Heredity.

"Ex pituitoso pituitosus, ex biloso bilosus gignitur, ut ex tabido tabidus, et ex lienoso lienosus * * * * * Semen etiam genitale ab omnibus corporis partibus procedit. A sanis sanum, a morbosis morbosum".

Hippocrates.

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Heredity.

During the past few years inquiries at the bedside into the family history of patients have become very general; and in many cases they may be considered almost as essential to a correct and complete diagnosis as the examination of the pulse or tongue.

We may learn from such inquiries not merely what diseases to expect and guard against; but, even if the disease from which the patient suffers be one not considered capable of hereditary transmission, they may elucidate complications and peculiarities otherwise inexplicable; for it is well known how very numerous are the varieties of individual diseases in different constitutions. Their importance does not end when we have explained by them to our own satisfaction certain puzzling symptoms; but they must be carefully kept in view in forming our prognosis, and in mapping out for ourselves a line of treatment. How frequently do we find in pneumonia, for example,

a patient seemingly strong and otherwise healthy, who has been reared under all the hygienic advantages of good food, pure air, and judicious clothing, pass on to death on account of some hereditary taint; while another less carefully reared and to all appearance less fitted to weather the disease, which at its commencement may be as severe in his case as the other, return to work in a few weeks comparatively well, his only primary advantage being a good family history. In such a case as the former our prognosis should be guardedly given, and our treatment should not include an early application to the lancet as it would probably have done had we belonged to an earlier generation; but we should use our best endeavours to save our patient's strength and otherwise assist him to fight with this peculiarity with which we have made ourselves acquainted.

So great is the importance of this subject that there are very few cases indeed in the investigation of which it would be proper to omit a few questions

in this direction. Very considerable tact is frequently necessary to elucidate the required information. The unwillingness of parents to believe themselves capable of transmitting anything injurious to the constitutions of their children, or still stronger the desire to hide facts which they consider irrelevant and in no way necessary in the examination of the particular case, leads them to equivocate, and often renders an accurate conclusion a result impossible to be attained. We are accustomed in the consideration of a disease to search for a prime cause; and it is only when we clearly see that from this starting point the result was inevitable under pervading circumstances that we rest perfectly satisfied. But in actual diagnosis we have rarely a clear conception of all these circumstances; and the primary cause it is frequently impossible to find. Nevertheless, other excitants being equal, we are able by a consideration of family tendency to explain many disparities between individual cases.

Although it is medical men who most commonly have their minds directed to this subject of heredity it has very great importance and interest apart from its connection with disease. It points to the source of certain admirable qualities in one individual as plainly as in another it may reveal the origin of some transmitted disorder. A man may receive his keen intellect from the same parent and by the same law as he receives his gout.

A family likeness indeed seems to pervade all nature's works; and it is this which enables us to divide and subdivide natural objects into classes or groups having certain peculiarities as separating characteristics. The two great classes into which matter is divided are organic and inorganic, each having certain distinctive qualities. The organic consists of organised bodies built according to a definite and generally complicated plan; whereas the inorganic consists of bodies which have no such arrangement,

but are made up of elements in certain proportions and quantities in a fashion capable of imitation and production by man. The organic world again is divided into vegetable and animal kingdoms, its being so classed from certain recognised likenesses and differences in its objects. Vegetables have undergone various classifications by different writers. Some have fixed upon one class of peculiarities which seemed to characterize a group and classed them according to their views. Others have, upon other grounds, classified them in some other way. There are families and races in the vegetable as in the animal kingdom; but for our purpose it will be sufficient to look for a little for evidences of hereditary transmission in the various races of mankind.

Human descent. A question at once arises, the difficulty in settling which is as great as it is in itself interesting and important; namely whether it be possible for the existing races, with their separate family peculiarities to have come in direct descent from Noah. If

is believed that Ham was the father of the coloured races; and that from him and his two brothers sprang the whole human family as it is now. At first three persons transmit to their offspring their peculiarities, and by the continued transmission of individual features distinct races are formed each with its characteristic stamp. This view seems to me difficult of belief, whereas the other, that each race had its origin in a distinct and separate creation, would, if it were only scriptural be accepted at once and easily understood. I think there can be at present no question of the permanence of the existing physical types. Nott says that without separate creations the phenomenon can only be explained in one of three ways. First, that it is the result of a miracle; second, that is from the gradual action of physical change, climate, food, habits, etc; and third, that is from congenital or accidental varieties. Dr Prichard, in his Physical History of Mankind gives examples of Jews

Persians, Hindoos, Arabs, etc. who migrated and were found a thousand or fifteen hundred years afterwards each to have preserved their original types. He says a Sunburnt cheek is never handed down to posterity, that is to say that acquired peculiarities are not transmitted to the offspring. This is a point which will be considered further on. Some amusing explanations are given of natural differences. For example, it was stated that the round head of the Turk was from wearing a turban, that the Hottentot's small head was from scarcity of food; and Coombe says that the Dutch owe their dulness and phlegm to their living among marshes. Sir Charles Bell is credited with having said that the heavy clogs of the Englishman accounted for his slender legs; and that the vigorous calf of the French woman was from the absence of side garments in Paris.

I cannot but believe that until very recently much of our information regarding the various tribes was unreliable,

and that frequently some particular dis-
-similarity noticed in one or two individuals
was given to us as the distinguishing feature
of the tribe. That these malformations as
I believe them to have been would be common
in isolated races we can readily understand
from what we know of the results of
consanguineous marriages nearer home.
Some races are said to be unable to extend
their arms or legs to full extension; some
have two or more fingers or toes webbed;
some no arms, only hands; others no legs,
merely feet; in some the thighs are too
short or the arms; in some the back
is straight, not curved; some have claws,
and some races have hare lip and cleft
palate. That a whole race should
exist characterised by some such
peculiarity I cannot accept as true,
but that such malformations are common
I readily believe and ascribe many of
them to the family intermarriages. Now
we can easily believe that a particular
temperament or disposition, strongly develop-
-ed in both husband and wife will be

liable to reproduction and be still more greatly developed in the offspring, destroying that balance necessary to health and ending in incapacity and disease.

However any two races may differ they are capable of fruitful union, and the offspring will bear evidence of the parentage. The Mulatto for example is the offspring of a negro and a European woman, or of a negress and a white man; and it bears plainly the likeness of both parents. The skin is neither black nor white, but of a yellow hue; and otherwise the child shows its parentage by a commingling of the characters of each, or, as in some instances by having some part of its body strongly resembling one parent and another part the other. One case is reported where the child was very fair like its mother who was a white woman, but showed the likeness of its father, a black, by its right hip and thigh being as black as his.

Theories of family resemblances.

How are we to explain this likeness of the offspring to the parent? The likeness

of the child to the father has been ascribed to the mother's mental impressions being sympathetically conveyed to it. But there are other three explanations, some one of which is probably true. The general belief is that the ovum matures to a certain extent in the ovary of the mother and requires but a vivifying "aura" from the male parent, when the germ, which would otherwise have perished, develops step by step and carries with it the resemblance not only of its originator, but of the co-operator, who seems from this theory to have so little to do with its production. Many have justly questioned whether this aura is likely to stamp so strongly as we frequently see it the resemblance to the male parent; and have taken, it seems to me, a less probable view, and one just as far on the other side of what is probably the truth. They say that the germ is contributed by the father, and that what we call the ovum is only an abode for this germ until, at the proper period, the

shell is broken, and development in this sphere comes to an end. At first sight we should say, arguing as formerly, why does this production resemble its maternal parent so forcibly if she is only the cradle for its nurture? But this we could explain from its intimate connection with her during the period of maturation, receiving as it does from her its food, and suffering as we know with her the consequences of sometimes slight mental emotions.

In the most simple subject we often find ourselves struggling through heavy mists after an explanation of difficulties, which when we have found it makes us blush that we did not discern it before, and lament the loss of time that seems misspent. Of the first theory it is said that it is not simple enough. Why does not nature with her universal simplicity complete the whole in one parent when the interference of the other is so slight? Again, can it be possible that this "breath" can stamp

the shape of a finger nail or give the offspring a taste for music? The second explanation is a very beautiful one.

It is this: that the father supplies the germ while the mother provides for its development; that the germ is created in him and reaches a certain stage of maturity - but remains at this stage unless provided with a harbour and food for its development, which only the mother can supply. It is impossible by the most careful examination to demonstrate the existence of this germ; but what I believe its nature to be I will explain when I have finished the consideration of these two theories. We can, however, see the cradle in which it is received and nourished; and soon after it has received the paternal germ, according to this theory, its character is obviously changed and in the centre of the brain is visible the developing germ of the offspring. Although in the human species our opportunities of observation are few for the elucidation

of this subject, we can with great interest and benefit study the subject in some of the lower animals and vegetables. No better example of the development of the embryo can be shown than that of the hen egg; and in the first place I would say of it that so far as we know there is so little difference between it and the human ovum that we are justified in arguing from analogy that what takes place in the one takes place in the other also. We find that there are eggs which although placed under the most favorable circumstances for hatching remain without any appearance of fœtal development; while others after a few weeks warmth have their coverings broken, and from their interiors emerge the young as far advanced in growth and development as there was food and space within the shell to allow. In other words there are eggs which are fertile and eggs which are barren, the difference being that the eggs which are capable of producing young have come

under the influences of the male parent, the others have not. One theorist would say that the vivifying aura of the male parent had awakened to life the germ of the ovum in the fertile egg, while no such influence had extended to the other. Another theorist would say that there was no germ at all in the egg that was barren, and that the most necessary element to reproduction had not been contributed by the male.

So in vegetable life we find that it is necessary for both parents to take part in the production of new life. No plant is really self-produced. We find the male and female existing in different relations, but their existence and connection are necessary before they can reproduce themselves. They exist sometimes in the same flower, sometimes on different flowers of the same plant, and sometimes on different plants entirely. But for the preservation of the species nature

has beautifully arranged that they shall come together even under what often seems impossible circumstances. Certain it is that whether it is only necessary that the pollen should give a vivifying aura to the ovum, or that the ovum takes the pollen or its essential part into its interior, they must come together, else the seed which would otherwise produce in all its beauty a plant bearing the characters of its ancestors, would shrivel and die.

Mr. Cox's theory.

The third theory explaining why both parents are required in our production has been advanced within the last few weeks by Mr. Ed. W. Cox, S. L., F. R. G. S., and I must confess myself a convert to the view, explaining, as it does to my mind, points which seem inexplicable by either of the other theories I have mentioned. These points are the hereditary transmission of parental peculiarities, chiefly those of the father; and, secondly, the limit to prolific intercourse in divergences from the original type. Mr. Cox's theory is

this, that organised structure is produced by the junction of two germs, one being supplied by each parent. That the female parent provides the food and habitation is admitted, but more than this, it is contended that she supplies a germ which by some mysterious affinity connects itself with the germ contributed by the father, and this junction is the beginning of the embryo. Now we can readily see why the offspring should resemble either or both parents; why the peculiarities of the father are equally represented with those of the mother. This theory will also explain the symmetrical arrangement which pervades every animal or vegetable.

It will be said that one side of the offspring would resemble the father and the other the mother; the child of a negress by a European would perhaps have one side black and the other side white. We know, however, from actual dissection as well as from the result of experiments by galvanism, that the nerve centres of the one side send nerves to the other; and we

can thus understand why it is that the characters of the parents are blended, in the double germ from the nervous system thus interchanging. We cannot find in vegetables anything like nerve fibres, but most of us believe that there must be something to represent them; for we have beautiful illustrations of sensation and motion in many plants. This substitute for the nervous system must interchange its influences the one side with the other as I believe it to do in the germ of the animal. Would not this commingling of characteristics derived from each parent produce a child whose qualities occupied exactly a middle position? No doubt the germ bears the stamp of both parents; but as the nerve force in some particular direction is stronger in the one parent than in the other the offspring is most forcibly stamped with that character which pre-dominates in the one or the other. Thus we explain how the simple father may have a clever son, and a gentle mother a passionate child. "I should sin" says Miranda in The Tempest

"to birth but nobly of my Grandmother's
good wombs have born bad sons". No
doubt the character of the germ is
considerably changed also by its residence
within the mother, bearing as it does
so close a relation to her, and
receiving from her evidences visible some-
times after its birth of having been
affected by her emotions. It is in
the mental powers chiefly that a
child bears resemblance to its parents;
and this from the fact that it is the
character of the nerve system of the
parents that is transmitted to the germ.
This germ is, I consider, a minute
object containing the nerve skeleton
of half the future embryo; this nerve
skeleton bearing probably all the
characteristics of the parent who
supplied it, as a bud from his or
her nervous system.

Explanation of hybridism.

These germs must bear a certain
resemblance to each other before they will
unite to form one body; and so we can-
-not have beyond a certain limit fertile

connection. The germs of the horse and the ass are not sufficiently unlike to be repellent to each other; but the germ of their offspring, the mule, is not sufficiently like either to join in forming an embryo. This is the explanation of hybridism, and the only one, it seems to me, capable of satisfying the mind; but I would entirely exclude the possibility of certain kinds of monsters which sometimes we hear of, bearing a likeness to two distinct kinds of animals. We know, however, that within certain limits Nature's laws seem frequently transgressed, and congenital peculiarities are by no means uncommon. "While we find cause," congenital peculiarities. says Dr Holland "for wonder at the extraordinary transmission of resemblances from parent to offspring, we must admit the equal wonder that there should ever be deviations from these likenesses. The one is in reality as great a miracle to our understanding as the other". Such deviations are doubtless much more common than

many of us believe. When we reflect that only such as are very obvious that are likely to come under our notice we must admit that the existing number of these deviations must be very large. Indeed I question very much if a large majority of mankind have not something of this sort which could it be known would serve to distinguish them more or less from their fellow men. It might be a mole, an almost imperceptible capilliary nævus, such as I have seen, or some other slight divergence from what we consider natural; nevertheless it was decidedly a congenital peculiarity as a six-toed foot, which might in some cases be the only existing difference between one particular individual and the generality of mankind. I think there is no doubt that congenital peculiarities are most common when either or both parents are in a not very sound state of health; but more consideration ought to be paid to the strange accounts we hear in connection with certain maternal

impressions acting upon the fœtus in utero. Many I know are inclined to smile at them, but belief in what are generally considered amongst the profession "old wives' tales" is becoming more common, and some of them are certainly extremely interesting, although popular ignorance has no doubt led to exaggeration in them.

Maternal impressions.

The nervous system seems to be responsible for these peculiarities; but how the maternal impressions are communicated to the child through a nerveless connection such as the umbilical cord is believed to be appears mysterious. Could we discover nerve fibres as well as blood vessels in the cord then the great difficulty would be explained; but in their absence, if they are absent, we are driven to the belief that the maternal blood transmits these impressions to the fœtus. One writer on the subject, Mr. Clapperton, suggests that possibly nervous communication may exist in some unexplored region such as the vaso-motor nerves. The same

writer, speaking of the great resemblance which the ovum in its early condition bears first to a fish, then to a reptile, then a bird, and lastly a mammal, thinks that anything arresting the development at any one of these stages may give the child the appearance of any one of these animals. I consider this most improbable, and while admitting that these impressions alter in some way the foetus I am of opinion that such resemblances as we are sometimes told of are more generally mental illusions of the observer than well defined existences; and that the observer, as Dr Lee says, forces the resemblances to suit the theory. No doubt many of these abnormalities would have occurred had the woman never had a fright. It is generally believed that a sudden impression is not sufficient to cause the change; but that continued brooding over the subject, in relation to the pregnant condition, is necessary to produce it. We know, however, that the incident explaining the occurrence which is afterwards

observed had sometimes taken place before the mother was aware of her condition, rendering any mental dread of such a thing impossible. A story is told of a dog whose pups bore a strong resemblance to a cur which it had seen shut just before it had connection with the father of the pups, the cur having never had coition with the mother.

It is generally understood that these abnormalities occur in the early months of pregnancy, but in the case of the witch just related it occurred before pregnancy although immediately before it.

The woman too must be women of peculiarly impressible organisation, for we know of cases where serious frights with weeks or months of threat or apprehension have produced nothing of this kind. Dr Lee asks if it might not be that certain emotions affect certain organs of the foetus, as we know they do in ourselves; and he quotes from Dr Peacock

who says — "The occurrence of accidents and strong impressions upon the mind of the mother are also supposed to conduce to the irregular development of the offspring, and in many cases such causes appear to have operated. In several instances which have fallen under my own notice the mothers of children labouring under malformations of the heart have assigned the defects in their offspring to strong mental impressions and shocks which they sustained during pregnancy; and there seems reason to believe that such causes by deranging the maternal and indirectly the foetal circulation, might produce the effects." Here is an interesting point. We should naturally expect, and we find it to be true, that when the cause of fright in the mothers is of a moral character, the abnormalities of the children are of the intellect and these cases are extremely common, although difficult to cite, inasmuch as the intellectual derangement is not observed until the children have reached ages

at which we can judge of their mental capacity. Independently of the cause just mentioned, maternal impressions, there are others which I should name as likely to influence the parents sufficiently to account for degeneracy, at least, in the offspring; but why I should in any particular case take one shape, and in another another shape, is as inexplicable now as I fear it will remain for ever. It has been questioned whether any acquired peculiarity in the parent other than constitutional character could be transmitted to the offspring; and although it is difficult to explain, it sometimes seems to be the case. Acquired constitutional diseases are, unquestionably, so transmitted, as we find so frequently in syphilis, but it seems that accidental non-constitutional characteristics occasionally affect the offspring. There is an instance of a father of three healthy children who received an injury which necessitated the amputation of a limb. The next child which his wife bore had the corresponding limb

shorter and weaker than the other. This might be from the mental impression of the mother being sympathetically conveyed to the child, but it is certain that these occurrences are extremely rare and might almost be looked upon as peculiar co-incidences.

Degeneracy

The continued increase of crime and suicide, the precocity of young criminals, certain formations of skull, physiognomical resemblances in the criminal class, the increased number of lunatics in the country, the relative increase of certain constitutional diseases and nervous affections are spoken of as points to be considered in judging of the correctness of any suspicion of degeneracy in our race; and the most common causes of such degeneracy I will now mention.

(1) Toxæmia. The impressions made upon the parents by the influence of poisons are transmitted to the offspring, for as the poisons decrease the procreative power of the father so do they diminish the vital standard of

the child. "Not only" says Morel, "is the vice of alcoholic abuse hereditarily transmissable, but it also frequently leads to insanity in the offspring of the drunkard and where dipsomania has been transmitted its cure is generally impossible." I should like to give one instance of hereditary dipsomania cited by Morel.)

The great grandfather was a dipsomaniac and the first generation was characterised by its excesses, immorality, depravity and brutishness; the second by hereditary drunkenness, mania, and general paralysis; and the third by sobriety; odd to say, but hypochondriacis, hypomania, & homicidal tendencies; the fourth by feeble intelligence, mania at sixteen, stupidity - running on to idiotcy, and to a condition involving extinction of the race.

We should expect, and we find, similar results from the use of opium and such narcotics, when habitually used, but chiefly from alcohol; and when both parents are in the habit of resorting to them con-

we expect otherwise than that they should have an unhealthy generation succeeding one whose functions were generally kept suppressed or perverted by the habitual use of some such poison? (a sanis sanum; a morbosis morborum.) Malaria acts in a similar way by depressing the system which is exposed to its influences; and a tolerance of it seems to be gained by long experience as in the case of these other poisons.

(2.) **Epidemics** have a similar character and influence upon succeeding generations, the only great difference being that we cannot to the same extent avoid their influences although our increasing knowledge of sanitary laws will to a large extent suppress their hurtfulness.

(3) **The Town System** acts also in decreasing the vigour of our children, and our children's children, from the deficiency of air in many of our dwellings, as well as from its inferior quality, incorporated as it is with the

smoke inseparable from all large towns. Add to these, hurtful occupations, improper or insufficient nourishment, great immorality, or wretchedness and crime, and the town system will be seen to possess few of the qualities likely to improve the mental, or physical character of our future generations.

Consanguineous Marriages.

(4) **Consanguineous Marriages.** There is another reason given to explain many divergences from health in the offspring of reasonably healthy parents; it is most frequently met with away from large towns where a few families seem to be separated from the rest of mankind in some lonely village. I mean the hurtful influences of consanguineous marriage. This subject of consanguineous marriages is so closely connected with that of heredity that the consideration of the latter would be incomplete without some reference to the former. The subject is a very difficult one from the fact that we can only be guided by statistics,

and these are so frequently fallacious. It will be well to look for a little to plants and the lower animals to see if anything can be found in regard to them which may help us to a proper understanding of the subject. Sprengel, a German botanist, pointed out one variety of plant whose pollen could be carried by the wind from one flower to another in consequence of its light, powdery, character; and another whose pollen could only be carried from flower to flower by insects owing to its heavy, glutinous character, and that in this case the pollen could only be applied to the stigma through such a medium. The most important fact to my mind against consanguineous marriages from this view has been supplied by Mr. Darwin, and Professor Earnest Faivre of the Faculty of Science, Lyons, has also written upon the subject, showing that although in some flowers both stamens and pistil may exist, any attempt at fertilization between them ends either in degeneracy in the character of the

seed, or is entirely unfruitful, while neither the pollen nor the pistil is in itself unsound or incapable of healthy reproduction. It is only necessary that the pollen of one flower should reach the pistil of some other flower of the same species and the desired result ensues. The purpose seems to be the prevention of the continued propagation of individual characteristics; and Professor Hickson, in an Introductory Lecture delivered to the students of Glasgow University, expresses his opinion on the subject. Speaking of propagation by gemmation he says:- "Now it may very naturally be asked how, or why, with this simple and apparently non-injurious method of propagation does there exist the more complicated arrangement of sexuality. The reason or use it seems to me is not far to seek. The avoidance of self-fertilization and the facilitation of cross-breeding, so manifest, for instance, in the vegetable kingdom, really amounts to, or may be expressed in other words as the avoidance of the

perpetuation, and favouring of the dilution of individual peculiarities. The function of sexuality therefore seems to be to keep up an average tone or quality in the species; and by dilution of individual peculiarities to eliminate possible sources of evil in their appearance; and if I am right in this opinion it is quite evident that in the practice of consanguineous marriages the special end or use of sexuality as such would be frustrated, for instead of dilution we should then have not merely perpetuation but probably exaggeration of individual peculiarities; and if these partake, as they but too frequently do of the nature of constitutional defects could hardly fail to be injurious."

Domesticated animals have been pointed to by one party as giving proof not only the innocency but the good results to be derived from what is called breeding in and in. In England cattle breeding has arrived at great perfection; and although I believe they often put father and daughter, mother

and sin together. The general impression is that this can be carried too far and will ultimately end in degeneracy. "La consanguinité élève l'hérédité à sa plus haute puissance; elle est favorable si les producteurs sont bons, nuisible, au contraire, s'ils sont entachés de vices héréditaires, qui se transmettent à leurs descendants avec d'autant plus de certitude que les parents sont eux-mêmes plus rapprochés par liens du sang".

But we cannot forget that just as too far east is west so too much good is bad; and it is often said of the English racehorse that when there has been this interbreeding the foal has not its father's strength, that many of its admired qualities arise from its nervous irritability, and that the system tends to produce degeneracy in its vigour and power of propagation. Much might be said on both sides, but those who defend the innocency of interbreeding seem rather to criticise the statements produced by those who hold the opposite view than bring forth facts for themselves. There are a few cases recorded by them, however, which are worthy

& notice. Bourgeois says of his family that there has been 68 unions toutes surchargées de consanguinité and no evil results. Sequin gives a history of 10 consanguineous marriages in which a single deformed or infirm child cannot be shown. Lagneau cites the case of two families in which there has been 8 intermarriages in 87 years whose descendants are still sound and vigorous. An interesting case is recorded by Dally (a strong supporter of the innocency of these marriages,) of the family of one of his pupils. During the period of 150 years 5 generations of marriages had been consanguineous. The degree of relationship never reached beyond that of cousins-german, except in two cases where the daughters of cousins-german married their uncles. The total offspring was calculated at from 120 to 140 and in that number there was not one deaf-mute or idiot or one sufferer from any disease which could be considered the result of the

marriage. Only two, who were females, died from phthisis; one only was demented, and that not until the age of 68 years, three years previous to death. No diathesis except the rheumatic belonged to any single one; and the number of offspring was the more surprising as a great number became priests. These facts are of much importance as showing that under certain circumstances these unions are innocent; and whole villages are pointed to as demonstrating their harmlessness. Partisans of the other view also point to villages which they think prove as clearly their side of the question. Many facts in this way are interpreted differently by the opposite sides, and turned to strengthen their respective cases. Statistics seem the only source for real information and the question to be solved is whether they show that certain infirmities are more numerous after such alliances. It seems clear that such alliances do not

invariably produce evil results; but this is all that the supporters of our view have demonstrated. They have certainly not shown these unions to be desirable or worthy of encouragement. Bodin computes the number of consanguineous to non-consanguineous marriages in France at 2 per cent, but it is difficult to rely upon this though it is the very foundation of our research. We find others stating it to be as high as 25 per cent and even 30 per cent; and Dr Arthur Mitchell gives it as one to 60 or 70. This point could be settled by compelling persons when they marry to tell the registrar their relationship, if any existed; and through the registrar's figures we should get at the number. If this point were fixed how should we proceed in our investigation? Should we examine from the parents to the children or from the children to the parents? If the former the difficulties are insurmountable. How could we get

to know with accuracy the hereditary diseases they possessed before marriage, and the state of health of their ancestors; how many miscarriages had the female had and the causes which produced them; how many children had died and the correct causes of death? Again, when supposing we found the family healthy how are we to know that some infirmity may not appear in some future generation. Suppose the parent is free from hereditary disease, may not the infirmity attributed to consanguinity arise from some other cause — the mothers emotions, such as I have before mentioned, or affections of the mother and child during gestation? We must exclude all possible influences other than the intermarriage before we can accept of the examples. The other method of examination, from children to parents is much more easily conducted. We start

with an unsound person and inquire if the parents were blood relations; but the great difficulty again arises, as to whether the infirmity is not produced by some other cause, probably hereditary transmission. Deaf-mutism seems to be a common consequence of these alliances; and Boudin found that of 95 deaf-mutes 19 had parents already consanguineously related. Professor Dickson, quoting from Dr Arthur Mitchell gives the following results: of 411 idiots and imbeciles there were 98 whose parents were thus related, 42 the offspring of first, 35 of second, and 21 of third cousins; thus showing that the nearer the relationship the greater is the risk. Of 544 deaf mutes 28 were from related parents. Boudin points to the Jews also to support his theory of the hurtfulness of intermarriages. He says that this is why the Jews degenerate and that it accounts for the

greater prevalence amongst them than amongst Christians, of deaf-mutism and dementia. Dr Liebreich speaks of the prevalence of deaf-mutism amongst the Jews of Berlin and of what is called retinitis pigmentaria, ascribing the greater prevalence of these to consanguineous marriages. I have thus endeavoured to show the difficulties surrounding the subject, but we can at least come to this conclusion that it would be very desirable, until the innocency of these marriages be satisfactorily proved which I believe will never come to pass, that they should not be contracted as there is the strongest reason for believing that the effect upon descendants is injurious.

Hereditary diseases.

I now come to the last part of my subject, that of hereditary diseases; and the number of these is very large. I will enumerate the most important of them; and as it is impossible in this essay to con-

-sider each separately. I will chose that which seems to me best understood as an example and speak of it as typical of the character of the rest. The most important diseases usually considered liable to hereditary transmission are Scrofula, Phthisis, Cancer, Insanity, Epilepsy Apoplexy, Asthma, Dropsy, Gout, Rheumatism, Quinsey, and Syphilis. No doubt there are others, but these come most commonly under our notice. The disease itself however does not always appear in the offspring by the same manifestations as in the parent. For example, we find epilepsy in the father and, it may be, insanity in the child; or hysteria or some other nervous affection. Nor do we always find it appear in the immediate offspring, but, missing one generation, it may appear in the next. This is particularly noticeable in cancer.

The example which I wish to chose is syphilis, as the disease which at least

by myself is most commonly under observation and the hereditary character of which is often most painfully obvious. Although we can obtain the matter which contains the syphilitic poison we have not been able to distinguish its essential principle. Still we know that this being introduced the blood undergoes some change more or less slowly, which ends in manifestations that are spoken of as secondary; the local result of the innoculation being its primary phenomenon. The tertiary symptoms appear still later on in the disease. It is however of the appearance of the disease in the offspring that I wish to speak as serving to complete my subject of hereditary. There can be little doubt that the blood is the part of the system whence the poison is derivable; and that the body, nourished by this blood or any secretion or excretion of the body carries with it a diseased taint. Some have spoken of a

peculiar appearance of the blood corpuscles in persons affected with this disease. Although this may be so it does not constitute a reason for believing that the poison is lodging here more than in any other part of the body, but is simply the result of the action of the virus, which may show some other manifestation in some other part of the body simultaneously or afterwards. The mother whose system is saturated with the disease will almost necessarily produce children similarly contaminated; or the father having a syphilitic constitution will contribute to the fœtus his disease, whence the mother also will become affected as we can easily understand from their intimate connection. One parent being perfectly healthy will no doubt greatly counteract the evil influence of the other. A healthy widow may by a second healthy husband, bear syphilitic children from the hurtful

influence of her first husband; and Professor McLeod has told us also that a healthy woman falling with child to a healthy father may have this child syphilised by her future connection previous to its birth with a man suffering from the constitutional disease. No doubt other diseases of the same character can be communicated in obedience to the same laws. Sir Thomas Watson, speaking of the impossibility of communicating phthisis by contagion says "A wife watches the deathbed of her consumptive husband and presently sinks herself to consumption, and there may be no traceable or acknowledged example of scrofula in her pedigree. Yet her latent diathesis may fairly be presumed to have existed. Very few families are perfectly pure from a strumous intermixture." Surely it is not necessary to assume the presence of any such predisposition

in the case of this woman for as we have already seen a syphilitic father can through the fœtus communicate the disease to the mother I think we can with equal correctness explain such a case as this in the same way.

Conclusion. I have shown how one generation communicates its likeness to the next; how individual peculiarities are propagated or subdued; how the sins of the father are visited upon the children in the form of diseases which personally they had as little hand in contracting, as they have power to prevent. I have shown how gravely men ought to consider their responsibilities, since the consequences of any indiscretion may not only fall upon themselves but upon those whom most they love and be a source of heart-rending regret in after years.