The only conclusion I can draw from these findings is that arteriosclerosis is probably a negligible factor in the class of cases under consideration, leaving the burden of proof on those who assume that in such cases this lesion is present in the brain, though not discoverable elsewhere in the body.

Furthermore, so large a proportion of the cases fell in the chronic and hopeless class as to make it extremely doubtful if the presence of arteriosclerosis should weigh heavily in the prognosis, especially when coupled with the fact that cases do occur in which the mental depression has disappeared in spite of marked arteriosclerosis. It is with hesitation that I venture this opinion in the face of Kräpelin's dictum, based on the fact that numerous examples speak for the early appearance of arteriosclerosis, and the fact that the symptoms sometimes first appear after a stroke, evidence not, after all, conclusive unless checked by control observations. My conclusion is also somewhat at variance with the opinion of Robertson, who, while not regarding arteriosclerosis as a cause of the disorder, mentions, in connection with the prognosis of involutional melancholia, the frequent presence of arteriosclerosis and other organic diseases.

Aside from the question of the prevalence of arteriosclerosis in the involutional form, it has been noted that the blood pressure of individuals with manic-depressive insanity is higher during the depressed than during the exalted state. Dr. Abbott of the McLean Hospital tells me that in a series of such observations he found the blood pressure from 10 m.m. to 20 m.m. higher in the morning depression than in the evening remission, a finding in practical accord with that of Dunton and of Craig (*loc. cit.*), who regard the higher blood pressure as causal, while Alexander attributes it to the retention of waste products of metabolism resulting from the depression and Sheldon¹⁶ thinks the emotional change itself may raise the pressure, citing its elevation in one case after the patient was informed that it was already high. In this connection I would also call attention to the fact that agitated and apprehensive patients are apt to harden the muscles of the arm, thus causing a higher reading than the blood pressure itself would justify. This was impressed upon me by one case, examined early in the series, in which the first reading was 140, the second 130 and the third 120. In casting about for an explanation of this apparent change of blood pressure within a few moments, I remembered that muscular rigidity, at first present disappeared as the harmlessness of the test became evident to the patient, in other words, whereas in the third of the three observations I was measuring the blood pressure, in the first and second I was measuring also muscular resistance. Indeed, this rigidity is occasionally so intense as practically to render the readings valueless unless relaxation supervenes. When this fact is taken into consideration it is all the

more striking that the readings in the depressed series here reported were so moderate. But to this aspect of the question I have not paid special attention, having carefully limited the investigation to the question of arteriosclerosis, regarding which I have drawn the following conclusion:

Arteriosclerosis probably plays an unimportant part, if any, in the causation of involution psychoses and, when present, has probably little, if any, bearing upon the prognosis.

- ¹ Jour. Amer. Asso., Jan., 1908, vol. 1, p. 169.
- ² Allgemeine Zeitschr. f. Psychiatr., 1906, 63, p. 402.
- ³ Monatshefte f. Psychiatrie u. Neurologie (Ziehen) 1900, Bd. 8.
- ⁴ Archiv. f. Psychiatrie, 1901, Bd. 34.
- ⁵ Psychiatr.-Neurol. Wochenschrift, 1901-2.
- ⁶ Monatshefte f. Psychiatrie u. Neurologie (Ziehen), 1902, Bd. 11.
- ⁷ Centralbl. f. Nervenheilkunde u. Psychol., June 15, 1902, pp. 399-412.
- ⁸ Manual of Psychiatry, 1908, p. 303.
- ⁹ Lancet, 1898, vol. 1, p. 1742.
- ¹⁰ Read at meeting of New England Society of Psychiatry, March 28, 1912.
- ¹¹ American Journal of Insanity, vol. 62, no. 1, p. 37.
- ¹² Journal of Mental Sciences, July, 1911, vol. 62, no. 202 (new series).
- ¹³ Read at meeting of New England Society of Psychiatry, March 28, 1912.
- ¹⁴ Lancet, 1902, vol. ii, p. 18.
- ¹⁵ BOSTON MED. AND SURG. JOUR., 1903, vol. cxlix, p. 422.
- ¹⁶ Med. Rec., Feb. 13, 1912.

HEREDITY: WITH ESPECIAL REFERENCE TO THE LAW OF GREGOR JOHANN MENDEL, O. S. A.

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(Concluded from page 799.)

Let us now consider a few of the applications of Mendel's law to human beings. A study of the curious deformity of brachydactyly shows that its inheritance is clearly in accordance with Father Mendel's law. Dr. Drinkwater has carefully traced the peculiarity among the members of one family and has given us the following pedigree.

It will be noted that all affected individuals have an affected parent; that none of the un-

affected individuals, though sprung from the affected, ever have descendants who are affected; and that in families where both affected and unaffected occur, the members of the two classes are on the average equal. In other words, brachydactyly behaves as a simple Mendelian dominant to the normal form, and the recessive normals cannot transmit the affected condition whatever their ancestry. Once free they are always free, and can marry other normals with full confidence that none of their children will show the deformity.²¹

Among the most interesting of all human pedigrees is one published by Nettleship of a night-blind family living near Montpellier in the south of France. In night-blind people, as you know, the retina is defective, not being sensitive to light which falls below a certain intensity, and such people are consequently blind in failing daylight or in moonlight. The disease frequently results in total blindness in later life. As the Montpellier case had excited interest for some time, the records are unusually complete. They commence with a certain Jean Nougaret, who was born in 1637, and suffered from night-blindness, and they end, for the present, with children who are today but a few years of age. Particulars are known of over 2000 of the descendants of Jean Nougaret. Through ten generations and nearly three centuries the affection has behaved as a Mendelian dominant and there is no sign that long continued marriage with people of normal vision has produced any amelioration of the night-blind state.²¹ But here again "once free, always free."

The same principle is illustrated in the following pedigrees of retinitis pigmentosa and hereditary optic atrophy, in which the inheritance is obviously Mendelian.

FIG. 18.

Retinitis Pigmentosa.

(Nettleship, Royal London Ophthalmic Hospital Reports, Vol. xvii, p. 1.)

FIG. 19.

Hereditary Optic Atrophy (Leber's Disease).

(W. Ilbert Hancock, Royal London Ophthalmic Hospital Reports, Vol. xvii, 1908, p. 167.)

A group of cases of exceptional interest is that in which the incidence of disease is largely, if not absolutely, restricted to one sex, and so far as is known the burden is invariably borne by the male. In the inheritance of color-blindness, for instance, the transmission is according to the following scheme; which explains the fact,

FIG. 20.

Method of Inheritance of Color-blindness.

(Davenport.²²) (Heavy circles represent females capable of transmitting the condition.)

which we have often had occasion to observe, that color-blindness is much commoner in men than in women. A color-blind man, however, does not transmit color-blindness to his sons, but only to his daughters. The daughters, however, are themselves normal providing the mother was, yet they transmit color-blindness to half their sons. A color-blind daughter could be produced, apparently, only by the marriage of a color-blind man with a woman who transmitted color-blindness, since the daughter to be color-blind must have received the character from both parents; whereas the color-blind son receives the character only from his mother; but a color-blind woman's sons will all be color-blind. It looks, therefore, as though color-blindness were due to the presence of an extra Mendelian factor as compared with the normal, and that a single dose of it will suffice to produce color-blindness in the male, but a double dose is required to produce it in the presence of the factor for femaleness.

In the peculiarly male disease, hemophilia, which Grandidier calls "the most hereditary of the hereditary diseases," the inheritance in its general trend is not unlike that of horns among sheep and it is evident that we are here dealing with a character which is dominant in one sex, recessive in the other.

FIG. 21.

+ indicates a death from the disease.

Haemophilia.

(Appleton-Swain Family, Reading, Mass. (After Pratt, in Osler's System.)

Here are other pedigrees showing polydactylism, split-foot, Huntington's chorea, deaf-mutism, feeble-mindedness, twins, ichthyosis, and others, concerning which space is wanting for more than passing notice. I wish merely to say that a study of the charts shows that all of these affections clearly Mendelize.

FIG. 22.
Polydactylism (Lucas, 1880).²²

FIG. 23.
Syndactylism, "Split-foot" (Parker and Robinson, 1887).²²

FIG. 24.
Huntington's Chorea (Hamilton, 1908).²²

FIG. 25.
Deaf-mutism (Fay, 1898).²²

FIG. 26.
Feeble-mindedness (Goddard, 1910).²²
Here the mental strength of the first husband brought the required element into the combination so as to give good children. The children of the alcoholic sex-offender (probably also feeble-minded) who was the second husband, were, on the contrary, all feeble-minded.

FIG. 27.
Twins (Stocks, 1861).²²

FIG. 28.
Twins (Wakley, 1895).²²

FIG. 29.
Ichthyosis (Bond, 1905).²²
(Only males affected.)

FIG. 30.
Exophthalmic Goitre (Davenport, 1911).²²

FIG. 31.
Color-blindness. (Jennings' "Color Vision and Color Blindness," p. 41.)

FIG. 32.
Brachydactyly (Farabee).⁴⁴

FIG. 33.
Sarcoma of the Eye-ball (Silcox).⁴⁶

I will simply mention that Davenport and Weeks in the *Journal of Nervous and Mental Diseases* for November last have shown that epilepsy is inherited according to the Mendelian law, the proportion of epileptic children in the latest complete generation being double that of the preceding. And they conclude that "provided marriage matings continue as at present and no additional restraint is imposed, the proportion of epileptics in New Jersey would double every thirty years." They, therefore, advise segregation of all epileptics during the reproductive period.

By this means, cretinism, as you know, has within the last twenty years been practically wiped out from the city of Aosta by segregating the cretins in an asylum in charge of the Little Sisters of the Poor under Sœur Lucia, Mother Superior.¹⁷

Of imbecility* we may say that it is due to the absence of some definite, simple, Mendelian factor, as is indicated by the simplicity of its method of inheritance. Two imbecile parents, whether related or not, have only imbecile offspring. There is no case on record where two imbecile parents have produced a normal child. "So definite and certain," says Davenport, "is the result of the marriage of two imbeciles, and so disastrous is reproduction by an imbecile under any condition, that it is a disgrace of the first magnitude that thousands of children are annually born in this country of imbecile parents to replace and probably more than replace the deaths in the army of about 150,000 mental defectives which this country supports. The country owes it to itself as a matter of self preservation that every imbecile of reproductive age should be held in such restraint that reproduction is out of the question."

That these problems are not academic but are knocking for solution at our very doors is evidenced in this quotation from the *Boston Transcript* of November 18, 1911:

* Drewry (Virginia Med. Semi-Month.) defines amentia in the words of J. T. Searcy, as a "comprehensive term which has been used to designate an all-round want of normal mentality which has existed all the person's life, or since he has been old enough to have his mentality graded." In other words, "amentia is want of normal efficiency in all departments of thought." An *idiot* is "an ament who cannot be taught to be useful in any way to himself or to others, one who is utterly helpless and dependent"; an *imbecile* is "an ament who can be taught to do useful things under the immediate care and direction of others"; a *feeble-minded* person is "one who can be trained and educated to be quite useful and sometimes can work independently of outside help, if the work is not too complicated." De Moor defines abnormal children as "those afflicted with anything whatever that unfavorably affects their lives in relation to the social medium in which they live."

"In one of the prettiest and most picturesque villages nestling in the foothills of the Berkshires there was till recently a family which is directly descended from the blood of a Mayflower voyager. For three or four generations the representatives of this house have been idiots. They have intermarried with idiots whose ancestry is as fine and pure as their own. The children who have again intermarried have been also feeble-minded. Clearly such a condition must not continue. Here were men and women peopling the New England hills with their crazy kind; here were children running to waste and worse. Common humanity demanded that the thing be terminated. The S. P. C. C. terminated it. Armed with the prosecuting powers that a fortunate law has given it, the organization took away the children from their 'homes,' sent the mothers that were likely to give birth to more children to Waverly for life, cleaned up the children, took stock of their abilities and placed them either in homes where they could be brought up intelligently or else in hospitals suited to their various conditions. The net result is that the western part of Massachusetts is rid forever of a dangerous plague spot; lives which might have gone out in living darkness are given a chance to shine; the countryside is morally purged; a job without price has been well done."

The question of preventing the propagation of the feeble-minded by legalized vasectomy or castration has already been ably treated before this Guild. When I read in the writings of so high an authority as Rosanoff⁴¹ these words: "Even if it were possible not only to enact laws for the sterilization of neuropathic subjects, but also to enforce them, nobody today would be in a position to tell whether or not it would be desirable or on the whole profitable for the human race to do so. . . The net result of such legislation has been so far no good and much harm. . . The time has not yet come for radical action. The immediate need is for further investigation," I am, with Davenport,²² "struck by the contrast between the haste shown in some states* in legislating on so serious a matter, compared with the hesitation in appropriating even a small sum of money to study the subject." But it may not be out of place to point out here that such legislation as has been enacted does not take into consideration the light which has been shed upon the subject of heredity by Father Mendel's researches. It is based entirely on the old and now discredited notion that parents transmit *their* traits to their children. We now know that traits are transmitted by means of the gametes and by them alone. No one transmits his somatic traits but rather the determiners in his germ plasm. Legislation which fails to square itself with the demonstrated truths of biology is as patently ridiculous as much of the so-called "vocational training" of

* Indiana, California, Washington, Connecticut, New Jersey, Iowa, Nevada, and New York have already passed such laws.

which we now-a-days hear so much is inherently vicious in tendency because opposed to natural biological laws.

"The evidence goes to show that if, for example, a man whose gametes have the determiner for normal mentality marries a feeble-minded woman all of the children will be mentally normal or practically so. (See Fig. 26.) Here we see the blessing of heredity. One can easily imagine the marrying of a well-to-do, mentally strong man and a high-grade feeble-minded woman with beauty and social graces which should be productive not only of complete domestic happiness but also of a large family of normal, happy children. Half of the gametes of such children would, indeed, be defective; but as long as the children married into normal strains, the offspring, through an indefinite number of generations, would continue to be normal. Yet in many states of the Union such a marriage would be against the law, and in others, the potential mother might be sterilized." These laws, if enforced, would have resulted in preventing the birth of Swift, Cowper, Shelley, Lamb, Burns, Keats, Byron, Schumann, Wagner, Glinka, Sir Isaac Newton,⁴¹ and scores of others whose loss would have been irreparable. Such laws are unscientific in the highest degree, and every scientific man must oppose them on this ground if on no other.

And it gave me a new glow of pride in my religion when I read over again, the other day, in Tanqueray, and Schoupe, and Nolden the clear, logical, definite, and, if I may say it, scientific exposition of impediments to marriage as the church rules and contrasted it with the contradictory and unscientific faddism of legislative minds untrained even to seek the truth from those competent to guide.

When we approach the question of the transmission of criminality we think immediately of one of the best-known families of this type, the so-called 'Jukes' family of New York State, so carefully investigated by Dugdale.⁴ This family is traced from the five daughters of a lazy and irresponsible fisherman, born in 1720. In five generations this family numbered about 1200 persons, including nearly 200 who married into it. This family history was easier to follow than are some others because there was very little marriage with the foreign-born; "a distinctly American family." Of these 1200 idle, ignorant, lewd, vicious, pauper, diseased, imbecile, insane, and criminal specimens of humanity, about 300 died in infancy. Of the remaining 900, 310 were professional paupers in almshouses a total of 2300 years; 440 were physically wrecked by their own diseased wickedness; more than half the women were prostitutes; 130 were convicted criminals; 60 were habitual thieves; 7 were murderers. Not one had even a common-school education. Only 20 learned a trade and 10 of these learned it in State prison. They have cost the State over a million and a quarter of dollars and the cost is still going on.

Probably the most complete family history of this kind ever worked out is that of the "Familie Zero," a Swiss family whose pedigree has recently been unravelled in a splendid manner by Jorger. In the seventeenth century this family divided into three lines; two of these have ever since remained valued and highly respected families, while the third has descended to the depths. This third line was established by a man who was himself the result of two generations of intermarriage, the second tainted with insanity. He was of roving disposition and in the Valla Fontana found an Italian vagrant wife of vicious character. Their son inherited fully his parental traits and himself married a member of a German vagabond family. This marriage sealed the fate of their hundreds of descendants. This pair had seven children, all characterized by vagabondage, thievery, drunkenness, mental and physical defects, and immorality.

In 1861 a sympathetic and charitable priest attempted to save from their obvious fate many of these "Zero" children and others who resided in and near his village, by placing them in industrious and respectable families to be reared under more favorable auspices. The attempt failed utterly, for every one of the "Zero" children either ran away or was enticed away by his relatives.¹⁸

And yet illustrations by the dozen could be given of those whose heredity was bad enough to bind them to evil as with hoops of steel: whose actual indulgence in vicious courses had been long continued; and whose environment was full of gross and selfish influences, who yet raised themselves to the heights and became great saints, sages, leaders.

As to alcohol, I have been unable to find any satisfactory evidence of hereditary transmission of the overpowering desire for alcoholic drinks, or that drinking habits on the part of the parents cause the transmission to the offspring of a tendency to alcoholism. I have consulted every available book issued on the subject, and while there are general statements in plenty, I find no definite evidence that could by any possibility appeal to our scientific sense.³³ Dr. W. W. Hall,²³ it is true, writing in 1872, called attention to cases which he had noted, in which a drunken father had had drunken sons but not drunken daughters, while the daughters, marrying total abstainers, bore sons who afterward, in spite of proper environment, became drunkards. This looks like sex-influenced Mendelian transmission, but no figures are given as to the number of families in which this occurred, and the whole subject needs further study. At the present time we are forced to say that, as yet, the fact of transmission of the alcohol habit by heredity is "not proven." At the same time there is no question that the degrees in which men are tempted by alcohol differ greatly, and it is for students of this subject to discover how great a part therein environment or suggestion

plays. Bishop Brent³⁴ in his "Sixth Sense," says, "It is rather the tradition of the family trait of intemperance than a transmitted physical peculiarity that keeps the line of drunkards unbroken." I believe that there is a tendency in this regard to place on heredity the blame that really belongs on the individual. As Service puts it in his "Spell of the Yukon":

"From out the mesh of fate our heads we thrust.

We can't do what we would, but what we must,
Heredity has got us in a cinch.

(Consoling thought when you've been on a bust.)"

Neither can I find any evidence that insanity is more frequent in the descendants of drunkards than in those of the sober. The undoubted evils to the individual of excessive drinking are bad enough, but it is not self-evident that physical or mental degeneration of the descendants is among them. Again we say, this has not yet been proved; in fact the evidence is rather the other way, and it may be a false hope to suppose that these evils could be removed merely by the regulation of drink. If, however, the Mendelian law can be shown to apply, then this, like any other character, may undoubtedly be continued by unwise or eliminated by prudential mating in the course of two or three generations. The history of nations in regard to alcohol would be a fruitful field for some competent writer to engage upon. It will be found that almost all nations pass through the same stages with alcohol as with contagious diseases, such as measles. Measles introduced into a virgin race is very deadly, as witness Robert Louis Stevenson's account of the 20,000 deaths of the inhabitants of the Fiji Islands within four months of a first invasion.²⁵ But civilized nations have developed resistance in a way which is now well understood by medical men. So runs the parallel regarding alcohol, and we can all name races which are quite immune, others which are now painfully working out immunity, others which are at a more primitive stage.

But man is neither plant nor mere animal. For ours is no chance existence, and whatever may be the hereditary tendencies of our gametes, each one of us holds his soul as a new creation fresh from God's hand. That is a beautiful expression in the Talmud: "There are three partners in the production of the human being, viz. the Holy One, blessed be He, the father and the mother." (Kid. 30.)

The spiritual in man, constituting him a higher order, has steadily differentiated him from all below him. It has enabled him to transcend both heredity and environment.

And although the laws of heredity allow him to transmit to his descendants no tittle of his toilsomely gained mathematical, linguistic, or other stores of knowledge; nor even a greater facility in their acquirement, since the gamete reckes as little of conic sections as of Greek roots; and the zygote must develop his faculties and talents by individual volitional action; and though he is forbidden to pass on to his off-

spring, by congenital endowment, that strength of character and mastery over temptation which he has himself painfully acquired through many days of struggle and many nights of prayer, let it be yet remembered that "it is a finer and stronger thing to improve steadily the tradition of family or race by a series of successive personal conquests and achievements than to gain exemption from evil tendencies by the more or less mechanical process of procreation."³⁴

From all this we are able to see the wisdom of the Church in her age-long asking that the little children be suffered to come unto her for their education and training in the life of the Spirit. Character cannot be inherited. It must be won. It is not safe to trust to hereditary transmission of religious feelings and ideals. In every generation there is need of a fresh, individual instruction and discipline. Thus we see that the experience of the centuries and the newest law of biological science are in absolute accord.

Regarding insanity I cannot do better than to include from one of the most recent authoritative works²⁷ the following quotation:

"Recent investigations seem to show that those forms of insanity and allied neuropathic conditions which are transmissible by heredity are so transmitted in accordance with the laws of Mendel. These laws, when found to hold for any hereditary character, render possible a fairly definite prediction of the types of offspring that may be expected to result from any given mating.

The following extensive quotation from a recent contribution to the subject of heredity in insanity gives the essential points of the Mendelian laws, some results of an analysis of pedigrees of insane subjects, and rules of theoretical expectation:

The total inheritance of an individual from his parents is divisible into unit characters, each of which is inherited independently of all the rest and may, therefore, be studied without reference to other characters.

The inheritance of any such character is believed to be dependent upon the presence in the germ-plasm of a unit of substance called a determiner.

With reference to any given character the condition in an individual may be dominant or recessive; the character is dominant when, depending upon the presence of its determiner in the germ-plasm, it is plainly manifest; and it is recessive when, owing to the lack of its determiner in the germ-plasm, it is not present in the individual under consideration.

The dominant and recessive conditions of a character are often designated by the symbols D and R respectively.

To make the matter clearer we may take as an example of a Mendelian character the case of eye color.

The brown color is the dominant condition while the blue color is the recessive condition, as

was shown by Davenport. It would seem that the inheritance of brown eyes is due to the presence in the germ-plasm of a determiner upon which the formation of brown pigment in the anterior layers of the irides depends.

On the other hand, the inheritance of blue eyes is believed to be due to the lack of the determiner for brown eye pigment in the germ-plasm; for the blue color of eyes is due merely to the absence of brown pigment, the effect of blue being produced by the choroid coat shining through the opalescent but pigment-free anterior layers of the irides in such cases.

It must be borne in mind that as regards the condition of any character every person inherits from two sources, namely, from each parent. Therefore, with reference to any character, he may be pure bred or hybrid.

A case of inheritance of a character from both parents is spoken of as one of *duplex inheritance* and is often designated by the symbol DD.

A case of inheritance of a character from only one parent is spoken of as one of *simplex inheritance* and is designated by the symbol DR.

A case in which a character is not inherited from either parent, therefore exhibiting the recessive condition, is spoken of as one of *nulliplex inheritance* and is designated by the symbol RR.

We are in a position to estimate the relative number of each type of offspring according to theoretical expectation in the case of any combination of mates.

There are but six theoretically possible combinations of mates. Continuing to make use of the case of eye color as an instance of a Mendelian character, let us consider in turn each theoretical possibility.

1. Both parents blue-eyed (nulliplex): all children will be blue-eyed, as may be represented by the following biological formula,

$$RR \times RR = RR.$$

2. One parent brown-eyed and simplex (that is to say inheriting the determiner for brown eye pigment from one parent only), the other blue-eyed: half the children will be brown-eyed and simplex and the other half blue-eyed:

$$DR \times RR = DR + RR.$$

3. One parent brown-eyed and duplex, and the other blue-eyed all the children will be brown-eyed and simplex:

$$DD \times RR = DR.$$

4. Both parents brown-eyed and simplex: one-fourth of the children will be brown-eyed and duplex, one-half will be brown-eyed and simplex, and the remaining one-fourth will be blue-eyed (nulliplex):

$$DR \times DR = DD + 2DR + RR.$$

5. Both parents brown-eyed, one duplex and the other simplex: all the children will be brown-eyed, half duplex and half simplex:

$$DD \times DR = DD + DR.$$

6. Both parents brown-eyed and duplex: all the children will be brown-eyed and duplex:

$$DD \times DD = DD.$$

It will be readily seen from these formulae that in attempting to predict the proportions of the various types of offspring that may result from a given mating it is necessary to know, not only whether the character is in each parent dominant or recessive, but in the case of the dominant condition, also whether it is duplex or simplex.

Turning again to the case of eye color, an individual with blue eyes we know to be nulliplex as he has no brown pigment in his eyes and, therefore, could not have inherited the determiner for brown eye pigment from either parent. But how are we to judge in the case of a brown-eyed person whether he has inherited the determiner for that character from both parents or only from one? We can judge this only by a study of the ancestry and offspring of the individual.

To put the whole matter in a nutshell, the essential difference between a dominant and a recessive condition of character is in the fact that in a case of simplex inheritance the dominant condition is plainly manifest while the recessive condition is not apparent and can be known to exist only through a study of ancestry and offspring.

This is important because it constitutes the criterion by which we are able to determine whether any given inherited peculiarity or abnormality is, as compared to the average or normal condition, dominant or recessive.

One of the first facts that appeared in the study of the pedigrees was that any form of insanity or even all the forms of hereditary insanity do not constitute an independent hereditary character, but that they are closely related to imbecility, epilepsy, hysteria, and various mental eccentricities that are not usually included under the designation insanity. In other words, the distinctions between these conditions as clinical entities cannot, in the light of their manner of origin, be regarded as deeply essential.

We find as manifestations of the neuropathic make-up in closely related persons cases of feeble-mindedness, convulsions in childhood from trivial causes or chronic epilepsy, cases of grave hysteria, various eccentricities, cases of dementia precox, manic-depressive insanity, paranoic conditions, involutional psychoses, and the like.

It is not to be assumed, however, that what we have called here the neuropathic make-up constitutes the basis of all the clinical forms of nervous and mental diseases, for, on the one hand, some of these conditions, like general paresis or alcoholic polyneuritis, are probably purely exogenous in origin, and, on the other hand, others, like Huntington's chorea, are plainly independent Mendelian characters.

The pedigree charts contain a number of instances of neuropathic children born of normal parents, but not a single instance of a normal

child born of parents both of whom are neuropathic.

This proves that the neuropathic make-up cannot be dominant over normal; but that if its transmission occurs at all in a manner corresponding to the Mendelian laws, it must be recessive to normal. (If this is true it would seem quite possible to reduce in a few generations the enormous sum expended by the State of Massachusetts for the care of the insane, amounting to one-fourth of the entire State income, by the application of Mendel's law to marriage matings.—J. M. C.)

We have seen that in our material the correspondence between theoretical expectation and actual findings is very close. That is to say, the hypothesis according to which the neuropathic make-up as here defined, is recessive to normal, in the Mendelian sense, is borne out by the facts as shown in our pedigrees.

Should larger accumulations of such data in the future give similar results we shall be able to establish the following rules of theoretical expectation:

1. Both parents being neuropathic, all children will be neuropathic.

2. One parent being normal, but with the neuropathic taint from one parent, and the other parent being neuropathic, half the children will be neuropathic and half will be normal but capable of transmitting the neuropathic make-up to their progeny.

3. One parent being normal, and of pure normal ancestry and the other parent being neuropathic, all children will be normal but capable of transmitting the neuropathic make-up to their progeny.

4. Both parents being normal, but each with the neuropathic taint from one parent, one-fourth of the children will be normal and not capable of transmitting the neuropathic make-up to their progeny, one-half will be normal but capable of transmitting the neuropathic make-up, and the remaining one-fourth will be neuropathic.

5. Both parents being normal, one of pure normal ancestry and the other with the neuropathic taint from one parent, all the children will be normal; half of them will be capable and half incapable of transmitting the neuropathic make-up to their progeny.

6. Both parents being normal, and of pure normal ancestry, all children will be normal and not capable of transmitting the neuropathic make-up to their progeny."

Lack of space obliges me to pass rapidly over the solutions of the kindred questions raised at the beginning of this paper. No medical man who is capable of logical thinking can be induced for a moment to believe that any mother on receiving a mental impression ever transmitted that impression to her offspring. Many of the laity, however, believe something still more essentially unbelievable when they claim

that the mother receives a mental impression and transmits to the offspring something entirely different, a physical abnormality; or that she receives a physical impression and that the child is said to develop a physical character, but not the character the mother acquired. The mere statement of the proposition discloses the solution. *Nemo dat quod nullo modo habet.* The theory of telegony has of course long since been abandoned.

In regard to syphilis, the recent proof that the *treponema pallida* is the cause of this disease settles forever the question of its inheritance. This spirochete multiplying in the parent body may pass from the parent to the germ cell, embryo, or fetus, precisely as it may pass to an adult individual. It is no more inherited than a bullet is inherited which pierces a mother and enters her fetus.

The consideration of the facts of heredity inevitably raises the ancient question of the freedom of the will. Many of our foremost biologists today are rigid determinists. It is by all of them admitted that Mendelism has dethroned Lamarckism and Darwinism, has thrown biology back to the permanency of species in themselves and done away forever with all idea of "missing links," since there are and can be no gradual connecting gradations. But it is not yet so clearly seen that if Father Mendel is right the determinists are of necessity wrong, and that we are forced still to maintain that old thesis which twenty years ago I defended, "*Voluntas humana gaudet libertate arbitrii.*"

The discovery of Mendel shows, as has been so clearly shown in no other way, the essential brutality and wicked waste of war, which has always been a prime factor in destroying the most desirable elements for male parentage, leaving the less desirable for the future of the nation.

Prof. Robert De C. Ward⁴⁰ of Harvard has demonstrated how the biological truths flowing as consequences from Mendel's law of heredity should at once be applied to our immigration laws, to the end that a careful selection of our incoming alien millions may screen out the insane, the imbecile, the idiot, and the habitual criminal, potential parents here of physical and moral degenerates.

Giving new answer to the old question of Job, "Who can bring a clean thing out of an unclean?" the law of Mendel points out distinctly the fatal flaw in the Socialistic philosophy, that social reform may be brought about by changing the environment. And the message of Mendel, like that of his Master, is that to have a new society there must first of all be a new man.

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THE TREATMENT OF PULMONARY TUBERCULOSIS BY ARTIFICIAL PNEUMOTHORAX, ACCORDING TO THE METHOD OF FORLANINI.

WITH A REPORT OF TWENTY-ONE CASES.

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(Continued from page 808.)

REPORT OF CASES.

All the following cases except three are ambulatory—in different stages of the disease. The average duration of the disease is about two years.

Cases 1, 2, 3, 6, 5, and 7 are respectively cases 26, 27, 28, 22, and 23 of the Robinson and Floyd series reported in the *Archives of Internal Medicine*, April 12, 1912. These were patients that I provided from my private clinic and in which I continued the treatment to the present time.

With the exception of Cases 17-19 and 20 they have all been seen at various times during the course

of treatment by Dr. Samuel Robinson to whom I am indebted for much help and many suggestions in the preparation of this work.

To Dr. Walter J. Dodd and his associates I am indebted for the x-ray work.

CASE 1. J. A. Female, white, married, 29. Occupation, housework. *Family History.* Father and mother living, three sisters, one brother dead. *Past History.* Six years in U. S. A., 6 years married; 4 children, last one born March 25, 1911. Erythema nodosum last year. *Present Illness.* 10 days' cough, pain in chest, fever, general weakness, headache, "all-gone" feeling, appetite poor, bowels regular. Temperature 102; pulse 120; respiration 30. In bed 3 days, night sweats, cough very troublesome. *Physical Examination.* May 5, 1911. Well developed and nourished. Good size. Poor color. Pupils react. Tongue coated, protruded in medium line, teeth good, kneejerks normal. Tubercle bacilli in sputum. In the right chest above the second rib in front and the spine of the scapula behind there are dullness, bronchovesicular breathing and an occasional fine dry rale. On the left side above the third rib in front and the midscapular region behind there are dullness, bronchial breathing, increased vocal and tactile fremitus and an occasional moist rale. Nitrogen (1000 c.c.) injected in the left anterior axillary line.

May 12. Following the production of the artificial pneumothorax there was a great deal of discomfort, pain and weakness. Had to lie down for 2½ hours. Pulse 120, rather weak, gradually grew stronger and came down to 96. Vomited half an hour after taking morphia. Seen at home, in the night, was comfortable in bed and resting, though complaining of pain and heaviness on left side.

May 14. Up and about; feels better, but complains of pain on the left side. Is taking food well.

May 16. Weight 123 pounds. Examination shows on the right side that there is now only slight dullness at the apex behind. Respiration is harsh throughout the chest. On the left side below the fifth rib back and front there is tympany with diminished respiratory sounds. Above this area there is dullness, bronchial breathing and rare dry râles.

June 3. General condition good. Cough slight. Raises half an ounce in 24 hours. At left base percussion note slightly tympanitic respiratory sounds diminished. An occasional dry rale at left apex in front. Patient given injection amounting to 1,000 c.c. of nitrogen.

June 21. Feels fairly well. Cough diminished and much drier. Light pains in left chest. Weight 121½ pounds. General condition improved. Examination showed some dullness with diminished voice sounds. No pneumothorax present except small area in upper axilla. No signs on right side. On the left side few scattered râles especially in left front. Patient given an injection of nitrogen gas anteriorly to the amount of 600 c.c.

July 15. Feels well except for slight cough in the morning, raising small amount of frothy sputum. She has been doing her housework and taking care of a family of seven; four children—one is nursing. *Examination.* No pneumothorax evident. Slight dullness and diminished voice sounds and scattered râles in left front. 1000 c.c. nitrogen injected, left anterior axilla. No untoward symptoms.

July 30. Feels well, slight cough. Partial pneumothorax. Injected 800 c.c. nitrogen gas. Pneu-