

Living Science Readers

The History of a Mouthful of Bread

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Publisher's Note:

While reading this wonderful living book about how the human body works, keep in mind that it was originally published in 1861 in France, later translated into English by Margaret Gatty, who wrote the story portion in *Parables From Nature*, a volume in our “Discovering Nature & Science” course. Therefore, you may find some of the descriptions and information a bit antiquated, but most of it is still very much what we know today. We chose to make some updates here and there, but to keep the majority of descriptions of processes the same as in the original, because they truly do bring the understanding of the inner workings of the human body “to life,” as you will soon discover.

I

INTRODUCTION.

I am going to tell you, my dear child, something of the life and nature of men and animals, believing the information may be of use to you later in life, besides being an amusement to you now.

Of course, I shall have to explain to you many particulars which are generally considered hard to understand, and which are not always taught even to grown-up people. But if we work together, and between us succeed in getting them clearly into your head, it will be a great triumph to me, and you will find out that the science of learned men is more entertaining for children, as well as more comprehensible, than it is sometimes supposed to be. Moreover, you will be in advance of your years, and one day may be astonished to find that you had mastered in childhood, almost as a mere amusement, some of the first principles of anatomy, chemistry, and several other of the physical sciences, as well as having attained to some knowledge of natural history generally.

I begin at once, then, with the *History of a Mouthful of Bread*, although I am aware you may be tempted to exclaim, that if I am going to talk only about that, I may save myself the trouble. You know all about it, you say, as well as I do, and need not to be told how to chew a bit of bread and butter! But you must let me start at the very beginning, and you be amazed at what an incredible number of facts will be found to be connected with this

chewing of a piece of bread!

Have you ever asked yourself *why* people eat?

You may laugh at such a ridiculous question.

"Why do people eat? Why, because there are cakes, and cookies, and fruit, and all kinds of things good to eat." Very well, that is a good reason, and you may think that no other is needed. If there were nothing but soup in the world, indeed, the case would be different. There might be some excuse then for me asking my question.

Now, then, suppose that there *is* nothing in the world to eat but soup; and it is true that there are plenty of people for whom there is nothing else, but who go on eating nevertheless, and with a good appetite, too. Why *do* people eat, then, even when they have nothing to eat but soup? This is what I'm going to tell you.

The other day, when your mamma said that your dress "had grown" too short, and that you could not go out visiting until you had changed into one that fit you better, what was the real cause of this necessity?

What a ridiculous question, you say, and you answer — "Because I had grown, of course."

To which I say "of course," too; for undoubtedly it was you who had outgrown your dress. But then I must push the question further, and ask — How had you grown?

Now you are puzzled. Nobody had been to your bed and pulled out your arms or your legs as you lay asleep. Nobody had pieced a bit on at the elbow or the knee, as people slip in a new leaf to a table when there is going to be a larger group than usual at dinner. How was it, then, that the sleeves no longer came down to your wrists, or that the body only reached your knees? Nothing grows larger without being added to, any more than anything gets smaller without having lost something. If, therefore, nothing was added to you from without, something must have been added to you from within. Some sly goblin, as it were, must have been cramming into your frame whatever increase it has made in arms, legs, or anything else. And who, do you think, this sly goblin is?

Why, my dear, it is *yourself*!

Think now, of all the bread-and-butter, and cookies, and cakes, and even soup and plain food (the soup and plain food being the most useful of all) which you have been sending, day by day, for some time past, down what we used to call "the red lane," into the little gulf below. What do you think became of them when they got there? Well, they set to work at once, without asking your permission, to transform themselves into something else; and gliding into all the holes and corners of your body, became there, each as best he might, bones, flesh, blood, and such. The transformation is perfect and complete. And it is the same with everybody.

Look at your little pink nails, which push out further and further every morning; examine the tips of your beautiful hair, which gets longer and longer by degrees; coming out from your head as grass springs up from the earth; feel the firm corners of your second teeth, which are gradually succeeding those which came to you in infancy; you have *eaten* all these things, and not that long ago.

Nor are you children the only creatures who are busy in this way. There is your kitten, for instance, who a few months ago was only a tiny bit of fur, but is now turning gradually into a grown-up cat. It is her daily food which is daily becoming a cat inside her—her saucers of milk now, and very soon her mice, all serve to the same end.

The large ox, too, of whom you are so much afraid, because you cannot as yet be persuaded what a good-natured beast he really is — that large ox began life as a small calf, and it is the grass which he has been eating for some time past which has transformed him into the huge mass of flesh you now see, and which by-and-by will be eaten by man, to become man's flesh in the same manner.

But, further, still: Even the forest trees, which grow so high and spread so wide, were at first no bigger than your little finger, and all the grandeur and size you now look upon, they have taken in by the process of eating. "What, *do trees eat?*" you ask.

They are the most greedy of eaters, for they eat day and night without ceasing. Not, as you may suppose, that they

crunch cookies, or anything else as you do; nor is the process with them precisely the same as with you. Yet you will be surprised, I assure you, to find how many points of resemblance exist between them and us in this matter. But we will speak further of this presently.

Now, I think that there are few fairytales more marvelous than this history of bread and meat turning into little boys and girls, milk and mice turning into cats, and grass into oxen! And I call it a *history*, observe, because it is a transformation that never happens suddenly, but by degrees, as time goes on.

Now, then, for the explanation. You have heard, I'm sure, of those spinning-machines which take in at one end a mass of raw cotton and give out at the other a roll of fine fabric, all folded and packed up ready to be delivered to the store. Well, you have within you a machine even more ingenious than that, which receives from you all the bread-and-butter and other sorts of food you choose to put into it, and returns it to you changed into the nails, hair, bones and flesh we have been talking about, and many other things besides; for there are quantities of things in your body, all different from each other, which you are manufacturing in this manner all day long, without knowing anything about it. And a very fortunate thing this is for you: for I do not know what would become of you if you had to be thinking from morning to night of all that requires to be done in your body, as your mother has to look after and remember all that has to be done in the house. Just think what a relief it would be to her to possess a machine which should sweep

the rooms, cook the dinners, wash the plates, mend torn clothes, and keep watch over everything without giving her any trouble; and, moreover, make no more noise or fuss than yours does, which has been working away ever since you were born without your ever troubling your head about it, or probably even knowing of its existence! Just think of this and be thankful.

But do not think that you are the only possessor of a magical machine of this sort. Your kitten has one also, and the ox we were speaking of, and all other living creatures. And theirs render the same service to them that yours does to you, and much in the same way; for all these machines are made after one model, though with certain variations adapted to the differences in each animal. And, as you will see by-and-by, these variations exactly correspond with the different sort of work that has to be done in each particular case. For instance, where the machine has grass to act upon, as in the ox, it is differently constructed from that in the cat which has to deal with meat and mice. In the same way in our manufactories, though all the spinning-machines are made upon one model, there is one particular arrangement for those which spin cotton, another for those which spin wool, another for flax, and so on.

But, further:

You have possibly noticed already, without being told, that all animals have not all had the same advantages bestowed on them. The dog, for instance, that loving and intelligent companion, who almost reads your thoughts in your eyes,

and is as affectionate and obedient to his master as it were to be wished all children were to their parents — this dog is very superior in many ways to the frog, with its large goggle eyes and clammy body, hiding itself in the water as soon as you come near it. But again, the frog, which can come and go as it likes, is decidedly superior to the oyster, which has neither head nor limbs, and lives all alone, glued into a shell, in a sort of perpetual imprisonment.

Now the machine I have been telling you about is found in the oyster and in the frog as well as in the dog, only it is less complicated, and therefore less perfect in the oyster than in the frog; and less perfect again in the frog than in the dog; for as we descend in the scale of animals we find it becoming less and less elaborate—losing here one of its parts, there another, but nevertheless remaining still the same machine to all intents and purposes; though by the time it has reached its lowest condition of structure we should hardly be able to recognize it again, if we had not watched it through all its gradations of form, and escorted it, as it were, from stage to stage.

Let me make this clear to you by a comparison.

You've probably seen an old fashioned oil lamp. Take off first the shade, then the glass which prevents it smoking, then the little chimney which holds the wick and drives the air into the flame to make it burn brightly. Then take away the screw, which sends the wick up and down; undo the pieces one by one, until none remain but those absolutely

necessary to having a light at all—namely, the receptacle for the oil and the floating wick which consumes it.

Now if any one would hear you say, "Look at my lamp," what would he reply? He would most likely ask, "What lamp?" — for there would be very little resemblance to a lamp in that mere ghost of one before him.

But to you, who have seen the different parts removed one after another, that wick soaked in oil will still be the lamp to you, however divested of much that made it once so perfect, and however dimly it may shine in consequence.

And this is exactly what happens when the machine we are discussing is examined in the different grades of animals. The person who has not followed it through its changes and reductions cannot recognize it when it is presented to him in its lowest condition; but anyone who has carefully observed it throughout, knows that it is, in point of fact, the same machine still.

This, then, is what we are now going to look at together. We will study first, piece by piece, the exquisite machine within ourselves, which is of such unceasing use to us as long as we do not give it more than a proper share of work to perform. Do you understand? We will see what becomes of the mouthful of bread which you place so coolly between your teeth, as if when that was done nothing further remained to be thought about. We will trace it in its passage through every part of the machine, from beginning to end. It will therefore be simply only the *History of a*

Mouthful of Bread I am telling you, even while I seem to be talking of other matters; for to make that comprehensible I shall have to enter into a good many explanations.

And once you thoroughly understand the history of what you eat yourself, we will look a little into the history of what animals eat, beginning by those most like ourselves, and going on to the rest in regular succession downwards. And while we are on the subject, I will say a word or two on the way in which vegetables eat, for, as you remember, I have stated that they do eat also.

Do you think this is likely to interest you, and be worth the trouble of some thought and attention?

Perhaps you may tell me it sounds very tedious, and like making a great fuss about a trifle; that you have all your life eaten mouthfuls of bread without troubling yourself as to what became of them, and yet have not been stopped growing by your ignorance, any more than the little cat, who knows no more how it happens than you do.

True, but the cat is only a little cat, and you are a human child. Up to the present moment you and she have known, one as much as the other on this subject, and on that point you have therefore had no superiority over her. But she will never trouble herself about it, and will always remain a little cat. You, on the contrary, are intended by God to become something more in intelligence than you are now, and it is by learning more than the cat that you will rise above her in this respect. To learn, is the duty of all men,

not only for the pleasure of curiosity and the vanity of being called learned, but because in proportion to what we learn we approach nearer to the destiny which God has appointed to man, and when we walk obediently in the path which God himself has marked out for us, we necessarily become better.

It is sometimes said to grown-up people, that it is never too late to learn. To children one may say that it is never too early to learn. And among the things which they may learn, those which I want now to teach you have the double merit of being, in the first place amusing, and afterwards, and above all, calculated to accustom you to think of God, by causing you to observe the wonders which He has done. Sure am I that when you know them you will not fail to admire them; moreover I promise your mother that you will be all the better, as well as wiser, for the study.

II

THE HAND.

At the foot of the mountains from where I write to you, when we want to show the country to a stranger, we begin by making him climb one of the heights, whence he may take in at a glance the whole landscape below, all the woods and villages scattered over the plain, even up to the blue line of the Rhine, which stretches out to the distant horizon. After this he will easily find his way about.

It is to the top of a mountain equally useful that I have just led you. It has cost you some trouble to climb with me. You have had to keep your eyes very wide open that you might see to the end of the road we had to go together. Now then, let us come down and view the country in detail. Then we shall go as if we were on wheels.

And now let us begin at the beginning:

Well, doubtless, as the subject is eating, you will expect me to begin with the mouth.

Wait a moment; there is something else first. But you are so accustomed to making use of it, that you have never given it a thought, I dare say.

It is not enough merely that one should have a mouth; we must be able to put what we want within it. What would you do at dinner, for instance, if you had no hands?

The hand is then the first thing to be considered.

I shall not give you a description of it; you know what it is like. But what, perhaps, you do not know, because you have never thought about it, is, the reason why your hand is a more convenient, and consequently more perfect, instrument than a cat's paw, for instance, which yet answers a similar purpose, for it helps the cat to catch mice.

Among your five fingers on each hand, there is one which is called the thumb, which stands out on one side quite apart from the others. Look at it with respect; it is to these two little bones, covered over with a little flesh, that man owes part of his physical superiority to animals. It is one of his best servants, one of the noblest of God's gifts to him. Without the thumb three-fourths (at least) of human arts would yet have to be invented; and to begin with, the art not only of carrying the contents of one's plate to one's mouth, but of filling the plate (a very important question in another way) would, but for the thumb, have had difficulties to surmount of which you can form no idea.

Have you noticed that when you want to take hold of anything (a piece of bread, we will say, as we are on the subject of eating), have you noticed that it is always the thumb who puts himself forward, and that he is always on one side by himself, whilst the rest of the fingers are on the other? If the thumb is not helping, nothing remains in your hand, and you don't know what to do with it. Try, by way of experiment, to carry your spoon to your mouth without putting your thumb to it, and you will see what a long time it will take you to get through a poor little plateful of broth. The thumb is placed in such a manner on your hand that it

can face each of the other fingers one after another, or all together, as you please; and by this we are enabled to grasp, as if with a pair of pincers, whatever object, whether large or small. Our hands owe their perfection of usefulness to this happy arrangement, which has been bestowed on no other animal except the monkey.

I may even add, while we are about it, that it is this which distinguishes the hand from a paw or a foot. Our feet, which have other things to do than to pick up apples or lay hold of a fork, also each five fingers (well, actually, they are toes, but you get the comparison), but the largest cannot face the others; it is not a thumb, and it is because of this that our feet are not hands. Now the monkey has thumbs on the four members corresponding to our arms and legs, and thus we may say that he has hands at the end of his legs as well as of his arms. Nevertheless, he is not because of this better off than we are, but quite the contrary. I will explain this to you presently.

To return to our subject. You see that it was necessary, before saying anything about the mouth, to consider the hand, which is the mouth's purveyor. Before the cook turns on the oven, she must go shopping for something to cook, must she not?

If we were in the habit of giving thought to everything, we would never even gather a nut without being grateful to the Providence which has provided us with the thumb, by means of which we are able to do it so easily.

I hope that I have succeeded in showing you clearly, how absolutely necessary our hand is to us in eating, and why it has the honor to stand at the beginning of the history of what we eat.

It still appears to you, I suspect, that even if you were to lose the use of your hands you would not, for all that, let yourself die of hunger.

This is because you have not attended to another circumstance, which nevertheless demands your notice—namely, that from one end of the world to the other, quantities of hands are being employed in providing you with the wherewithal to eat.

To go on further: Have you any idea how many hands have been put in motion merely to enable you to have your coffee and roll in the morning? What a number, to be sure, over this cup of coffee (which is a trifle in comparison with the other food you will consume in the course of the day); from the hand of the worker who gathered the coffee crop to that of the one who ground the berries, to say nothing of the hand of the sailor who guided the ship which bore them to our shores. Again, from the hand of the laborer who sowed the corn, and that of the miller who ground it into flour, to the hand of the baker who made it into a roll. Then the hand of the farmer who milked the cow, and the hand of the refiner who made the sugar; to say nothing of the many others who prepared his work for him, and I know not how many more.

How would it be, then, if I were to amuse myself by counting up all the hands that are wanted to furnish—

The sugar-refiner's manufactory,
The dairy farmer's barn,
The baker's oven,
The miller's mill,
The laborer's plow,
The sailor's ship?

And even now is there nothing we have forgotten? Ah, yes! the most important of all the hands to you; — the hand which brings together for your benefit the fruits of the labor of all the others—the hand of your dear mother, always active, always ready, that hand which so often acts as yours when your own is awkward or idle. Let's not also forget the hands of your father, perhaps your mother also, who goes to work each day to make the money needed to purchase that bread for you to eat.

Now, then, you see how you might really manage to do without those two comparatively helpless little paws of yours (although there is a thumb to each), without suffering too much for want of food. With such an army of hands at work, in every way, to furnish provision for that little mouth, there would not be much danger.

But cut off your cat's fore paws—oh dear! what am I saying? Suppose, rather, that she has not got any, and then count how many mice she will catch in a day. The milk you

give her is another matter, remember. Like your cup of coffee, that is provided for her by others.

Believe me, if you were suddenly left all alone in the woods, like those pretty squirrels who nibble nuts so daintily, you would soon discover, from being thus thrown upon your own resources, that the mouth is not the only thing required for eating, and that whether it be a paw or a hand, there must always be a worker, or many workers, for Mr. Mouth, and to provide him with food.

Happily, we are not driven to this extreme. We take hold of our biscuit between the thumb and forefinger, and behold it is on its road—Open the mouth, and it is soon done!

But before we begin to chew, let us stop to consider a little.

The mouth is the door at which everything enters. Now, to every well-kept door there is a doorkeeper, or porter. And what is the office of a well-instructed porter? Well, he asks the people that present themselves, who they are, and what they have come for; and if he does not like their answers, he refuses them admittance. We too, then, need a porter of this sort in our mouths, and I am happy to say we have one accordingly. I wonder whether you know him? You look at me quite aghast! Oh, ungrateful child, not to know your dearest friend! As a punishment, I shall not tell you who he is today. I will give you until tomorrow to think about it.

Meanwhile, as I have a little time left, I will say one word more about what we are going to look at together. It would

hardly be worth while to tell you this pretty story which we have begun, if from time to time we were not to extract a moral from it. And what is the moral of our history today?

It has more than one.

In the first place it teaches you, if you never knew it before, that you are under great obligations to other people, indeed to almost everybody, and most of all perhaps to people whom you may be tempted to look down upon. This laborer, with his coarse clothes and heavy shoes, is the very person who, with his rough hand, has been the means of procuring for you half the good things you eat. That workman, with turned-up sleeves, whose dirty fingers you are afraid of touching, has very likely blackened and dirtied them in your service. You owe great respect to all these people, I assure you, for they all work for you. Do not, then, think yourself above them—you who are of no use in any way at present, who want everybody's help yourself, but as yet can help nobody.

Not that I mean to reproach you by saying this. Your turn has not come yet, and everybody began like you originally. But I do wish to impress upon you that you must prepare yourself to become some day useful to others, so that you may pay back the debts which you are now contracting.

Every time you look at your little hand, remember that you have its education to accomplish, its debts of honor to repay, and that you must make haste and teach it to be very

useful, so that it may no longer be said of you that you are of no use to anybody.

And then, my dear child, remember that a day will come, when the revered hands that now take care of your childhood—those hands which today are yours, as it were — will become weak and incapacitated by age. You will be strong, then, probably, and the assistance which you receive now, you must then render to her, render it to her as you have received it — that is to say, with your hands. It is the mother's hand which comes and goes without ceasing about you, her child now. It is the child's hand which should come and go around the old mother hereafter—her child's hand and not another's.

Here again, my child, the mouth is nothing without the hand. The mouth says, "I love," the hand proves it.