that there is scarcely a Moor in Barbary who has not more or less of the virus in his blood; indeed, in many families it has become hereditary.

The peasantry in the interior of Turkey and Asia Minor are most abstemious, both as regards eating and drinking, being greatly dominated by the religious sentiment, which forbids to them the use of all fermented liquors. Less scrupulous upon this point than their co-religionists of the interior, the Mussulmans of the capital of the Osmanlis, in order to procure pleasant and agreeable sensations, often have recourse to other substances not less hurtful to the health than *esrar*, namely, mastic, raki, and other fermented drinks, while throughout the whole of Morocco till beyond the Atlas mountains, from the highest grades in society to the lowest, wine, gin, and brandy distilled from dates are indulged in to a very large extent indeed, notwithstanding the interdiction by the Koran of the use of all fermented beverages.

Having given as full and accurate an account of hashish and its various preparations as a brief paper like this will permit, I will only add that it is my intention to describe in a future paper the police measures adopted by the Government of Turkey against the use of the esraric substance by the people; to set forth more fully the ordinary phenomena that its use provokes in men in the enjoyment of their reasoning faculties; to describe the experiments made with the drug which I have witnessed on the insane in the East; and also to point out the various disorders which the use of *esrar*, hashish, or *kif* occasions in the intellectual, physical, and moral conditions of those who abuse it, and also the hereditary consequences of its abuse.

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*The Data of Alienism.* By Charles Mercier, M.B., Lond., F.R.C.S.

## II.

### The Organism—The Inherited Organization.—*Continued.*

The second law of heredity is equal in importance to the first, and since it is of special importance in the study of insanity, and since both the law and its consequences have been hitherto almost overlooked by alienists, it is necessary to insist upon it with additional emphasis, and to discuss it at some length. This is the more necessary since there has been no formal enunciation of this law, although the

several positions that it includes are very generally recognised. The following is the somewhat cumbrous expression of what I propose to call *the Law of the Limited Dissimilarity of Parents.*

*There are certain limits, on the one hand of similarity, and on the other of dissimilarity, between two individuals, between which limits only can the union of those individuals be fertile; and in proportion as these limits are approached, the offspring deteriorates in organization.*

First as to similarity. When a certain degree of similarity exists between parents, the offspring inherits their common distinctive characters in an intensified degree, and when these characters are beneficial the offspring is a more highly developed organism than either of its parents, and *vice versâ;* but there is a certain degree of similarity between the parents, not necessarily of closeness of blood relationship, but of actual connature,—of identity of physiological characters, which is inimical to the perfect development of the offspring, or its development up to the normal standard of the race. As the similarity between the parents increases, the offspring becomes more and more markedly inferior, and when a sufficient degree of similarity is reached no offspring can be produced.

A distinction has just been drawn between nearness of blood-relationship and closeness of physiological characters, which requires explanation. If two brothers inherit strongly the characters of one of their parents, and if each of these brothers transmits these qualities prepotently to his children, the cousins thus produced will have not only a close relationship of blood, but a close similarity of physiological characters, and if they marry, their offspring will be likely to be imperfect. If, however, of two brothers one inherits strongly the characters of the father and the other exhibits a strong reversion to the maternal great-grandfather, and if the children of one brother inherit mainly from the father, while the qualities of the mother are prepotent in the children of the other, it is evident that although the blood-relationship is as near as in the former cousins, yet since these cousins have a considerable physiological dissimilarity, their offspring will be likely to be well developed. In this reasoning we find an explanation of the varying conclusions of those who have studied the marriage of near kin. Those who have made the most careful and copious observa-

tions of the marriages of cousins have concluded that on the whole very little ill effect is traceable, while here and there instances have been recorded which unquestionably point to such an ill effect. On the other hand, the testimony of breeders of animals is overwhelmingly strong on the evil effects of inbreeding, but then inbreeding when applied to animals means far more than a simple union of cousins. It is admitted on all hands that it is the effect of *continued* inbreeding that is detrimental, and the union of a pair of cousins would certainly not come under this description. "Manifest evil," says Mr. Darwin, "does not usually follow from pairing the nearest relations for two, three, and even four generations." But when the inbreeding is continued far enough the deterioration of the offspring is certain, and the ultimate extinction of the race inevitable. "Mr. J. Wright crossed the same boar with the daughter, grand-daughter, great grand-daughter, and so on for seven generations. The result was that in many cases the offspring failed to breed; in others they produced few that lived; and of the latter many were idiotic, without sense even to suck, and when attempting to move could not walk straight." That this result was due to inbreeding, and to no other cause, is seen from the fact that when these sows were paired with other boars they produced large litters of healthy pigs. This is but one of many similar cases. It is to be particularly noticed that the later products of this inbred race were many of them idiotic, and I would particularly insist on the fact that not only are the mental qualities among the first and most affected by inbreeding, but that the resulting mental derangement is almost always in the direction of idiocy. Thus of 3,822 children of near kin reported by Dr. Bemiss, 447 were either idiotic or deaf and dumb, and only 36 were insane. Now, according to the general proportion of the number of insane to that of the sane population, 11 of these may be accounted for by general causes, leaving only 25 whose insanity can be strictly attributed to the consanguinity of their parents. The testimony of all breeders agrees that with inbreeding vigour and robustness are lost, and the want of these qualities is the physical counterpart, as it is also the physical accompaniment, of idiocy.

Second as to dissimilarity. That a certain minimum degree of dissimilarity between the parents is necessary for the production of any offspring is another way of stating the foregoing proposition. With a greater dissimilarity between

the parents the offspring are larger and more vigorous than either of them; with a still greater degree the offspring become infertile, and with parents more dissimilar still, no offspring is produced.

The testimony of all who have had experience in the matter is absolutely unanimous as to the truth of these propositions, and innumerable cases of the most convincing character have been recorded. Whenever a stock has been deteriorated by inbreeding, a cross with a distinct race *invariably* produces a sudden increase in their size and vigour. The benefit arising from introducing "new blood" has become proverbial. The case of the pigs previously related may be adduced as an example, and the following instance is highly characteristic:—A race of fighting cocks which had been inbred until they had lost their disposition to fight, and stood to be cut up without making any resistance (observe the character of the mental defect), and were so reduced in size as to be disqualified for the best prizes, on being crossed resumed at once their former courage and weight. The most incontrovertible evidence, however, is that expressed by money value, and it is well established that for the purposes of the butcher—that is, for size, weight, and early maturity—the value of cross-bred animals is indisputably greater than that of pure stock. The beneficial effect of crossing varieties of fruit-yielding plants has been described by experienced gardeners as "astonishing."

As the dissimilarity between the parents increases these effects remain, but fertility is diminished, and at length lost. There is abundant evidence that when species—that is, widely dissimilar forms—are crossed, "although size, vigour, precocity, and hardiness are with rare exceptions gained, fertility is in a greater or less degree lost." As to the loss of fertility, so true is this, that it has been proved beyond doubt that among plants "a series can be formed from species which, when crossed, yield fewer and fewer seeds to species which never produce a single seed, but yet are affected by the pollen of certain other species, for the germen swells," and so on to species so divergent that not even this small result is produced.

It is particularly to be noticed that while in inbreeding the bodily and mental vigour deteriorate together with, or even before, the fertility, in cross-breeding the bodily vigour and size of the offspring are almost always maintained, or even increased, and the fertility alone suffers, first in the

remote offspring, then in nearer, then in the immediate offspring, and lastly in the parents themselves.

Besides the increase in size and vigour, and the decrease in fertility, there are certain other results of crossing—that is to say, of the union of widely dissimilar parent forms—which must be borne in mind.

The first of these is the production of Reversion, which, as has already been noticed, is a frequent result of crossing. Mr. Darwin gives many wonderful instances of this occurrence, which he was himself the first to establish. He "selected long-established pure breeds of fowls in which there was not a trace of red, yet in several of the mongrels this colour appeared, and one magnificent bird, the offspring of a black Spanish cock and a white silk hen, was coloured almost exactly like the wild *Gallus bankiva*. All who know anything of the breeding of poultry will admit that tens of thousands of pure Spanish and pure white silk fowls might have been reared without the appearance of a red feather." And, it may be added, would agree that hundreds, and perhaps thousands, of generations must have intervened between the wild *Gallus bankiva* and the bird which so resembled it. Again, some breeds of fowls have lost the instinct of incubation, yet when two such breeds are crossed the instinct reappears, and the mongrel sits, says Mr. Tegetmier, "with remarkable steadiness." Professor Jaeger crossed the Japanese or masked pig with the common German breed, and the offspring were intermediate in character. He then recrossed these mongrels with the pure Japanese, and in the litter thus produced one of the young resembled in all its characters a wild pig. It is to be noticed that in all these cases in which reversion follows crossing, the offspring reverts to a far distant ancestor common to both the parents, and in the case of domesticated animals usually to the original feral ancestor.

The second of the incidental or occasional effects of crossing is included by Mr. Darwin as a particular case in the first, but as I wish to lay especial stress upon it, I consider it separately. It is this:—When a domesticated animal is crossed with a distinct species, whether this is a domesticated or only a tamed animal, the hybrids are often wild to a remarkable degree. This has been noticed in the cases of pigs, goats, ducks, cattle, fowls, and other animals. Mules, it is true, are not at all wild, but they are notorious for obstinacy and vice. These facts, Mr. Darwin goes on to say,

"remind us of the statements so frequently made by travellers in all parts of the world on the degraded state and savage disposition of crossed races of man." Livingstone remarks that halfcastes are much more cruel than the Portuguese. An inhabitant remarked to Livingstone, "God made the white men, and God made the black men, but the devil made the halfcastes."

These two laws,—the Law of Inheritance, and the Law of the Limited Dissimilarity of Parents,—and the subordinate propositions stated in connection with them, represent the conclusions which have been inductively reached through the labours of many observers upon the subject of Heredity. Such obvious limited applications of them to the purposes of the alienist as have from time to time presented themselves have been noticed in passing, but before any general application can be made it is necessary to go back to more general principles, and discover deductively a wider significance.

By a pure race is meant a race the individual members of which are closely alike, and transmit their characters unchanged to their offspring—that is to say, it is a race whose characters do not materially alter either among contemporary individuals or in successive generations; and, further, the characters proper to one individual, save only those which pertain to the successive stages of life, do not alter. But if an aggregate of any kind does not alter, it is because its parts are equilibrated to one another, and the aggregate itself is stably arranged with respect to surrounding conditions. For if the forces acting on the several parts are not in equilibrium, the parts will move relatively to one another, and will so alter the aggregate; and if the forces acting on the aggregate are not in equilibrium, then will it move in the direction of their resultant; and if it move, the incidence of the forces upon it will be altered, and these forces, acting in new ways, will, if the aggregate be plastic, alter the disposition of its parts. Hence, if a race does not vary, its component individuals are in a condition of stable equilibrium, and the race, as a whole, is equilibrated to its environment; and if the individual members of a race do not vary, their structures are in a condition of stable equilibrium, and the individual, as a whole, is equilibrated to his environment.

Now, the approach towards general equilibrium in organisms has been shown by Mr. Herbert Spencer ("Principles of Biology," Vol. I., p. 274, *et seq.*) to be accompanied

by an approach towards molecular equilibrium in them. Hence we must expect to find that the purer a race is maintained, and the more fixed and permanent the characteristics of its component individuals, the more evidence will there be of molecular equilibrium in its tissues, and the less evidence of a store of unbalanced molecular forces. We have therefore to inquire—First, What is the general effect,* on an aggregate, of a large amount of motion among its molecules? and second, What is the particular effect in the case of the nervous system?

When oxygen and hydrogen are mixed together they will remain in contact for an indefinite time unchanged if undisturbed, but if by the electric spark a violent commotion is produced among their molecules, they combine chemically to form water. Conversely, water will stand unchanged in a closed vessel for an indefinite time, but if by an electrolytic current a sufficient amount of motion is produced among its molecules, they are decomposed into oxygen and hydrogen. If lead is heated in air, it combines with the oxygen to form plumbous oxide or litharge, and if this oxide is further heated in the presence of the sulphide, the oxide is decomposed, and metallic lead is reproduced. Thus a high degree of molecular motion favours both composition and decomposition—both rearrangement into a more complex disposition and rearrangement into a more simple disposition—according to the other accompanying conditions. "Incident forces work secondary redistributions easily when the contained motion is large in quantity, and work them with increasing difficulty as the contained motion diminishes." Such is the general effect of a large store of molecular motion.

The function of the nerve centres, physically considered, is to store up and expend force, and force is stored up or energy rendered latent by the compounding of matter into complex combinations; and force is liberated by the resolution or decomposition of the complex arrangements into simpler forms. Every muscular contraction is set up by a delivery of force from the nervous centre through a nerve-fibre into the muscle, and every liberation of force by a nervous centre is due to a rearrangement of its molecules into a simpler combination, to be followed normally by a recombination into the more complex form. The more the molecular forces approximate to equilibrium, the more stable

* The general question is dealt with by Mr. Herbert Spencer in his "First Principles," Chap. xiii., from which the description here given is in part reproduced.

will be their arrangements, and the less readily will this decomposition and recombination take place. But we have seen that those organisms approach nearest to molecular equilibrium which are of the purest race and of the least variable characters; hence, when purity of race is pushed to excess, we shall expect to find that muscular movement is conspicuously deficient. Turning back to the facts already recorded, what do we find? We find that "the testimony of all breeders agrees that with inbreeding vigour and robustness are lost;" that is to say, the languid and feeble offspring of an inbred race are incapable of the amount, power, rapidity, and duration of movement normal to the species.

The rapid decompositions and recompoundings which constitute the energizing or discharge of the nervous centres are not the only rearrangements which nervous elements undergo. The evolution of the organism from the minute and almost homogeneous germ to the condition of full maturity is, under one aspect, a continuous building up of simpler structures into more and more complex forms, and the latest and most highly evolved, which are also the most complex arrangements, are the nervous arrangements which underlie the highest mental qualities, and these highest nervous arrangements are not complete until an advanced stage in the life of the organism. Now, we have seen that "incident forces work secondary redistributions easily when the contained motion is large in quantity, and work them with increasing difficulty as the contained motion diminishes." In an organism which contains but little molecular motion, whose molecules are in a condition of approximately stable equilibrium, the opposition to the rearrangement of the molecules will be greater than in one which is more mobile; and it is evident that, as a less amount of movement is required to effect a simple rearrangement than is required to effect a complex rearrangement, those rearrangements which will be most difficult to effect, and which will most likely fail to be effected in a stably equilibrated organism, will be the most complex arrangements of all; that is to say, those which underlie the highest mental qualities. But an individual in whom the highest mental qualities are undeveloped is a person of low intelligence, and an individual in whom many of the topmost strata of nervous arrangements are wanting is an idiot. Hence, as purity of race, or, in other words, inbreeding, is pushed to excess, we shall expect to find first low intelligence and then idiocy. In collecting the ascer-

tained facts of interbreeding we found that while there was much difference of opinion as to whether the marriages of cousins produced any mental effect in the offspring, opinion was unanimous that when such an effect did result, the mental aberration was in the direction of idiocy; and, moreover, the feebleness, the languor, and the diminution in size of inbred animals were pointed out to be the physical counterpart, as they are also the physical accompaniments, of idiocy.

Furthermore, not only are the parts of the inbred organism equilibrated to one another, but the organism, as a whole, is equilibrated to its environment. The race having been exposed to the same set of incident forces through many generations, has gradually been moulded into more or less complete conformity with them, so that continually recurring similar sets of conditions in the environment produce continually recurring similar reactions of the organism. The nerve currents in the nervous centres continually following in the same paths, will more and more tend to become limited to those paths, new combinations will become increasingly difficult; and as on the one hand the movements of the organism will become more and more automatic, so on the other its intelligence will tend more and more to crystallize into instinct.*

If the organism thus stably constituted is subjected to a change in its environment, the necessary adaptation to this change of circumstances will take place slowly and with difficulty, and if several sets of new conditions follow one another with some rapidity, the sluggishly changing organism will fail to keep pace with them, and must be artificially protected, or it will perish. Hence we expect to find inbred races wanting in constitutional adaptability or hardiness, and reference to the recorded facts shows that this is precisely what we do find. †

* It would be out of place, in a work dealing with the individual organism, to follow these consequences to their operation among races of men, or social organisms. It will be enough to instance the small community of Andorra in the Pyrenees, numbering about 8,000 people, who not only refuse to marry outside of their community, but among themselves marry only their equals in rank, and who are described as an "unchanged and unchanging people." That the Chinese also have approached equilibratum is seen both in their remarkable facial similarity and in the fixed character of their institutions.

† It is true that Mr. Herbert Spencer says that while mixed breeds are of larger growth, pure breeds are more hardy, but the whole of Mr. Darwin's evidence is strongly opposed to this view, and as Mr. Spencer merely mentions it very incidentally, without in any way insisting upon it, or adducing any evidence, I think that the opposite view may be taken as the established one.

It may here be inquired very pertinently, Why, since inbreeding to the continued degree which alone is known to be harmful is admittedly so rare in the human race that for practical purposes it does not exist, is it necessary to enter upon so elaborate an argument to trace out its consequences? It may be answered that if inbreeding is extremely rare, crossing in various degrees is extremely common, and the consideration of the one forms a necessary preliminary to the consideration of the other; but the real necessity for this inquiry is that the principles thus arrived at, with their complements, to be presently considered, underlie the whole fabric of alienism, just as the alteration of the nervous processes underlie the whole circumstances of insanity, and that it is of profound importance to have them firmly established and vividly presented.

We have seen that inbreeding, or the union of closely similar forms, and crossing, or the union of widely dissimilar forms, have this in common, that if pushed to an extreme degree they both alike result in the extinction of the race. It is manifest that this result must be arrived at in very different ways in the two cases, and it is further manifest, *a priori*, that the process of extinction in the one case must be the converse of that in the other.

A number of cubes can be built up into a rectangular solid, which is an aggregate on the one hand of very regular form, and on the other hand of very great stability. Similarly a number of balls can be piled into a pyramid, which also is an aggregate both of very regular form and of very great stability. But if the balls and the cubes are mixed together, not only is it impossible to build the heterogeneous units into an aggregate of regular shape, but the irregular aggregate formed by them will much more easily suffer disturbance of its arrangement than either of the aggregates of similar units. It is a more unstable aggregate. What is true of those widely unlike units is true in a less degree of less widely unlike units. "That units of like forms can be built up into a more stable aggregate than units of slightly unlike forms, is tolerably manifest *a priori;* and we have facts which prove that the mixing of allied but somewhat different units, *does* tend to comparative instability. Most metallic alloys exemplify this truth. Common solder, which is a mixture of lead and tin, melts at a much lower temperature than either lead or tin. The compound of lead, tin, and bismuth, called 'fusible metal,' becomes fluid at the temperature of boiling water, while the temperatures at

which lead, tin, and bismuth become fluid are respectively 612°, 442°, and 497° F." The meaning of these facts, in general terms, is that "the maintenance of a solid form by any group of units, implies among them an arrangement so stable, that it cannot be overthrown by the incident forces. Whereas the assumption of a liquid form, implies that the incident forces suffice to destroy the arrangement of the units."

Just as we found, therefore, that an individual of pure or inbred race, being formed by a union of like units, was of markedly stable organization; so we may expect to find that an individual of mixed race, being formed by a union of widely unlike units, is of markedly unstable organization. The previous discussion will show us where to look for the evidences of this instability.

An unstable molecular arrangement will be one which readily allows of rearrangement. Hence we shall expect to find evidence of abundance of those smaller and more temporary decompositions and recombinations which accompany, and, in a sense, cause the storage of force, in and its reliberation from the nervous centres. They will not only be more numerous, but they will be more rapid, will be more readily set going, and will be started by smaller disturbances.

Such organisms will, therefore, display great activity. They will possess great energy and plenty of muscular movements; and correspondingly we found that by crossing "size and vigour"—that is to say, the amount, force, and rapidity of movement—"are invariably increased." "The evidence," says Mr. Darwin, "is abundant." It "rests on the universal testimony of breeders." When domesticated animals are crossed, the offspring are often "wild to a remarkable degree," and the most conspicuous difference between wild and domesticated animals is the immensely greater activity of the lives led by the former. It should be mentioned, moreover, that this peculiarity has been noticed chiefly in those animals—pigs, goats, ducks, fowls, and cattle—which, when domesticated, lead indolent, inactive lives.

Again, since the nervous processes underlie and elicit the mental processes, we shall expect to find, that as the mental peculiarities displayed by inbred animals are negative defects—qualities, that is to say, which imply defective activity of the nervous processes—so the mental peculiarities displayed by cross-bred animals will be qualities of markedly positive character—qualities, that is to say, which imply ready mobility, ease of rearrangement, and powerful action of the

nervous elements; and which show themselves in ready reception of impressions, complex combination of them, and in a response to them by movement which is either complex or strongly energetic, or both. This reasoning is corroborated by the recorded facts. Thus the wildness, which from one aspect is the liberation of a greater amount of movement, is from another aspect greater wariness and watchfulness, a keen perception of slight impressions, and a quick and energetic response to them. The fighting cocks which became so stupid and cowardly when inbred, regained by a cross not only their size, but their courage and fighting qualities. The inbred races of pigs not only recovered by crossing their size and fertility, but lost their taint of idiocy. The notorious obstinacy and vice of mules, and the cruelty and viciousness of halfcaste men, have in common this character of positive activity.

Then, since the greater store of molecular activity possessed by a member of a crossed race will render equilibration in all its forms more difficult, the equilibration between assimilation and waste will be retarded, and the longer preponderance of assimilation will result in larger growth. This retardation of the completion of structure will allow more time for the most complex arrangements—those of the highest nervous centres—to take place, and as we have seen that a greater mobility favours a more complex combination, these arrangements will be facilitated in two ways, and hence will be rendered much more likely to occur.

So far we have considered the effects of crossing on the organization of the progeny; we have still to consider its effects upon the adaptation of the progeny to the environment. We have seen that a pure race—that is, a stable race—is one that has arrived at an equilibrium with surrounding conditions, one whose structures and functions are thoroughly adapted to the actions and reactions of its environment. If this race is crossed, its union with a dissimilar form will produce a new offspring, differing from both parents, and not only this, but, as we have seen, the offspring is likely to differ much more widely from each of the parents than the parents differ from each other. Hence neither of the environments of the parent races, to which they have become equilibrated by a long process of adaptation extending over many generations, will be suited to this new and different organism. Either, therefore, the new organism must migrate in search of a new environment, or

it must readjust itself to that in which it is placed. Since the qualities of this new individual are, as the laws of heredity necessitate, the result of a totally irregular and quasi-haphazard intermingling of the qualities, patent and latent, of its parents, which are themselves equilibrated to different environments, the chances will be infinitely opposed to its discovering an environment exactly suited to it, even if it do migrate, and in many cases circumstances will prevent migration. Hence in many cases the sole, and in all cases the chief, method of bringing about readjustment must be by the organism seeking a new environment in the locality in which it finds itself. Here it will be brought into competition, in its struggle for life, with the parent races; and since, by hypothesis, they are equilibrated to their respective environments, the hybrid will have no chance against them in those environments; neither will it have any chance against organisms occupying simpler environments in the same locality, for it is the stress of the more arduous struggle for existence in these lower grade environments that has compelled the parent races to emerge into a more complex environment, in which the struggle is less keen. If the parents cannot exist in a less complex environment, *a fortiori* the offspring cannot. There remains, then, but one alternative—the hybrid must adapt itself to more remote, more discrete, and more complex environmental conditions. An adjustment to such conditions requires on the part of the organism a perception and discrimination of slighter impressions, a more highly complex combination of impressions, and acts more complex and more enduring; and we have already seen that the conditions for attaining the complex rearrangements of nervous processes which fulfil these requirements, are present to an eminent degree in organisms the result of crossing. But these highest and most complex nervous processes are the substrata of mind, and the more complex the processes the higher the degree of intelligence. Hence this readjustment of the hybrid to its environment is accompanied by an increase of intelligence, a result which might have been arrived at directly by remembering that an extension of the correspondence between the organism and its environment *is*, from one point of view, an increase of intelligence on the part of the organism. Hence it appears that the union of widely dissimilar organisms produces both a tendency to, and a necessity for, increased intelligence on the part of the offspring.

This is the physiological side of the subject. It is necessary to examine now its pathological aspect, and inquire how far these conclusions afford data to the alienist.

It has been shown that the conclusions reached deductively harmonise with the conclusions reached inductively, and that both are supported by a powerful body of evidence, in showing that the offspring of widely dissimilar parents have a more unstable molecular constitution, and especially a much more unstable molecular arrangement of the nervous centres, than the offspring of two closely alike individuals. An unstable molecular arrangement is one that readily lends itself to rearrangement, either in the direction of recompounding, on the one hand, or of decomposition on the other.

If decomposition and recompounding take place with rhythmical alternation in small oscillations about a fixed mean, there results simple activity of function. If, in addition to these small changes, there is a large and general movement in the direction of recompounding into higher and higher orders of complexity, there results increase of intelligence. If the decomposition outbalances the recompounding, so that the mean state of complexity is lowered, there results diminution of intelligence. The form that this diminished intelligence takes need not be here entered on in detail, but since every subsidence of matter from a more complex into a simpler form is attended by a liberation of motion, it will be found that generally, if the decomposition of the nervous centres is very gradual, the contained motion is liberated too slowly to propagate currents along the nerves,* and the inactive and progressive condition of dementia results. If the decomposition is rapid, the motion is liberated more rapidly, the muscular action is considerable, and the result is mania. If the decomposition is sudden, the motion is liberated suddenly, the muscular action is enormous, and the result is epilepsy.

Not only are the nervous arrangements of a mixed-bred race more unstable, and *ipso facto* more easily decomposed than those of a pure race, but, as has been shown, the

* It is too well known to be more than mentioned that it is only a sudden change at the central end of a nerve that will cause a shock to be delivered along it to the muscle. A powerful continuous current may be sent along the nerve without effect on the muscle. It is only when the current is made or broken that a contraction ensues, and the more sudden the make or break the more vigorous—other things being equal—is the contraction.

offspring of cross-bred individuals must seek new conditions of life, and must therefore be exposed to more numerous and more various incident forces, so that its nervous arrangements are not only more easily disturbed, but are more exposed to disturbing agents.

Lastly, as it is compelled to readjust itself to a new environment, not only will its nervous arrangements be more unstable, but they will be actually in course of rearrangement, and will on that account be additionally susceptible to disturbance from without, just as an invasion is more dangerous to a nation which is already undergoing an internal revolution.

The bearings of the Law of Limited Dissimilarity on the data of alienism, as ascertained by the foregoing chain of reasoning, may therefore be summed up as follows:—

The offspring of closely similar parents will be liable to be incompletely developed, and especially to that incomplete development of the higher nervous centres, which results in idiocy; but if they become completely developed, they will be little liable to insanity.

The offspring of widely unlike parents will tend to be of high intelligence, and they will also be prone to insanity.

Thus do the deliberate reasonings of philosophy tardily overtake the poetical intuition which led Dryden to say two centuries ago—

> Great Wits are sure to madness near allied,
> And thin partitions do their bounds divide.

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*Some Observations on the State of Society, past and present, in Relation to Criminal Psychology.* By David Nicolson, M.D., Deputy Superintendent, State Criminal Lunatic Asylum, Broadmoor.

*(Continued from p. 16.)*

I have sought to point out and to illustrate how all-pervading was the hold which the belief in witchcraft obtained upon all classes of society in the sixteenth and seventeenth centuries. I have pointed out how a species of criminal lunacy arose in connection with this belief; and how in the same connection, society might be said not only to have created a crime, but also to have manufactured the criminals.

All the records of the trials for witchcraft speak to the