

THE RELATION OF MEMORY AND INSTINCT

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There is no branch of science about which it is so desirable that everyone should have some general knowledge and of which, at the same time, the general public is so little informed as the Science of Mind, or Psychology. We are all every day and almost every hour of the day, talking about matters with which we deal, and using all sorts of ready, but often erroneous, conclusions to guide us in practical matters where it is concerned. There is no elementary instruction in this subject attempted in our schools nor in English Universities, though for a century or more the Scotch Universities have made the teaching of it a prominent feature. There is no good modern book of a readable kind on the mind of man; whilst the older books as Carpenter are out of date and out of print. We know the anatomy of the brain in great detail, and everyone can readily acquire a good straightforward knowledge of it. But there is no attempt to give us a corresponding anatomy of the mind—that is to say, an orderly survey of mental properties and activities. The older attempts at such a survey—an enumeration and consideration of the relations of one another of the various kinds of mental activity—were no doubt faulty, and have therefore fallen into disrepute. But it has long been admitted that a bad theory is better than no theory at all and what is now wanted is a fresh attempt to construct a working scheme of the qualities and activities of the human and the animal mind which shall not necessarily be more than an attempt to bring order into the use of popular words and conceptions—such as perception, thought, reason, will, emotion, memory, intelligence, consciousness, instinct, temperament. It is all the more necessary that this should be done by the most competent and authoritative students of the mind, inasmuch as loose and misleading notions as to the nature and possibilities of mental activities and a corresponding misuse of terms are becoming widespread in proportion as an interest in the nature of man and his relationship to animals become general and widely spread. It would not be possible to deal adequately with this great subject in this place. But I propose to write a few lines about unconscious memory and the relation to it of dreams and of those fancies as to memories of the events, persons, and places of remote ages sometimes said to be inherited from their ancestors by individuals or even whole races of men.

We can make a step towards giving a clear meaning to what we call "memory" as an attribute of the human mind if we examine some of the actions of the lower animals, and consider whether they indicate the possession of such a memory. Many insects (beetles, &c.) when touched, assume the attitude and stillness of a dead specimen. This often leads to their being rejected by an insectivorous bird or lizard which requires living food. The insect has not tried this posture, found it a successful trick, and remembered it. The posture of

death is one which was assumed owing to alarm and consequent paralysis by a few of the insects' ancestors. They were thus prevented from the futile attempt to run away made by their relatives and escaped death, whilst the "runners" were eaten. Hence the "death-shamers" survived, and transmitted their posturing mechanism—that structure of the nervous system which resulted in the fortunate paralysis—to their off-spring, and these survived and multiplied in every generation until the running tendency disappeared, and the death shamming tendency became fixed. So, too, "the looping caterpillars," which pose as dead, did not "try" the experiment and remember its success. Those which postured as twigs escaped death and transmitted their habit. It is on this principle that we can account for very elaborate actions on the part of insects and other animals. They do not owe these habits to memory, but to the transmission of a nervous mechanism—at first an accidental variation from the normal—which comes into play under certain circumstances, and is of advantage to its possessor. Little by little one feature after another has been added in virtue of variation and selection of advantageous variations, until wonderfully elaborate processes are carried out by animals as though they had experimented, remembered, and reasoned.

Such habits and procedures are no more the result of what is properly called (in an analysis of the human mind) "memory" than are the colored spots, stripes, length of claw, tooth, leg, or wing characteristic of different groups and species which also are traceable to the step-by-step selection of structural variations which happened to be advantageous. These habits, procedures, and tendencies of animals are spoken of as "instincts," and a very sharp line is drawn between them and that behaviour of animals and of man which is due to individual experience and memory. It is by no means easy to assign with certainty some given behaviour of an animal to memory and others to instinct. The spider's spinning and affixing of its marvellous geometrical web is undoubtedly inherited, the performance (so to speak) of an inherited nervous mechanism which has been gradually built up in the spider's ancestry by selection and survival, just as its colors and survival, just as its color spots and eyes have been. So, too, the elaborate storing of grubs stung, so as to paralyze but not kill them, by certain wasps as food for their unborn young is due to a definite step by step variation and selective survival; it is an instinct. Memory on the other hand, is essentially the result of individual experience—"burnt child dreads the fire" is a saying which points both to the absence of an instinctive mechanism in the child, causing it to avoid the fire, and to building up in it, after exposure to the pain of burning, of a nervous mechanism (memory), as the result of its individual experience, which causes it to avoid, shrink from, and dread fire ever after.

It remembers the fire; the structural mechanism called "memory" has been formed by its experience.

The heritable nervous mechanism called "instinct," and the individual newly acquired mechanism called "memory," are two very different things. Though they both lead to important actions, tending to the preservation of the individual by avoidance of danger, by recognition of safety and suitable food and of mates, yet they have quite distinct origins. The instinctive nervous mechanisms are the more primitive and the general among animals, and have only been gradually superseded by the memorising nervous mechanisms, which are more valuable than instincts, since they are based on the experience of the special circumstances of the individual, and apply to them; whereas the feats of instinct are based on the long past remote history of the species, and not rarely are ill-suited to the immediate case. There is antagonism between instinct and memory (that is, individual memory, which is what we commonly understand by the word). The one gets in the way of the other. The development of a considerable capacity for memory only occurs in animals in which the instinctive mechanisms are few and most of them feeble, as in the case in mankind. Often we are able to observe the contest between the instinctive and memorising mechanisms, as where in man, and even in the dog and some of the higher animals, the memory of individual experience of a pleasant food the taking of food or the friendly reception of an individual, whilst instinct is all the time condemning the new-found confidence based on experience.

In all attempts to determine the mental operations of animals and even of other men we have to start with ourselves. We find that memory has become an immensely important thing in man, the starting-point of reason and intelligence—the record to which that indefinable state called "consciousness" relates. Memory is, as we know, more or less detailed, complete, and vivid in various individuals. To what extent does it exist at all in animals? It is found to be very defective in lower races of men in comparison with the higher; it seems to be non-existent in infants, and gradually develops in childhood. It is a very limited thing in animals (as contrasted with man), even the highest, but certainly exists in animals in various degrees of efficiency. Experiments made by placing sugar on various colors for insects to visit—and then the choice by the insects on a subsequent visit (after an hour or so) of the color which had carried the sugar, but now no longer does so—seem to show an elementary kind of memory—an enduring (if only briefly enduring) association of that sweetness and that color in the tiny brain of the fishes and reptiles the hereditary instinctive mechanisms are abundant and effectively determine the responses of the animal to ex-

ternal changing conditions, we find evidence in birds, and more especially in the warm-blooded, hairy animals—the mammals—of an increased capacity for memory, and of its employment as a mechanism, guiding action in response to the incidents of life, which becomes more and more evident as we pass to the higher and latest developed kinds. This new found power, the capacity for memory attains, with something like a sudden rush, enormous increase and importance in man, who is launched on a new career of development by its dominating quality. Reasoning, choice, foresight follow; and the accumulation of its record is immensely increased by the communication of his fellow memory or record by man to his fellows by means of language (that special faculty attained by the human race). This is further increased, so as to furnish an inexhaustible store, by man's discovery of the arts of writing and printing. Man's record of things remembered thus becomes no longer a purely individual possession, but, in large degree, a vast permanent extra-corporal structure, not subject to the decay and death of living things, but handed on as a solid lifeless creation of human art—a real heritage—from generation to generation, increasing with prodigious and available for the building up of the memory of all.

The instinctive mechanisms of the brain are set at work by approximate "stimuli"—occurrences which act upon the individual through the channels of the senses, as an automatic machine is set to work by placing the right-sized coin in a slot. On the other hand, the study of the apparatus of memory must be separated into two parts—that which relates to the receptive process by which it is built up, and that which concerns the retentive and effective mechanism by which it is related to action. There is nothing corresponding to the receptive, building-up process in the case of instinctive mechanisms. They are innate and ready for action. It is the retentive mechanism of memory built up by successive receptions of experiences which resemble the mechanism of instincts, and require, as they do, a stimulus—a penny in the slot to make them work. The record of memory is there, but quiescent just as an inherited mechanism of instinct is in other cases. Once set at work by some agent external to it, it may give rise to action as rapidly as the instinctive mechanism, but very frequently there is delay, due to further complication of the mental processes.

The power of building up a memory—which is usually confused under that same term with the achieved result, the formed remembering of the insect. Whilst in all the invertebrates and nerve tissue—may differ in quantity and in acuteness and rapidity. It is termed "educability," and the animal or man which possesses it is "educable" in varying degree. Educability requires a large brain. Animals with small brains have little or no educability, but may have lodged in the brain a complete provision of the most elaborate and perfect inher-

ited mechanisms of instinct. There has been an increase in the size of the brain of many races of mammals, such as the horse, rhinoceros, deer and monkey, since the beginning of the middle Tertiary period of geologists which is called the Miocene. The ancestors of these animals had, in pre-Miocene times, brains from one-fourth to one-eighth the size of their present descendants, and it is probable that more and more since Miocene times those animals have become educable, and have made use of memory and experience in place of depending solely on instinctive mechanisms. Though we have not yet discovered Miocene man or his representative, it seems that man more any other mammal has increased the size of his brain. He has, in proportion to his size, the largest brain and the smallest provision of innate instinctive mechanisms of any animal. Even the lowest savages have a far larger brain than the highest monkeys and apes. The gorilla's brain would fill a half pint measure, that of the Australian black-fellow would nearly fill a two pint measure, and that of an average European half a pint more. The educable material is thus provided for in man, and a very curious fact is that the superiority in many ways of the mental attainments of the "higher" races of men over those of the lowest human race does not seem to be indicated by a proportionate difference in size. Even the Neanderthal man of the glacial period had a brain as big as, even bigger than, that of the average European of today. The difference seems to depend in the case of the various races of man—not so much upon "educability" (which they all possess in fair measure) as upon the chance—the concurrent circumstances—which have led to strenuous education in one race and not in another. There are not sufficient experiments for a conclusion on this subject, but one would like to see an Australian black baby taken at two years of age and educated in the bosom of a highly capable and cultivated English family, with absolutely no intimation of its origin, no difference in its treatment from that accorded to its white foster-brother. Then it might be possible to ascertain what are the innate defects and qualities of the two races compared, and for how much "education" is responsible, and for how much "educability." Unfortunately, a single experiment would not be enough—from ten to twenty would yield results of great interest. Herodotus tells us that a king of ancient Persia made the experiment of bringing up a child apart from all sound of the human voice, in order to find out what it would say without imitation of other human beings, and accordingly what was the primitive human language. The Persian King's attempt to satisfy scientific curiosity might be imitated at the present day, with due regard to humane treatment of the little black fellows, whilst today we could frame a more reasonable scheme of questions to be answered by the experiment, and we should not prevent them from learning to speak.—London Daily Telegraph.

An Historical Pageant

A pageant illustrative of the history of our great Indian Empire is to form one of the chief features of the Durbar celebrations in India in December next, and this part of the entertainments in connection with their Majesties' visit promises to equal in spectacular effect even that of the great Durbar itself.

The King and Queen have graciously intimated their intention to be present at the pageant, which is to be given at Calcutta immediately following the Durbar at Delhi. Mr. Frank Lascelles has been engaged by the Imperial Reception Committee at Calcutta to take charge of the pageant. The chairman of the committee is Maharajah Sir J. R. Tagore, who is a great antiquarian and a scholar of Indian history.

Mr. Lascelles told a Daily Telegraph representative recently that Sir J. R. Tagore had already worked out in most wonderful detail the historical scenes to be shown in the pageant, and there was no doubt whatever that this part of the Durbar proceedings would be of the greatest interest, not only to Europeans, but to the native population also. One of the outstanding features was that both Mohammedans and Hindus would take part in the proceedings. The pageant would deal with the history of India from the earliest times down to the seventeenth century. All the reigning Princes of India were taking part in the event by lending their servants, costumes, and animals. No fewer than 200 elephants would take part in the spectacular event.

The processional part of the pageant is to be four miles long, and the set scenes will take place on the Maidan, a large open space just inside Calcutta. On this fine site a grand stand, capable of seating the reigning Princes and some thousands of the principal guests, with a Royal box for the accommodation of the King and Queen, has been built.

Mr. Lascelles, who has been appointed to the task, will have some 6,000 people under his command, including a large number of native and British troops and servants of the Maharajahs. The display will last several days. The pageant will start with the earliest days of Indian history and will carry on the history of this part of our Empire down to the year 1687. This will, of course, leave out all connection with British rule, and the probability is that the pageant will also not deal with the East India Company. The performers will wear the most elaborate costumes, and so deep is the interest

taken in the matter by the great Princes that a number of historic costumes and uniforms from the museums of the Maharajahs and others will be used.

Historical Costumes

When Mr. Lascelles organized the Pageant of South Africa recently he found that there was a disposition amongst the Boers to treat the idea as a popular "show," but when it became known that one of the wagons to be used in the procession was to be an original vehicle used in the Great Trek, the seriousness of the function was brought home to them. In the same way in India, the authorities and others, knowing that historical costumes are to be used, are displaying great interest in the matter, and a record attendance is promised on the Maidan show ground.

There is a law in India prohibiting elephants from passing through the streets of villages, and it has therefore been necessary to get a special Act passed permitting the two hundred elephants to pass along the side streets of Calcutta. The proceedings on the Maidan will occupy about three hours a day, and eight scenes a day will be gone through. The procession of elephants, with their costly trappings and magnificent howdahs, filled with bejewelled and historically-costumed people, of scores of camels, dromedaries, and horses, also richly caparisoned, should form a scene of magnificence and splendour never before seen in India or in any other country.

Every province in India will be represented on the parade ground, and no expense is being spared in connection with the function. A committee was formed in the Province of Calcutta to raise the necessary funds, and these were forthcoming with extraordinary alacrity.

Mr. Lascelles leaves England on the 27th inst. Starting with the Oxford Pageant, he has successfully arranged five others, including that in connection with the Wolfe and Montcalm memorial celebrations in Canada, the Union of South Africa festivities, and the great Pageant of Empire now running at the Crystal Palace. In connection with the latter Mr. Lascelles mentioned the interesting fact, illustrative of the great interest taken by individual performers in their duties, that recently a notice was affixed to one of the official buildings in the Palace, asking whether the performers desired the Pageant to continue up to Sept. 16. The result was that in two days no fewer than 6,000 persons had at-

tached their signatures on the affirmative side, and not one on the negative.

Dealing with the musical side of the Calcutta Pageant, Mr. Lascelles said that each scene would be accompanied by the music of the period, and in this connection it has been found necessary to make copies in instruments which were used many centuries ago.—London Daily Telegraph.

THE KING'S EVIL

The belief that the King's touch could heal scrofula was clearly derived from Christian origins. It is an offshoot from the mediaeval belief in miraculous cures effected at the shrines of saints. The King, as representative of the Church and defender of the faith, was gradually invested, in the popular imagination, with the faculties which had hitherto belonged only to the canonized. It seems certain, however, that no English King practiced the King's touch before Edward the Confessor, although in France the custom had long been reverently observed. Several examples of healing are recorded by the Confessor—cases of blindness, as well as of the King's Evil, and from his time the belief in the monarch's miraculous influence increased so powerfully that the proper liturgy to be used on the occasion was duly incorporated in the Prayer Book. By the time of Edward III. as many as four or five hundred persons were touched by the King in a single year; but after that period the invasion of the Black Death diminished the number of applicants very considerably, and it also seems as though a growing fear of infection caused grave restrictions to be made upon the freedom of access to the King. The Tudors practiced the healing touch freely, but by the time of the Stuarts it had become the custom to placard provincial towns with notices defining the somewhat rare occasions upon which the King would grant audiences to the diseased. No doubt, the spread of knowledge was beginning, about the same time, to break down the popular superstition, but even in the middle of the seventeenth century the King's claim to divine and miraculous power was carefully set forth by the proper authorities.

"It's a shame to have to pay for that water which Nature so bountifully supplies." Water-rate Collector—"But Nature doesn't supply the pipes, ma'am!"

She—"Yes, I love Ted; he is so extravagant. He—"That is hardly the best qualification for a husband, is it?" She—"Of course not. I am not going to marry him."

The Thermometer

On an ordinary Fahrenheit thermometer there is written opposite 212 degrees, "Boiling point of water," and opposite 32 degrees, "Freezing point of water." Neither of these is correct except for a certain condition of the atmosphere, and that is when it gives on the barometer about thirty inches, or fifteen pounds' pressure to the square inch. This is the ordinary pressure at what is known as sea level, and to this all thermometers are calibrated. In a mountainous region the pressure is hardly ever so much as fifteen pounds, and water boils at sometimes as low as 200 degrees.

If water is boiled in a diving bell, where the pressure is forty or fifty pounds a square inch, its temperature will be several hundred degrees instead of 212. If water is boiling in a near vacuum, the temperature is so small that the hand thrust into the water would actually feel cold.

Facts About Freezing

What has been said about the boiling point applies to some extent to the freezing point, says the New York Tribune; but here it differs for different materials, whereas the remarks about the boiling point of water apply to the boiling points of all liquids. Some substances when they freeze become larger, whilst others are smaller. On this depends the freezing point at different pressures of atmosphere. Water expands on freezing; so do type metal and some other things. All other substances become smaller on freezing. Water pipes burst when the water freezes. Coins of gold and silver are stamped instead of being moulded, for the metals grow smaller on freezing or solidifying, and consequently the coin would be wobbly.

It has been found that the things that expand on solidifying, as water, freeze at a lower temperature when the pressure is increased, while the others freeze at a higher. When a substance that expands freezes under higher pressure than usual, it has to exert more force to shove the pressure away, and consequently has to use up more of its heat energy, thus losing more heat and consequently becoming colder. Take the substance that contracts when it solidifies. The pressure will help it to get smaller, and consequently the greater the pressure the less heat it has to lose on attaining the solid state; so it will freeze at higher temperature. If the pressure is great enough, it may freeze or sol-

idify at a thousand degrees' temperature which is high enough to change most substances to vapour under ordinary atmospheric pressure. This is one of the reasons advanced to prove that the interior of the earth is solid; for the assumption is that the core is made up of substances that contract when freezing, and there is of course an enormous pressure a few hundred of miles below the surface.

The Boiling Point

In regards to the boiling points of liquids there is an upper limit to the point at which a thing boils; that is, changes to the state of vapour. It is called the critical temperature. No matter how great a pressure exists on a substance, if it is at a temperature point held back the making of liquefied gases—such as air, carbon dioxide, etc.—for many years. The experimenters tried to liquefy gases at ordinary temperatures by enormous pressures; whereas if they had just cooled the gases below their critical temperatures before applying the pressure liquefaction would have ensued immediately.

This is the method employed today in making liquid air. The air is compressed at first and then allowed to issue from a small orifice, thus expanding and cooling. It is then pumped back and compressed by the pump, allowed to go through the orifice again, thus cooling still more, until at last it is below the critical temperature, when the compression caused by the pump liquefies it.

"My doctor told me I would have to stop eating much meat." "Did you laugh him to scorn?" "I did at first. But when he sent in his bill I found he was right."

The Robin—"There's some talk lately of the R.S.P.C.A. putting bells on cats." Sparrow (fiercely)—"Bells are too good for the assassins—they should be cannel."

Gibbs—"What makes you think they had theatres in Pharaoh's time?" Dibbs—"Didn't Joseph's brethren remove him from the family circle and put him into the pit?"

A West London hawkker was busy selling pickling cabbages the other day, when an old lady came up to him and said: "Can you tell me the way to Turnham Green?" "Wot d'yer want to turn 'em green for?" said the man. "Can't yer see they're for picklin'?"