On Instinct: A Psycho-Physical Study in Evolution and Dissolution.[1]

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THE object of the present paper is to direct your attention to the facts—

(1) That volitional and instinctive movements are performed by different motor tracts of the nervous system;

(2) That the volitional motor system, being evolved and developed later than the instinctive, is earlier and more readily affected in mental disorder; and

(3) That when the instinctive motor system is attacked the instincts disappear in the reverse order of their development and therefore of their evolution.

Instinct is usually defined as the faculty of acting in such a way as to produce certain ends, without foresight of the ends, and without previous education in the performance. A few instances will make this definition clear.

Butterflies and moths invariably lay their eggs on or near the leaves of that plant which is the natural food of their young. Now, these insects never knew their parents, and they will never know their children; the butterfly, therefore, has no means of knowing what she is depositing when she lays her eggs near the food-plant of her caterpillar. Why does she do so? It is just instinct, she cannot help it, and the performance is known as an instinctive act.

The first-year bird that has a fertilised egg in her oviduct starts collecting roots, moss, hair, and feathers, and builds herself a nest; yet she can have no idea that she is going to lay eggs therein, she has had no previous experience of such a performance, yet she makes almost as much provision for the occasion as a young mother of the human species, with whom the preparation is, perhaps, rather a series of voluntary acts.

And when the bird has laid her eggs there seems to be no possibility that she can have the remotest idea of their nature; yet she sits, and sits, and sits upon them until they are hatched. Why does the bird go through all this performance? Simply because she cannot help it, it is the inborn way of the bird, it is instinct. If ever a bird existed that made no provision for

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its young, its race has died out; it is the old principle of the survival of the fittest.

These are but a few examples; but it may be stated generally that some of the lower mammals, all birds, all vertebrates, and perhaps all animals lower in the scale than birds lead a purely instinctive life. Voluntary action is peculiar to mammals.

This fact is of the greatest interest when it is correlated with the anatomical differences between the motor nervous system of mammals and that of the birds and lower vertebrates. The motor system of birds consists of neurons going from all parts of the cerebral cortex to the optic thalamus, and a further system of neurons from the thalamus to the motor cells of the anterior horns of the spinal cord. This latter tract crosses from the thalamus to the opposite side of the cord, where it occupies a similar position to the pyramidal tract of mammals. The pyramidal tract is peculiar to mammals.

In considering the mammalian nervous system it will be seen that it is not difficult to decide which is the representative of the motor system of the bird; for there is only one descending mesencephalic tract which crosses to the opposite side of the cord, viz. the bundle of Monakow, which arises, as Held and Probst, Buzzard and Collier have shown, on the ventral side of the red nucleus, decussates in Forel's crossway with the corresponding bundle of the opposite side, and is traceable in the neighbourhood of the lateral tracts as far as the sacral region of the cord. It connects the opposite red nucleus with the ventral horn of the cord.

The cortical portion of this motor system consists of fibres which take origin in all parts of the cortex, but especially in the parietal lobe. Dr. and Mdme. Déjérine, who describe the system, state that the fibres reach the thalamus just above the radiations of the internal geniculate body, enter into the constitution of the fillet, and reach the red nucleus at its antero-supero-external part.

We find, then, that there are in the higher mammals and in man, whom we are especially considering to-day, two motor nervous systems. One is the cortico-rubro-spinal representative of the pristine instinctive motor system; the other is the pyramidal tract, which is, I submit, the volitional motor system.

I have elsewhere shown reason for the belief that the cortico-rubro-spinal system forms an important part of the physical

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basis of emotion (2), and that eminent psychologist, Professor James, has pointed out that emotion and instinct are really the same thing, the only difference being that instinct brings the organism into more practical relationship with the external world than emotion.

Evolution.

Now, it has often been said that the child, in its development, reproduces the history of the race, and this is well shown in the development of the two motor systems now under consideration. The cortico-rubro-spinal system is already fairly well myelinised at birth, but the pyramidal tract is not completely myelinised until the child is about seventeen months old.

Similarly, the child has all sorts of instinctive movements at birth, and more instincts develop during the first seventeen months and after, but true voluntary acts do not make their appearance until seventeen months of age, when the pyramidal fibres have received their myelin-sheaths.

I will now proceed to consider in detail the development of the various instincts, starting from birth, and as I do so I will ask you at the same time to think of the patients under your care in various stages of degeneration, especially your general paralytics. Those of you who have to deal with imbeciles will naturally think of your patients as being in various degrees of retarded evolution.

The following account of the dates at which the various instincts develop has been obtained by striking an average, after collecting information from the works of Darwin, Preyer and Sully, from masters and mistresses of schools, from several observant fathers and mothers of families, to all of whom I now tender my sincerest thanks for their interest and assistance in this research, and from numerous personal observations.

At birth the child resembles the general paralytic in the terminal stage of his disease. It lies on the bed with limbs curled up and eyelids closed, wet and dirty, and quite incapable of appreciating the nature of its environment. It will grasp an object placed in its hand or suck an object placed in contact with its lips. It does not *seek* the breast, but it will instinctively suck when its lips are placed in contact with the nipple.

On the second day reflex movements of the eyes occur, the two eyes moving independently of one another.

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During the first few weeks of life further observations are rarely made, partly on account of the sentimental interest attaching to a new-born baby, and partly because the nurse refuses to allow such sacrilege as accurate scientific observation of her charge.

In the third week resentment is sometimes observed.

By the sixth week eye movements are practically complete, and the child will instinctively converge for near objects. Passive attention develops, so that he will turn his head in the direction of a sound and reach out towards an object. Tactual space perception, however, is yet incomplete, for at this age he will perhaps reach for the moon.

The seventh week is characterised by the development of the smile.

In the ninth week the instinct to handle objects is first observed, and by the eleventh week movements, which have hitherto been quite aimless, begin to assume a more purposeful aspect.

The instinct to imitate sounds also makes its appearance about this time. Surprise and fear now begin to develop especially fear of change. This fear of change goes on developing during the fourth month until, in the fifth, we find it crystallised into an instinctive shrinking from strangers.

Laughter first shows itself at the end of the fourth month. During the fifth month the child develops the instinct to sit up and about the end of that month the instinct to carry objects to the mouth.

The idea of distance which a chick has as soon as it leaves the shell does not appear in the human infant until the sixth month of life. The instinct to grasp objects also appears in this month, but the child seems to have no idea of letting go until two months later.

In the eighth month the child begins to take pleasure in making a noise, an interesting instinct which appears to be preserved through life. It will throw things on the floor for the pleasure of thus making a noise.

The instinct of locomotion is usually first observed during the tenth month; this is followed in the eleventh month by the instinct to stand, the child constantly trying to get upon its feet, and during the twelfth month this develops into the walking instinct.

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During the ninth month the instinctive basis of language appears for the first time, and such sounds as "kak-kak," "ba-ba," and "da-da" are uttered. These repetitive sounds have probably little or no meaning until about the fifteenth month, when "dada" and "bow-wow" are uttered in association with the respective percepts of a dog and a man. The appellation "dada" is not limited to the child's father until the twenty-first month. But all these sounds are at first instinctive.

Perhaps the sound "kak-kak" or "ack-ack" is the most striking example of instinctive language. It occurs in almost every child belonging to the Aryan race, and is an expression of disgust. The Hindoo word *khaki* means brown, the colour of dirt, dust, or fæces. I have frequently heard the same sound uttered by the young monkeys in the Zoo when they have been in any way annoyed by another monkey. Now, the monkey has no voluntary language; here we have, therefore, an interesting demonstration that this sound is of instinctive origin.

The sixteenth month is of great interest on account of the very earliest beginning of voluntary language. The child will say "ey" (an attempted "yes") for assent; but the word "no" is not used as a verbal negation until some months later.

Language is first learned by instinctive imitation. During this month the child learns to say "ta" when it is given anything; but it does so instinctively, for volition is not yet; and if the child is told to say "ta" or "tata" it does not do so, for the simple reason that to say a word to order is a volitional act.

A similar condition is frequently observed in some patients with motor aphasia, who will answer "no" to a question but who cannot say "no" when told to do so.

The dawn of volition, including voluntary language, occurs in the seventeenth and eighteenth months. Volition continues to develop at least up to thirty years of age, and perhaps through the whole of life. The volitional motor system gradually acquires control of the instinctive from the second year onwards. For the present I will say no more of volition, because I wish to-day to direct your attention especially to instinct.

Instincts still continue to develop. Curiosity makes its appearance about this time, in the eighteenth month.

In the nineteenth month the child shows signs of acquisitiveness by clamouring for its brother's or sister's toys. At this

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age covetousness and greediness may cause the parents alarm concerning the character of their progeny.

In the twentieth month the child shows a desire for social intercourse, the beginning of the instinct of sociability.

About the twenty-first month the instinct of cleanliness appears, not active cleanliness but the avoidance of filth, and about the end of the second year the child ceases to be wet and dirty.

The instinct of make-believe and play develops in the later half of the third year.

During the third year the child gets some idea of time, and has a definite concept of past and future. Accordingly, memory, on the one hand, and anticipation on the other begin to appear. The instinct of rebellion also makes its appearance, and the child gains some consciousness of self, the ego concept.

Destructiveness is an instinct which appears in the fifth year. The child often exhibits it by pulling off the legs and wings of flies. Disinterested cruelty is a primitive attribute of our nature. From this year onwards the boy loves to tease others, and he fights others with intent to do bodily harm. Here is the beginning of the instinct to kill, not only the lower animals for food, but even human rivals. When this instinct gets out of hand, murder may result.

Constructiveness develops a couple of years later; if a six-year-old pulls his father's watch to pieces, it is partly for the purpose of giving himself the subsequent pleasure of putting it together again.

Emulation and rivalry appear about this time. Children of this age will, for example, vie with one another in collecting the largest bouquet of wild flowers for their mother.

The instinct to make collections of some kind of thing usually shows itself, at least in boys, about the ninth or tenth year.

The instinct to eat, which develops at a very early age, becomes especially prominent from ten years of age up to puberty. At this age the boy eats everything that is placed before him; there seems to be no possibility of satisfying his appetite, and he takes the greatest interest in the "tuck-shop"; I do not mean the sweet-shop, but the "tuck-shop," where they sell such things as dough-nuts.

The period between twelve and fifteen is characterised by well-marked boastfulness and conceit. This generally develops

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into a feeling of power, general *bien-être*, and if it is not soon under volitional control a state of simple mania.

Modesty is a remarkable instinct which develops at puberty. The sexual instinct appears shortly afterwards. Then follow, in man, the instincts of hunting, fishing, and shooting, stronger in man than in woman, for it is the man's natural duty to provide food for his family. In civilised communities these last instincts usually find an outlet in open-air games.

Dissolution.

Now, in the various forms of mental dissolution the first motor system to be affected is the volitional, the pyramidal system which is myelinised at least sixteen months after the instinctive cortico-rubro-spinal system.

The first symptom of mental disorder is loss of voluntary control of the instincts. The pyramidal system is unable to control the cortico-rubro-spinal. Accordingly, we find in the lightest grades of mental disorder, for example, those cases of moral imbecility which we encounter so frequently in every-day life, that the patient has insufficient control of those instincts which were latest developed. The man is unable to maintain interest in his every-day routine occupation; he must be out of doors playing games, at which he is, as a rule, very good. A latter-day exemplification of this out-of-door instinct is motoring. Motoring all day and every day is not uncommonly the first symptom of general paralysis.

When dissolution is slightly more advanced he is a sexual libertine. Boastfulness, conceit, and a general sense of *bien-être* once more become prominent.

The eating instinct next gets out of hand, and the general paralytic (male) bolts whole potatoes and slices of meat without waiting to cut them up. This is so well recognised that all the general paralytics in establishments for the insane are fed on mince.

As dissolution proceeds the collecting instinct once more becomes prominent. The general paralytic orders fifty watches, twenty pianos, and a dozen motor-cars. At this stage the relatives commonly realise the true state of affairs, and the patient is sent to an asylum, where he takes to collecting rubbish.

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A few months ago I noticed in the daily paper an account of a man who had been in this stage of dissolution for years; his house was so full of old newspapers that only a narrow gangway was left between the heaps in each room.

Keeping to general paralysis as the most convenient type of insanity to follow, because of the slow, steady course of the dissolution, we find that the patient now becomes quarrelsome, having lost control of the instinct of rivalry. Constructiveness once more becomes prominent and shows itself in the characteristic schemes, albeit impracticable, of the general paralytic, schemes to make eggs out of oyster shells, to warm the North Pole by a system of hot-water pipes, etc. He next becomes destructive; his volitional nervous system is in the same condition as at the age of five.

Dissolution proceeds, and the patient, after passing through a well-marked stage of rebellion, becomes social once more; he becomes friendly with the attendants, calls them by familiar names, and is always anxious to shake hands with the doctor.

He returns to the age of make-believe and play, says that his room is full of valuable pictures, that rugs are heaps of pearls, and so forth.

During the whole of this time the patient's language has become more and more limited. I will not enter into this gradual limitation in detail, but will merely draw attention to the fact that the last word to go was the first voluntary word to come, viz. "yes." The instinctive beginnings of language do not reappear in general paralysis.

Long before the voluntary motor system has reached this stage of degeneration the pristine instinctive motor system has become involved in the process.

The out-of-door instinct disappears, shortly after the patient takes to collecting. The sexual instinct disappears much later, about the time when the patient becomes excessively social.

In their turn modesty, boastfulness, and rubbish-collecting all disappear, and the patient, still destructive, may be compared, so far as his instinctive motor system is concerned, to a child of six. He loses the instinct of cleanliness, and becomes wet and dirty. He is mentally equivalent to a child of two.

As he is losing the instinct to walk, he stands still against the wall in a corner of his room. As the instinct to stand disappears, he sits on the floor; but he cannot be induced to lie

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down. Further, although in a sitting posture, he is in constant movement all over his room; for he has returned to the age when the instinct of locomotion is dominant.

The instinct to sit up is now lost and the patient takes to crawling about on all fours, reminding us of our quadrupedal ancestry.

About this time the instinct to handle objects becomes dominant, and commonly shows itself in the general paralytic by his constantly polishing the floor of his room with his hands. He is the mental equivalent of a child eight months old.

The rather inane instinctive smile which has up to this stage been an almost constant feature of the patient's expression, now disappears.

The patient lies on his back, incapable of appreciating his surroundings, but his eyes instinctively follow any moving object.

Lastly, his eyelids close, and before death he returns to the state in which he was immediately after birth. His limbs are curled up, he will grasp anything placed in his hand, or suck an object placed in contact with his lips.

This outline, in which only some of the more prominent instincts have been considered, serves to show that dissolution proceeds on the following lines: First, volition gradually loses control of instinct, the instincts becoming dominant in the reverse order to that of their evolution; then instinct itself undergoes dissolution in the reverse order to that of its evolution. In physical terms:—the volitional pyramidal system is the first to go, then follows dissolution of the instinctive cortico-rubral system.

This principle is applicable at least to most, and probably to all, cases of mental disorder. In some cases dissolution is rapid, in others it is slow. In some cases instinct is preserved long after volitional control has disappeared, in others the latest acquired instincts go before control of the earlier instincts is lost.

You all know how frequently the old man who has hitherto led a most exemplary life becomes, to everybody's astonishment, a sexual libertine, gets into the hands of the police and is sentenced to a term of hard labour, merely because his senile decay has followed the natural laws of dissolution. It is the beginning of his second childhood.

I have at present under observation two cases of intermittent

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insanity, men of the third decade, who have returned to the age of twelve. One talks of cakes and buns just like a boy of twelve. All day long he chews his handkerchief or eats paper; he has lost control of his eating instinct. The other steals food from the confectioner; he has lost control of the instincts of eating and acquisitiveness.

At the other end of the scale I have a case of intermittent insanity of some thirty years' duration who has not only lost all voluntary control, but he has lost the out-of-door instinct, the sexual instinct, and the eating instinct. There is, in this case, not any revulsion from food, but he has lost the instinct to eat, and the attendants have to constantly remind him that there is a plate of food before him. He does not collect rubbish as he was wont to do years ago. Emulation and rivalry are gone; he is neither querulous nor sociable. The instinct of cleanliness has gone, and he is wet and dirty. He scarcely speaks at all, but he stands and walks fairly well. For practical purposes he is a child eighteen months old.

I have cases of melancholia which I am endeavouring to treat by prolonged rest in bed. These cases have lost none of their instincts; but they have lost control of most of them, as far back as the instinct to sit up; consequently they sit up in bed, they cannot lie down, so strong is their instinct to sit up.

I will not weary you with further details; these cases are familiar to you all. I merely wish to bring to your notice this mode of regarding mental disorders in the hope that it may prove a guide to the degree of dissolution in any given patient, and hence a help in prognosis.

The distinction between volitional and instinctive acts is of the utmost importance, and in estimating the conduct of any given person they should be considered independently of one another. In criminal cases, for instance, one of our duties as expert witnesses should be to decide whether the crime was an instinctive act performed through the mediation of the cortico-rubro-spinal system, or whether it was a volitional act performed, after a train of reasoning, by the pyramidal system. If the crime was an instinctive act the accused should be held irresponsible; if it was a volitional act he should, *ceteris paribus*, be held responsible.

(1) Read at the South-Eastern Divisional Meeting at Hill End Asylum, April 25th, 1906.—(2) *Brain*, Winter, 1904.

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