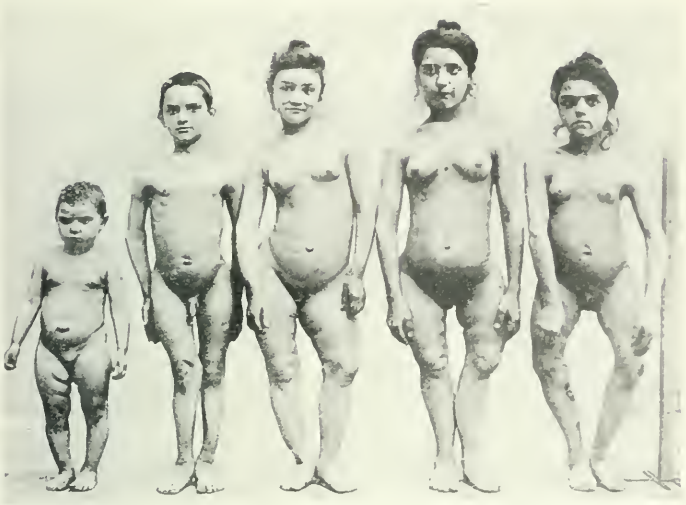
PLATE V.



Dwarf growth of rickets. Sister and brother. Reproduced from the
"Treasury of Human Inheritance," vol. i, plate NN.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENDISH LECTURE, 1912.

PLATE VI.



Family rickets. To illustrate how the birth of a first rickety child does not deter persons from parentage at present.



Reproduced in the "Treasury of Human Inheritance," vol. i, plate Y, from the *Nouvelle Iconographie de la Salpêtrière*.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENDISH LECTURE, 1912.

PLATE VII.



Split foot or lobster claw family. Pearson's case. Mother and two daughters. Reproduced from "Biometrika," vol. vi, plate XI, by permission of the Proprietors.

TO ILLUSTRATE PROFESSOR KARL PEARSON'S CAVENDISH LECTURE, 1912.

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