

EVOLUTION OF SOCIAL QUALITIES.

BY SANFORD A. MOSS.

OUR young tom-cat caught a mouse this morning! This is not an article on nature study, so I will not dwell upon the way he tossed it about, and scampered around the kitchen. He did just what other cats do always under the circumstances, and this is the point I do want to dwell upon. Our cat never had lessons in mouse-catching and never acquired from external sources any information as to what to do when a mouse became an element in his environment. What then is this internal thing called "instinct" which resulted in his doing what other cats always do? I am going to try to give a partial answer to this question, with which I hope the reader will agree. Then I will extend the discussion to human qualities in a way which I also will try to make satisfactory. I will finally draw some resultant conclusions as to the foundations of human society which, while they may not be wholly new, are not as current as I think they should be.

We must, of course, dig a little into the details of this phenomenon of nature which we call "instinct". Merely knowing of it and giving it a name does not count for much. The physiologists have done enough to make it certain that the cat's instinct is connected in some way with its brain. We can therefore make a good beginning by consideration of the "matter" of which the brain and nerves are composed. In order to begin far enough back in this study of "matter", let us start with any piece of "dead" matter, say a lump of coal.

Its properties seem fairly simple to our understanding, so that it furnishes a good object with which to make comparisons.

The physicists tell us that the lump of coal is composed of molecules, atoms and electrons, and that it is held together by cohesion and burns because of the chemical affinity of carbon and oxygen.

Furthermore, there are vibrations of these molecules, atoms and electrons, due to temperature and radiation, so that really our piece of coal is far from dead. On the contrary, the electrons are whirling around and the molecules bearing back and forth in a most lively way.

But as the physicists well know, they have only begun to scratch the surface of knowledge about such a piece of matter. They have only recently begun to know a little about electrons, radio-activity and the like.

In what way do the carbon molecules differ from the oxygen molecules and what is the origin of their "love" or affinity for each other and what is a molecule, anyway? The physicists themselves know little more about this than a high school freshman who has flunked in his "physics".

Hence we shall have to agree that even such an apparently simply thing as a lump of coal is really complex, infinitely beyond our moral understanding.

So our analysis of details can only go so far as to note that there are things called atoms and molecules which, for some reason or other, have all sorts of powers of attraction and aggregation. These unite elements such as carbon and oxygen, and to hold together mobile drops of water, so that they become solid ice, and draw together falling particles of ice so as to form the beautiful hexagonal snow crystals, and react in many other such ways.

When certain combinations occur of such molecules of certain highly complex forms, we have what the biologists call a "cell". The particular form of affinity which makes them aggregate or "grow", we call "life". We need not here consider whether or not this "life" involves anything beyond the physical and chemical aggregating forces such as cohesion, crystallization, chemical affinity and the like. But whatever it is that makes cells multiply, they do form trees, bacteria, sea-anemones, starfish, and animals. Why they do this we understand no more and no less than we understand the lump of coal.

Our lump of coal responds to external influences in many well-known ways. Thus, a piece breaks off if it is shipped, the

volume expands slightly due to rise of temperature and there is a sound wave transmitted through the entire lump and into the surrounding atmosphere if the coal is struck. There is a chemical combination called combustion if there is contact with oxygen at a certain temperature, and so on.

We may call such effects "reaction to environment". So also a cell or aggregation of cells reacts to environment. With simple cell aggregation such as in trees, and low forms of animal life, the reaction is merely local. The tree exudes sap if cut, the low animal retracts if touched, and they both absorb nourishment from their surroundings if the necessary chemical reactions occur properly. The cat's bones are somewhat similar cases.

The biologists distinguish forms of life reaction to environment, of successively greater complexity. The simplest is the local effect already mentioned. Next there is intervention of a complex cell system called a "nerve" so that an environment effect at one place causes an effect at some other place. Next there is the local "ganglion" or nervous center which receives "afferent nerves" of simple type from various nearby points and sends out "efferent nerves". And finally, there is the system of the cat with which we started off, where there is a central brain which receives afferent nerves from senses of different kinds and sends out efferent nerves to muscles of different kinds. The system of most mammals is like this in a general way.¹

We shall later return to the discussion of the reactions of the cat's brain cells. We will stop now with the generalization that our tom-cat has a system of senses with nerves going to a brain and nerves coming from it to muscles. These nerves, brains and the like, which are the seat of the cat's instincts, are all composed of cells with chemical affinities, molecular properties, and all sorts of such actions. They react to environment just as do the successively simpler organizations down to our lump of coal, but in ways billions and trillions of times more complex. We say we understand the properties and reaction of the lump of coal, and in the same sense

¹ In the *Monist*, January, 1921, I have tried to demonstrate that man, as distinguished from animals, has a nervous system of a still higher grade, with the addition of a "memory organ", which stores records of past environments, which are recalled by associations of present environment, so that the next effect produced on the brain at any instant is due not only to the existing environment as transmitted to the brain by the senses, but also to past environments recalled from the memory by associations due to the present environment.

we understand the reactions of the cat's sense, nerve and muscle system.

We can pause for breath after this rapid excursion through matters which have taken years for development by physicists, chemists, biologists and other scientists. We have collected enough data on points usually agreed upon, to enable us to start on the cat's instinct.

First, what do we mean by "instinct"? We have already skimmed over the mechanism which is concerned with instinct, consisting of the senses, afferent nerves, brain, and efferent nerves. By the operation of this mechanism, when the cat which is furnishing our text, saw or smelt or heard the mouse, it pricked up its ears, sought a favorable position, crouched, and at the proper instant leaped, stretched out its claws and captured its prey. All of these actions followed the perception of the mouse, and I need not expend any philosophy on the point that the perception and subsequent action had the relation of cause and effect. Neither need I spend any time in proving that the entire mechanism between perception and action exists within the cat's body. There are no waves or psychic influences or any other agencies whatever outside of the cat's own skin, which have any part in the performance. The entire drama (the mouse would call it a tragedy) of the capture, comprised the cat, the mouse and the forces of nature immediately adjacent, such as gravity, temperature, radiation, and the like.

Physiologists understand the sense mechanism fairly well and are quite certain about the pulses already mentioned from senses to brain and back again from brain to muscle. They are also quite certain that something goes on in the brain which, upon receipt of the incoming pulses, acts in some way or other to send out the outgoing pulses. This something is the "instinct" toward which we have been leading. With the data we have been collecting in the rapid trip we have just completed thru realms of physics, biology and what not, we ought now to be able to show just how instinct operates. But, alas, we are far from being able to do this completely because physiologists do not yet know the details of the brain cell processes. But between the physiologists and psychologists, we do know a great deal, however.

For one thing, we cannot escape the conclusion already mentioned that instinct is purely a matter of brain cell reaction. The

brain ends of the afferent or incoming nerves deliver their pulses to the adjacent brain cells, and some sort of cellular effect occurs in the midst of the brain and in turn the brain ends of the efferent or outgoing nerves are affected and their pulse started. While the action is so wonderfully complex that we can have no conception of the details, we are forced to conclude that for every possible combination of incoming nerve pulses, due to environment effects on the senses, the brain cells produce such reaction as to send out a consequent or corresponding set of outgoing nerve pulses which make the muscles perform the action which matches with the environment. We have already discussed the molecular and atomic reactions of dead matter, as well as the claim of the school of vitalists that the cat's cells are subject to "vital forces" beyond the attracting and aggregating forces and the like, of dead matter. But whatever is the cause of these reactions, the cat's brain cells certainly do react to the incoming nerve pulses, which are produced by the environmental effect on the cat's senses caused by the mouse, and as a result, outgoing nerve pulses are produced which result in the muscle movement which effect the capture.

The cat's instinct, then, resides in the configuration or quality or other properties of its brain cells, which make them react to given nerve influences in a definite way.

We define "instinct" therefore as a reaction or other such effect which occurs in brain cells when an afferent nerve pulse is received from senses, and which serves to send forth a corresponding efferent nerve pulse to muscles.

This is, of course, no explanation of instinct, but it is a distinct clarification of the idea. Furthermore, it is the first step in that complete explanation for which all biologists strive. We do not have the overwhelming mystery of the behavior of the cat as being possibly the result of influences from supernatural beings, as supposed by the Egyptians or being due to a supernatural soul transmigration from some previous being, or as being due to influences from the moon or stars.

We have, on the other hand, localized the reasons for the cat's behavior as being due to reactions of atoms and molecules of life cells of a certain group called the brain, definitely located within the cat's skull. We still have the overwhelming mystery of the nature of the reactions of the brain cells, but these are identical with or allied to the reactions of the atoms and molecules of the

lump of coal, so that we have some complete or partial analogies to guide our analysis of the cats' instincts.

Another evidential matter is the fact that our particular cat caught its mouse and played with it afterwards in much the same way as does your cat or any of the cats we knew in our childhood. These cat actions the reader knows perfectly well from personal experience. We also all know how they differ from dog actions under similar circumstances. The theory of instinct which has been given explains this adequately. The same sort of brain cells grow up inside the skulls of all cats, and the reactions of these cells must be the same.

The hypothesis that the reactions of the molecules of the lump of coal are a similar sort of thing to the reactions of the cat's brain cells, is important enough to warrant a little further discussion.

A simple oxygen molecule is bound to react in a definite way in an environment comprising high temperature and carbon molecules. The point we seek to make is that in a similar sort of way the vastly more complex molecules of the brain cells, and the incomprehensibly complex aggregation which constitutes the cell itself, and the trillion times more complex aggregation of cells in a section of cat brain, will react in a perfectly definite way to any given environment of pulses from sense nerves so as to send an exactly resultant pulse along muscle nerves.

Molecules, like the simple aggregations of a few elements such as carbon and hydrogen, are more complete than the oxygen molecule. These have certain properties and do certain things under given environmental conditions of a much more complex nature than oxygen reactions.

Such reactions give us the various effects produced by chemists and engineers. The carbon in steel is arranged so as to give it various properties; and thereby bridges, automobiles and skyscrapers are produced. The lump of coal is manipulated so as to make the atoms of carbon and hydrogen associate first into coal tar and then into dye-stuffs with all of the colors of the rainbow, or into explosives used to charge bombs.

The biologists tell us that molecules in living protoplasm are much more complicated aggregates of carbon, hydrogen and other atoms, than the molecules with which chemists and engineers deal. Their reactions are therefore correspondingly complicated. A cell is a complex organization of several different types of matter, each

portion containing countless molecules. Hence the parts of the cat's brain which receive the pulses from the sense nerves have countless possible kinds of reaction corresponding to the different kinds of effect transmitted from the senses. A single carbon atom such as in the lump of coal has a few simple reactions when subjected to certain effects. We can conceive a numerical calculation of the greater number of reactions which a brain cell can have, based on the permutations and combinations of the effects due to its billions on billions of atoms, combined in many ways in countless molecules of many different types, and these further combined in all sorts of living matter forming cell nuclei, cell walls and other kinds of brain cell substance.

Simple reactions of living matter have been studied by biologists and the exact occurrences analyzed under the name "tropism". Light, heat, stimulation and other environmental effects make simple aggregations of living cells perform definite actions which are well understood in many cases. There are increasingly complex reactions of living matter in plants and trees and in the cells of the cat's muscles and stomach. Finally, when we come to the cat's brain cells, the complexity is past all understanding. In the ascending scale from the oxygen molecule, through more complex chemical compounds, through simple life cells, and more complex ones in various parts of the cat's body, and finally to the cat's brain cells, there is never any point where anything occurs that cannot be referred to increasingly complex reactions of matter.

Ever since alchemists tried to find the Philosopher's Stone, finite hands have made all sorts of combinations of matter, and have recombined systems so as to initiate all sorts of reactions. The alchemists themselves made sulphuric acid and many kinds of simple chemicals. Their successors, the modern chemists, make tri-nitro-toluol and coal tar colors. But no finite hand has ever created an atom of the things we know as matter, nor a bit of the other thing we call energy. The philosophers called "vitalists" therefore maintain that there is a third thing called "life" which endows matter and energy with properties not otherwise possible. However, we need spend no time on this problem, but can confine our attention only to the reactions of life calls such as in the cat's brain, without inquiry into the distinction, if any, between life processes and the reactions of non-living matter. They are all reactions of one sort or another and it is not our present purpose to

distinguish between the sorts. The cat stopped for no philosophy as to why he acted as he did when the mouse appeared, and we can watch him do it and trace the affair back to brain cell reaction, without going back any further, as to the ultimate how and why the brain cells came to be and to react.

The common way of starting a discussion of "how life cells multiply", is to begin with the growth of crystals. There often has been given the description of how the molecules have an affinity or love for each other in certain ways, so as to build up an aggregation with the characteristic structure. Thus certain salts crystalize out of a saturated solution, or ice crystals form in slowly cooled water. Unfortunately, I cannot here keep on with the concrete case of a lump of coal, in order to fix attention in this matter of crystallization. The molecules of carbon in the lump of coal do form crystals, but if I knew how to describe the action, I would be manufacturing artificial diamonds instead of writing this article.

The complex molecules of living matter aggregate and grow in much more complicated ways than do crystals, and furthermore, have the marvelous faculty of reproduction, whereby a new organization is started, which aggregates and grows in the same way as the parent. But we have no intention of going into the biological details of how a tom-cat will transmit his instincts to his kittens.

There is one point which we do want to make, however, and that is that the kittens, in common with all other reproduced offspring, differ slightly from the old cats. This is a sudden plunge into the midst of evolutionary theory, but we have no space for the details. The various schools of evolution are having a merry quarrel about the exact reason for the "variations" or slight differences between the old cats and the kittens, so that we laymen had better steer clear of this particular point. There are, however, certain things upon which the various evolutionists do agree, in between the times when they are disagreeing. Fortunately, therefore, an author may assume that his readers nowadays, will also agree on the general principle of evolution.

Instead, then, of the allegory in the first chapters of Genesis we have the statement that all life has grown up from more elementary forms. There are differences in successive generations of offspring, such as to better and better fit them to survive amidst their environment. So have successive generations of plants, ani-

mals and all living things acquired coverings, frames, internal organs and means of reproduction which fit the individual and the race to survive.

The reason then, why our tom-cat has claws and teeth and a furry tongue is because the possession of these things has assisted survival.

One purpose of this article is to convince the reader that the instincts of the cat, mouse-catching and otherwise, are just as much a part of the cat's evolutionary heredity as its claws. The brain cell formation which, when subject to the environment of the mouse, reacts so as to make the claw muscles move in a certain way, is a physical thing of exactly the same sort as the claw itself. The shape of the claw, its sharpness and hardness, we call a physical formation. The shape of the cat's brain cells, which react so as to make the claw move in a certain way, when subjected to a certain nerve pulse stimulation, is a physical formation of exactly the same nature. Thus far the reader will probably go with me without question. I hope the evidence I have already submitted will insure this. The point which I hope the reader will concede also, is that the cat's instincts, since they are things of the same nature as its physical qualities, are transmitted by the same evolutionary laws. This is really not violently novel. It is not difficult to conceive that only those cats survived who had brain cells which reacted so as to move the claws and do the other mouse catching acts. Just as the claw mechanism was evolved through countless generations of cats, so as to have a shape well suited to catch mice, so the brain cells whose reactions served to move the claw muscles, were evolved also. This aspect of evolutionary theory seems very important and very evident to me, and yet it is dwelt upon but little. Darwin himself gives scant attention to this point. So far as I know, the Mendelian experimenters have never devoted any attention to transmission of instincts. Yet there must be Mendelian transmission of instinctive characteristics just as of physical characteristics.

While nothing probably has been actually recorded for cats, there are certainly records for some breeds of dogs, showing that rat catching ability is hereditary. This means not only inheritance of the claws, muscles and other obvious physical configurations which make efficient rat-catchers, but also inheritance of the brain cell configurations called "instincts" which give reactions which

properly operate the obvious parts. Many breeds of dogs have perfectly good paws and claws for catching rats, but do not have brain cells which react so as to operate the paws and claws in a way which makes for success. We must conclude then, that instincts are due to brain cell configurations which react in definite ways as the result of sense and nerve influences and that these configurations are evolved in exactly the same way as are the cells which produce protective colorings, sense organs and other elements in the theories of "Survival of the Fittest".

We have concentrated attention upon the effects which the brain cells at the ends of the cat's afferent nerves, have upon other brain cells as the beginnings of its efferent nerves. However, while the initial configuration of these two molecular organizations is possibly the principal thing, there are many other agencies in the cat's body which affect the condition of these cells and their reactions. The blood, digestive juices, glandular secretions and the general physiology of the cat all have some influence on the general way in which the brain cells react, but we have neither space or knowledge to go into such details. We generalize, by saying that the cat's instincts are due to its physical organization as evolved by the law of the survival of the fittest.

Of course the reader has long since penetrated the innocent little camouflage I have adopted of using our tom-cat as a means of fixing the attention in the matter of instincts in general. The human animal has a set of instincts of exactly the same kind as the cat. Due to these, the new born infant makes its discomfort and hunger known by cries, or suckles when there arrives a combination of hunger and opportunity. As the infant matures and becomes an adult, there are many other things which it does as a matter of instinct with the same sort of brain cell reaction as in the case of the cat. There also may be things which a human being does which may not be a matter of instinct. Some would include in this category, so-called reasoning and will power. Such things are not our present subject. There are, however, enough human actions to occupy our attention, which I hope to show are plainly matters of the same sort of hereditary transmission of brain cell configuration as those which govern the cat's instincts.

A good example of an instinct common to man and many animals is the one of "self preservation". We include a vast complex of heterogeneous brain reactions in this category. The reader

has a good general idea of the matter and can take the detailed analysis for granted without being bored here by it. One of the first things to appear, as animal life has evolved from lower to higher forms, is retreat in the face of danger. The tiny kitten with no actual experience with dogs will back into a safe place and arch its little back in a most ludicrous way at the approach of a dog. Similar instances could be tabulated without number culminating in the efforts at self-preservation of an unreasoning human infant. If the infant is in a safe and comfortable situation it rests quietly and mayhap coos with pleasure. But if it is placed in an uncomfortable or dangerous situation, it struggles blindly until accidentally extricated by its own efforts or by some adult attracted by its lusty cries. All infants who did not have such protective instincts were evolved out of existence when our race was in its early wild state.

Similar sorts of instincts keep us alive in our adult period. We have instinctive fears and struggles in the face of real or fancied dangers. A sleeping person will struggle to extricate himself from an uncomfortable situation with no knowledge of the matter when he awakes.

There are a great many other instincts of animals and humans which have not the immediate effect of those cited above but which make for preservation in the long run. An animal prepares a lair or cocoon in summer which protects him in winter, birds build nests and squirrels store nuts. Men build houses, lay in coal for winter, serve an apprenticeship at a trade, save up for old age, and do a quantity of similar things covered by the term "provident".

Some people lack such instincts and so much of our poverty arises. The African savages are at one extreme in this matter and the prosperous Anglo-Saxon middle class is at the other, and there are all grades between. There is obviously an inborn difference in the mental characteristics of various classes, so far as providence for the future is concerned. I hope I have given enough evidence to prove that this is due to a difference in physical configuration which cause different kinds of noses, hair or skin pigment.

The grasshopper, who in the fable, sings all summer and the ant who stores for the winter, have the same inborn differences. Each reacts in a way which has been evolved through countless generations to fit its own race to survive.

This instinct of self-preservation of course has a certain ele-

ment of selfishness. In order to preserve its own personality and its own kind, each individual is, upon occasions, more or less indifferent or even antagonistic to other individuals or other races.

It would seem that a certain amount of selfishness is necessary for self-preservation. However, there is one unselfish instinct necessary for survival. This is the one which leads to mating, and to care and nurture of the young. Female chickens, dogs, birds and many other animals will reverse their usual instinct to seize food, in order to benefit their young. Man has similar instincts, developed much more highly, however. We have love and marriage and great sacrifice for the sake of offspring. Most parents will protect their children at any cost. Yet this is not inevitable and there are frequently fathers, as well as mothers, who lack the usual parental instincts. We call such cases abnormal. They are clearly due to a difference of brain structure from the usual type. Such a difference should obviously evolve into rarity, and this has actually occurred, since these cases are known to be "abnormal".

Most human animals, particularly females, at all times, have instincts which lead them to protect children. A little girl plays with dolls and a grown woman with live babies. On the other hand, most other female animals only nurture young for a period after they have been mothers. Any young ones, whether of her own litter or not will be nursed by a female mammal for a certain time. At other times, they wholly ignore young. Carniverous males will freely attack the young of other species but instinctively leave unharmed the young of their own kind. All of these instincts obviously have been evolved and any race whose individuals do not possess them, obviously will not survive.

Mankind has many attributes beyond the instincts of animals, which of course, help in determining his relations to others. Among these are habit, reasoning ability, will and power to follow precept and example. The explanation of these attributes has been a matter of philosophical discussion for centuries. There are the "mechanists" who believe that everything we do is a matter of cell reaction and the like. These reactions are immensely complicated perhaps, but still, they believe, differ only in complexity and not in kind from the reactions of crystals or plants.

There are other philosophers, whose views are shared by the majority of people, who hold that in addition to the cell structure of the brain, with the reactions which we have been discussing,

there is a "personality" or "soul" with will-power of a non-mechanical kind. We do not need here to take sides on any of these points. In any case, the exact configurations of the brain cells have an appreciable influence and we need not agree on the exact extent of this influence. The particular kind of action which occurs in any case is still largely matter of the fundamental brain formation, regardless of the kind of philosophy we hold. If a brain lacks those qualities which tend to make the individual considerate of others, we say he is born selfish. We know well that people are born misers, spendthrifts, "poor white trash", laggards and so on. These things are all to some extent matter of a physical brain, regardless of soul, will or reason. There must exist therefore some fundamental brain formation which enables exercise of reasoning, will power, or attention to precept from others. In other words, whether or not human beings have any mental power beyond purely mechanical results of cell reaction to environment, these powers are, more or less, dependent upon the existence of a physical brain with a definite cell formation which has been evolved on the basis of the survival of the fittest.

We make the hypothesis therefore that *the ethical and social qualities which we possess are due to evolution, and are such as have made our race survive*. The exact combination of selfishness and altruism which the average human being possesses is such as has kept the race in existence, and enables it to evolve from lower forms. Of course the evolution is still in process and those social qualities are sure to become more predominant which best assist survival.

It will be worth while to consider a few more examples of this fundamental premise. Certain animals and a few abnormal men cannot tolerate others, even of their own kind, and have what we call ferocious "instincts". It is obvious that a race with such characteristics cannot survive. On the other hand, most if not all races of animals which have survived, do not usually attack their own kind. However, most animals will attack their own kind if their personal privileges are encroached upon. Obviously, individuals which would passively submit to encroachment would be soon evolved out of existence. On the other hand, a certain amount of aggressiveness and desire to seize what is needed for existence, is also necessary for survival. Thus has been evolved the compromise

already mentioned between selfishness and indifference to others, which governs the social relation of most animals.

It is to be noted that what are called "abnormal mental characteristics" such as idiocy and insanity are simply extreme variations in the physical configuration of the brain. They are the same kind of variations as give evolution in general. In this case, there is a form of "unfitness". Such variations automatically evolve themselves into rarity and this is the reason they are unusual or abnormal. Evolutionary theory tells us that variations are always occurring for better or for worse, in shapes of paws, claws and physical characteristics in general, as well as in those physical configurations of the brain which give mental characteristics.

As already noted, most animals passively tolerate others of their kind and actively and unselfishly assist young of their kind under certain circumstances. Observation shows that most humans go much further than this and often unselfishly assist adults of their own kind, as well as other animals. If a healthy animal has a comfortable lair safe from the elements, and a sick one approaches, it is at least unusual, and perhaps unheard of, for the strong to give place to the weak, at the expense of his own exposure to the elements. Yet occurrences such as this are normal for human beings, and in many ways we have practice of the "Golden Rule."

Now it is not inevitable that a human being should practice the Golden Rule. Animals do not, and savages do so, to a much less extent than a modern Anglo-Saxon. In many cases, there is more toleration of others with neither friendship nor animosity. There are, however, some selfish persons who are not merely indifferent towards others, but positively hostile. In cases where it adds to their own comfort, they try to get what they themselves need even at the expense of others. There are at a further extreme, cruel persons, who discommode or torture others without actual gain to themselves, but merely because they have pleasure in seeing others suffer.

After all of the discussion above, I hope it will be agreed that the various kinds of attitudes towards others are matters of fundamental arrangements of the brain cells, as transmitted by heredity. In other words, one is not selfish because he wants to be or because

he wills to be, but because his brain has an inborn twist in that direction.

There are, as already remarked, many parts of the physical organization which participate in the action of the brain, such as the glands and digestive juices. We always refer to every part of the physical system, which influences the brain when we briefly mention "brain configuration".

It has also been noted that the actual brain reactions are affected by an individual's experience, and by the precepts he has received. However, as has been pointed out, there remains always a large influence due to the inherited brain configuration, and this is the thing we are here discussing.

Due primarily to an evolved brain configuration, and secondarily, to environment and experience, human beings of a race grow up with certain ideas of "right" and "wrong". Some races have strongly defined instincts regarding lying or stealing, which is easily developed by precept into a definite code of morality. Others have less pronounced instincts in this direction, but of sufficient strength to be developed by precept into a similar code. Still other races and individuals are deficient in these particular instincts, so that they never see impropriety in fibbing, or appropriating property of others. A similar situation exists with regard to selfishness and altruism, care of the aged and sick, and many similar ethical and social attributes.

As far back as our knowledge of the human race goes, many of these criteria of right and wrong have been said to have come from supernatural sources. I have no intention of controverting any present day ideas in this matter. I believe it will be freely admitted, however, that many such ideas of ancient races, have really not been supernatural, but have grown up through purely human agencies, notwithstanding ideas to the contrary, at the time. No God or other supernatural agencies ever made it "right" to sacrifice human beings, or even animals, or to burn widows on funeral pyres, or, coming down to our own Christianity, to burn and torture people for witchcraft and heresy.

Many types of religion, ancient and modern, teach morality and altruism, and much of the progress of mankind in ethical directions has been due to religious influences. Here again, however, there must also be an hereditary factor. The fact that an individual or race will attend to ethical teachings of a religion is

due to the sort of fundamental brain configuration of which we have so often spoken. The conclusion which I hope to draw is that ideas of right and wrong are matters of the same sort of instinct as led the tom-cat to catch the mouse, and are therefore matters of brain configuration as evolved by laws, such as that of survival of the fittest.

Much as we may hate to admit it, many races have survived whose instincts have led them to think it right to war on other more peaceful nations and take land and goods from them. Most other races think it right to defend themselves from such warlike ones.

It is desirable to develop further the point already mentioned, that there is always a great influence upon a given individual, due to environment, and to example and precept from parents, associates, teachers and preachers. Thus a neutral person may under differing circumstances become either a moderately truthful person or a moderate liar. On the other hand, there is a type so well known as to have given rise to the popular term "natural born liar". Such a person under differing circumstances would become either a moderate or a great liar. In other words, the fundamental characteristics are greatly modified, restrained or developed by circumstances, environment, will-power, reason, precept and perhaps other things besides heredity. The fact that these things can have an influence is more or less of an hereditary trait. However, the exact relation between influence of hereditary and of other things has involved a great deal of biological discussion, and I have no intention of dragging it into this article. I have no doubt that it will be admitted that heredity has *some* influence on the moral characteristics of an individual, and that is enough so far as this article is concerned.

A kitten may become a ferocious alley cat of ugly mien, with one eye out and with ears and tail chewed off, ready to fight for its life under most adverse circumstances. On the other hand, the same kitten could grow up to be a children's pet, fat and lazy, spending its days basking in the sun and preening its handsome fur, with practical loss of the mouse-catching instinct with which we started. In both cases, however, the inherited brain configuration has a great influence in spite of other circumstances. So it is with human mental characteristics, the evolved inheritances plays a great part, but other things are modifying factors.

One very important instinctive brain configuration possessed by

many animals including man, is the one which gives the inclination to follow the leader. This is axiomatic in the case of sheep. In the case of humans, we call it "custom". We very often have a conflict between this general instinct to follow custom, and an opposing individual instinct. This general instinct to follow custom is probably the means whereby various types of individual instincts which have enabled a race to survive, are made use of by other individuals who may not possess the original instincts. On the other hand, custom also often tends for a period to preserve things which do not on the whole assist survival. Evolution teaches us, however, that in the long run, even such things will be eliminated. But in whatever way it acts, the instinct to follow custom is due to a brain configuration which has its effect in common with many others in determining the evolutionary development of our race.

Another characteristic of the brain configuration of animals and men is the ability to form habits. Here again there must be a fundamental ability to form the habit. Only certain types of dogs can be given the habit of herding sheep, and only certain men can learn to juggle balls.

Many physical characteristics are inherited which are neutral so far as survival is concerned. It is probable that a sharp thin nose or a broad flat nose, or blue or green eyes are matters of development. A similar situation must exist with many mental characteristics. However, if I list some mental characteristics which appear to me to be non-essential, I might offend a reader who may have some, which he thinks are essential. I will escape this difficulty by letting the reader supply his own list.

The evolution of mankind itself makes changes in essentiality of characteristics. When our ancestors lived in woods and caves, those who had instincts which made them successful fighters, hunters and fishers were the ones which survived, while those who had characteristics, which nowadays make them mechanics, engineers, chemists or the like, did not get on so well. Existing vestiges of the early instincts of the race are shown by those who hunt, fish or engage in athletics for sport. We would now have vastly greater abilities in physics, chemistry and engineering if they had always been as important factors in survival as they are today. But so far as social and ethical qualities are concerned, there has been no such change. It has always been as important for survival as it is today, that members of a race should assist each other, and should not lie

or steal. The ethical instincts we have are therefore of very early origin.

It is possible to classify the ethical instincts possessed by various kinds of living things. Plant and low forms of animal life have no ethics whatever. They have tropisms or instincts which tend to preserve themselves and propagate their kind with complete disregard of the rest of the universe. They nourish themselves regardless of whether or not they deprive other living things of nourishment.

Next comes those animals which tolerate others of their kind under most circumstances. They may deprive some others of food or even devour others, but usually respect certain or all of their own species. Next are animals which unselfishly nurture the young, but merely tolerate others. The highest degree of all comprises those who assist others. Human beings possess this instinct to some degree or other. Perhaps dogs possess it to a slight degree.

The way in which there are transmitted those social characteristics which assist survival, is well known to us through the story of the evolution of paws, claws, and other purely physical characteristics. For some reason or other, a variation from the usual brain configuration occurs. Such things are now occurring all of the time. Many individuals have criminal instincts, are kleptomaniacs, or otherwise possess something which we term degeneracy or deficiency. On the other hand, there are geniuses, philanthropists, and many who possess special skill or other unusual qualifications not in an evil direction. But these two types are only manifestations of differences. If those things we call "evil" would assist survival, they would be the normal things. The fact that they seem evil to us is because they do not coincide with the brain configurations, which have been the normal ones to survive. And so these "evil" instincts, since they do not assist survival, are not propagated and die out as often as they accidentally occur. The other "good" instincts do, however, propagate themselves, and when one accidentally occurs, it tends to become permanent.

The way evolution acts with physical characteristics is so well known, that I need spend no further time on the identical actions with mental characteristics. Of course our race is evolving all of the time, and those ethical and social characteristics which best fit us to survive ultimately are being approached as the centuries go by. A century or two is nothing to Nature, as she evolves char-

acteristics, both mental and physical, so that we see no rapid change. I think, however, that we can see ethical changes in historical times, and on the basis of these, make some predictions for the future.

Our race has certainly become more observant of the golden rule. One prominent change is in the matter of cruelty. Public sentiment has so evolved that there is a great decrease in the matter of torture and infliction of pain upon persons who may be for any reason in the power of others. It also seems self-evident that the instincts of the human race as an average have evolved within historic times in regard to slavery, unjust imprisonment, and similar matters. The present inhabitants of the globe differ greatly in all such instincts. Some races deem it cruel to destroy any animal life, and even go to the extreme of having two little stilts on each shoe to avoid crushing anything under foot as far as possible. A second class comprises those races or individuals who will not knowingly make animals suffer, but are willing to kill them for self-protection or food. Those of a third class go further and in addition will hunt and fish for amusement even when they do not need food, but will not wantonly be cruel to animals.

These two latter classes include such instincts as are considered normal, while the next two classes are considered abnormal. Those of the fourth class are indifferent to the sufferings of animals, while those of a fifth class find pleasure in the sufferings of animals and even of human beings. It seems to me that evidence can be given showing that the human race is evolving in this matter. Perhaps, we are approaching the second class above mentioned.

Another matter in which the human race is evolving at an appreciable rate is in the matter of superstition. We all have certain beliefs that this or that theory is truly based on more or less reliable evidence. We now know that many once firmly held beliefs were really false. We know of the falsity of the astronomical beliefs of those who tortured Galileo, of the beliefs in mummies of the Egyptians, of the beliefs in witchcraft of the Puritans, and of the beliefs in their Gods of the early Greeks. Present day normal beings do not believe in the supernatural origin of dreams, nor in lucky charms, love philters, fortune telling and astrology.

We are evolving so that we fix our beliefs more and more on definite evidence, and less and less on insufficient evidence or "faith". We may be sure that this evolution will continue. Many religious beliefs now considered as matters of life and death, or

even as matters of eternity, will be found false by the human race evolved in time to come. This is not necessarily because of any intrinsic tendency of the human race toward truth, but solely due to the fact that in the long run those who have such brain configurations as enable them to weigh evidence and assign natural occurrences to their true causes, are better fitted to survive than those who are deluded by superstition. One who believes it unlucky to go under a ladder because he has been told so, and perhaps has seen a few accidental instances, has a brain configuration less adapted to survival than another who can analyse cause and effect so as to realize that there can be no natural law connecting the ladder with succeeding occurrences.

Slight accidental variations in brain configurations of successive generations are just as likely to give instincts in one of these directions, as in the other, but as with every variation, those which tend to cause proper analysis of cause and effect, survive by natural selection, and those which tend toward unreasoning superstition are gradually evolving themselves out of existence.

Another matter of brain configurations in which I hope we are going through visible evolution, is the matter of "war". Certain races think it right to attack other more peaceful nations and to take land and goods from them. Many think that war is a "biological necessity". Others think that it is proper for so-called civilized races to impress their "culture" on so-called barbarians by warlike means. Other races or individuals do not think it right to make offensive war, but do think it right to defend themselves. It seems to me that this is the state toward which mankind is evolving. The warlike races and individuals are probably being eliminated by effect of their own instincts. Some people claim that they will not provide for their own defense from warriors. They will probably be eliminated also.

Therefore, as in all of the other cases we have considered, each being has a fundamental brain configuration which largely determines his ideas and actions in the matter of war. We cannot say that anyone's ideas are intrinsically right or wrong, but only that those ideas which best assist survival will be the ones to persist.

It is probable that there has been an evolution within historic times in the matter of individualism versus socialism. Our present average instincts are such that all attempts have failed to substitute pure socialism for the competition of individualism. Never-

theless, the most advanced races have a good measure of association for public good, in the way of roads, postoffices, schools and Government activities in general. We will probably have evolved to degrees of socialism now impracticable in the course of some thousands of years. It must be remembered always that an individual must possess enough selfishness for self-preservation. We are evolving toward the best balance of selfishness and altruism.

We may conclude then that anything which will be good for the human race as a whole will inevitably become a predominating characteristic, be it physical or mental. Those mental, social or ethical characteristics which best assist survival, are the ones which will necessarily persist. Hence those whose fundamental brain configurations are such as to make them think that those characteristics which are going to survive, are "right", are the ancestors of the future races. There is no other criterion of "right" and "wrong". We have come a long way from the catching of the mouse to this conclusion and it will be well to make a brief resume of the individual steps.

(a) Molecules and atoms, in both "dead matter" and in living cells, have all sorts of reactions, which cause them inevitably to do definite things under given environmental conditions.

(b) The reactions to environmental conditions, of organized beings such as animals and men, are in many cases due to "instincts" which are similarly due to reactions of certain brain cells upon other ones.

(c) The "instinct" or particular kind of reaction which occurs under any given environment is due to the quality or configuration of the brain cells and related parts of the animal organization.

(d) The brain and other qualities or configurations which determine instincts in animals, are inherited from parents just as are purely physical characteristics, such as paws and claws.

(e) Physical characteristics are transmitted from parents to offspring with slight irregular differences or variations.

(f) Such of these differences as make the offspring better fitted to survive, become permanent characteristics of the future race, and we have evolution.

(g) The brain and other configurations which determine instincts are transmitted by the same laws of evolution as are physical characteristics.

(h) Therefore the instinctive action of animals, including human beings, are such as have been evolved by the law of survival of the fittest.

(i) The relations of animals and men one to the other, i. e., their social qualities or ethics, are determined largely by instinct, and hence these qualities have been evolved by the law of the survival of the fittest.

(j) The social qualities which are best adapted to give survival to the race as a whole, will be the ones to persist. The individuals whose brain configurations are such as make them believe those things are "right", will be the ones to perpetuate the race.

What is "good" for one individual is "evil" for another. What is "right" for man's actions toward animals is "wrong" from the animal's point of view. Hence there can be no fundamental criterion. The only thing we do have is the definite law of evolution, that the fittest will survive.

(k) Altruism, observance of the golden rule, and elimination of cruelty of all kinds, are the sort of qualities which will best assist survival of human beings, and we can therefore be sure that evolution will slowly but surely advance such qualities, and gradually eliminate antagonistic ones.

Normal civilized beings now regard as "right" many such qualities which appear to assist survival. Hence the progress of the human race is certain to be in the direction of many of the ideals of present normal civilized beings. This is not because of the intrinsic Right or Beauty of such ideals, but by virtue of the slowly working, but inevitable laws of evolution.